

## Student Information

Arches National Park, for its size, has more natural holes in rocks than anywhere in the world. Over 2,000 arches and windows, as well as many delicately carved pinnacles, spires and strangely shaped rocks, make up the scenery in this land of red rocks. Delicate Arch is the most well known arch. Landscape Arch, located in the park at Devils Garden, stretches over 300 feet in length and is one of the largest arches in North America. Other interesting places in the park include Courthouse Towers, Balanced Rock, Fiery Furnace and the Windows Section.

### How Did All This Get Here?

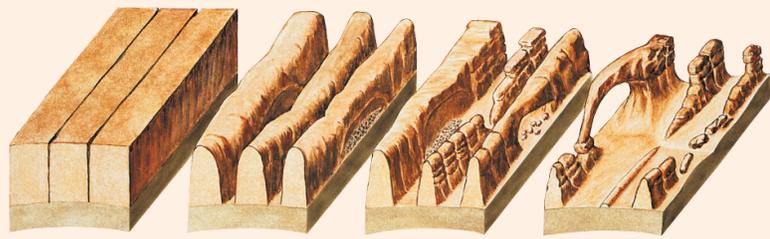
The red rocks of Arches National Park were deposited in layers over millions of years. Later, erosion carved them into the features seen today. Water, ice, and very hot and cold temperatures cause erosion.

Seas covered this region 300 million years ago. When they dried up they left behind thousands of feet of salt. Later, layers of sand and other sediments covered the salt. When buried, the sediments were compressed into sedimentary rock. The buried salt moved under the pressure of the overlying sediment like toothpaste in a tube. As the salt moved, it ran into underground faults or barriers that caused the salt to go upward. Near the earth's surface, the salt formed what looked like long giant bubbles in the upper layers.

The overlying rocks did not bend as easily as the salt did, and so they cracked in parallel fractures. Over time, water ran into these cracks and dissolved much of the salt below. The rock on top soon had nothing to hold it up. It collapsed on itself, similar to a badly-baked loaf of bread.

Water carried away sand grains one by one and widened the cracks into narrow canyons. Today, the thin rock walls between these canyons are called fins, because they look something like a fish's fins. In cooler months, water in the form of rain and snow enters tiny cracks in the fins, freezes and expands, and causes little pieces of sandstone to flake off. After a long time, the tiny cracks break all the way through the fin and an arch is formed. Arches are still forming today, and many ages and sizes of arches are found throughout the park.

In 1973 it was decided that in order for a hole in the rock to be considered an arch it had to have an opening of at least three feet. Even if the opening is one inch high, as long as it is three feet long, it counts as an arch. While you are visiting the park, keep your eyes open because if you find a new arch, you get to name it. Many arches have been named for their shapes such as Pork Chop arch and Piano Leg arch. There are over 2000 documented arches in the park and probably some more to be found!



How were arches formed? Over time, parallel fractures in surface rock eroded to form "fins." As the process of erosion continued, arches were created where the fins were worn completely through.

### Park Facts

- Park Designations:  
*Arches National Monument* - April 12, 1929  
*Arches National Park* - November 12, 1971
- Acreage: 76,519 acres or 119 square miles
- Highest Elevation: Elephant Butte 5,653 feet
- Lowest Elevation: Visitor Center 4,085 feet
- Average annual precipitation: 10 inches
- Number of documented arches: 2,000 and counting
- Largest arch: Landscape Arch (over 300 feet)
- Visitation: 1,014,405 (2010)
- 483 species of plants  
Rare species: *Canyonlands Biscuitroot*
- 186 species of birds  
Threatened species: *Bald Eagle*, *Mexican Spotted Owl*
- 52 species of mammals
- 6 species of fish  
Endangered species: *Bonytail Chub*, *Colorado Pikeminnow*, *Humpback Chub*, *Razorback Sucker*
- 6 species of amphibians
- 21 species of reptiles
- Historic structure – Wolfe Cabin

### Weather

The Park is located in southeast Utah. It is high in elevation, between 4,000 and 5,600 feet above sea level. The area is sometimes referred to as a "cold" desert. Winters are cool, with low temperatures sometimes dropping below zero degrees Fahrenheit. Strong winds are common in spring. Summer temperatures often exceed 100 degrees Fahrenheit in July and August. A summer downpour can produce spectacular flash floods and water falls. Rainfall averages only ten inches per year.

