

# Article

## Death Valley

### America's Youngest National Park

The very name conjures images of soaring vultures circling over doomed travelers who dare to trespass through this forbidding terrain. At once hostile and formidable--and yet strikingly beautiful and inviting--Death Valley's mystique offers contemporary visitors an existential encounter that will leave an indelible, lifelong impression.

The valley itself, located near the border of California and Nevada, is the centerpiece of a wider region originally designated as a national monument on February 11, 1933 by then President Herbert Hoover, with the intention of preserving one of the nation's rarest natural geographical environments. This federally protected wilderness, redesignated as Death Valley National Park in 1994, lies mostly in Inyo County, California, with portions extending into Nye and Esmeralda Counties, NV. Covering an area of about about 3,000sqmi (7,800km<sup>2</sup>) in the Great Basin Province, the valley is a graben that stretches north to south between the Amargosa Range (including the Funeral and Black Mountains) on the east and the Panamint Range on the west, and enclosed by the Sylvania Mountains in the north and the Owlshead Mountains



that border the park at its southern end.

#### Climate

Death Valley has a subtropical, hot-desert type climate that features long, extremely hot summers; short, warm winters; and very little rainfall. It is the lowest, driest, and hottest region in

North America.

Badwater Basin (282 feet *below* sea level; -86 m) hosts the lowest elevation on the continent. Consequently, the difference in elevation from Badwater to the adjacent Telescope Peak in the Panamints (11,043 feet *above* sea level), represents the largest differential in North America (11,325 feet; 3,366 m). In addition, Badwater is only 84.6 miles (136.2km) from Mt. Whitney, the highest point (14,505 feet; 4,421 m) in the contiguous United States.



Four major mountain ranges (Coast, Sierra Nevada, Inyo, Panamint) lie between Death Valley and the ocean, each one adding to an increasingly drier rain shadow effect. On average, the Mojave Desert receives about 6 inches of rain per year. By contrast, the average annual precipitation in Death Valley, which is in the Mojave, is just 2.36 inches!

The wettest month on record is January 1995 when 2.59 inches fell on the valley. The wettest period on record was mid-2004 to mid-2005, in which nearly 6 inches of rain created ephemeral lakes and prompted fantastic wildflower blooms. Snow with accumulation has only been recorded in January 1922, while scattered flakes have been recorded on other occasions. The years 1929, 1953, and 1989 saw no rain at all recorded, and 1931 to 1934 was the driest stretch on record with only 0.64 inches of rain over a 40-month period!

The depth and shape of Death Valley influence its summer temperatures. The valley is long and narrow, walled by high, steep mountains. The clear, dry air and sparse plant cover allow sunlight to heat the desert surface. Lower altitudes tend to have higher temperatures. When the sun heats the surface, air at ground level rises. Trapped by surrounding high mountains, the slightly cooled air mass sinks back down towards the valley more compressed. This air is then reheated by the sun to an even higher temperature, moves back up the mountains again, and the process continues in a circular motion in cycles, similar to how a convection oven works.

This process is especially important in Death Valley as it provides its specific climate and geography. The superheated air increases ground temperature markedly, contributes to perpetual drought-like conditions in the region, and prevents much cloud formation from passing through the confines of the valley, where precipitation is often in the form of virga. Because of the unusual combination of geologic and atmospheric factors, Death Valley still holds numerous local and global temperature records.



**Badwater Basin is a permanent pond on the east side of the valley at the foot of the Black Mountain Range. The popular attraction lies along Badwater Road about 17 miles south of its intersection with SR190 near the Furnace Creek Inn. The actual lowest elevation point is further out on the salt pan.**



The hottest ever air temperature *officially* recorded on Earth was 134°F (56.7°C) on July 10, 1913, at Furnace Creek (a reported temperature of 136.4°F (58°C) recorded in Libya in 1922 was later determined to be inaccurate). During the heat wave that peaked with the all-time record high, five consecutive days reached 129°F (54°C) or above!

The greatest number of consecutive days with a maximum temperature of 100°F (38°C) or above was 154 days in the summer of 2001. The summer of 1996 had 40 days over 120°F (49°C), and 105 days over 110°F (43°C). The summer of 1917 had 52 days where the temperature reached 120°F (49°C) or above with 43 of them consecutive!

On June 30, 2013, the temperature reached 129°F (54°C) at Furnace Creek Station—the hottest air temperature ever recorded for the month of June!

### History

Death Valley is home to the Timbisha tribe of Native Americans, formerly known as the Panamint Shoshone, who have inhabited the valley for at least the past millennium. Some families still live in the valley at Furnace Creek.

The valley received its English name in 1849 during the California Gold Rush. In October of 1849, a group of wagoners left Salt Lake City to head for the gold fields in California. Leaving too late in the season to head over better-known trails through the Sierra Nevadas—just a couple years earlier a group of pioneers called the Donner Party was destined to make history by attempting the ill-advised winter journey—the San Joaquin Party of 107 wagons headed instead for another route called the Old Spanish Trail established after 1829 by Mexican merchants to link Sante Fe with missions in southern California. That route went around the southern end of the Sierras and was safer to travel in winter. However, no pioneer wagons had ever traversed it, and only one person could be found who knew the route and would agree to lead the party.



Along the way, a group decided to split off from the main party and follow a dubious route that supposedly would cut off 500 miles of the journey. After this party split again to follow different routes, both eventually converged near the present-day Death Valley Junction. They entered the valley before them, only to be confronted by the towering Panamint Mountains that they had wrongly assumed were the Sierras.

