National Park Service
U.S. Department of the Interior

Arches

The La Sal Mountains with the Windows Section in the foreground NPS PHOTO / PAUL STOLEN

We Need Your Help

BY RACHEL JOHA

Arches National Park is a destination for over 1.5 million people a year. Numbers like that can have a huge impact on the landscape. No matter your experience in the outdoors, we all play a role in protecting and preserving our public lands. The Seven Principles of Leave No Trace are helpful guidelines to minimize your impact here at Arches or anywhere you visit.

Plan Ahead and Prepare
Plan your trip activities to match your goals, skills, and abilities. Research the park and current conditions ahead of time. Bring enough water, a map, food, and appropriate gear so you don't need rescuing. Dozens of hikers at Delicate Arch and Devils Garden get in trouble every year from lack of preparation.

Travel and Camp on Durable Surfaces
Concentrating your activity on non-vegetated durable surfaces (e.g. a trail, rock, a drainage path, or pavement) spares vegetation, sand dunes, and soil crust from damage. Don't walk through desert puddles, whether they are wet or dry. They contain living organisms.

Dispose of Waste Properly
"Pack it in, pack it out." Don't leave behind any trash or food scraps. In arid climates like ours, organic litter like orange peels or nut shells does not decompose quickly. "Go before you go." Before starting a hike, use the bathroom and carry a human waste disposal bag for emergencies.

Leave What You Find
Chalking, carving, scratching, or painting on the rocks is considered graffiti and is illegal. Cairns (stacks of rocks) mark routes in the park. Don't change existing ones or build your own, which can mislead other hikers.

Minimize Campfire Impacts
Never leave a fire unattended, and thoroughly extinguish all fires. Fires are only allowed in designated pits at Devils Garden Campground and in picnic areas. Collecting firewood or kindling is not allowed in the park.

Respect Wildlife
Do not feed wild animals. Secure your food and trash so clever ravens can't get into it. Keep pets under control and on a leash so they don't harm or stress wildlife. Pets are not allowed at overlooks, on trails, or in the backcountry, even in carriers. Observe wildlife quietly from a safe distance so as not disturb them.

Be Considerate of Other Visitors
Avoid disrupting natural quiet with loud music or shouting. Remeber— you share public lands with other other visitors. Respect and protect the quality of everyone's outdoor experience.

Thank You!
Practicing these Leave No Trace outdoor principles is a powerful way to show your love and help preserve public lands for future generations.

Leave No Trace™
Center for Outdoor Ethics

Welcome to Arches

Have a safe and enjoyable visit by remembering these rules and advisories.

Drink water. It is easy to become dehydrated here, even in cold temperatures. Plan on drinking at least 1 gallon (4 L) of water per day. You can get water at Arches Visitor Center and Devils Garden.

Do not rely on cell service at Arches.
Coverage varies throughout the park. There are pay phones at the visitor center. **Emergency? Call 911**

Respect nature.
Leave plants, rocks, and artifacts where you see them. Do not feed or disturb animals.

Find your way.
Cairns (small rock piles) mark routes. Don't build your own; they could mislead other hikers. If you get lost, stay where you are, and wait for rescue.

Keep off the arches.
It's prohibited—and dangerous—to climb on any arch or on prominent features like Balanced Rock.

When thunder roars, go indoors.
There is no safe place outside during a storm. Seek shelter in a safe building or vehicle.

Leave drones at home. Launching, landing, or operating unmanned aircraft (such as model airplanes, quadcopters, or drones) is prohibited.

Walk on hard surfaces.
Stay on trails to protect fragile biological soil crusts and plant and animal habitat, and to reduce your risk of getting lost.

The sun is intense, and shade is rare.
Avoid exertion during peak heat (>90°F /32°C). Protect yourself with sunscreen, sunglasses, and a hat.

Watch your step.
Rocks fall. People fall. Sandstone is slippery when wet or icy. In winter, avoid snowy or icy trails.

Leave the rocks as you see them.
Graffiti—carving, scratching, chalking, or any type of marking—is illegal and unsightly.

Do not use ATVs. It's prohibited to use any type of ATV or OHV. There are many roads outside the park where you can use ATVs and OHVs.

Emergencies call 911

National Park Service
U.S. Department of the Interior

Arches National Park
PO Box 907
Moab, UT 84532
email **archinfo@nps.gov**
phone **435-719-2299**

Visitor Guide 2021, Volume 1

Arches Visitor Guide published by Canyonlands Natural History Association, a nonprofit organization that assists the National Park Service in its educational, interpretive, and scientific programs. For more information, see page 8.

Find us online.

Follow ArchesNPS to share your park experiences with us and our growing online community:

website **nps.gov/arches**
facebook.com/**ArchesNPS**
twitter **@ArchesNPS**
instagram **@ArchesNPS**
flickr.com/**ArchesNPS**
youtube.com/**ArchesNPS**

Park Fees

Arches National Park charges fees for park entrance, camping, and some permits. Eighty percent of the fees collected at Arches are returned to the park to address priority needs in maintenance, infrastructure, resource management, and visitor services. Fees are subject to change.

Entrance Fees	
Single vehicle (per vehicle)	$30
Motorcycle (per vehicle)	$25
Pedestrian/Bicycle (per person)	$15
Interagency Annual Pass	$80
Southeast Utah Parks Pass	$55

Passes for US citizens or permanent residents with disabilities, seniors, and active-duty military personnel are also available. Inquire at the entrance station or visitor center.

Camping Fees	Nightly Fee
Devils Garden	$25 per site
Juniper Group Site (based on group size of up to 55 people)	$100-$250
Canyon Wren Group Site (based on group size of up to 35 people)	$75-$160

Park Information

HOURS OF OPERATION

The park is open 365 days a year. The visitor center is open daily from 9 am to 4 pm, with extended hours spring through fall. The visitor center is closed December 25.