### More Information

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Mule Deer

### What Animals Live Here?

Most animals in this desert climate are nocturnal; that is, they eat, drink and move about at night. Fifty-two kinds of mammals have been sighted in the park. Mule deer, bighorn sheep, cottontail rabbits, kit fox and ground squirrels are seen frequently. Birds are common certain times of the year and in certain locations. At least 186 kinds of birds have been seen in the park. Common ones include pinyon jays, mountain bluebirds, red-tailed hawks and ravens. Visitors who leave their cars during the warm part of the year are almost guaranteed to see lizards! Shy midget-faded rattlesnakes are also present, but are seldom seen.

Believe it or not, the hot temperatures (up to 114 degrees Fahrenheit) in the summer are just one of the many harsh conditions for the animals that live here. Animal adaptations are also aimed at coping with the dryness, lack of food, and extreme temperature changes.

Every animal needs water to live. In the desert, water isn't always there when you need it. Humans have a great advantage because we can plan ahead, fill up our water bottles, and carry as much water as needed (in the summer, about four quarts per person per day). Animals have to find water nearby on a regular basis, unless they can fly or walk a long way.



Western Scrub-jay

Some animals have adaptations that help them live in a dry, hot and cold desert. For instance, black-tailed jackrabbit, kit fox, and mule deer all have large ears with lots of blood vessels in them. They stay cooler by radiating heat from their blood to the air. Some animals such as the kangaroo rat have specialized kidneys that can make water out of dry foods, and have specialized nasal passages that prevent too much moisture from escaping when they breathe.



At Arches National Park, water sources for animals include potholes, springs, seeps, washes, and the Colorado River. Potholes are depressions in rock that collect rainwater and generally evaporate in a week or two. Seeps and springs are more reliable water sources. Most washes have flowing water only after rains. Afterwards, some water flows into the Colorado River and some seeps into the sandy wash bottoms, and the washes dry up. The Colorado River is the southern boundary of the park and is too far away to be useful to many animals that live in the park.

Since water is precious to all life and is rare in the desert, it is important not to swim in water sources. Sunscreen or bacteria on humans can contaminate the water and kill organisms living in it. Carry enough water so that the lives which depend on these clean water sources are not disturbed.



Midget Faded Rattlesnake



Seedling in Biological Soil Crust

### What Plants Grow Here?

Over 400 kinds of plants grow and flourish in Arches, despite extreme temperatures and low rainfall. Plants play an important role in the Arches National Park ecosystem. Plants have adaptations that put them into three different categories: drought escapers, drought resistors and drought evaders.

Drought escapers are plants that take advantage of good growing conditions when they exist. For example, these plants will grow when there is enough water. Seeds of these plants may wait years until there is a rainstorm, and then grow. Many flowers and grasses are in this category.

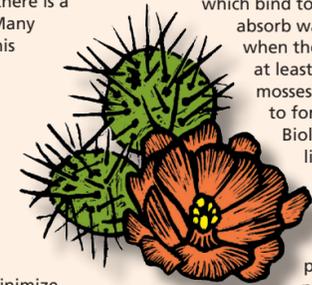
Drought resistors are those plants that have specialized parts that help them survive without much water. Some of these plants have small leaves to reduce water loss through the stomata. Others have spines or hairs on their leaves to minimize evaporation. Yucca plants have a long taproot that helps the plant find water below the reach of other plants. Other drought resistor plants include cacti, mosses and sagebrush.

Drought evaders are plants that live only where there is a lot of water. Springs, rivers

and streams are examples of places where there is water in the desert. In Arches National Park, drought evader plants might grow near the Colorado River or in Courthouse Wash. Drought evader plants include cottonwood trees, willows, ferns and even poison ivy! All of these plants require a reliable source of water.

The plants at Arches National Park would not be as healthy or numerous without the help of organisms like cyanobacteria. Cyanobacteria live on top of the soil. They have sticky sheaths, which bind to individual grains of sand and absorb water. They are invisible to us when they are young. When they are at least 50 years old, fungi, algae and mosses grow with the cyanobacteria to form a crust. The crust is called Biological Soil Crust since it's literally a living crust.

