THE SONORAN DESERT

The Sonoran Desert extends over twelve degrees of latitude, from roughly 23° N, on the tip of Baja California, to 35° N, on the border between Arizona and California on the Colorado River. More than two-thirds of its total area lies within Mexico in two separate areas: One section occupies two-thirds of Baja California, and the other portion covers more than half the state of Sonora. In the United States, the Sonoran occurs in extreme southeastern California and in the southern third of Arizona, especially in the southwestern quarter. In an altered form, with fewer species, it also occurs in scattered patches virtually to the Arizona–New Mexico border.

The Sonoran is a young desert. In its current form it has probably existed for no more than 10,000 years. Despite its youth, the Sonoran is the most complex of any of our desert types—complex in the sense that a great diversity of species can be found within its boundaries and also in its general structure, both biological and geological. Surface features include sedimentary, metamorphic, and volcanic rocks that vary widely in age. The Precambrian rock outcroppings in the northern parts of the desert (between 33 and 35° latitude in Arizona) are about two billion years old. Certain lava fields, including the Pinacate region of northern Mexico along the United States border, were formed mainly 100,000 years ago, yet experienced eruptions as recently as 1300 years ago.

While the diversity of plant and animal life in the Sonoran can in part be accounted for by its unique geologic history—the working and reworking of the rocks by water and wind, and the development of soil complexes on slopes and in the basins—geological substrates are not the only explanation.

The Sonoran is a subtropical desert. Tropical and subtropical locations tend to have more plant and animal species, in areas of comparable size, than do more temperate habitats, and the Sonoran is no exception.

Further, the Sonoran's biseasonal pattern of rainfall promotes the existence of more species than in our other deserts. This is just what one might anticipate. If the Mojave Desert can have winter annuals in response to the long-duration, low-intensity winter rains, and if the Chihuahuan can have summer annuals in response to the high-intensity, short-duration summer rains, then the Sonoran should be expected to have a number of annuals of each type.

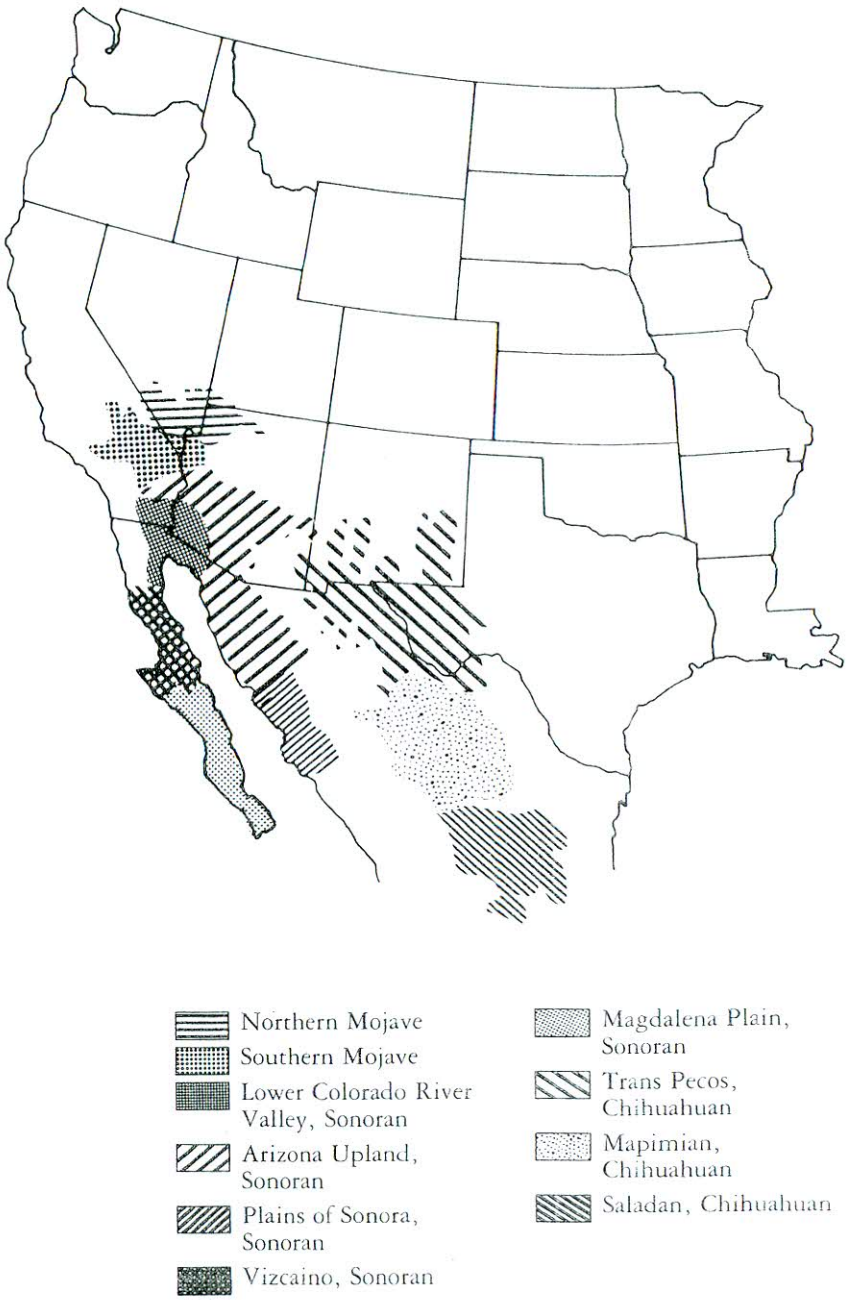
The Sonoran's diversity is more than a diversity of species. The plants come in more shapes and sizes on average Sonoran Desert sites than on average sites in other deserts. Large, tall, columnar cacti such as Saguaros tend to dominate the horizon. Their prominence sometimes masks the presence of other cactus forms. Add to this the presence of several species of very tall, single-stemmed shrubs (called subtrees—palo verde is an example) and you begin to get an idea of the structural diversity of Sonoran plant communities.

Saguaro
Cereus giganteus
331

Plant Life

A number of interpretations of Sonoran Desert biogeography have been proposed. The system presented by the eminent

Hot Desert Subdivisions



desert ecologist Forrest Shreve in 1951 is used here. Shreve described the Sonoran as containing seven subdivisions; of these, only two occur in the United States.

The largest subdivision in this country is the Lower Colorado River Valley. This area includes all of the Sonoran Desert in California, as well as the portions in western Arizona. In essence this subdivision forms a U-shaped section from 29½° N latitude in Baja California that extends up and around the head of the Gulf of California and back down along the coast of Sonora to 29° N. Based on the plants occupying it, the subdivision has been given a variety of names. It has been called the microphyllous (small-leaved) desert because many of its plants have leaves of reduced size, an adaptation to decreased water loss. It has also been called the *Larrea-Franseria* region, because Creosote Bush and White Bur Sage (now placed in the genus *Ambrosia*, but previously in the genus *Franseria*) dominate the valley floors, accounting for up to ninety percent of all the plant cover. Typical of this subdivision are areas close to Phoenix and those south on I–10, areas around Yuma on I–8 from Gila Bend to the border, and any Sonoran locality in California.