FOOD, GAS, AND LODGING

There is no food, gas, or lodging in the park. The town of Moab, five miles from the park entrance, has a full complement of restaurants, lodging, grocery stores, gas stations, and other services. For information visit www.discovermoab.com.

CAMPING

Devils Garden Campground has 50 sites and is located 18 miles from the park entrance. The campground has two group sites for groups of 11 or more. The campground is usually full every day, March through October. We recommend reserving a site before you arrive. If you don't have a reservation, plan to use other area camping options. For camping outside the park, ask at the visitor center, or visit www.discovermoab.com

SHARE THE ROAD

Park roads are narrow and winding. Do not stop in the roadway—save sightseeing for designated viewpoints. Watch for pedestrians and bicycles. Ensure a minimum distance of 3 feet (1 m) when passing.

RESERVATIONS

You can reserve: • standard campsites up to six months in advance, • group campsites up to 12 months in advance • ranger-led Fiery Furnace hikes (see below) up to six months in advance. Visit www.recreation.gov or call 877-444-6777 (toll free), 877-633-6777 (TTY), or +1 518-885-3639 (international).

PETS

You **may** have your pet at Devils Garden Campground and may walk your pet along roads and in parking lots. You **may not** have pets on hiking trails, at overlooks, or anywhere in the backcountry, even in carriers. Pets must be on a leash no longer than six feet (1.8 m) at all times. Do not leave pets in vehicles when temperatures are above 65°F (18°C); they can die of heat exhaustion. Moab has kennels with boarding services. Many public lands outside the park allow pets.

ACCESSIBILITY

People with **mobility impairments** can access: • visitor center and toilets throughout the park • Devils Garden Campground site 4H • Park Avenue Viewpoint: Paved • Delicate Arch Viewpoint: Hard surface, level • Balanced Rock Viewpoint: Paved, level • Wolfe Ranch Cabin/Rock Art Panel: Hard surface, level • Double Arch: Hard surface with slope; may need assistance.

For people who are **deaf** or have **hearing loss**, we have a variety of publications at the visitor center, exhibits throughout the park, and all video programs are captioned.

At the visitor center, we have audio recordings, tactile models, maps, and rock samples for people who are **blind** or have **low vision**. We also have large print and braille publications as well as an audio version of the park brochure. At the bookstore, you can purchase or rent an audio tour of the park's scenic road.

Service animals, dogs or horses trained to perform specific tasks for a person with a disability, are allowed on trails. Emotional support ("therapy") animals are not considered service animals under the Americans with Disabilities Act.

Things to Do

RANGER PROGRAMS

Check the visitor center or website for information on ranger programs and special events. Programs are always subject to change.

Evening Programs May be offered most nights in summer at Devils Garden Campground amphitheater. 45 minutes. Free.

Fiery Furnace Hikes May be offered daily, spring through fall. Physically demanding hikes require scrambling up and through narrow cracks and along ledges above drop-offs. Children under 5 are not permitted. Make reservations or ask at the visitor center. Hikes may fill weeks in advance. $10-$16 for adults, half price for youth.

FOUR-WHEEL DRIVING

Arches has a limited number of four-wheel-drive roads. ATVs/OHVs are prohibited. Check at the visitor center for current road conditions, especially after recent rain. The Bureau of Land Management (BLM) maintains many popular four-wheel-drive routes outside the park.

STARGAZING

Many overlooks with open views of the sky offer great stargazing. The farther you are from Moab, the darker the sky will be. Try stargazing at Panorama Point or The Windows. Read more stargazing tips on page 6. Rangers offer stargazing programs in summer. Check at the visitor center.

CYCLING

Ride bicycles or e-bikes only on roads—not on hiking trails or off-road. Shoulders are narrow; there are no bike lanes. There may be large vehicles on the road. Ride single file. The unpaved Willow Springs Road offers an enjoyable two- to three-hour ride. Most popular biking trails are on Bureau of Land Management (BLM) land.

HIKING

There are many options for hiking, ranging from a short stroll to a strenuous, multi-hour hike. Check page 4 for a list of hiking trails.

BACKPACKING

Arches has only a few areas for overnight backpacking. Outside the developed visitor area there are no designated trails, or reliable water sources. To backpack at Arches, you must obtain a backpacking permit at the visitor center and camp in designated sites or zones. Or, consider backpacking at **nearby places like Canyonlands National Park** that offer more extensive backcountry opportunities.

CLIMBING AND CANYONEERING

Most routes require advanced skills. Plan ahead, and be prepared for self-rescue. Follow all regulations, route closures, and group size limits. Get permits and route information on the park website. **Climbing of any type is prohibited on all arches and prominent features, including Balanced Rock.** Slacklining is always prohibited.

PHOTOGRAPHY

Take home great photos of your Arches experience. Here are some tips for where you might capture that magic moment at both sunrise and sunset. **"Light Painting,"or using artificial light sources to illuminate features at night is prohibited.**

Early Morning Moab Fault • Three Gossips • Sheep Rock • Turret Arch • Double Arch • Cache Valley • Delicate Arch Viewpoint • Wolfe Ranch • Landscape Arch • Double O Arch

Late Afternoon Park Avenue • La Sal Mountains Viewpoint • Courthouse Towers • Petrified Dunes • Balanced Rock • Garden of Eden • The Windows • Delicate Arch • Fiery Furnace Viewpoint • Skyline Arch • Tower Arch

Using New Techniques to Combat Graffiti

BY MATT SMITH

Each year, park visitors hike up the steep, deceivingly difficult trail to Delicate Arch. Along the way, hikers encounter another natural wonder, Frame Arch. Also known as Twisted Donut Arch, Frame Arch truly does "frame" Delicate Arch when viewed from just the right angle. Unfortunately, in April 2016 Frame Arch was tragically damaged.

"ANDERSEN," deeply chiseled and nearly six feet (1.8 m) in length along the base of Frame Arch was an act of vandalism park staff discovered that spring morning.

Vandalism: action involving deliberate destruction of or damage to public or private property.

