

Coordinates: 32°15′N 112°55′W

The **Sonoran Desert** (Spanish: *Desierto de Sonora*) is a hot desert in North America and ecoregion that covers the northwestern Mexican states of Sonora, Baja California, and Baja California Sur, as well as part of the southwestern United States (in Arizona and California). It is the hottest desert in both Mexico and the United States.<sup>[3]</sup> It has an area of 260,000 square kilometers (100,000 sq mi).

In phytogeography, the Sonoran Desert is within the Sonoran Floristic province of the Madrean Region of southwestern North America, part of the Holarctic realm of the northern Western Hemisphere. The desert contains a variety of unique endemic plants and animals, notably, the saguaro (*Carnegiea gigantea*) and organ pipe cactus (*Stenocereus thurberi*).

The Sonoran Desert is clearly distinct from nearby deserts (e.g., the Great Basin, Mojave, and Chihuahuan deserts) because it provides subtropical warmth in winter and two seasons of rainfall (in contrast, for example, to the Mojave's dry summers and cold winters). This creates an extreme contrast between aridity and moisture.<sup>[4]</sup>

## Location

The Sonoran desert wraps around the northern end of the Gulf of California, from Baja California Sur (El Vizcaíno Biosphere Reserve in central and Pacific west coast, Central Gulf Coast subregion on east to southern tip), north through much of Baja California, excluding the central northwest mountains and Pacific west coast, through southeastern California and southwestern and southern Arizona to western and central parts of Sonora.<sup>[5]</sup>

It is bounded on the west by the Peninsular Ranges, which separate it from the California chaparral and woodlands (northwest) and Baja California desert (Vizcaino subregion, central and southeast) ecoregions of the Pacific slope. The Gulf of California xeric scrub ecoregion lies south of the Sonoran desert on the Gulf of California slope of the Baja California Peninsula.

To the north in California and northwest Arizona, the Sonoran Desert transitions to the colder-winter, higher-elevation Mojave, Great Basin, and Colorado Plateau deserts.

The coniferous Arizona Mountains forests are to the northeast. The Chihuahuan Desert and Sierra Madre Occidental pine–oak forests are at higher elevations to the east. To the south the Sonoran–Sinaloan transition subtropical dry forest is the transition zone from the Sonoran Desert to the tropical dry forests of the Mexican state of Sinaloa.<sup>[5]</sup>

## Sub-regions

### Sonoran Desert



Saguaro National Park in Arizona



Sonoran desert

### Ecology

<b>Realm</b>	<u>Nearctic</u>
<b>Biome</b>	<u>Deserts and xeric shrublands</u>
<b>Borders</b>	<b>List</b> <div><div><u>Arizona Mountains forests</u></div><div><u>Baja California desert</u></div><div><u>California coastal sage and chaparral</u></div><div><u>California montane chaparral and woodlands</u></div><div><u>Chihuahuan Desert</u></div><div><u>Colorado Plateau shrublands</u></div><div><u>Gulf of California xeric scrub</u></div><div><u>Mojave Desert</u></div></div>

The desert's sub-regions include the [Colorado Desert](#) of southeastern California; and the [Yuma Desert](#) east of the north-to-south section of the [Colorado River](#) in southwest Arizona. In the 1957 publication *Vegetation of the Sonoran Desert*, Forrest Shreve divided the Sonoran Desert into seven regions according to characteristic vegetation: Lower Colorado Valley, Arizona Upland, Plains of Sonora, Foothills of Sonora, Central Gulf Coast, Vizcaíno Region, and Magdalena Region.<sup>[6]</sup> Many ecologists consider Shreve's Vizcaíno and Magdalena regions, which lie on the western side of the [Baja California Peninsula](#), to be a separate ecoregion, the [Baja California desert](#).

Within the southern Sonoran Desert in Mexico is found the [Gran Desierto de Altar](#), with the [El Pinacate y Gran Desierto de Altar Biosphere Reserve](#), extending 2,000 square kilometers (770 sq mi) of desert and mountainous regions.<sup>[7]</sup> The biosphere reserve includes the only active erg dune region in North America. The nearest city to the biosphere reserve is [Puerto Peñasco](#) ('Rocky Point') in the state of Sonora, [Mexico](#).

