

D-M Field Trip

Mojave Desert

A Land Beside the Water

Owing its existence to the rain-shadow effect of the majestic Sierra Nevada, the Mojave Desert is certainly hot and dry, but nonetheless plays host to thousands of hardy plant and animals species, millions of people, and utterly spectacular scenery!

Located primarily within southeastern California and southern Nevada, with small areas extending into southwestern Utah and northwestern Arizona, the Mojave (mo-HAH-vee) Desert (named after the Mojave Nation word that means *beside the water*) occupies nearly 50,000mi² (130,000km²) of basin-and-range topography created by the rifting of the western portion of the continent that began about 17 million years ago (early Miocene).

Such rifting created natural borders that define the region. The Tehachapi Mountains serve as the westernmost boundary of the desert, while the San Gabriel and San Bernardino Mountains do likewise to the southwest. These elevations are distinctive as they lay along the two largest fault systems in California—the Garlock and San Andreas Faults. To the east, the famous Grand Wash Cliffs separate the Mojave and the local portion of the Basin-and-Range Province from the adjacent Colorado Plateau Province.

The rifting episode that thinned and ultimately broke the numerous rock formations of the crust led to the development of structural uplifts called *ranges* (formed



when one side of a faulted block slid down a rupture, elevating the opposite side like a seesaw), and *basins* (the downthrown portion of a fault block abutting the upthrust side of an adjacent block) in a generally north-south echelon between the flanking geologic provinces. Many of the basins are endorheic; water that flows in has no outlet, often forming temporary lakes and streams that precipitate salt deposits when the water evaporates.

The Mojave plays host to one famously unique geologic setting found nowhere else on the continent. The notoriously hot and salty Death Valley, which lends its name to the surrounding national park, is a stark product of the tectonic rifting, and though it cannot be considered “typical” of the Mojave’s general climate, the valley does serve as a reminder of how extreme the desert environment can be.

At once captivatingly beautiful and environmentally hostile, the valley is the site of one of the hottest *reliably* recorded air temperatures (134°F; 56.7°C at Furnace Creek Ranch in 1913), the highest ground temperature ever recorded on the planet (201°F;

93.9°C in 1972), the lowest average precipitation of the continent's deserts (2.36 inches; 60mm), the lowest elevation in North America (282 feet; 86m below sea level at Badwater Basin), and one of the largest vertical rises (11,331 feet; 3454m between Telescope Peak and Badwater Basin).

Climate

Whereas its general climate is not as extreme as that of the inimitable Death Valley, the Mojave—the smallest of the North American deserts—is certainly the driest of the four arid regions in the southwestern United States, which includes the Great Basin Desert to the north, the Sonoran Desert to the south, and the Chihuahuan Desert to the east and southward. And, winter temperatures *can* get cold—as low as about 20°F (-7°C) on valley floors, and below 0°F (-18°C) at higher elevations where substantial snowfall does accumulate. In fact, Charleston Peak in the Spring Mountains—the highest summit within the Mojave at 11,918 feet (3,633m)—retains enough snow to support a ski resort! Nevertheless, it's the heat and aridity that attract headlines.

Customary westerly airflow off the Pacific gets dehydrated by the towering Sierra Nevada and other lofty ranges, including the Panamint and Spring Mountains, thus producing a rain-shadow effect that promotes desertification. However, late summer humid air arriving from the south produces monsoonal storms that often inundate localized areas. Regardless, while any one location can receive a significant amount of rain from a single downpour in a very short period of time—creating powerful and dangerous flash floods that wipe out roads, structures, et al.—the Mojave receives on average only about 5 to 6 inches of annual precipitation, compared to as much as 16 inches in the Sonoran Desert.

All of which profoundly affects the type and diversity of both plants and animals that call the Mojave Desert home.



Joshua Tree

Signature plant of the Mojave Desert, as it grows nowhere else in the world!