Some American Indians believe, as their ancestors did, that Arches National Park is a sacred place. Some recognize arches as portals in space and time, allowing access to perspectives from the past, present, and future. Today's technology allows visitors from around the world the opportunity to share moving experiences inspired by visiting Arches National Park. Across cultures, arches are widely treasured.

So, for countless park visitors, graffiti applied anywhere in the park is a senseless and selfish act that alters a hallowed place. Graffiti upsets park visitors—and staff too.

Some deeply incised graffiti requires the use of power grinding by a skilled operator. But the harm to Frame Arch was too severe. Grinding away a six-foot-long, ¾-inch-deep (2 cm) area would have drastically changed Frame Arch, destroying a large portion of what nature took so long to create.

Fortunately, treatments to reclaim deep graffiti continue to be developed. Two methods include infilling with a mixture of ground sandstone and an acrylic bonding agent, and in-painting with organic pigments.

In October 2017, after studying the damage and carefully matching colors, we began partial infilling and in-painting on Frame Arch. We completed repairs in 2018. We continue to monitor the infilling and may use this same technique in other areas of the park.

National parks are places where shared experiences bring people from around the world together. Why do a few people choose vandalism as a park experience? How can the act of defacing geological masterpieces be justified in the mind of one who vandalizes?

Regardless of the answer, we require vigilance to mitigate graffiti at Arches. We must act quickly to discourage additional harm by copycat offenders.

NPS PHOTOS / CHRIS WONDERLY

We find graffiti in the park frequently. In October 2017, we began filling some carved graffiti with a mixture of ground sandstone and an acrylic bonding agent. We continue to monitor the filling and may use the technique in other parts of the park.

Your involvement is crucial. Choose to leave no trace by not marking on rocks. Talk to friends and family about why graffiti is not OK, and promptly report any violations you witness.

Moving forward together, our partnership of shared care and concern can help preserve our national parks and monuments.

Share the Scenery

Since 2010, Arches' visitation has topped 1 million people. The park is popular for good reasons. The breathtaking scenery attracts people from around the world.

Park staff have been working to manage traffic in the park since 2006. We continue to consider traffic management options, and are gathering information, data, and analysis to guide future planning.

In the mean time, you can use these tips to have an enjoyable experience and to help preserve these timeless landscapes for others to enjoy:

- **Start your day early.** Enter the park before 8 am. Sunrise is just as beautiful as sunset.
- **Allow extra time.** There is plenty of scenery for all to enjoy, and the rocks aren't going anywhere—at least, not on a human time scale.
- **Carpool**. Parking is very limited, so consider leaving extra vehicles, large RVs, or trailers at the hotel, campground, or visitor center parking lot.
- When parking lots fill, staff may delay vehicle entry for several hours.
- If the park is too busy, **visit other parks and public lands** nearby. See page 8 for some options.

An Extra Note about Parking
During the busy season, you may see rangers assisting in crowded parking lots. Please follow their directions.

Acceptable parking places include individually marked stalls, parking "lanes" along fences, and existing turnouts along the roads. Never park on vegetation or in a manner that blocks traffic, and please don't hold up the flow of cars by waiting for a parking spot. **If there isn't room, move to another area and come back later.**

NPS PHOTO / SHEENA HARPER

Hey Kids—This One's For You!

NPS PHOTO / ANDREW KUHN

Do you want to explore Arches and help protect the park? Then become a junior ranger! Becoming a junior ranger is a serious and important task, but it's lots of fun too. Ask at the visitor center how you can get involved. Options include completing a booklet or checking out a Red Rock Explorer Pack. You'll earn a badge and certificate and join the ranks of the many junior rangers who help protect this special place.

Plan Your Visit

DRIVING

In 1½ hours, you can:

- Drive to The Windows and see some of the park's largest arches.
- Drive to Delicate Arch Viewpoint and see the world's most famous arch from a distance. Stop at Wolfe Ranch on your way back, and imagine homesteading here in the late 1800s.

In 3 hours:

- Drive the whole park road, spending 10 minutes at each viewpoint.

In half a day:

- Drive the whole park road, spending 10 minutes at each viewpoint, and take a short walk at The Windows Section, Delicate Arch Viewpoint, or Balanced Rock.

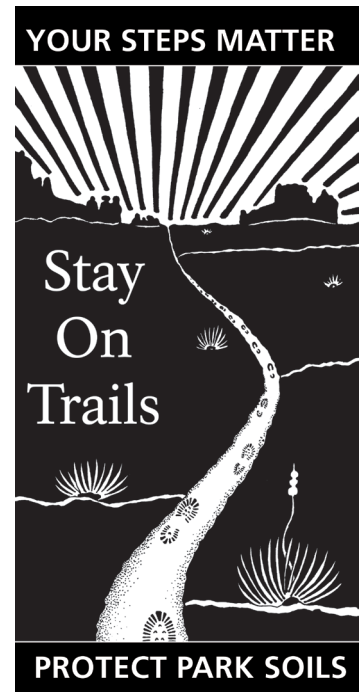
HIKING

In two hours, you can do one of these four routes:

- Hike The Windows loop trail and between parking areas to Double Arch. Drive back to Balanced Rock and walk the trail around its base.
- Hike up the sloping slickrock to see Delicate Arch. ***(Avoid this trail in midday summer heat.)***
- Walk between tall fins in Devils Garden to see Landscape Arch, North America's longest.
- Walk to Sand Dune Arch, then across the field to Broken Arch. Continue through the end of the campground and return. Enjoy Tapestry Arch and the sandstone fins.