Creosote Bush
Larrea tridentata
342

White Bur Sage
Ambrosia dumosa
355

The open valley floors of this region, dominated by the same association that typifies much of the Mojave Desert—White Bur Sage and Creosote Bush—can be quite monotonous. In some areas Bur Sage replaces White Bur Sage. If there is a large amount of sand in the soils here, Creosote Bush drops out. When this occurs, a grass, Big Galleta, may be common, along with Indigo Bush and a Mormon Tea, *Ephedra trifurca*, which like many other *Ephedras* can stabilize loose sandy soils, forming pedestals. This species is also widely distributed and common in the Chihuahuan. Of the cacti, the most obvious forms are the chollas, such as Pencil Cholla and several larger species. Many places support *Atriplex* species, as well as mesquite (*Prosopis*); in Arizona this is often Velvet Mesquite. Most of the shrubs on the valley floors are evergreens (mesquite is a rather obvious exception). In wet years, however, these ordinarily dull looking sites can produce more than sixty species of annuals, including Desert Sand Verbena, Desert Sunflower, and numerous species of evening primroses (*Camissonia*) and cryptanthas (*Cryptantha*).

Bur Sage
Ambrosia deltoidea
360

Big Galleta
Hilaria rigida

Indigo Bush
Psorothamnus schottii

Mormon Tea
Ephedra spp.
364

Pencil Cholla
Opuntia ramosissima

Velvet Mesquite
Prosopis velutina
310

Since the valley floors are crossed by runoff from the surrounding mountains and bajadas, they are often covered by intricate patterns created by rills. Such areas, with slightly greater moisture available, can increase the plant diversity by permitting species with high water requirements, such as Graythorn, burrobush, (*Hymenoclea*), or lycium (*Lycium*), to become established (plate 15).

Desert Sand Verbena
Abronia villosa
53

Desert Sunflower
Geraea canescens
135

Graythorn
Ziziphus obtusifolia

In California and some parts of Arizona you are likely to see the gray pads of the Beavertail Cactus, and if you are lucky, you may see its brilliant red-magenta flowers. Be careful, however! Beavertail does not have obvious spines so it is often touched by the unwary. To their surprise, the tufts of rusty, hairlike, barbed structures called glochids, which are on the pads, embed themselves painfully into the skin.

Beavertail Cactus
Opuntia basilaris
41

As you ascend the bajada, the plant diversity picks up rapidly. Blue Palo Verde, a subtree, can be locally common (plate 12), often in association with bur sages. Ocotillo, a tall multi-stemmed species, occurs on the slopes and is often mixed with one of the more evident and widespread of the chollas, Golden Cholla (plate 10). It is in these upper bajada areas that you are most likely to see the Barrel Cactus and the stately Saguaro. Even the Desert Ironwood, a subtree less common than the palo verdes, may be abundant on upper bajadas (plate 13). Two additional conspicuous species are the incredibly densely spined Teddybear Cholla and the low growing Hedgehog Cactus. In these areas, you will also see the Desert Agave. Its flower stalk may be more than eighteen feet tall.

Blue Palo Verde
Cercidium floridum
301, 316

Ocotillo
Fouquieria splendens
335

Golden Cholla
Opuntia echinocarpa

Barrel Cactus
Ferocactus acanthodes
122

Desert Ironwood
Olneya tesota
319

Teddybear Cholla
Opuntia bigelovii
332

Hedgehog Cactus
Echinocereus engelmannii

Desert Agave
Agave deserti

A careful look among the rocks on the uppermost portions of the bajada will reveal a surprising diversity of smaller perennials. Desert ferns and spike mosses can be found at some localities, especially in the shade of rocks.

Many spectacular sand dune areas occur in the Lower Colorado River subdivision. Visits to places like the Algodones dunes in California (only a few miles from Yuma, Arizona) will add a great number of sand dune endemics to your life list of plants. One of the more spectacular of these may resemble a stand of mushrooms or dried feces. This plant, *Ammobroma sonorae*, is a parasite on six other plant species. Its bloom consists of dozens of tiny purple flowers covering the fleshy mound that sits on the sand surface. While the species is rare today, in the past it was commonly eaten by Indians. In fact, it was first discovered by scientists in the 1850s, when it was served to them for dinner by Sand Papago Indians.

Other specialized habitats contain some interesting and attractive plants. Washes of various types are always good bets for finding unusual plants. Rocky washes contain plants like *Trixis californica*, a shrub with yellow flowers, while sandy washes are home to two species, *Justicia* (*Beloperone*) *californica* and *Anisacanthus thurberi*, both of which have the common name Chuparosa (Spanish for hummingbird) and whose bright red, tubular flowers draw hummingbirds. Also found here are Desert Lavender and Sweetbush.

Trixis
Trixis californica
106

Chuparosa
Beloperone californica
160

Desert Lavender
Hyptis emoryi

Sweetbush
Bebbia juncea

The second subdivision of the Sonoran Desert in the United States is the Arizona Upland Division, an area also called the palo verde cacti desert. This subdivision is often used for movie locations and frequently shows up in "beautiful" desert pictures in magazines around the world. Often there are shrubs of various heights: one vegetation layer is less than eighteen inches high; another is about three feet tall; and there is an upper layer of subtrees. Superimposed is a mixture of cactus types, including the dominant, majestic Saguaro—the trademark of the Sonoran Desert. This subdivision forms the eastern boundary of the Sonoran in Arizona and in Sonora, Mexico. It is a rather narrow band, less than a third the area of the Lower Colorado River Valley subdivision. The area around Tucson, Organ Pipe Cactus National Monument, and many areas of the Tonto National Forest east of Phoenix are excellent places to see this habitat. Try stopping for a few hours at the

Buckthorn Cholla
Opuntia acanthocarpa

Cane Cholla
Opuntia spinosior

Jumping Cholla
Opuntia fulgida
325

Prickly Pear Cactus
Opuntia phaeacantha

Desert Christmas Cactus
Opuntia leptocaulis
162

Night-blooming Cereus
Cereus greggii
87

Fishhook Cactus
Mammilaria microcarpa
39

Fishhook Barrel Cactus
Ferocactus wislizenii

Organ Pipe Cactus
Cereus thurberi

Senita
Cereus schottii

Purple Martin
Progne subis
577, 578

Gila Woodpecker
Melanerpes uropygialis
565

Boyce Thompson Southwestern Arboretum at Superior, Arizona. Here you may see the natural desert communities, as well as a collection of Sonoran Desert plants from the other desert subdivisions. Similarly good plant collections can be found at the Desert Botanical Garden in Phoenix. And, of course, no place can match the Arizona-Sonora Desert Museum in Tucson in its rich collection of plants, animals, geological exhibits, and other desert interests.