Sub-regions

Sonoran Desert sub-regions include:

- [Colorado Desert](#)
- [Gran Desierto de Altar](#)
- [Lechuguilla Desert](#)
- [Tonopah Desert](#)
- [Yuha Desert](#)
- [Yuma Desert](#)

Climate

The Sonoran desert has an [arid subtropical climate](#) and is considered to be the most [tropical](#) desert in [North America](#).<sup>[8]</sup> In the lower-elevation portions of the desert, temperatures are warm year-round, and [rainfall](#) is infrequent and irregular, often less than 90 mm (approx. 3.5”) annually. The [Arizona](#) uplands are also warm year-round, but they receive 100–300 mm (approx. 4-12”) of average annual rainfall, which falls in a more regular bi-seasonal pattern.<sup>[2]</sup>

According to the [Köppen climate classification](#) system, the majority of the Sonoran Desert has a Hot desert climate (*BWh*). [Hot semi-arid climate](#) (*BSh*) exists on some of the higher elevation mountains within the desert, as well as in a continuous swath on the eastern and northeastern fringes as elevations gradually rise toward the [Madrean Sky Islands](#) in the east and the [Mogollon Rim](#) in the northeast. There are also a few small areas of [Cold semi-arid climate](#) (*BSk*) and even [Hot-summer Mediterranean climate](#) (“Csa”) on only the highest of mountain peaks within the region.

	<a href="#">Sierra Juárez and San Pedro Mártir pine-oak forests</a> <a href="#">Sonoran-Sinaloan transition subtropical dry forests</a>
<b>Bird species</b>	246 <sup>[1]</sup>
<b>Mammal species</b>	120 <sup>[1]</sup>
<b>Geography</b>	
<b>Area</b>	222,998 km <sup>2</sup> (86,100 sq mi)
<b>Countries</b>	<a href="#">Mexico</a> · <a href="#">United States</a>
<b>States</b>	<a href="#">Arizona</a> · <a href="#">California</a> · <a href="#">Baja California</a> · <a href="#">Baja California Sur</a> · <a href="#">Sonora</a>
<b>Coordinates</b>	<a href="#">32°15'N 112°55'W</a>
<b>Rivers</b>	<a href="#">Colorado River</a>
<b>Climate type</b>	<a href="#">Hot desert</a>
<b>Conservation</b>	
<b>Conservation status</b>	Relatively Stable/Intact <sup>[2]</sup>
<b>Habitat loss</b>	10.5% <sup>[1]</sup>
<b>Protected</b>	39% <sup>[1]</sup>

Climate data for 7 WNW Sundad, AZ, Elevation 945 ft (288 m), 1991–2020 normals, extremes 1981-2022													
Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
<b>Record high</b> °F (°C)	82.1 (27.8)	90.7 (32.6)	98.8 (37.1)	103.6 (39.8)	111.5 (44.2)	117.6 (47.6)	120.6 (49.2)	116.2 (46.8)	114.1 (45.6)	105.4 (40.8)	96.6 (35.9)	83.7 (28.7)	120.6 (49.2)
<b>Mean daily maximum</b> °F (°C)	68.0 (20.0)	71.4 (21.9)	78.4 (25.8)	85.7 (29.8)	94.0 (34.4)	103.2 (39.6)	106.5 (41.4)	105.4 (40.8)	100.4 (38.0)	89.8 (32.1)	77.0 (25.0)	66.6 (19.2)	87.3 (30.7)
<b>Mean daily minimum</b> °F (°C)	39.0 (3.9)	42.0 (5.6)	47.3 (8.5)	52.6 (11.4)	60.5 (15.8)	69.2 (20.7)	77.8 (25.4)	78.0 (25.6)	70.5 (21.4)	57.4 (14.1)	45.3 (7.4)	37.8 (3.2)	56.5 (13.6)
<b>Record low</b> °F (°C)	18.1 (−7.7)	24.3 (−4.3)	29.0 (−1.7)	38.1 (3.4)	44.3 (6.8)	52.8 (11.6)	62.4 (16.9)	64.5 (18.1)	51.2 (10.7)	36.5 (2.5)	25.8 (−3.4)	19.9 (−6.7)	18.1 (−7.7)
<b>Average precipitation</b> inches (mm)	0.74 (19)	0.71 (18)	0.55 (14)	0.13 (3.3)	0.08 (2.0)	0.03 (0.76)	0.68 (17)	0.78 (20)	0.52 (13)	0.39 (9.9)	0.43 (11)	0.62 (16)	5.64 (143)
<b>Average snowfall</b> inches (cm)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)
<b>Average relative humidity</b> (%)	40.6	37.7	31.9	23.1	20.4	17.5	27.4	32.0	30.6	28.1	32.1	40.5	30.1
<b>Average dew point</b> °F (°C)	30.1 (−1.1)	31.2 (−0.4)	32.4 (0.2)	29.8 (−1.2)	33.5 (0.8)	37.0 (2.8)	53.8 (12.1)	57.7 (14.3)	51.0 (10.6)	38.6 (3.7)	31.2 (−0.4)	28.9 (−1.7)	38.0 (3.3)
Source: PRISM <sup>[9]</sup>													