In half a day, take one of these two hikes:

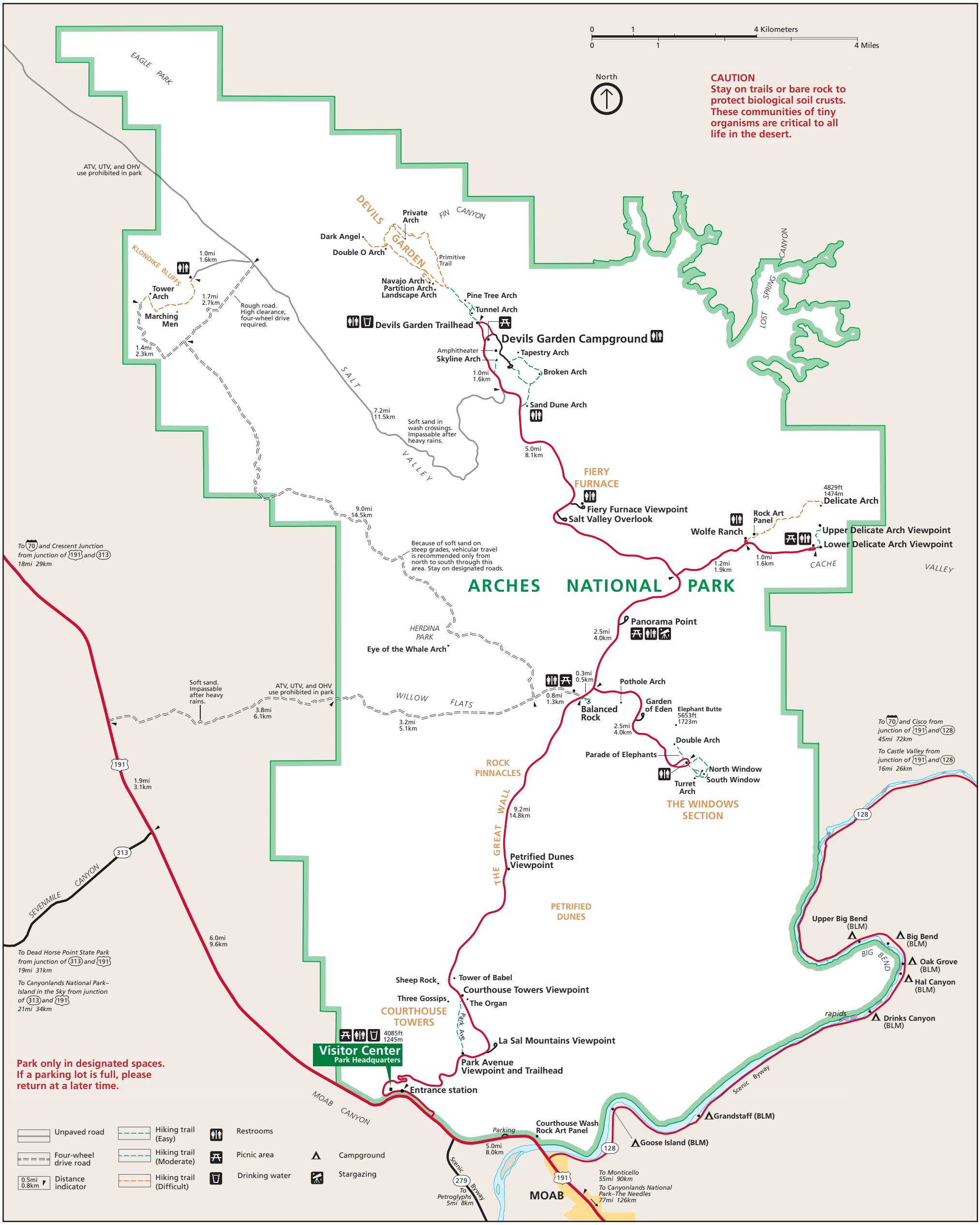
- Climb up the fins of Devils Garden trail to the spire called Dark Angel. On your way back, hike the primitive trail route only if you're up for challenging slopes, exposure to heights, and narrow traverses.
- If you don't mind driving an unpaved road to the remote area called Klondike Bluffs, hike the primitive trail to Tower Arch.