The diversity of cacti in the Arizona Upland cannot be overemphasized. All forms are abundant. Chollas include the abundant, highly variable Buckthorn Cholla, the Cane Cholla with its characteristic gray spines, and the Jumping Cholla, a species whose fruits may accumulate over a period of years, thus forming chains. Four or five chollas may occur in close proximity to one another, and when this happens, hybridization may occur. Another abundant cactus is the Prickly Pear, a species common in all of our hot deserts. Several low chollalike forms also occur. Desert Christmas Cactus and Pencil Cholla are two; they are often found among or near shrubs such as Creosote Bush. Another common associate of Creosote Bush is the marvelously fragrant, but seldom observed, Night-blooming Cereus. This plant has stems that look like dead sticks or the branches of Creosote Bush. Thus it is well hidden, belying the fact that it has a huge underground tuberous root that is used as a water storage organ. The minute Fishhook Cactus and its relatives are often found under a variety of shrubs. The crowns of small flowers encircling their tops are a desert delight. Barrel cacti, such as Fishhook Barrel, can be very abundant and are often mistaken for young Saguaros even though their spine patterns are very dissimilar. Two large cacti that are more common in Mexico extend into the United States in the vicinity of Organ Pipe Cactus National Monument. Organ Pipe Cactus is by far the more common of the two. The other species, Senita, is less abundant, but shares the same multiple-branched, upright structure as the Organ Pipe.

The star of all these cactus scenarios is the Saguaro (plates 10 and 11). Its commanding presence in the Sonoran Desert not only captures the eye, but is also a focus of animal activity. Woodpeckers, wood rats, Purple Martins, owls, lizards, and other animals make their homes in the Saguaro in cavities originally excavated by woodpeckers, including the Gila Woodpecker. The hole consists of an opening and a downward-positioned chamber. The cactus forms a hardened covering, a callus, over these "injured" surfaces, leaving the cavity lined with a thin, woodlike layer. When a Saguaro dies, these cavity linings sometimes resist decomposition and can be found on the desert surface, where their shoelike appearance gives them the name "Apache boots."

For some years, biologists were shocked at the apparent lack of Saguaro reproduction on some sites in the Southwest, including parts of Saguaro Cactus National Monument near Tucson. This lack of reproduction and a decline in adult populations in some areas were variously attributed to frost

disease, pathogens, animals, or a combination of these agents. A detailed series of studies was conducted by university and park service personnel at the University of Arizona, particularly by Warren F. Steenbergh and Charles H. Lowe. The research suggests that Saguaro is a semitropical species that has only within the last few thousand years moved into more northern climates. In fact, Saguaro is the most northern of the columnar cacti, ranging to 35° 6′ N. The result of this incursion into a northern and less hospitable environment is that when frosts of sufficient intensity and duration occur, many individual plants die. Death can be caused either directly by frost damage, or by pathogens that attack the injured cactus tissues following frost damage. Especially vulnerable are young plants that are less than four years old, and the very old, many-branched giants. Individuals that are unbranched and between eighteen inches and sixteen feet in height suffer the lowest mortality.

The role of native animals in the death of Saguaros is much smaller than once thought. Woodpecker holes have little effect other than to weaken the plant's structure. Attacks by the larvae of a noctuid moth which burrow in the cactus tissue and by woodrats (*Neotoma*) or other mammals may increase the probability of freezing damage, but their actions do not directly kill many cacti.

Grazing by domestic animals, especially cattle, however, does have an important effect. Cattle can remove much of the plant cover on a site, cover that provides protection to young Saguaros while they become established. Without such "nurse plants," the mortality of young Saguaros increases dramatically, especially in areas without rocks, since rocky slopes make it more difficult for cattle to graze.

Once Saguaro is established, the probability of its survival greatly increases with each passing year. The age of a Saguaro can be roughly estimated by its size. A six- to seven-inch specimen is roughly fourteen years old; a six- to seven-foot individual is thirty-five to forty years old. When a Saguaro is twelve to thirteen feet high, it is about fifty years old; it is then that the cactus is ready to begin developing its first arm. An eighteen- to twenty-foot plant is about sixty-five years of age and has one arm, and a cactus that is twenty-five feet tall or taller is more than eighty-five years old—a branched adult. The stately individuals we admire the most are well over one hundred years of age. These older plants are the tallest features of the landscape and are often damaged by lightning.

Although Saguaros are threatened in certain spots, the populations in many places in the United States are very stable, and we are not in any danger of losing these desert monarchs.

In many areas cacti are protected by law, a move necessitated by the massive collecting of cacti for use as house plants. No species is exempt from this pressure: Even large Saguaros are "rustled" to use as landscape accents. For some species, this human influence is more significant than any natural process as a source of possible extinction.

Foothill "Yellow" Palo Verde
Cercidium microphyllum
309, 318

Brittlebush
Encelia farinosa
136

A noncactus dominant of the Arizona Upland subdivision is the Foothill Palo Verde. The Saguaro and the Foothill Palo Verde occur on all sites but the valley floors, and reach high densities on middle to upper bajadas (plates 11 and 14). In the same location, White Bur Sage is replaced by Bur Sage, and Brittlebush can be locally dominant.

While Creosote Bush also occurs in the Arizona Upland, it is not as dominant as in the Lower Colorado River Valley subdivision. Desert Ironwood, another species that occurs in the Lower Colorado River Valley, is much more characteristic of the Arizona Uplands. It is not as widely distributed on slopes as palo verde, probably because it is not as tolerant of cold. Ironwood has many important uses. Its wood is so dense that it does not float in water. This denseness makes it ideal for the production of elegant carvings, though it easily dulls carving tools. The seeds are edible when roasted or when ground. Personally, I prefer Ironwood to mesquite for broiling fish and steaks over a desert campfire.

There are so many other shrubs that can be associated with the "big four" (Saguaro, Bur Sage, palo verde, and Ironwood) that it is difficult to do more than provide a list. Several small leguminous shrubs can attain local dominance. Whitethorn Acacia is one of the more conspicuous, but it is not nearly so attractive as the much smaller, delicately flowered Fairy Duster. The very flexible, reddish branches of Limber Bush attract notice most of the time, especially when they are covered by shiny, bright green, heart-shaped leaves. Also very noticeable is the leathery, gray-green Jojoba. Jojoba has a very large fruit, remotely reminiscent of the lower portion of an acorn. When processed, Jojoba fruits yield an oil of very high quality that can be used for purposes such as high-temperature lubrication, that previously called for the oil obtained from sperm whales. In addition, the meaty portions of the Jojoba fruit may be suitable as feed supplements for farm animals. Because of its potential economic significance, there has been a great deal of research on Jojoba over the past fifteen years. It is currently being planted on an experimental basis in several states and may become an extremely important cash crop in the near future.

Whitethorn Acacia
Acacia constricta

Fairy Duster
Calliandra eriophylla
48

Limber Bush
Jatropha cardiophylla

Jojoba
Simmondsia chinensis
347

Ratany
Krameria parvifolia
56

Desert Buckwheat
Eriogonum fasciculatum
359

Paperflower
Psilostrophe cooperi
137

Desert Willow
Chilopsis linearis
306

Desert Broom
Baccharis sarothroides

Dock
Rumex hymenosepalus

Canyon Ragweed
Ambrosia ambrosioides

Desert Hackberry
Celtis pallida

Mexican Jumping Bean
Sapium biloculare

Mixed in with these other shrubs is Ratany, a plant with finely divided grayish stems and bright purple flowers. Desert Buckwheat also grows in local abundance. Add to this a lycium (*Lycium*), a zinnia (*Zinnia*), Paperflower, and one of several other shrubs, and the potential complexity of the area will become apparent.