## Flora

Many plants not only survive, but thrive in the harsh conditions of the Sonoran Desert. Many have evolved to have specialized adaptations to the desert climate. The Sonoran Desert's bi-seasonal rainfall pattern results in more plant species than any other desert in the world.<sup>[2]</sup> The Sonoran Desert includes plant genera and species from the agave family, palm family, cactus family, legume family, and numerous others.

The Sonoran is the only place in the world where the famous saguaro cactus (*Carnegiea gigantea*) grows in the wild.<sup>[10]</sup> Cholla (*Cylindropuntia* spp.), beavertail (*Opuntia basilaris*), hedgehog (*Echinocereus* spp.), fishhook (*Ferocactus wislizeni*), prickly pear (*Opuntia* spp.), nightblooming cereus (*Peniocereus* spp.), and organ pipe (*Stenocereus thurberi*) are other taxa of cacti found here. Cactus provides food and homes to many desert mammals and birds, with showy flowers in reds, pinks, yellows, and whites, blooming most commonly from late March through June, depending on the species and seasonal temperatures.



The Sonoran Desert near Tucson, Arizona during winter.

Creosote bush (*Larrea tridentata*) and bur sage (*Ambrosia dumosa*) dominate valley floors. Indigo bush (*Psoralea fremontii*) and Mormon tea are other shrubs that may be found. Wildflowers of the Sonoran Desert include desert sand verbena (*Abronia villosa*), desert sunflower (*Geraea canescens*), and evening primroses.

Ascending from the valley up bajadas, various subtrees such as velvet mesquite (*Prosopis velutina*), palo verde (*Parkinsonia florida*), desert ironwood (*Olneya tesota*), desert willow (*Chilopsis linearis* ssp. *arcuata*), and crucifixion thorn (*Canotia holacantha*) are common, as well as multi-stemmed ocotillo (*Fouquieria splendens*). Shrubs found at higher elevations include whitethorn acacia (*Acacia constricta*), fairy duster, and jojoba. In the desert subdivisions found on Baja California, cardon cactus, elephant tree, and boojum tree occur.<sup>[11]</sup>



The California fan palm (*Washingtonia filifera*) is found in the Colorado Desert section of the Sonoran Desert, the only native palm in California, among many other introduced *Arecaceae* genera and species. It is found at spring-fed oases, such as in Anza Borrego Desert State Park, Joshua Tree National Park, and the Kofa National Wildlife Refuge.<sup>[12]</sup>



*Velvet mesquite (Prosopis velutina)*



*Washingtonia filifera* in Anza Borrego Desert State Park

## Fauna

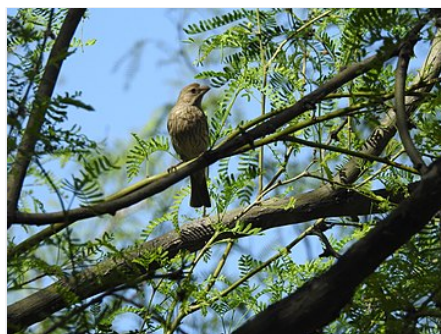
The Sonoran Desert is home to a wide variety of animals, birds and other creatures, such as the Gila monster, bobcat, mule deer, antelope jackrabbit, burrowing owl, greater roadrunner, western diamondback rattlesnake, and elf owl. There are three hundred fifty bird species, 20 amphibian species, over 100 reptile species, 30 native fish species, over 1000 native bee species, and more than 2,000 native plant species found in the desert area.<sup>[13]</sup> The Sonoran Desert area southeast of Tucson and near the Mexican border is vital habitat for the only population of jaguars living within the United States.<sup>[14]</sup> The Colorado River Delta was once an ecological hotspot within the Sonoran desert due to the Colorado river in this otherwise dry area, but the delta has been greatly reduced in extent due to the damming and use of the river upstream. Species that have higher heat tolerance are able to thrive in the conditions of the Sonoran Desert. One such insect species that has evolved a means to thrive in this environment is *Drosophila mettleri*, a Sonoran Desert fly. This fly contains a specialized P450 detoxification system that enables it to nest in the cool region of exudate moistened soil. Thus, the fly is one of few that can tolerate the high desert temperatures and successfully reproduce.