Hiking

Wheelchair-accessible trail
Toilet near trailhead
Water near trailhead

TRAIL	LENGTH	TIME	DESCRIPTION
EASY TRAILS			
Nature Trail	50 yards roundtrip *45 m*	10 min.	Learn about native desert plants on the nature trail behind Arches Visitor Center.
Balanced Rock	0.3 miles roundtrip *0.5 km*	15-30 min.	This is a loop trail at the base of a fragile, picturesque rock formation. Part of the trail is paved.
The Windows	1 mile roundtrip *1.6 km*	30-60 min.	A gentle climb up a gravel trail leads to the massive North and South windows, and Turret Arch. Return via the same trail, or take the slightly longer primitive trail around the back of the Windows from South Window viewpoint.
Double Arch *at The Windows*	0.5 miles roundtrip *0.8 km*	15-30 min.	A relatively flat trail leads to the base of two giant arch spans that are joined at one end.
Delicate Arch Viewpoints	100 yards roundtrip *91 m*	5-15 min.	*You can't hike to Delicate Arch on these trails; the hike to Delicate Arch begins at Wolfe Ranch.* A flat accessible trail leads to the lower viewpoint. A longer, moderately strenuous trail climbs steeply 0.5 mile (0.8 km) to the upper viewpoint, separated from Delicate Arch by a canyon.
Sand Dune Arch	0.3 miles roundtrip *0.5 km*	15-30 min.	Hike through deep sand to a secluded arch tucked among sandstone fins. *Do not climb or jump off the arch.*
Broken Arch	1.3 miles roundtrip *2.1 km*	30-60 min.	The trail crosses a large meadow to the arch. Extend the hike to 2 miles (3.2 km) roundtrip by hiking through the arch, past Tapestry Arch, and through the campground. Part of the longer loop includes some moderate scrambling.
Skyline Arch	0.4 miles roundtrip *0.6 km*	10-20 min.	A short, out-and-back hike on a flat, well-defined trail leads to an arch in a high wall.
Landscape Arch *at Devils Garden*	1.8 miles roundtrip *2.9 km*	30-60 min.	A hard packed trail leads to a spectacular ribbon of rock. *The trail beyond Landscape Arch becomes difficult, with rock scrambling, narrow ledges, and exposure to heights—see Double O Arch.*
Courthouse Wash Panel	1 mile roundtrip *1.6 km*	30-60 min.	Park 0.5 miles (0.8 km) north of the Colorado River on US 191. A short walk across the Courthouse Wash bridge and a brief climb leads to a prehistoric panel of rock markings (at the base of the cliffs, facing west).
MODERATE TRAILS			
Park Avenue	1 mile one way *1.6 km*	30-60 min.	The trail descends steeply into a spectacular canyon and continues to Courthouse Towers. For a roundtrip hike, retrace your steps along the trail rather than walking along the road. Elevation change: 320 feet (98 m)
DIFFICULT TRAILS			
Delicate Arch *at Wolfe Ranch*	3 miles roundtrip *4.8 km*	2-3 hours	*Take at least 2 quarts (2 L) of water per person. Avoid during midday summer heat.* This trail climbs 480 feet (146 m) up a steep slickrock slope. The trail has no shade and some exposure to heights. Just before you get to Delicate Arch, the trail follows a narrow rock ledge for about 200 yards (183 m), which is often icy in winter.
Tower Arch *at Klondike Bluffs*	2.6 miles roundtrip *5.5 km*	2-3 hours	The trail climbs a steep, short rock wall, cuts across a valley, and then meanders through sandstone fins and sand dunes. An alternate, shorter trail (0.3 mile [0.5 km] one way) begins at the end of the four-wheel-drive road on the west side of Tower Arch. This unpaved road washes out quickly in rainstorms; check road conditions before heading out.
Double O Arch *at Devils Garden*	4.2 miles roundtrip *6.8 km*	2-3 hours	The trail beyond Landscape Arch climbs steeply over sandstone slabs. There are uneven surfaces and narrow ledges with steep drop-offs. Spur trails lead to more arches. Dark Angel is 0.5 miles (0.8 km) beyond Double O Arch.
Devils Garden *all trails*	7.9 miles roundtrip *12.6 km*	3-5 hours	Full Devils Garden trail system includes Landscape Arch, Double O Arch, and the primitive trail. This challenging hike involves narrow ledges, steep exposures, uneven surfaces, rock scrambling, and few trail markers. *Avoid when rock is wet or icy.*
Fiery Furnace *(Fee Area)*	The Fiery Furnace is a labyrinth of narrow sandstone canyons that requires agility to explore. To enter the Fiery Furnace, you must accompany a ranger-guided hike (see p. 2) or obtain a day-use permit at the visitor center. Everyone in your group must be present at the visitor center to get a Fiery Furnace permit.		



Trailhead parking is limited. If parking lots are full, move on and come back later.
For the best chance of finding a spot, arrive before 9 am or after 3 pm.

2021 Night Sky Almanac

Stargazing Tips

Look for a high viewpoint or a wide open area to see the most stars. Try stargazing at Panorama Point or The Windows Section. Give your eyes 20-30 minutes to adjust to the darkness. Skies will be darkest when the moon is out of sight. Use a red flashlight to protect your night vision, or just cover a white flashlight with red fabric or cellophane. Help other stargazers by not shining your headlights or flashlights on rock formations (prohibited). Check star charts and other stargazing tips at the visitor center.

Meteor Showers

(best viewing midnight to dawn)

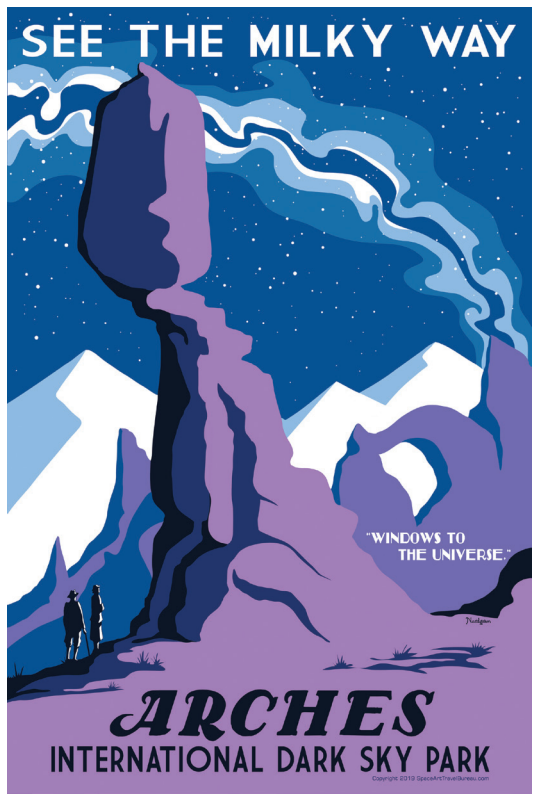
JAN 3 Quadrantids Meteor Shower
APR 22 Lyrids Meteor Shower
AUG 8 Perseids Meteor Shower
OCT 21/22 Orionids Meteor Shower
NOV 17 Leonids Meteor Shower
DEC 13/14 Geminids Meteor Shower

Moon Phases

JANUARY 6 Full Moon • **28** New Moon
FEBRUARY 27 Full Moon • **11** New Moon
MARCH 27 Full Moon • **13** New Moon
APRIL 27 Full Moon • **12** New Moon
MAY 26 Full Moon • **11** New Moon
JUNE 24 Full Moon • **10** New Moon
JULY 24 Full Moon • **20** New Moon
AUGUST 22 Full Moon • **8** New Moon
SEPTEMBER 20 Full Moon • **7** New Moon
OCTOBER 20 Full Moon • **6** New Moon
NOVEMBER 19 New Moon • **4** Full Moon
DECEMBER 19 New Moon • **4** Full Moon

Other Dates

MAR 20 Spring Equinox
JUN 20 Summer Solstice
SEPT 22 Autumnal Equinox
DEC 21 Winter Solstice



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Curious Behavior

BY MICHAEL MATTHES

From somersaulting through the air to sliding in the snow, the behavior of the Common Raven (*Corvus corax*) is curious to say the least. These bold, playful passerines are one of the most common wildlife sightings in the park. If you're a "people-watcher" then you may become a "raven-watcher" by the end of your visit; these birds are remarkably like you and me.