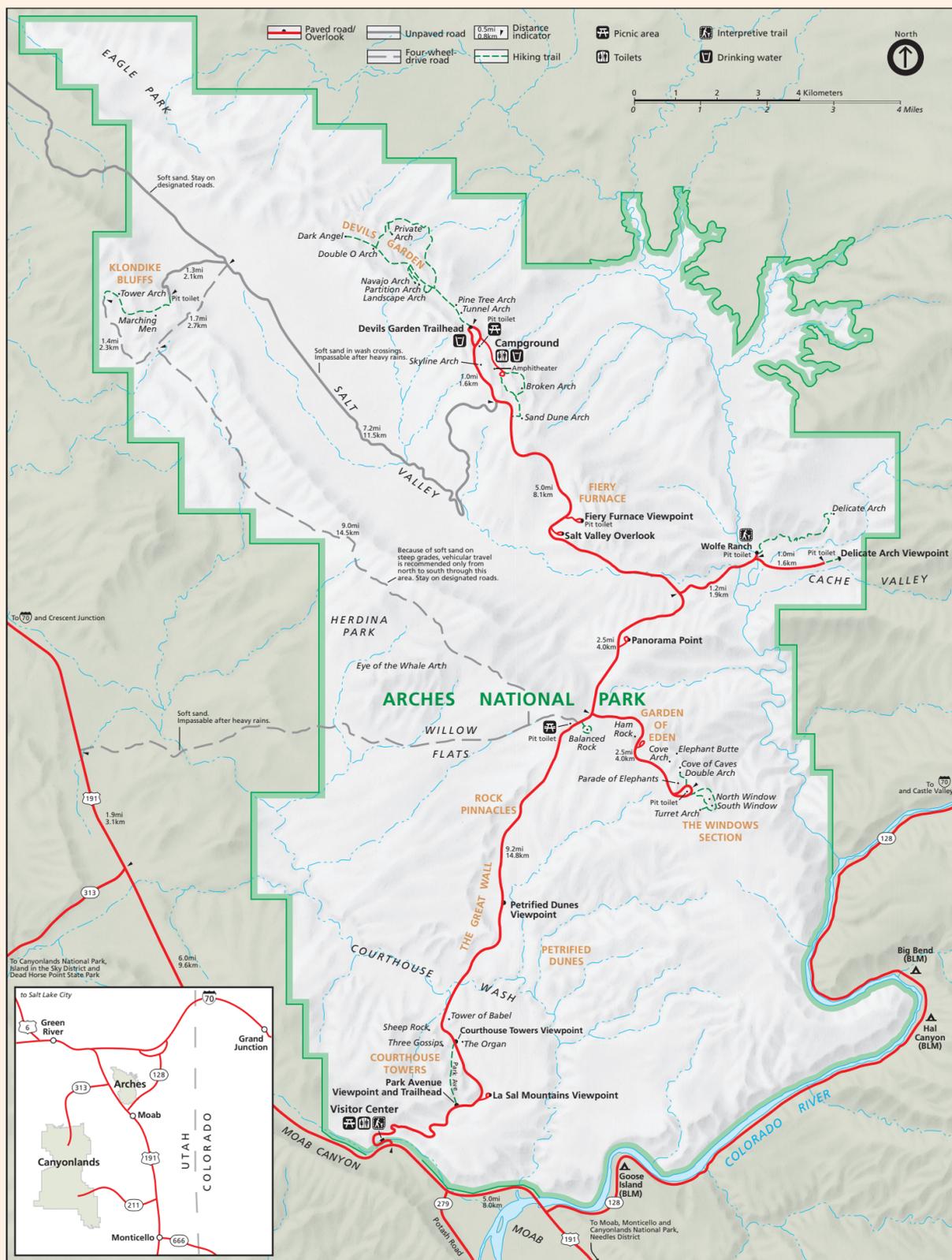
As the crust builds up nutrients, plants begin to grow. There are various plant communities within the park, including pinyon-juniper woodlands, desert shrublands, grasslands, hanging gardens, and riparian corridors. One would not expect to find a water-loving fern living within a few feet of a cactus, but that is exactly what can happen at Arches National Park because of the diverse communities.