*Crotalus cerastes* in Puerto Peñasco, Mexico



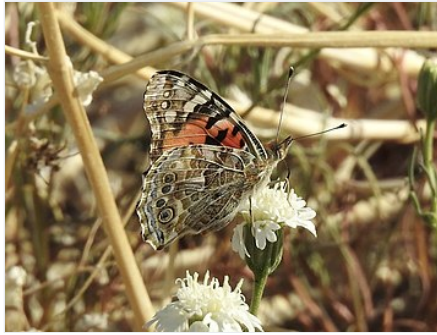
*Campylorhynchus brunneicapillus* in Phoenix, United States



*Haemorhous mexicanus* in Maricopa County, United States



*Callisaurus draconoides* in Los Cabos, Mexico



*Vanessa cardui* in Riverside County, United States



*Bombus sonorus* in Phoenix, United States

## Human population

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The Sonoran Desert is home to the cultures of over 17 contemporary Native American tribes, with settlements at American Indian reservations in California and Arizona, as well as populations in Mexico.

The largest city in the Sonoran Desert is Phoenix, Arizona, with a 2017 metropolitan population of about 4.7 million.<sup>[15]</sup> Located on the Salt River in central Arizona, it is one of the fastest-growing metropolitan areas in the United States. In 2007 in the Phoenix area, desert was losing ground to urban sprawl at a rate of approximately 4,000 square meters (1 acre) per hour.<sup>[16]</sup>

The next largest cities are Tucson, in southern Arizona, with a metro area population of just over 1 million,<sup>[17]</sup> and Mexicali, Baja California, with a similarly sized metropolitan population of around 1,000,000. The metropolitan area of Hermosillo, Sonora, has a population close to 900,000. Ciudad Obregón, Sonora, in the southern part of the desert, has a population of 375,800.<sup>[18]</sup>

## California

The Coachella Valley, located in the Colorado Desert section of the Sonoran Desert, has a population of 365,000. Several famous Southern California desert resort cities such as Palm Springs and Palm Desert are located here.



The entrance to Palm Springs, California via Highway 62

During the winter months, from November to April, the daytime temperatures in the Coachella Valley range from 70 °F (21 °C) to 90 °F (32 °C) and corresponding nighttime lows range from 46 °F (8 °C) to 68 °F (20 °C) making it a popular winter resort destination. Due to its warm year-round climate citrus and subtropical fruits such as mangoes, figs, and dates are grown in the Coachella Valley and adjacent Imperial Valley. The Imperial Valley has a total population of over 180,000 and has a similar climate to that of the Coachella Valley. Other cities include Borrego Springs, Indio, Coachella, Calexico, El Centro, Imperial, and Blythe.

## United States–Mexico border region

Straddling the Mexico–United States border with low levels of human-installed security, the Sonoran desert is a route for illegal entry across the border. The harsh conditions mean that the 3-to-5-day march, usually moving at night to minimize exposure to the heat, sometimes results in death.<sup>[19]</sup>

## Protected areas

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There are many National Parks and Monuments; federal and state nature reserves and wildlife refuges; state, county, and city parks; and government or nonprofit group operated natural history museums, science research institutes, and botanical gardens and desert landscape gardens.

- Index: Protected areas of the Sonoran Desert
- Index: Protected areas of the Colorado Desert

### Sonoran Desert protected areas include

- Arizona–Sonora Desert Museum
- Sonoran Desert National Monument <sup>[20]</sup>
- Boyce Thompson Arboretum State Park – *Sonoran Desert flora arboretum*
- Anza–Borrego Desert State Park
- Organ Pipe Cactus National Monument
- Saguaro National Park
- Joshua Tree National Park
- Reserva de la Biosfera el Pinacate y Gran Desierto de Altar – *Pinacate National Park, in Sonora, Mexico*
- Indio Hills Palms State Reserve
- Coachella Valley National Wildlife Refuge
- Cabeza Prieta National Wildlife Refuge
- Kofa National Wildlife Refuge
- South Mountain Park
- Sonoran Arthropod Studies Institute
- Skyline Regional Park