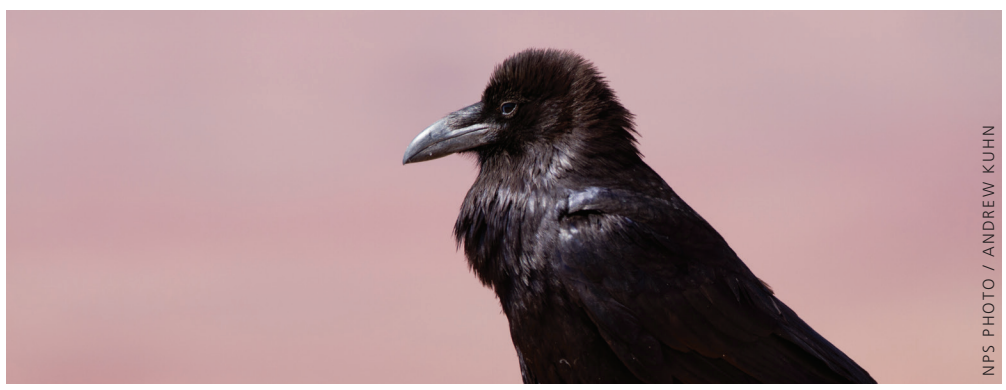
Like humans, ravens speak their mind. Their sophisticated avian vocabulary is complex with over 30 types of calls. From the low, croak-like "*kraaaah*" to the deep, nasal "*brooonk*," ravens are expressive communicators. Their vocal repertoire includes hunger calls, defense calls, flight calls, alarm calls, whistles, and territorial announcements. These loud-mouthed birds also make non-vocal sounds like wing whistling and bill snapping. The Common Raven can also mimic sounds from their environment including human speech.

Aerial acrobatics, demonstrations of intelligence, and providing food are key behaviors during the courting process. Once paired, ravens nest together for life, usually in the same location. Though not as social as crows and magpies, their close relatives, they are often spotted with or near their mates.

"Bird brain" isn't an insult when it comes to the raven; they actually have large brains and are extremely intelligent.

Cognitive processes such as imitation, insight, and the superb ability to solve problems truly set them apart from other bird species. Scientists believe that ravens memorize locations of food sources and have observed ravens using sticks as tools to raid other ravens' food caches. We humans are not the only species that relies on retaining and recalling past experience as we soar through life.

Ravens are opportunists and will eat just about anything they can get their claws on. Most of their diet consists of carrion, lizards, bats, insects, and seeds, but they aren't opposed to human food as well. These clever scoundrels have been known to break into unsecured coolers and vehicles for tasty yet unhealthy human treats. In an effort to keep wildlife wild, avoid feeding ravens by keeping your food properly stored in a secure location.



NPS PHOTO / ANDREW KUHN

A Microscopic Community

Biological soil crust is a living ground-cover that forms the foundation of high desert plant life in Arches and the surrounding area. Cyanobacteria dominates this knobby crust, but it also includes lichens, mosses, algae, microfungi, and bacteria.

Cyanobacteria, previously called blue-green algae, are one of the oldest known life forms. Scientists think that these organisms were among the first colonizers of Earth's early land masses, and played an integral role in the formation and stabilization of Earth's early soils. Extremely thick mats of these organisms converted the planet's original carbon dioxide-rich atmosphere into one rich in oxygen and capable of sustaining life.

When wet, cyanobacteria move through the soil and bind soil particles, forming an intricate web of fibers. The fibers join loose soil particles together, and an otherwise unstable surface becomes very resistant to both wind and water erosion. This soil-binding action does not require living filaments. One can still find layers of abandoned sheaths, built up over long periods of time, clinging tenaciously to soil particles, providing cohesion and stability in sandy soils up to 4 inches (10 cm) deep.

Vascular plants can't utilize nitrogen as it occurs in the atmosphere. Cyanobacteria convert atmospheric nitrogen to a form plants can use. This is especially important in desert ecosystems, where nitrogen levels in the soil are low, which often limits plant productivity. Soil crusts also trap and store water, nutrients, and organic matter that might otherwise be unavailable to plants.

NPS PHOTO / NEAL HERBERT

Even though these organisms are long-lived, they are also fragile. We can negatively affect the presence and health of soil crusts. Footprints or machinery impacts are extremely harmful, especially when the crusts are dry and brittle. Tracks in continuous strips, such as those produced by vehicles or bicycles, create areas that are highly vulnerable to wind and water erosion. Rainfall carries away loose material, often creating channels along these tracks, especially on slopes.

Impacted areas may never fully recover. Under the best circumstances, a thin veneer of biological soil crust may return in five to seven years. Recovery usually happens slowly during up to 50 years of cyanobacterial growth. Lichens and mosses may take even longer to recover.

Help us protect park soils during your visit. Please walk on trails, rock, or in sandy washes (where water flows when it rains), and keep your vehicles and bikes on designated roads.

Why So Many Arches?

Arches National Park has the densest concentration of natural stone arches in the world. There are over 2,000 documented arches in the park, ranging from sliver-thin cracks to spans greater than 300 feet (97 m). Why are there so many arches in this place? How do they form? And what is an arch, anyway?

First, you need the right kinds of rock.
Sandstone is made of grains of sand cemented together by minerals, but not all sandstone is the same. The Entrada Sandstone was once a massive desert, full of shifting dunes of fine-grained sand. They formed a hard rock that is very porous (full of tiny spaces), while The Carmel Formation, made of sand and clays, is softer and resists water.