Flora

Snuggled between two major desert regions, the Mojave is essentially a transitional desert, which creates climatic, floral, and faunal characteristics distinctive to the region. The boundaries confine the extent of the so-called Joshua Tree (*Yucca brevifolia*)—actually, not a tree at all, but a member of the yucca family—considered to be the signature plant of the Mojave Desert, as this species grows nowhere else in the



Mojave Yucca

One of the most common and readily recognized yuccas seen throughout the Mojave Desert.

world. Along with numerous members of the asparagaceae family that includes agaves and yuccas, these plants are among the most conspicuous and best recognized in the region.

Generally, desert plants have evolved to tolerate hot, dry, and often alkaline conditions, and developed various strategies to vie for limited resources (namely water). The different strategies ensure that not all plants compete for finite water at the same time, in the same manner.

Due to the harsh and dry conditions in the lower elevations, where water is the most scarce, some plants evolved to utilize various *water-saving* tactics. An example is CAM (Crassulacean Acid Metabolism) photosynthesis, in which a plant collects and stores CO₂ as malic acid during the night, then waits till daylight to convert the acid back to CO₂ to use in photosynthesis, thus greatly reducing water loss through evapotranspiration. Many others employ such techniques as producing succulent (fleshy) leaves, spines (modified leaves), and hairy or waxy leaves. These include the cactus family, which consists of such familiar varieties as prickly pear (*Opuntia* species), cholla (*Cylindropuntia* species), and barrels (e.g. *Echinocactus* species).

Still other desert plants employ *water-obtaining* methods. Some rely on deep tap roots to gain water that is out of reach to most plants. Examples include sagebrush (*Artemisia* group), and catclaw acacia (*Senegalia greggii*). Possibly the most “ingenious” of the water-obtaining group is exploited by the creosote bush (*Larrea tridentata*). Pores in the leaves open to absorb available moisture from the atmosphere. This includes respiration from a person’s breath, enticing a distinctive aroma reminiscent of creosote, thus the name of the plant. (Incidentally, this serves as an effective reminder to visitors inexperienced in desert travel that a great deal of water is lost to the environment mostly through breathing, in contrast to sweating!)

Aside from techniques for saving or obtaining water, most desert plants actually employ a more customary strategy...they only bloom during certain times of the year, usually spring. Many of these *ephemeral* plants are actually closely related to their better-known garden-variety brethren, including desert dandelions, poppies, phacelias, the sunflower family, snapdragon family, and many others. To a more extreme extent, some plants, like blackbrush (*Coleogyne ramosissima*), a member of the rose family, bloom so sporadically that they appear dead most of the time!

Higher elevations present less of a problem, since water is more plentiful either as rain or snowmelt. Here, the succulents are replaced in large part by such plants as cliffrose and apache plume (also members of the rose family), western redbud, velvet ash, and evergreens that include single-leaf pinion pine and Utah juniper.



Cliffrose

A rose-family shrub found in the Rockies, throughout the Great Basin, and into Mexico.



Creosote Bush

A ubiquitous, drought resistant plant found throughout the deserts of the southwest.



Apache Plume

A rose-family shrub generally found on rocky slopes between 3,000 and 8,000 foot elevations.

Fauna

Just as with plant life, animals (including insects) must also resort to life-preserving strategies in order to survive and prosper in the desert. They commonly avoid heat and drought by remaining underground or hidden (in burrows, crags, crevasses, under leaves or rocks, etc.) during the hot summer days, cold winters, and dry spells.

Many are *strictly* nocturnal in habit, arising to hunt and forage only at night. A good example is the ringtail “cat” (*Bassariscus astutus*)...actually a member of the raccoon family. Many others are *primarily* nocturnal, such as the bobcat (*Lynx rufus*), mountain lion (*Puma concolor*), raccoon (*Procyon lotor*), and the various foxes.

While some do present during midday hours (*diurnal*), namely muledeer (*Odocoileus hemionus*), bighorn sheep (*Ovis canadensis*), coyote (*Canis latrans*), desert tortoise (*Gopherus agassizii*), lagomorphs (rabbits and hares) and red-tailed hawks (*Buteo jamaicensis*), to name just a few, the vast majority of desert inhabitants are *crepuscular* in nature, that is, they are most active during twilight hours (morning or dusk).