Where washes dissect the land surface, a whole new complex of vegetation exists. Here burrobush (*Hymenoclea*), Desert Willow, and Desert Broom are dominants. These same species also commonly occur along the edges of roads where road surface runoff simulates wash conditions.

Sandy washes may harbor the large-leaved, but low growing, Dock or the Canyon Ragweed, another large-leaved species, but one that is more erect. Edges of washes sometimes contain Desert Hackberry and Mexican Jumping Bean, usually without an insect (the larva of the moth *Carpocapsa saltitans*) to make the fruit of this shrub, the "beans," jump.

The five subdivisions of the Sonoran Desert that do not reach the United States contain an especially rich variety of species and some striking new forms. Along the coast of Sonora and the east coast of Baja California lies the Central Gulf Coast subdivision. This area is dominated by subtrees of the genus *Bursera* and by various species of *Jatropha*. The smaller layer of shrubs (up to eighteen inches tall) characteristic of many of our desert sites is generally absent, and Creosote Bush is only locally abundant. One species typical of this subdivision, Elephant Tree, extends into the United States all the way to mountain slopes near Phoenix. This magnificent species, a subtree, resembles a bonsai tree. Rich golden, exfoliating bark covers the lower parts of its trunk, while its branch tips are a deep reddish brown; its compound leaves are a beautiful green. Although its flowers are inconspicuous, the odor of this magnificent plant is highly pungent.

Elephant Tree
Bursera microphylla
312, 315

The Central Gulf Coast subdivision also contains more species related to ocotillo (*Fouquieria*). Among these are the remarkable Boojum Tree, a gray, spiny species that is more than thirty feet tall and resembles an upside-down carrot. It is not easy to find the Boojum on the mainland portion of Sonora, though it does occur on the slopes near the ocean. It is more accessible in Baja California, where it occurs as a highly conspicuous dominant in the Vizcaino subdivision.

Boojum Tree
Fouquieria columnaris

The Vizcaino subdivision extends from 26 to 30° N, occupying the western two-thirds of the peninsula. Here eerie landscapes, dominated by a variety of large agaves—especially Maguey—many yuccas, Boojum, and a columnar cactus, the Cardon, form architecturally complex scenes. Probably the world's largest cactus, Cardon replaces Saguaro here; they resemble one another, but Cardon has more, and longer, arms. Interestingly, despite the aridity of this subdivision, many of the large plants are covered with a Ball Moss much as one would expect in a more tropical environment. This is due to the presence of humid Pacific Ocean air, which these plants use as a water source.

Maguey
Agave shawii

Cardon
Cereus pringelei

Ball Moss
Tillandsia recurvata

Further south on the west coast of the Baja California Peninsula is the Magdalena Plain subdivision. Gone are the Boojum, the Maguey, and many other treelike forms. Some remain, however, and a few new ones occur. These include different mesquites (*Prosopis*), more Ocotillo relatives, and yet another *Bursera*. There are many large columnar cacti and a moderate number of medium-size shrubs.

The last two subdivisions show more clearly the subtropical affinities of the Sonoran. The Plains of Sonora subdivision is a small area wedged between the Central Gulf Coast subdivision on the west and the southern extension of the Arizona Uplands subdivision on the east. Here the genera are much like those of the Arizona Uplands division and in general appearance it resembles the Arizona Uplands division as well. The ground, however, is more open and supports fewer cacti and a smaller variety of shrubs. In general, it looks like an open woodland.

Mexican Palo Verde
Parkinsonia aculeata
307, 322

Tree Ocotillo
Fouquieria macdougalii

Mexican Palo Verde, commonly planted in Arizona, is native here, as is the unusual Tree Ocotillo. Many tropical trees extend into the area, but are not as dominant as they are in the last, most southern subdivision, the Sonora Foothills.
The Sonora Foothills division is dominated by a complex variety of subtrees. Indeed this vegetation form is so prevalent that some biologists consider the subdivision to belong to a tropical thornscrub series rather than to the desert. The diversity of subtropical trees in this subdivision shows the derivation of the subtree component of the vast area of the Sonoran Desert as a whole. Desert subtrees originated in the south, and their northward distribution into the United States is primarily determined by favorably warm temperatures.
The Sonoran Desert has many vegetation transitions. At its upper elevation, it meets grassland and a complex of junipers and oaks. Along its northern border in Arizona, the transition is marked by the presence of a characteristically transitional subtree, the Crucifixion Thorn. At a distance this species looks like palo verde with darker bark and it replaces palo verde as a codominant with Creosote Bush. In some places where the Mojave and Sonoran deserts meet at the Sonoran's upper elevational limits (at numerous places along US-83 between Wickenburg, Arizona, and I-40, for example), you can see plants of the grassland transition such as agaves, yuccas, and bear grass (*Nolina*) mixed in with Saguaros, Joshua-tree, junipers, Crucifixion Thorn, and a host of other species. These transitions can easily confuse the naturalist inclined toward tidiness and clarity of habitat boundaries.
The eastward plant transitions of the Sonoran Desert with the Chihuahuan are subtle. The visual dominants, such as Saguaro and palo verde, do not reach the Arizona–New Mexico border, but many plant species of lesser stature do. Given the plant distributions and the fact that the two desert faunas meet on the state boundaries, it is fair to say that the two deserts "switch over" virtually at the state borders.

Crucifixion Thorn
Canotia holacantha
314

Animal Life

The animals of the Sonoran Desert are as diverse as the plants. Unlike the plants, however, their occurrence does not coincide so neatly with subdivision boundaries or even with the more clearly defined boundaries of the four major desert vegetation types. Thus many species occur in all four desert types, including the seven subdivisions of the Sonoran.