Crack it into parallel lines.
Deep beneath the surface lies a thick layer of salts. Squeezed by rock above and below, the salt bulged upward, creating long domes. The rock layers covering these domes were forced to crack, like the surface of freshly-baked bread, into a series of more-or-less parallel lines.

Next, add the right amount of rain.
On average, the park receives 8-10 inches (18-23 cm) of precipitation a year. That might not sound like much, but it's enough to keep the engines of erosion working 24 hours a day, 365 days a year.

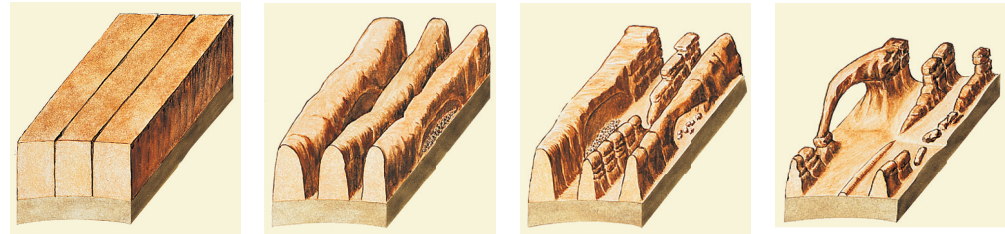
Rainwater soaks into the porous Entrada Sandstone easily, but gets trapped by the Carmel. It can slowly dissolves the calcite bonding the sand together—in other words, rotting rock from the inside out. In winter, water trapped in cracks expands when it freezes, then contracts, prying the rock apart.

If the park received too much precipitation, the sandstone could erode so quickly that arches might not have time to form. If it never rained here, the engines of erosion would stop.

Let the water do its work.
As erosion happens, a variety of shapes begin to appear. Rock walls erode into fins, then holes form. To be one of the park's official stone arches, a hole must have an opening of at least three feet (1 m) in any one direction. There is no requirement for width; many arches in the park are so skinny you have to place your cheek against the rock to see any light through them.

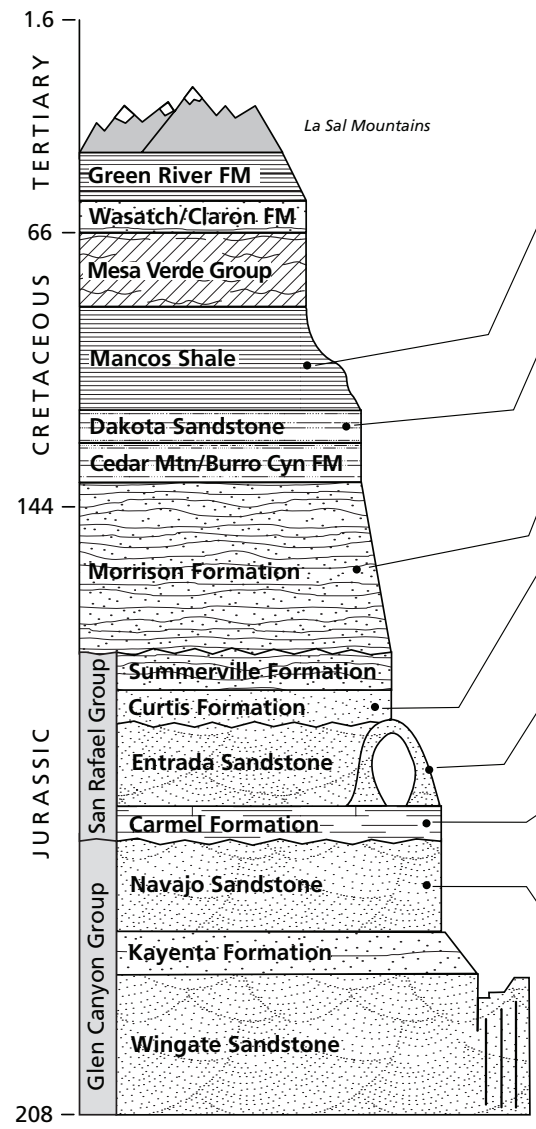
Is a window a special kind of arch? Not really. "Windows" are arches that are particularly large, are located on a high wall or fin, or "frame" a particularly scenic view beyond.

What about bridges? A natural bridge spans a waterway—or somewhere water once ran. Very few bridges exist at Arches, but Natural Bridges National Monument, just two hours south of here, has three tremendous examples of this feature. All of them are visible from a paved road or by hiking trail.



Make sure your rocks don't rock and roll.
Luckily, earthquakes are rare in this area, otherwise these massive outdoor rock sculptures would splinter and collapse. The fact that over 2,000 still stand tells us this area has been rather geologically stable for at least 50,000 years.

Lastly, pick the right time to visit. (You did.)
The rock layers visible in the park today were once buried by over a mile of other rock that had to erode first to expose what lay beneath. Visitors millions of years ago might have seen a wide flat plain dotted with vegetation. Imagine a visit far into the future, when these layers have fully worn away. What new rock shapes might you discover then?



Descriptions of the dominant layers in Arches National Park:

Mancos Shale
Greyish rock is the youngest in the park. Fossilized sea shells indicate deposition in a marine environment. Visible in SE Salt Valley.

Dakota Sandstone
Deposited at the edge of an ancient sea. Brownish-black cliffs and ridges can be seen when approaching Delicate Arch Viewpoint parking lot.

Morrison Formation
Contains petrified wood and dinosaur bones. Forms ledgy slopes in the Wolfe Ranch area.

Curtis Formation
Whitish sandstone marked by joints paralleling Salt Valley. Deposited as beach dunes, the Moab Member is found in parts of the Fiery Furnace and on the top of Delicate Arch.

Entrada Sandstone
The major arch-forming rock, it dominates the park, especially at Courthouse Towers, Fiery Furnace, and Devils Garden. This cliff-forming rock formed in a coastal dune environment.

Carmel Formation
Mudstones, siltstones, sandstones. Dark, reddish-brown layer formed in a tidal flat environment. Softer than the layers above and below it, it erodes more rapidly, an important factor in arch formation. Seen around Courthouse Towers, and forms the pedestal of Balanced Rock.