Mexican goldpoppies in the Sonoran Desert National Monument

## See also

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- Chihuahuan Desert
- Dust storm
- List of deserts by area
- List of ecoregions in the United States (EPA) (the Sonoran Basin and Range is item 81 on the map)
- List of ecoregions in the United States (WWF)
- Mojave Desert
- Spanish missions in the Sonoran Desert
- Category:Mountain ranges of the Sonoran Desert

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5. "Arizona-Sonora Desert Museum, Tucson, AZ – Zoo, Botanical Garden and Art Gallery" (<http://www.desertmuseum.org/>). *www.desertmuseum.org*. Retrieved 15 April 2018.



6. "Sonoran Desert: An Overview of the Sonoran Desert by William G. McGinnies" ([https://web.archive.org/web/20030121161839/http://alic.arid.arizona.edu/sonoran/documents/mcginnies/McGinnies\\_overview.html](https://web.archive.org/web/20030121161839/http://alic.arid.arizona.edu/sonoran/documents/mcginnies/McGinnies_overview.html)). 21 January 2003. Archived from the original ([http://alic.arid.arizona.edu/sonoran/documents/mcginnies/McGinnies\\_overview.html](http://alic.arid.arizona.edu/sonoran/documents/mcginnies/McGinnies_overview.html)) on 21 January 2003. Retrieved 15 April 2018.
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## External links

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- [Arizona–Sonora Desert Museum \(http://www.desertmuseum.org/\)](http://www.desertmuseum.org/)
  - [Map of the Sonoran Desert Ecoregion \(https://www.desertmuseum.org/images/csds/sonoran\\_map-lg.jpg\)](https://www.desertmuseum.org/images/csds/sonoran_map-lg.jpg)

- Sonoran Desert and its subdivisions (<http://www.desertmuseum.org/desert/sonora.php>) – *with photos*.
- Timeline of the Sonoran desert ([http://www.oneworldjourneys.com/sonoran/hist\\_timeline.html](http://www.oneworldjourneys.com/sonoran/hist_timeline.html))
- *An Overview of the Sonoran Desert*, by William G. McGinnies ([https://web.archive.org/web/20030121161839/http://alic.arid.arizona.edu/sonoran/documents/mcginnies/McGinnies\\_overview.html](https://web.archive.org/web/20030121161839/http://alic.arid.arizona.edu/sonoran/documents/mcginnies/McGinnies_overview.html))
- The Sonoran Desert Naturalist (<http://arizonensis.org/sonoran/>)
- Very short overview of Sonoran Desert Geology ([http://dana.ucc.nau.edu/~are-p/road\\_map/eco/geology.html#sonoran](http://dana.ucc.nau.edu/~are-p/road_map/eco/geology.html#sonoran))
- Sonoran Desert images at bioimages.vanderbilt.edu (<http://www.cas.vanderbilt.edu/bioimages/ecoregions/51310frame.htm>) (slow modem version (<http://www.cas.vanderbilt.edu/bioimages/ecoregions/51310.htm>))
- International Sonoran Desert Alliance (<http://www.isdanet.org>)
- Sounds of the Sonoran Desert (<https://web.archive.org/web/20110613193141/http://content.lib.utah.edu/u/?%2Fwss%2C2460>)

## Parks and recreation areas

- Sonoran Desert National Monument: official website ([https://web.archive.org/web/20090126014634/http://www.blm.gov/az/st/en/prog/blm\\_special\\_areas/natmon/son\\_des.html](https://web.archive.org/web/20090126014634/http://www.blm.gov/az/st/en/prog/blm_special_areas/natmon/son_des.html))
- Saguaro National Park: official website (<http://www.nps.gov/sagu/>)
- Anza–Borrego Desert State: official website ([http://www.parks.ca.gov/?page\\_id=638](http://www.parks.ca.gov/?page_id=638))
- Organ Pipe Cactus National Monument: official website (<http://www.nps.gov/orpi>)
- Joshua Tree National Park: official website (<http://www.nps.gov/jotr/index.htm>)
- South Mountain Park – Preserve (<https://web.archive.org/web/20000424121927/http://www.ci.phoenix.az.us/PARKS/hikesoth.html>)
- Arizona State Parks: official website (desert plants) (<https://azstateparks.com/desert-plants>)

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