Invertebrates

The Sonoran Desert's invertebrates are probably no more numerous than in other deserts, but they are often more conspicuous, in part because their diversity includes colorful or bizarre forms. Scorpions can be quite common, though they are not encountered often in the daytime. If you want to see them, a night trip with a black-light can be quite rewarding. The cuticle of many species of scorpions fluoresces under black-light, much like many minerals.
The scorpion's method of operation is to sit and wait for its prey to amble by, then grab it with pincerlike front appendages called pedipalps. Thus held, the prey is stung and devoured. The pedipalps are also used during "courtship." Males grasp the pedipalps of females and "dance" around. This dance actually represents the search for a suitable substrate upon which the male can deposit a sperm package, or spermatophore. Subsequently the female is pulled over the spermatophore, picking the package up with her genital opening; thus mating is accomplished.
Scorpion stings can be quite painful. Large species like the Giant Desert Hairy Scorpion may inflict damage simply because of the size of the "stinger." Most species, however, are of little consequence. Unfortunately, one potentially dangerous genus, *Centruroides*, does occur, in the Sonoran Desert of Arizona; stings from these animals, especially *Centruroides sculpturatus*, deserve immediate medical attention. Unlike many other common desert scorpions, *Centruroides* scorpions do not burrow. They hide by moving beneath stones or between the bark and wood of dead trees. Because they cling to such surfaces, extreme caution should be exercised when picking up firewood or turning over stones. Simply looking on the ground to avoid danger is not enough: The scorpion could be on the stone or the wood in your hand. In Arizona, mortality from scorpion stings is extremely rare. This is not the case in Mexico, where there are more types of dangerous scorpions and where scorpions with more toxic venoms occur.
Solpugids also inhabit the Sonoran. Like scorpions, which they resemble, these fast-moving creatures are nocturnal, but they can be found under objects on the ground during the day. At night you will occasionally see them under the lights of restrooms in campgrounds where they are hunting insects. They have powerful "jaws" and can inflict an unpleasant, though harmless, bite.
Spiders are common in deserts. After rains, roads may be alive with tarantulas (*Aphonopelma*). The ground surface is home to other species, such as the large Carolina Wolf Spider and the Desert Brown Spider or another species in this genus. Shrubs may harbor a variety of species, including jumping spiders, whose large eyes and often bright, sometimes metallic colors make them a surprising joy to find.
Most desert visitors fear the spiders and scorpions that conventional wisdom tells us are lurking out there. In fact, few accidents occur as a result of encounters with these animals. In all my years of sleeping on the ground in desert areas, I have never encountered a scorpion among my personal items. However, caution is certainly advised.
The beasts that cause the most discomfort in deserts are ants. Desert areas usually contain numerous ant species, any one of which can provide a surprise nip. As you move from Creosote Bush flats across a wash dominated by mesquite and acacia, and then up a bajada into an area with Saguaros and subtrees, you might easily encounter twenty to thirty ant species. Like the plants, ants can have habitat preferences that are narrowly

Giant Desert Hairy Scorpion
Hadrurus arizonensis
395

Carolina Wolf Spider
Lycosa carolinensis
401

Desert Brown Spider
Loxosceles deserta

Rough Harvester Ant
Pogonomyrmex rugosus
387

Spine-waisted Ants
Aphaenogaster spp.
385

Texas Carpenter Ant
Camponotus festinatus
388

Little Black Ant
Monomorium minimum
386

restricted or quite wide. The Rough Harvester Ant occurs on the *Larrea* flats and edges of the wash. Its range coincides with that of the Spine-waisted Ant. The Texas Carpenter Ant avoids the flats but occurs from the washes all the way up the bajada, a distribution that complements the preferred habit of the first two species. In contrast to the rather wide distributions of these other species, the Little Black Ant occurs only in the washes. Other species occur in equally defined patterns, broad or narrow.

Many of the ant species living in deserts have morphological specializations called psammophores that allow them to move sand. In the Rough Harvester Ant the task is accomplished with a ring of inward-facing hairs behind the mouth, while in honey ants (*Myrmecocystus*) some of the mouth parts are modified with a fringe to form a sand-moving basket.

Many other hymenopterous insects occur in deserts. Bees are common. Some eighty-four species in eight families occur on *Larrea* alone.

Wasps, flies, and beetles are abundant when flowers are in bloom and some groups can be observed at all times, with or without flowers. Particularly obvious at times are the blister beetles of the family Meloidae. These beetles get their common name for their habit of emitting "blood" from their knee joints and other parts of their bodies when they are alarmed. This fluid can cause painful blisters on your skin. Genera such as *Lytta* are common on flowers, but should not be handled, even though some species are strikingly attractive.

As is the case in all our deserts, grasshoppers and their relatives are abundant and conspicuous because of their calls, their often bright wing colors, and their sometimes very noisy flight. When they alight, however, many species disappear because they are so cryptically colored. A good example is the Green Valley Grasshopper. In flight this large green grasshopper is quite noticeable. When it lands on a palo verde, though, its green blends in well with the tree's green bark and branches, and it is difficult to find.

Green Valley Grasshopper
Schistocerca shoshone
367

Generally speaking, the more plant species you find on a desert site, the more grasshopper species you will find, regardless of which desert you visit. The relationship, however, is not one-to-one: Adding one plant species to a community does not necessarily add one grasshopper. The ratio in the Sonoran Desert, for example, is closer to one additional grasshopper for each additional two plant species.

Termites are also common and important components of Sonoran Desert ecosystems. Although they are rarely obvious, the tubes of soil that they construct on or around dead wood and grass clumps signal their presence.

Fish

A list of all the freshwater fishes that live in the Sonoran Desert, including Mexico, would contain more than eighty species. Many of these are introduced or not specifically characteristic of the deserts. Several species, however, are true desert forms. The one most likely to be observed is the Desert Pupfish. This species occurs in a number of sites, but one of the most pleasant places to observe it is at Quitoboquito Springs in Organ Pipe Cactus National Monument, Arizona.

Desert Pupfish
Cyprinodon macularius
293

Amphibians and Reptiles

Amphibians are not overly abundant in the Sonoran Desert. The six species you are most likely to see are best observed following a heavy summer rain, when a nighttime drive down a little-traveled desert road with your windows down and your eyes open can be quiet rewarding. The loud sound of a hoarse snore or a plaintive cry will usually lead you to a ditch or temporary pond where you will find spadefoot toads. The "snorer" is the Western Spadefoot, which typically calls while floating on the water surface. The crying comes from Couch's Spadefoot, a species similarly tolerant of dry conditions.

A more harsh, explosive clatter may indicate the presence of the Great Plains Toad, which can occur in numbers sufficient to make you fear for your hearing. Two other very attractive toads have more musical trills. The Red-spotted Toad is particularly common in rocky areas, while the Sonoran Green Toad, with its attractive green skin marked with a network of black, is more likely to be found at the edges of a temporary body of water that is surrounded by grasses or shrubs. The giant you see on the road in southern Arizona is the magnificent Colorado River Toad. This species is usually olive drab in color and has a white wart near the angle of its jaw. These animals do not usually stray too far from permanent water, but can be found on the flats on rainy nights. Along certain streams you might see the Canyon Treefrog among the rocks.

Western Spadefoot
Scaphiopus hammondi
276

Couch's Spadefoot
Scaphiopus couchi
274

Great Plains Toad
Bufo cognatus
283

Red-spotted Toad
Bufo punctatus
278

Sonoran Green Toad
Bufo retiformis
284

Colorado River Toad
Bufo alvarius
281

Canyon Treefrog
Hyla arenicolor
272

Reptiles, especially lizards, are abundant and easy to find in the Sonoran. The Desert Tortoise can be seen travelling at an ambling pace before the sun gets too hot, or during the heat of the day it may be spotted resting in a shallow depression beneath a shrub. The ever-present Side-blotched Lizard seems to be almost everywhere, as is the Western Whiptail. The Whiptail can often be seen turning over pieces of wood with its head, then eating the insects that it uncovers.