Other than rodents, the most conspicuous are the reptiles. A great many species of lizards and snakes eek out a comfortable living in the harsh desert environment. Even a casual trek will encounter any number of squamates, the most likely being iguanids, such as side-blotched, horned, whiptail, collard, and chuckwalla lizards occupying preferred habitats ranging from open scrubland to rocky crags. A rare sighting in the latter habitat is the seclusive Gila monster (*Heloderma suspectum*) that spends about 90% of its life in its burrow!

Without doubt, the most famous—and notorious—are snakes! Most are generally harmless members of the largest family, Colubridae. Colubrids are represented by the commonly seen gopher snake (*Pituophis catenifer*), red racer/coachwhip (*Masticophis flagellum*), striped whipsnake (*Masticophis taeniatus*), et al.; and the less commonly seen California kingsnake

(*Lampropeltis getula*), and milksnake (*Lampropeltis triangulum*).

However, the undisputed stars of the Mojave snake world are the rattlesnakes! Not as commonly seen as one might expect from watching Hollywood western movies, vipers (family *Viperidae*) are by far the most captivating and exciting to encounter. While their bites are seldom fatal, their demeanor when cornered is certainly intimidating. Though rattlesnakes are still the main perpetrators of snakebite injuries in North America, they rarely bite unless provoked...for good reason.

Venom is metabolically very expensive—one needs water to manufacture venom, and water is not usually plentiful in the desert! Therefore the snake intuitively understands that if it wastes its venom biting a person (who, incidentally, is not a regular item on its menu), that snake may not be able to eat for an extended period of time until it regenerates more venom. A matter of life and death! The last thing that snake wants to do is bite a passerby. And on a related note, a rattlesnake, contrary to popular portrayal, rarely rattles unless given no other choice, but to defend itself; rattling would give away its location. First instinct is to run (or rather slither); second, remain still and silent; finally, strike if given no other choice, heralded by the infamous rattle.

While at first glance the desert may appear desolate and monotonous, these strategies by both plants and animals help to preserve the biological richness of an otherwise challenging environment.



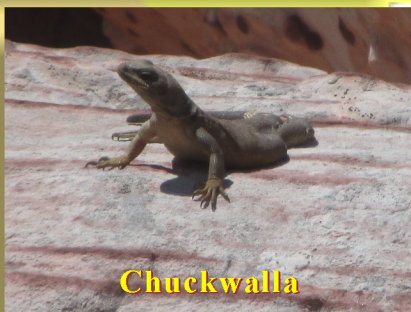
Panamint Rattlesnake



Gopher Snake



Mojave Rattlesnake



Chuckwalla



Mojave Desert Tortoise



Gilbert Skinks

Human Population

The Mojave Desert has become one of the most popular tourism destinations in North America, thanks primarily to the ever-growing gambling destination of Las Vegas. With a population of barely 200,000 in the entire valley just thirty years ago, the basin now boasts nearly 3 million people in the metropolitan area!

While the inner regions of the desert are sparsely populated, its peripheries support other large communities besides Las Vegas. These include San Bernardino, Lancaster, Palmdale, and Victorville in California; St. George in Utah; plus Kingman and Bullhead City in Arizona. With such prolific urbanization, it is not surprising to find large swaths of the desert under the protection of numerous preserves, recreation areas, and installations.

Within reasonable driving distance of Las Vegas, for example, awaits Joshua Tree and the fore mentioned Death Valley National Parks, plus the extensive Mojave National Preserve. Of lower protective status are two preeminent National Conservation Areas: Red Rock Canyon and Lake Mead, the latter being the host of one of the nation's most visited and famous man-made accomplishments...Hoover Dam. Here, visitors can walk or drive across the structure, descend into the power plant or dam itself, and learn about the structure's Great Depression history.

Still other areas are "preserved" by way of expansive military installations. These include Edwards Air Force Base, the China Lake Naval Air Weapons Station, and the Army's Fort Irwin.

Urbanization has certainly encroached upon the critical habitats of many plant and animal species, but with proper appreciation, care, education, and management, the Mojave Desert's vast wildlife and natural resources can continue to be a source of pride and marvel for many future generations of residents, visitors, and explorers alike.