

SOUTHWEST DESERT

Intent:

To depict the harshness and beauty of the desert and to show how various life forms adapt to this environment and relate to one another.

Content:

The American Desert lies inland from the Pacific coast and is cradled by mountain ranges. In its total expanse from Nevada to Mexico, the American Desert is seen in many forms. None is as familiar as the Sonoran Desert in Arizona.

Our desert areas are as beautiful as they are inhospitable. After the late spring rains, grasses and numerous kinds of annuals carpet the hard-baked ground, trees break into leaf, and flowering vines climb rapidly up the trunks.

Today's desert areas differ vastly in character from the land and wildlife that prevailed here in prehistoric times. Conifers once crowded great forests in this area as dinosaur behemoths dominated the wildlife scene. Time and circumstances transmuted some of those trees of 200 million years ago into the brilliant gems known today as petrified wood. Water rich in silica and other dissolved minerals of volcanic ash perked slowly through buried wood, petrifying it; the form remained, the substance changed to stone. This process is characteristic of arid lands, where the water table may be 2,000 feet below the surface, slowly seeping water deposits dissolved minerals at lower levels and in the process, percolating chemical solutions produced a kaleidoscope of brightly colored crystals of minerals.

In most North American deserts, plant and animal life is relatively abundant with only a few barren patches of land. Vegetation is sparse because there is not enough water to support plants living close together. There is hardly a trace of humidity and rarely a cloud in the sky. Dryness and heat are the conditions of life in the desert.

Mountain chains along the west coast act as a barrier to the ocean air that would otherwise bring rainfall inland; this is known as the rain shadow effect. As the ocean air rises up the mountain slopes, the moisture it carries condenses and is dropped as rain on the ocean side of the mountains. There is not much moisture left by the time the air crosses over the mountains.

The air and ground are both so dry that nothing interferes with the direct flow of sunrays, and the hard packed soil contains little moisture to evaporate and carry off the heat. It might be supposed that, with this kind of setting, the dry soil would soak up rainfall like a blotter, but this does not happen. First, the rain falls faster than the ground can absorb it. Secondly, the desert soil resembles city pavements more than blotting paper. There is relatively little vegetation for decomposition to enrich the soil, and earthworms are virtually nonexistent. In

many areas, the small burrowing animals have been eliminated. There is also no spongy layer of decaying grass or leaves to hold the rainfall. Much of the precipitation that reaches the ground is quickly lost from the hard soil to the extremely dry atmosphere. The aridity of the desert environment sets the stage for unique natural phenomena, such as flash flooding and mirage.

SOUTHWEST DESERT VEGETATION

Desert plants are concerned with getting water, conserving water, or as far as possible doing without water. Thousands of different plants grow in the desert but the ones people think of first is the cactus. Although they vary greatly in size and appearance, they share the same characteristics. They are succulents, have no leaves, and are spiny with shallow root systems. Cacti store water and shrink as it is used up. Without leaves, there is less surface to lose moisture. Photosynthesis takes place in the stem. Spines help protect the plant from herbivores, break up the sun's rays, and help diminish drying air currents.

Many desert plants that do have leaves either have very few or have leaves that can be shed when necessary. Many plants send down long taproots to reach sources of water. The flowering plants produce seeds, which can lie dormant until conditions are right for growth. The billions of seeds produced are then the basic support for many desert animals. Many plants twist their leaves during the warmest part of the day; with the result, that only the thin edges are exposed to the sun's drying rays.

Ocotillo bears fiery flowers and short leaves during wet spells, but sheds them between rains to conserve moisture for a new crop. Tough inner cells protect them from water loss. So sensitive is this plant to water supply differences that a fully leafed one may stand within a few yards of a stripped one which has been forced to drop its leaves under slightly drier soil conditions.

Paloverde tree have minute leaves to reduce water loss; these tiny leaves, no more than a millimeter across, are shed during drought. The stems and twigs contain chlorophyll (its name means green trunk in Spanish), so that photosynthesis can continue even after the leaves have fallen and the twigs have been stripped completely bare.

Mesquite: Most desert trees send down enormously deep taproots to draw water from the ground, and the mesquite may have taproots 100 feet long. A young mesquite is virtually all roots, and does not do much growing above ground until it has located an adequate water source underground. The mesquite is a stabilizer of sand dunes, sending out multiple shoots that emerge above the dune. These branches break the wind, causing more sand to accumulate, and the plant ramifies further. In time, there is a durable sand mound around each mesquite, held firm and immovable by the tree inside. Mesquite is one of the world's densest and finest firewood. Seeds that pass through the digestive tract of an animal sprout more readily than those falling directly on soil, apparently due

to the action of digestive juices on the glassy seed coat, allowing water to penetrate and initiate germination.