Desert Tortoise
Gopherus agassizi
169

Side-blotched Lizard
Uta stansburiana
202

In rocky areas, carefully search crevices for the Chuckwalla. Also among the rocks you may see either the spectacularly beautiful Collared Lizard or its near relative the Longnose Leopard Lizard. Leopard Lizards often can be found under shrubs. These lizards are somewhat plain in color; when the females are carrying eggs, however, they develop large bright orange spots on their bodies.

Chuckwalla
Sauromalus obesus
189

Collared Lizard
Crotaphytus collaris
200, 201

Longnose Leopard Lizard
Gambelia wislizenii
191

In more sandy areas the Desert Iguana can be found, often near Creosote Bushes, where its burrows are frequently located. Both male and female Desert Iguanas develop light pinkish areas along the sides of their bellies during the breeding season. In the same areas, the Zebratail Lizard may race by. If you should happen to catch one, you will be surprised by the beauty of its stomach, which is ivory white and, in the male, marked with ebony black bars against a brilliant blue background.

Desert Iguana
Dipsosaurus dorsalis
188

Zebratail Lizard
Callisaurus draconoides
203

Fringe-toed Lizard
Uma notata
182

Desert Horned Lizard
Phrynosoma platyrhinos

Regal Horned Lizard
Phrynosoma solare
195

Flat-tail Horned Lizard
Phrynosoma mcalli
194

Desert Spiny Lizard
Sceloporus magister
199

Gila Monster
Heloderma suspectum
180

Western Banded Gecko
Coleonyx variegatus
176, 179

Gopher Snake
Pituophis melanoleucus
263

Coachwhip
Masticophis flagellum
223, 229, 230, 233

Western Patchnose Snake
Salvadora hexalepis

Sonoran Whipsnake
Masticophis bilineatus
222

Common Kingsnake
Lampropeltis getulus
234, 246

Longnose Snake
Rhinocheilus lecontei
238, 247

Glossy Snake
Arizona elegans
268

Lyre Snake
Trimorphodon biscutatus
262, 270

Ground Snake
Sonora semiannulata
228, 231, 239

On very sandy areas, such as dunes, the Fringe-toed Lizard, which is perfectly adapted to its habitat, may surprise you as it dashes down the face of a dune, then dives into the sand and squiggles out of sight. Even in places with little vegetation, this species can be locally abundant, and its stomach, often marked with orange, is as spectacular as that of the Zebratail.
Three species of horned lizards might be encountered in the Sonoran Desert. In the western portions, the Desert Horned Lizard is often quite common, especially along washes. The largest of the group, the Regal Horned Lizard, with its large horns, can be found in gravelly to rocky areas in south-central Arizona. The Flat-tail Horned Lizard is limited to fine, windblown sands in extreme southeastern California, southwestern Arizona, and adjacent Mexico.
The Desert Spiny Lizard may be seen in the early morning, often as it climbs a subtree. On the bark of these plants you might also see one of several tree lizards (*Urosaurus*).
The Gila Monster occurs widely in the Arizona portions of the Sonoran Desert. Interestingly, the completely harmless Western Banded Gecko, which occurs along with several other species throughout both the Sonoran and Mojave deserts, is sometimes mistaken for a baby Gila Monster, probably because both species are salmon-colored with dark markings.
As in other deserts, only a few snakes are active during the day during the hottest parts of the year. Day-active snakes in the Sonoran include some of the same ones found in the Mojave, like the Gopher Snake, the Coachwhip, or the Western Patchnose Snake. One diurnal species that does not occur in any other desert is the Sonoran Whipsnake, a species that moves rapidly across the ground and may climb up into bushes or trees.
At night, as the whole desert comes alive, so do the snakes. The desert forms of the Common Kingsnake are active at night, especially following a rainstorm. The brightly banded Longnose Snake is likely to be found along with the Kingsnake, as are the widely distributed Glossy Snake and the Night Snake. The Night Snake is a very inoffensive species; however, it does have a mild venom, as does the larger Lyre Snake. Both species have a pair of grooved fangs at the back of their mouths; hence they are commonly called rear-fanged snakes. Neither species can harm a human, though the Lyre Snake is large enough to inflict a painful bite. Both species have elliptical pupils, a characteristic of truly nocturnal snakes. The Night Snake can occur in almost any habitat in the desert, while the Lyre Snake is usually associated with rocky areas in the higher portions of the Sonoran.
In certain areas a night drive may produce a look at one of a number of small desert specialists not usually encountered because of their secretive habits. Species such as leafnose snakes (*Phyllorhynchus*) are found in sandy to gravelly areas, often where Creosote Bush and palo verde are common. More closely tied to sandy areas or to soils where there is some moisture below the surface is the Ground Snake, a species that exhibits a bewildering array of color patterns. Also in such

Banded Sand Snake
Chilomeniscus cinctus
236

Western Shovelnose Snake
Chionactis occipitalis
235, 237

Sonoran Shovelnose Snake
Chionactis palarostris
240

Arizona Coral Snake
Micruroides euryxanthus
241

Western Blind Snake
Leptotyphlops humilis
226

Rosy Boa
Lichanura trivirgata
219, 224

Sidewinder
Crotalus cerastes
252, 253

Western Diamondback Rattlesnake
Crotalus atrox
256

Mojave Rattlesnake
Crotalus scutulatus
259

Speckled Rattlesnake
Crotalus mitchelli
251, 255

Blacktail Rattlesnake
Crotalus molossus
248

Tiger Rattlesnake
Crotalus tigris
249

areas, but more limited, is the Banded Sand Snake.
Several small snakes with unusual noses might also be encountered. Two species of shovelnose snakes (*Chionactis*) can be found in desert areas that have scant vegetation. The Western Shovelnose is found in sandier areas than the Sonoran Shovelnose.
Following rain, you might sight the beautiful, but venomous, Arizona Coral Snake searching for its secretive prey, the Western Blind Snake. The Coral Snake can be distinguished from other snakes banded with red, yellow-white, and black because the front portion of its head is black and the red band on its body is always separated on each side from the black bands by yellow bands. This latter characteristic has been popularized by a rhyme: Red and yellow, kill a fellow; red and black, friend of Jack. While this alone is a sufficient identifier for snakes in eastern North America, the Sonoran Shovelnose Snake has a banding pattern similar to that of the coral snake, but it has a white front half to its head.
If you are very fortunate, you may happen on to the stocky Rosy Boa. This attractive, mauve-striped snake of rocky areas is one of only two species of true boas that occur in the United States.
While all of these snakes are interesting and often extraordinarily pretty, there are many venomous snakes in the Sonoran Desert that can inflict a painful or even fatal bite. Six rattlesnake species can be found in the Sonoran, and three of these are locally common. In sandy areas the small Sidewinder can be traced by following its characteristic J-shaped tracks in the sand. This species is well camouflaged and can give you quite a start when it rattles close to your feet. The Western Diamondback Rattlesnake is common in a variety of situations, from open flats to rocky hillslopes. The color of this snake often includes a very attractive mauve shade, quite different from the appearance of the same species farther to the east. Looking very much like the Diamondback, but more greenish-yellow in color is the extremely venomous Mojave Rattlesnake. Often found with the Western Diamondback, this species should surely be avoided.
Three less common rattlesnakes also occur here. The Speckled Rattlesnake prefers rocky areas, which it matches by the patterning and coloration of its skin. Also associated with rocky areas, but not to the same extent as the Speckled Rattlesnake, is the beautiful and unaggressive Blacktail Rattlesnake. Blacktails occur up into the mountains to considerable altitudes, and they can often be found on the upper portions of the bajadas with Saguaros and subtrees.
Similarly associated with rocky areas is the Tiger Rattlesnake, which has a rather incongruous appearance because of its small head and large rattle. Many specimens have soft, attractive blue-gray or lavender colors between their "tiger" crossbands.
Rattlesnakes are not out to attack the visitor, but they should be avoided. This is most easily done by not placing your hands or feet where you cannot see them and by watching where you sit.