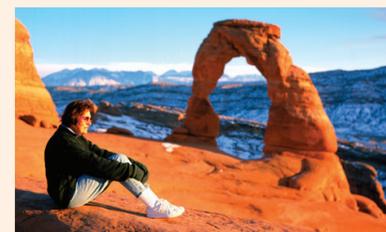
Sego Lily



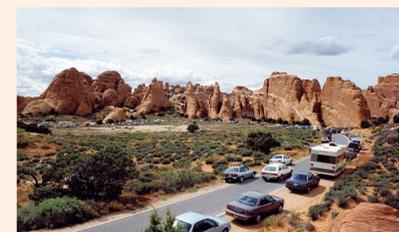
Pinyon Pine



Ute petroglyph panel near Salt Wash



Enjoying the sunset at Delicate Arch



Searching for parking at Devils Garden

## People At Arches

The first people to come to this area were prehistoric Indians. Hunter-gatherers migrated into the area about 10,000 years ago at the end of the Ice Age. As they explored the area, they found pockets of chert and chalcedony, types of quartz perfect for making stone tools. They chipped or knapped these rocks into dart points, knives and scrapers. If you know what to look for, you can still find piles of leftover fragments where they worked.

About 2,000 years ago, ancestral Puebloans and Fremont Indians lived in this area. They lived here only during times of year when they could find enough water. They left behind important clues about their lives, including yucca ropes and sandals, clay figures, pottery and rock art. The rock art includes petroglyphs that are "pecked" into the rock, and pictographs, which are "painted" onto the rock.

When the first European explorers reached this area in the 1700s, they met Ute Indians. A Ute rock art panel can be found in the park near Salt Wash. The first known white explorer was Denis Julien who carved his name and the date - June 8, 1844 - on a rock near Devils Garden. In 1898, John Wesley Wolfe and his son became the first white settlers. They lived in a cabin for 12 years, until 1910. Today, you can see the preserved cabin and root cellar of Wolfe Ranch.

In 1922 a man by the name of Alexander Ringhoffer visited the area of the park called Klondike Bluffs. Ringhoffer, who was a miner and prospector, promoted Arches, and it became a unit of the national park system in 1929. John W. "Doc" Williams practiced medicine around Moab for nearly 23 years and promoted the conservation of the natural wonders of Arches. Bates Wilson served as superintendent of Arches for twenty-three years. During that time park visitation went up a whopping 1,600 percent (from 13,270 in 1949 to 225,500 in 1972). Wilson was also the first superintendent of nearby Canyonlands National Park.

In 1968 author Edward Abbey published *Desert Solitaire*. The book describes Abbey's days as a seasonal ranger at Arches National Park in the 1950s and has inspired many visitors who call themselves "desert rats."

President Herbert Hoover proclaimed Arches National Monument on April 12, 1929. More people became interested in the red-rock formations, and in 1971, Congress approved Arches as a National Park.

## You and the National Parks

The National Park Service was created in 1916 to care for national parks, monuments and other lands set aside in the National Park system. The National Park Service must protect the scenery and natural and historic objects and the wildlife in the parks, and must provide for their enjoyment by people today and in the future.

Each year, more and more people visit our national parks. The National Park Service can preserve and protect the resources in parks only with help from people like you!

When you visit parks, treat them gently. Carry your trash home with you, be quiet and listen to the sounds of nature, and stay on the trails. Write your name on a trail register instead of the rocks, and don't feed or bother the wildlife (keep them wild!). Enjoy your parks and leave them as you found them, for others to enjoy.



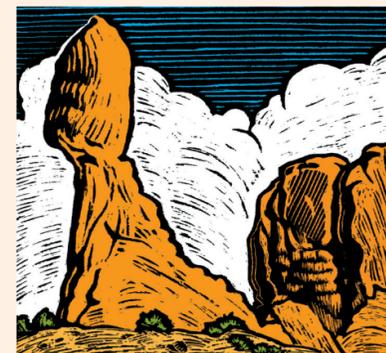
## Environmental Concerns

**Biological Soil Crust**  
Biological soil crust is the bumpy layer that grows on top of the sand at Arches and is a very important part of the desert ecosystem. These crusts hold sand grains together (preventing erosion), absorb water, give seeds a place to grow, and provide nutrients for plants (they fix nitrogen). Biological soil crust is very fragile. One footstep may destroy it. Since it lives everywhere, it is important to stay on trails and not "bust the crust" while at Arches. Biological crust grows in places throughout the world. See if you can find it where you live. Learn more at [www.soilcrust.org](http://www.soilcrust.org).