Splitting again near Furnace Creek, one group headed north toward the Mesquite Flat Sand Dunes, and after much suffering and discouragement, ultimately made it through the mountains via Towne Pass to Indian Wells Valley near today's city of Ridgecrest. Meanwhile, the other group found itself stranded in the valley after several attempts to find a passable route. Two men were sent across the range to look for help and get supplies. After a month and 300 miles of walking, the men returned to find only two families had remained—the others had left to find their own way out.

Ironically, only one man perished during the long wait, but as the group finally began the trip west, one of the members purportedly proclaimed, "Goodbye, Death Valley!" The impromptu name has persisted ever since.

### Geology

Death Valley is a typical example of a basin-and-range configuration; continental crust broken and tilted by tension on the Earth's crust caused by *plate tectonics*, resulting in mountainous fault blocks (the ranges) whose leading edges usually form relatively steep escarpments that loom over an adjacent block's downthrown back (the basins) in echelon, interspersed by upthrown blocks called *horsts*, and downthrown blocks called *grabens*.



**Complex faulting dissects the mountain range that looms over the Artist's Palette region of the park.**

The western margin of Death Valley is traced by peculiar erosional features resulting from periodic flash floods. As rainfall cascades down the steep mountainsides, it pours through narrow canyons, picking up everything from fine clay to large rocks. When these torrents reach the mouths of the canyons, they widen and slow, branching out into braided streams that drop their sediment load as the flow diminishes, forming deposits known as alluvial fans. Eventually, adjacent fans can coalesce to form even bigger deposits called bajadas. It is interesting to note that the paler the fans, the younger they are.



**Alluvial fans coalesce into bajadas to form gently sloping foothills along the base of the Panamint Mts.**

**The Badwater Turtleback is typical of the strange formations rarely found elsewhere in the world. The once-deep-seated rocks were stretched and domed by powerful and relentless tectonic forces.**



Lying at the southern end of a geological trough known as Walker Lane, which runs north into Oregon, the valley is bisected by a still-active right-lateral strike-slip fault system, represented by the *Death Valley* and *Furnace Creek* transverse faults (the eastern end of the left-lateral Garlock Fault intersects the Death Valley Fault). These faults are responsible for the development of rare geologic features called *turtlebacks*, smoothly arched metamorphic rocks stretched, deformed, and denuded of thousands of feet of overlying sedimentary formations.



## Biota

In spite of the overwhelming heat and sparse rainfall, Death Valley National Park exhibits surprising biodiversity. Wildflowers, watered by snowmelt, carpet the desert floor each spring. Among the many animals in the park, bighorn sheep, red-tailed hawks, and “wild” burros are the most often seen.

Death Valley has over 600 springs and ponds, and though Furnace Creek and the Amargosa River still flow through the valley—both eventually disappear into the sands of the valley floor—remnants of Death Valley’s wetter periods can still be seen in the region today; Salt Creek, a mile-long shallow depression in the center of the valley, supports several isolated populations of rare and endangered pupfish.

Darwin Falls, on the western edge of Death Valley National Park, falls a hundred feet into a large pond surrounded by willows and cottonwood trees. Over 80 species of birds have been spotted around the pond.

## Lakes to Deserts

Death Valley has not always been so hot and barren. At various times during the Pleistocene era (2.5 to .01 mya), inland lakes formed in the region as the result of much wetter conditions in the Sierra Nevada. The largest of those, Lake Manly, was nearly 100 miles (160km) long and 600 feet (180m) deep, the end-basin in a chain of lakes that began with Mono Lake in the north and continued through multiple basins down the Owens River Valley through Searles and China Lakes and the Panamint Valley to the immediate west, most of which are now also dry lakebeds.

As the Pleistocene waned about 10,000 years ago, a wet Death Valley began to evaporate to a dry lake bed (*playa*) composed of alternating layers of silt and salt, reflecting the various wet and dry periods throughout the era. However, it was in the the more recent middle Holocene, when the climate was wetter than it is today, that the valley floor was once again flooded by a shallow lake about 30 feet deep. It was the dessication of this unnamed lake that gave rise to the salt pan that dominates the current vista of Death Valley. Archeologic evidence suggests this lake existed from about 3,000 years ago up to about 1,000 years ago.

Each drying period left an abundance of evaporitic salts, composed primarily of sodium chloride, but including a variety of other salts distributed in predictable zones that reflect the differences in the solubility of the salts. These include sylvite, epsomite, mirabilite, thenardite, trona, calcite, and gypsum.

As briny water evaporates, the first minerals to form are calcium and magnesium carbonates deposited along the edges and bottom of the water body. Next to precipitate, inward from the receding shoreline and above the carbonate bottom layer, are sulfates of calcium and sodium. Finally, when the body of water is almost completely evaporated and reaches its maximum salinity, chlorides (predominantly sodium chloride) are deposited.



**Alternating bands of salts and silt testify to the ever-changing conditions that have sculpted Death Valley the past 2.5M years!**

Ironically—and most fortuitously for mankind—volcanic hot springs infused the lakes with one of the rarest of all elements in the entire universe... boron! The multitude of borates found throughout the region owe their existence to these concentrating vents.

Halite (common table salt) and borax were later exploited during the modern history of the region, primarily 1883 to 1907. Until about 1925, the Death Valley area was the primary source of borax for domestic consumption, competing with deposits in Tibet, Italy, and Chile.

The cycle will no doubt continue for millions of years into the future, with one notable addition. As the most recent lake dried up and the salt pan developed, the valley floor was gradually being tilted eastward. Shoreline evidence indicates that the eastern portion of the valley is now 20 feet lower than that on the western side...and still falling.

Death Valley may be aptly named, but as the youngest of America’s national parks, it is also possibly the most interesting and diverse in both geologic *and* human history, and certainly is a must-see destination for all to visit and appreciate.