Black-throated Sparrow
Amphispiza bilineata
610

Gambel's Quail
Callipepla gambelii
547

Greater Roadrunner
Geococcyx californianus
554

Le Conte's Thrasher
Toxostoma lecontei
594

Crissal Thrasher
Toxostoma dorsale

Bendire's Thrasher
Toxostoma bendirei
592

Curve-billed Thrasher
Toxostoma curvirostre
593

Burrowing Owl
Athene cunicularia
559

Mourning Dove
Zenaida macroura
551

White-winged Dove
Zenaida asiatica
550

Common Ground-Dove
Columbina passerina
553

Inca Dove
Columbina inca
552

Birds

Despite the fact that some desert areas, such as Organ Pipe Cactus National Monument, publish lists that include more than 250 bird species seen within their boundaries, typical Sonoran Desert sites generally have fewer than twenty-five breeding bird species.

In the most austere sites, such as a Creosote Bush flat, there may be only a single breeding species, the Black-throated Sparrow. As you move up a bajada into increasingly complex vegetation, especially where there are taller subtrees and columnar cacti, the species list increases. The density of breeding species can be quite low in deserts. On the lower parts of bajadas and on valley plains there may be no birds or just one for each three acres of land.

You may see the Gambel's Quail running on the ground, though it is most common close to springs or in places with succulent vegetation. You might also spot the elusive Roadrunner out on a morning search for lizards. Roadrunners mate for life and have a year-round territory. In some places in Arizona they are known to have two breeding seasons. Nests are built off the ground, in tall shrubs, subtrees, or cacti.

Also running on the ground are the thrashers, smaller birds with long, somewhat down-curved bills. Le Conte's prefers Creosote Bush flats with some chollas for nesting. It feeds on insects found in the litter. The Crissal Thrasher is much more at home in denser vegetation, where it hides quite effectively from the bird enthusiast. This preference of habitat usually limits the species to areas along rivers or in large washes. Both Bendire's and Curve-billed Thrashers also occur in the Sonoran. Although California and New Mexico are included in its range, Bendire's Thrasher is essentially limited to Arizona in terms of the likelihood of viewing it. Unlike other desert thrashers, it is a migratory species. The Curve-billed is by far the most commonly seen thrasher in the Sonoran Desert. It is found nesting in the most complex vegetation types where subtrees, Saguaros, and chollas abound, but can nest in other areas where there are suitable nesting sites, including cities and towns. In some areas of the Sonoran in California you may sight a Burrowing Owl. In Arizona this is not as likely except in the winter; I have seen this bird many times in the summer, however, on desert flats near Phoenix.

You are quite likely to see a variety of doves pecking around on the ground. The Mourning Dove occurs in a wide variety of desert sites, including the flats, while the White-winged Dove is more often seen in the portions of bajadas that have a greater diversity of vegetation. The best nesting sites for White-wings are the mesquite bosques (clumps of trees) along major streams and rivers. On the ground in such riparian situations you may see yet another dove, the Common Ground-Dove. Its bright rufous wings, seen when the bird flies, set it apart from doves other than the Inca Dove, which is much more common in desert cities than in uninhabited areas.

In the shrubs and subtrees look for the domed nest of the Verdin, a very small insect-eating species. Another small bird that coexists with Verdins is the Black-tailed Gnatcatcher. While both species nest in larger shrubs and subtrees, they each have been seen feeding in Creosote Bush, an unusual habit for desert birds, which seem to avoid this shrub, despite its abundance.

Verdin
Auriparus flaviceps
583

Black-tailed Gnatcatcher
Polioptila melanura
588

Ash-throated Flycatcher
Myiarchus cinerascens
573

Say's Phoebe
Sayornis saya
571

Lucy's Warbler
Vermivora luciae

Yellow-rumped Warbler
Dendroica coronata

Northern Mockingbird
Mimus polyglottos
590

Cactus Wren
Campylorhynchus brunneicapillus
584

Ladder-backed Woodpecker
Picoides scalaris
567

Northern Flicker
Colaptes auratus
568

Elf Owl
Micrathene whitneyi
558

Common Raven
Corvus corax
582

Turkey Vulture
Cathartes aura
530

Red-tailed Hawk
Buteo jamaicensis
536, 537

American Kestrel
Falco sparverius
542

The most common desert flycatcher is the Ash-throated Flycatcher, a cavity nester that seeks out holes in plants or even in posts and pipes. One might also see a phoebe, especially Say's Phoebe, or very rarely the Black Phoebe.

Lucy's Warbler occurs on upper portions of bajadas, though it is more common in riparian habitats, where the Yellow Warbler is also found. The Yellow-rumped Warbler—formerly called Audubon's Warbler—a bird of conifer forests, is a very common winter visitor to the Sonoran Desert.

The conspicuous Mockingbird, with its white wing patches, is common in all but the most barren Creosote Bush flats. Its curious habit of singing on moonlit nights suprises some desert visitors. Conspicuous for its noisiness—it has a rather rasping cry—is the Cactus Wren, the state bird of Arizona. Cactus Wrens, while often nesting in chollas, also nest in mesquites and palo verdes; they frequently build dummy nests, a characteristic trait of wrens.

Associated with the Saguaros are three woodpeckers. The loudest and most common of these is the Gila Woodpecker, a species that in the deserts is chiefly confined to areas where the Saguaro abounds, but which can become a pest and inflict serious damage in areas such as orange groves. The Ladder-backed Woodpecker has a more extensive geographic and ecological distribution. Because of its small size, the Ladderback nests in a variety of plants, including yuccas and mesquites; they are true desert woodpeckers, confined to this environment. The gilded race of the Northern Flicker finishes out the trio.

At night, by watching holes in Saguaros made by Gila Woodpeckers, you may see the Elf Owl, the smallest owl in the world. This species has a wide distribution and is not limited to Saguaros, nor even to deserts.

Numerous large birds can be seen perched atop tall plants. The Common Raven and Turkey Vulture are two such birds. In the early morning they may also frequently be seen picking up carrion along desert roads. Red-tailed Hawks are common, and their nests can sometimes be seen in the crotches formed between the arms and trunk of Saguaros. In some places, especially areas wooded by mesquites, you may see the handsome chestnut, black, and white Harris' Hawk. In many desert areas, American Kestrels may be seen catching grasshoppers, often hovering to position themselves above their prey.