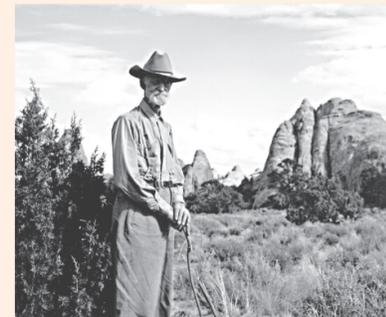
**Traffic Congestion**  
Over a million people visit Arches every year, and most of them drive here. From spring through fall, parking lots at popular spots in the park can be as busy as a shopping mall during the holiday season. All those cars waiting for a place to park create air pollution and noise pollution. Impatient drivers might pull off the road and damage the plants and fragile soils. The park is looking for ways to reduce this traffic, such as encouraging carpools, off-season visits and even piloting a shuttle system.

**Tamarisk**  
Tamarisk is an exotic plant (not from here) that grows within the boundaries of Arches, especially along the Colorado River. Also known as "salt cedar," tamarisk squeezes out native plants by creating dense thickets where few other seedlings can sprout. Tamarisk also excretes salt from its leaf openings, creating very salty soil where most plants cannot survive. One estimate is that tamarisk can establish new territory, crowding out other species of plants, at a rate of 12 miles per year. In recent years, biological control of tamarisk has met with some success. Learn more at [www.tamariskcoalition.org/BioControl.html](http://www.tamariskcoalition.org/BioControl.html).

**The Night Sky**  
Arches National Park is one of a few places left in the world where you can see the Milky Way and many other stars at night. As more and more development occurs in neighboring towns and cities, light pollution is affecting the night sky at Arches. The park hopes to lead by example: its own facilities will meet 100% compliance with "dark skies" lighting standards by the end of 2012. Learn more at [www.darksky.org](http://www.darksky.org).

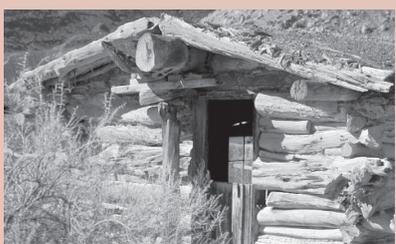


Balanced Rock



John W. "Doc" Williams

## Arches Historical Timeline

1900	1910	1920	1930	1940	1950	1960	1970	1980	1990	2000
<p><b>1898-1910</b> Civil War veteran John Wesley Wolfe operates a cattle ranch in the area destined to become Arches National Monument/Park.</p>  <p>Wolfe Cabin</p>	<p><b>August 25, 1916</b> Congress passes the National Park Service Organic Act establishing the National Park Service.</p>	<p><b>April 12, 1929</b> President Herbert Hoover signs Presidential Proclamation No. 1875 establishing Arches National Monument.</p>  <p>Skyline Arch today</p>	<p><b>November 25, 1938</b> President Franklin D. Roosevelt signs Presidential Proclamation No. 2312 enlarging Arches National Monument.</p>	<p><b>1940</b> Significant rock fall occurs at Skyline Arch.</p>	<p><b>July 22, 1960</b> President Dwight D. Eisenhower signs Presidential Proclamation No. 3360 adjusting the boundaries of Arches National Monument.</p> <p><b>1959</b> Visitor Center at Arches National Park completed.</p> <p><b>January 20, 1969</b> President Lyndon B. Johnson signs Presidential Proclamation No. 3887 enlarging Arches National Monument.</p>	<p><b>1975</b> Wolfe Ranch listed on National Register of Historic Places.</p> <p><b>Winter of 1975/1976</b> "Chip Off the Old Block" falls near Balanced Rock.</p> <p><b>November 12, 1971</b> President Richard M. Nixon signs Public Law 92-155 changing Arches from a National Monument to a National Park.</p>	<p><b>1979</b> 50th Anniversary of Arches National Monument/Park celebrated.</p>	<p><b>September 1, 1991</b> Significant rock fall from Landscape Arch.</p>  <p>Interpretive Ranger Dan Greenblatt carries the 2002 Olympic Torch through Arches.</p>	<p><b>February 4, 2002</b> Winter Olympic torch carried through Arches.</p> <p><b>October 30, 1998</b> President William J. Clinton signs Public Law 105-329 enlarging Arches National Park.</p>	