Creosote bushes and other shrubs: have widespread shallow roots, to gather surface moisture from the rain, and deep taproots that seek moist layers far underground. Their sparse foliage is usually waxy or leathery, to reduce evaporation.

Cactus: Of the 1,600 species of cacti, only five grow outside the Americas. Cacti have only shallow roots, but they suck in great quantities of surface moisture and store it. Many cacti surfaces are fluted like an accordion, so the fleshy stem may expand quickly when the plant drinks and contract slowly as it uses up the water. Spiny surfaces discourage thirsty animals. Their tough skins retard evaporation and help withstand heat.

Saguaro: The world's largest cactus, as high as 40 feet, normally lives to ages of 150 to 200 years old. They have been in decline since the end of the last century, and today are failing to reproduce. The introduction of cattle (1880s) disturbed the desert's protective ground cover, which resulted in erosion and flooding, lowering of the water table and other physical alterations in the environment. This in turn, reduced the survival of saguaro seeds and young plants. In addition, the reduction of coyotes by ranchers meant an increase in rodents, which destroyed the young saguaro. Future prospects are bleak. As the saguaros decline, so also do bird species whose lifestyle centers on them. Gila woodpeckers and gilded flickers dig holes for a single breeding season in the cacti. These holes are later occupied by a succession of other species such as screech owls, elf owls, sparrow hawks, purple martins, and crested flycatchers. The radius of a saguaro's root system often equals its height. After a downpour, the roots absorb and transport hundreds of gallons of water to the stem. A large saguaro may weigh 10 tons. Slow growing, the saguaro may be 20 to 50 years old when only a yard high. Some desert Indians, such as the Papagos and Pimas, mashed up the saguaro or liquid in times of drought. They ate its fruit, fermented its juice for alcoholic drink, and used its seeds for a kind of butter. Giant stems provided lodge poles and dead saguaros provided a fuel source. The saguaro fruit was so important to the Papago that their harvest time marked the Papago New Year.

Jojoba, or wild bush, may save the sperm whale from extinction one day. The seeds consist of 50% oil and are almost chemically identical to the oil from the sperm whale. Studies show that jojoba oil could replace sperm whale oil as a lubricant for high-speed machinery and in automobile transmission fluids. The jojoba bush is also called goat nut or deer nut and is the best browse plant within its range for many wild and domestic animals.

SOUTHWEST DESERT ANIMAL LIFE

Kangaroo rat has an efficient kidney that requires about one-fourth of the amount of water that the human kidney needs to excrete the same amount of urea. As a result, the kangaroo rat passes almost no urine. They have no sweat

glands, and seal themselves into burrows during the day to conserve and trap moisture. Being nocturnal, they are abroad only when the rate of evaporation is at a minimum. The kangaroo rat has a built-in loudspeaker. Large resonance chambers take up half of its skull space and allow it to detect dangerous visitors through the ground vibrations they make (as well as airborne sounds).

Peccary is the only native wild pig found in the United States. They abound in dense scrubby vegetation, moving in small bands of up to 20 individuals. They flee when alarmed; however, if there is no cover to flee to, the band forms a circle with their heads out. When disturbed, the hairs on the neck and back bristle, and the dorsal gland emits a musky secretion as a warning to others. More normally, the scent is used to mark foraging trails by rubbing against bushes and trees. Peccaries do not need water as long as succulent plants are available.

Kit fox is nocturnal in habit. Their huge ears, which enable them to detect subtle noises of the nighttime desert, are protected from dust and sand by a fine network of long, fine hairs lining the inside.

Cacomistle a close relative of the raccoon is most active at night. Often referred to as a ring-tailed cat, it feeds on small mammals, birds and insects.
Cactus wren builds a virtually impregnable nest in the spiny barbs of the chollas.

Elf owl is nocturnal in habit and one of the smallest owls. They nest in abandoned woodpecker holes in saguaro cacti.

Roadrunner has powerful legs, feet with claws which grip the ground in x-fashion (two forward, two backward), and a foot-long tail (acts like a brake and rudder) all account for its speed and nimbleness. It can run up to 15 mph. So quick are its reflexes that it can out strike a rattlesnake, killing it with its sharp beak.

Gila monster prowls the desert by night, feeding on eggs and small animals. One of the two venomous lizards in the world, it stores reserves of fat in its tail. Its hard, bead-like skin helps to conserve moisture.