Navajo Sandstone
Formed in a desert environment. The thin, slanting layers within it are due to the deposition of wind-blown sand. This deposition is referred to as "cross-bedding." Petrified Dunes are excellent examples of Navajo Sandstone.

Traces of the Past

BY ALICE DE ANGUERA

For most of Arches National Park's long history, red rock arches didn't exist. Salty inland seas, braided river systems, coastal plains, and sand dunes fill the chapters in our geologic history book. How do we know? Geologists, like detectives, use clues such as fossils, ripple marks, and cross-bedding to understand the story of each geologic layer.

Marine fossils in the 300-million-year-old Honaker Trail Formation are remnants of an ancient sea. Cheerio-like discs of crinoid stems, lacy branches of bryozoans, and clam-like brachiopods tell the story of a warm, shallow sea teeming with life. Crinoids are animals that look like underwater flowers with feathery arms for collecting food. Trilobites, an early ancestor of the crab, crawled or swam among the corals. While crinoids, bryozoans, and brachiopods still exist, other animals, such as horn corals and trilobites, have been extinct for millions of years.

Fossils are not the only clues to the stories written in the rocks. Ripple marks reveal evidence of past running or lapping water. Both the main arch-forming layer, Entrada Sandstone, and the tan Navajo Sandstone, show diagonal lines called cross-bedding. These are the inner structure of ancient sand dunes frozen in time. Amazingly, geologists can figure out ancient wind direction by studying cross-bedding. Visit Petrified Dunes Viewpoint for a taste of the largest dune field in the history of North America.

NPS PHOTO / A. DE ANGUERA

Cross-bedding—evidence of ancient dunes—near The Windows.

To see some local fossils and other geologic clues, visit the Arches Visitor Center geology display. Rangers can offer suggestions about where to view fossils in the Moab area. Remember, it is illegal to collect fossils or make plaster casts of them; leave them for future visitors and scientists to enjoy and study. This landscape has many stories to tell, from marine wonderland to dusty desert. The next time you're out on the trail, bring your curiosity and discover a page or two for yourself.

Where Does My Money Go?

In 2004, Congress passed the Federal Lands Recreation Enhancement Act (FLREA), which replaced the Recreational Fee Demonstration Program. The law allows us to use 80 percent of fees collected at Arches National Park for repair, maintenance, and facility enhancement to support visitor enjoyment, visitor access, and health and safety.

Your fees also support visitor information and education, visitor services staff, and informational signs; habitat restoration for wildlife observation or photography; and law enforcement services related to public recreation.

Fees for ranger-guided Fiery Furnace walks also remain in the park and go directly to supporting the program.

Your user fees funded these improvements at Arches:

- Rehabilitating park trails
- Upgrading roadside toilets
- Picnic and stargazing area at Panorama Point
- Enhancing trailheads and pullouts
- Staff to assist with traffic and parking

Your fees support (clockwise from top left) new toilet facilities, a stargazing area at Panorama Point, improved picnic areas, and staff support for parking and traffic congestion. NPS PHOTOS

Friends of Arches and Canyonlands Parks

The Friends of Arches and Canyonlands Parks: Bates Wilson Legacy Fund provides direct support to Arches and Canyonlands national parks and Natural Bridges and Hovenweep national monuments in order to enhance existing projects in these spectacular areas, and to conserve the land and its cultural treasures for present and future generations to enjoy.

This mission honors the legendary work of Superintendent Bates Wilson, who came to Arches in 1949, inspiring and leading the effort that resulted in the establishment of Canyonlands National Park in 1964. He is regarded by many as the "Father of Canyonlands."

Friends of Arches and Canyonlands Parks

Please visit www.foacp.org to learn more and make your donation. Thanks!

Bates Wilson firmly believed that:

- The park visitor must have a great experience;
- Preservation is our obligation to future generations;
- Exploratory and educational opportunities must abound;
- Youth indeed are the future: Bates enhanced the lives of countless young people as they explored and learned to appreciate the parks with him.

Canyonlands Natural History Association (CNHA) is the official nonprofit partner of the National Park Service, Forest Service, and Bureau of Land Management in southeast Utah. Since 1967, CNHA has donated over $12 million to these federal partners.

CNHA sells hundreds of items about Arches National Park and the rest of Utah's canyon country. **Your purchase supports public education and research at the park.**

Visit CNHA's outlets at **Arches Visitor Center** and **Moab Information Center** (corner of Center & Main streets in Moab).

CANYONLANDS
Natural History Association
Partners in Public Land Education

Canyonlands Natural History Association
435-259-6003
www.cnha.org
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FIND YOUR PARK

The area surrounding Arches National Park is a treasure trove of recreational opportunities. During your visit, consider exploring these other parks and public lands.

Canyonlands National Park
nps.gov/canyonlandsnp

- Island in the Sky: *28 miles (45 km)*
- The Needles: *79 miles (127 km)*
- The Maze: *133 miles (214 km)*

Canyonlands invites you to explore a wilderness of canyons and fantastically formed buttes carved by the Colorado River and its tributaries. Rivers divide the park into four districts: Island in the Sky, The Needles, The Maze, and the rivers themselves.

Hovenweep National Monument
nps.gov/hovenweep
125 miles (201 km)
Hovenweep includes six prehistoric villages built between A.D. 1200 and 1300. Explore a variety of structures, including multistory towers perched on canyon rims and balanced on boulders.

NPS PHOTOS

Natural Bridges National Monument
nps.gov/naturalbridges
124 miles (200 km)
Three majestic natural bridges invite you to ponder the power of water in a landscape usually defined by its absence. View them from an overlook, or hit the trails and experience their grandeur from below.

Other nearby public lands:
Colorado National Monument
Manti-La Sal National Forest
Dead Horse Point State Park
Bureau of Land Management
For more area information visit:
www.discovermoab.com