Many other birds might be seen in the Sonoran, especially in park areas where there is more lush plant growth to provide a source of food and nesting sites. Many of these species are temporary visitors or opportunists rather than true desert inhabitants.

Coyote
Canis latrans
523, 524

Badger
Taxidea taxus
514

Black-tailed Jack Rabbit
Lepus californicus
509

Desert Cottontail
Sylvilagus audubonii
508

Bighorn Sheep
Ovis canadensis
526

Round-tailed Ground Squirrel
Spermophilus tereticaudus
504

Rock Squirrel
Spermophilus variegatus
505, 506

White-tailed Antelope Squirrel
Ammospermophilus leucurus
499

Harris' Antelope Squirrel
Ammospermophilus harrisii
498

Kit Fox
Vulpes macrotis
521

Merriam's Kangaroo Rat
Dipodomys merriami
485

Desert Kangaroo Rat
Dipodomys deserti
484

Mammals

In the Sonoran, mammals, especially small species, tend to be nocturnal. Animals that might be seen during the day are rabbits, Coyotes, some ground squirrels, and, somewhat less likely, the Collared Peccary and Badger.

The Black-tailed Jack Rabbit can be found in almost any desert habitat. These animals are quite conspicuous because of their size. During the day they seek shelter beneath shrubs. Desert Cottontails require more densely shrubbed habitats than jack rabbits. They also avoid the midday sun, and may enter burrows. Cottontails are more patchy in their distribution than jack rabbits, but where they occur, they are often more numerous.

Coyotes can be seen shyly running across the desert in the day, usually in the early morning or late afternoon. You are probably more likely to encounter a Badger attempting to dig potential prey out of the ground.

Because of its size, the Bighorn Sheep is a species that you might expect to find. While this magnificent animal can be seen, it is very wary and blends in with its background. Search very quietly for Bighorn near watering places such as small springs in rocky areas.

Depending on where you are in the Sonoran Desert, you will see one or another species of diurnal ground squirrel. The Round-tailed Ground Squirrel occurs commonly throughout the Sonoran, occupying areas from the flats all the way into those dominated by subtrees. In rocky areas, and at upper elevations of the desert, look for the Rock Squirrel among boulders where it nests, though it is also a good climber in plants. Two species of antelope ground squirrel occur in the Sonoran. The White-tailed Antelope Squirrel occurs in the California and Baja California portion of the desert, while Harris' Antelope Squirrel occupies the Arizona and Sonoran portions. Both species attract attention because of their tail-flicking habits—the White-tail especially, because the tail's underside is quite white. Harris' is more tied to desert areas; the White-tail ranges well up into cool montane environments.

As night falls, the rodents and their mammalian hunter, the Kit Fox, dominate the scene. Kit Foxes are agile and are almost exclusively carnivorous, feeding mostly on kangaroo rats in many parts of their range. These foxes often den great distances from any water and are assumed to obtain sufficient moisture from their food. Their dens have multiple openings and multiple dens are constructed and used in the course of a year. Kangaroo rats (*Dipodomys*) and pocket mice (*Perognathus*) may appear in great abundance. Usually there are at least two species of each in any area. The most likely species to be encountered is Merriam's Kangaroo Rat, a resident of all North American deserts. This "K-rat" occurs in any spot where the soil can be dug and where a sufficient number of seeds can be harvested and cached. In sandy sites in the western portion of the Sonoran, Merriam's Kangaroo Rat may be associated with the Desert Kangaroo Rat; it is found with Ord's Kangaroo Rat in the eastern portions. In grassland/desert transition areas, the large, handsome Banner-tailed Kangaroo Rat may be an associate; its extensive communal burrow sites are very evident.

Ord's Kangaroo Rat
Dipodomys ordii
480

Banner-tailed Kangaroo Rat
Dipodomys spectabilis
483

Desert Pocket Mouse
Perognathus penicillatus
477

Rock Pocket Mouse
Perognathus intermedius

Bailey's Pocket Mouse
Perognathus baileyi
476

Long-tailed Pocket Mouse
Perognathus formosus
475

Silky Pocket Mouse
Perognathus flavus
471

Deer Mouse
Peromyscus maniculatus
489

Cactus Mouse
Peromyscus eremicus
492

Canyon Mouse
Peromyscus crinitus

Southern Grasshopper Mouse
Onychomys torridus
488

Desert Woodrat
Neotoma lepida
493

White-throated Woodrat
Neotoma albigula
494

Botta's Pocket Gopher
Thomomys bottae
469

Mexican Long-nosed Bat
Leptonycteris nivalis
454

Of Sonoran pocket mice, the Desert Pocket Mouse is the most abundant. These animals prefer valley plains with loose soil, a habitat in stark contrast to the rocky areas occupied by the similarly distributed Rock Pocket Mouse. In the Arizona and Baja California portions of the Sonoran, the large, grayish Bailey's Pocket Mouse may be encountered, while in California the Long-tailed Pocket Mouse dominates on gravelly soils. The eastern portions of the Sonoran are occupied by the Silky Pocket Mouse, a small, attractive species. All of these animals are predominantly seed-eaters. Like certain other desert rodents, pocket mice can go into a state of torpor when seeds are not available.

Rounding out our nocturnal cast of characters is the ubiquitous Deer Mouse, which avoids the driest desert sites, and one of its relatives, the Cactus Mouse. The latter occurs in all of our hot deserts, nesting in burrows amid even the most open vegetation. The Canyon Mouse, by contrast, prefers rocky canyon areas in the western Sonoran Desert. Some areas, especially upper elevations, may harbor the Southern Grasshopper Mouse, an omnivore that can make a meal on such unpromising creatures as scorpions or tenebrionid beetles, overcoming the latter's chemical defenses.

Daytime strolls will reveal the presence of two other types of mammals, though you won't see the animals themselves, but signs of their activity. The Desert Woodrat often accumulates pieces of cholla to add to the sticks, yucca leaves, and even cow chips it uses to make its home. It may also be found nesting within yucca stems in chambers it has hollowed out. Somewhat restricted to the drier parts of the desert and to desert transitional sites is the White-throated Woodrat.

As in the Mojave Desert, the characteristic earthen mounds formed by Botta's Pocket Gopher may dot local landscapes.

Bats, as usual, are present, numerous and diverse, but they are very difficult to observe. In the Mexican Sonoran, an exception might be a chance observation of the Mexican Long-nosed Bat, which hovers as it feeds on pollen and nectar from the flowers of an agave or Saguaro.

The Sonoran Desert is our most diverse desert habitat. Since there are a variety of national monuments, national forests, state parks, botanical gardens, and museums close to large cities, it is among the most accessible deserts in North America, even to the least intrepid traveler. Even a one-day trip will reward you with breathtaking scenes and a unique biota.

Wildflowers

Reptiles

Amphibians

Fishes

Trees, Shrubs, Cacti, and Grasses

Insects and Spiders