Sidewinder exhibits a unique style of side-looping locomotion that permits it to travel easily over loose sand.

Chuckwalla heads for a rock crevice when alarmed. If molested, it instantly sucks in air and inflates itself so that it becomes jammed tight and cannot be pulled out.

EARLY NATIVE AMERICANS OF THE SOUTHWEST DESERT

The cultural adaptations of early American Indians enabled them to use the seemingly barren resources of the desert to good advantage. As early as 300

BC, the Hohokam Indians of southern Arizona had established themselves as the early irrigationists of the desert. The cultivation and irrigation of maize, beans and squash were ancient arts in these arid lands, where 250,000 acres must have been under irrigation in the Salt River Valley of Arizona alone. The Hohokam's irrigation canals were hand-dug with sharp sticks. The canals stretched for miles along the upper terrace of the Gila River Valley, safe from sudden floods yet near at hand for maintenance and water control, and for directing water to the fields. The flow of water was controlled by a series of head gates, movable devices for blocking and unblocking a branch channel; those built by the Hohokam are thought to have consisted of tightly woven-grass mats, backed by stakes, which could be raised or lowered as required. The Hohokam culture apparently flourished with a highly developed architecture and a successful farming economy long before the first pueblo had been built.

The early Hohokam brought with them a basic kit of tools that included hammering stones, stone knives, small projectile points, mortars, pestles, and trough stones called metates, for making cornmeal. From this lowly kitchen utensil came the beautiful palettes of later ages. The carved stone palettes held pigments with which the Hohokam painted their bodies for games and religious ceremonies. They often gave these palettes the stylized shapes of men or desert animals such as lizards, snakes and birds.

The Hohokam engaged in a sport that resembled the ball game of Mexican ancients. The ball court consisted of a depression in the earth, with rings in the walls at either end. Players attempted to knock a ball (probably made of guayule) through these rings with hips, knees or elbows. The scorer, it is believed, could claim the clothing and jewelry of spectators.

Despite the Hohokam's sophisticated agriculture and crafts, their way of life never spread beyond those river valleys that were broad enough and had water enough to make large-scale irrigation possible. By far, the most widespread of the southwestern farming cultures were the Anasazi who flourished to the north of the Hohokam. The Anasazi were the first tribes to build apartment-like dwellings of adobe named pueblos by the early Spanish explorers.

The earliest Anasazi settlements, dating from around the beginning of the Christian era, give little hint of accomplishments to come. They were composed of dome-shaped structures that were built around shallow depressions in the ground. A few centuries later, the Anasazi were building more conventional pit houses with a central fire pit. It was not until about 900 AD that they began building pueblos. Curiously, the pit house survived amid the new-style architecture though its earthen walls had come to be lined with masonry.

By the time they were building pueblos, the Anasazi had developed a culture that was vigorous enough to spread its style of architecture and other traits over much of the Southwest, apparently without warfare. The Anasazi originally

occupied a limited area known today as Four Corners, but at their peak around 1200 AD, their villages were scattered across a considerable part of each of the four states.

Sometime in the 12th and 13th centuries, the Anasazi abandoned their mesa top pueblos and retreated into caves below the sandstone rim. There is abundant evidence that many people moved, and sometimes moved their building timbers and the very stones of their masonry, into the cave pueblos. They are among the most inaccessible homes ever inhabited. Built in regions of high mesas deeply scarred with narrow canyons, they occupy lofty ledges in the faces of sheer cliffs. Most were too high to be reached from the canyon floors, and were accessible from the mesas above them only by precipitous paths. Some of the trails consisted of no more than a series of shallow toe holds hacked out of the rocks.

The first Anasazi probably lived by hunting and gathering wild food; they were skilled basket makers. By 500 or 600 AD, they were farming corn, beans and squash, and had learned to make primitive pottery. By 1100 AD, handsome pottery, painted black on a white background, had evolved; the turkey was domesticated.

Then, about 1300 AD, the Anasazi abandoned their pueblos. Most signs point to a people slowly forced from their land by drought and soil loss, moving in small groups to the south and disappearing by assimilation into other tribes situated on better land. Indeed, the indications of a long drought toward the end of the 13th century are unmistakable.

The Mogollon (pronounced "Muggy-on") culture is generally recognized as distinct although in many aspects it resembles the Basketmaker-Pueblo culture. Cultural advancements at comparable levels occurred much sooner in the Mogollon than in the Basketmaker-Pueblo culture. Many archaeologists deal with the Mogollons by including them with the Anasazi.