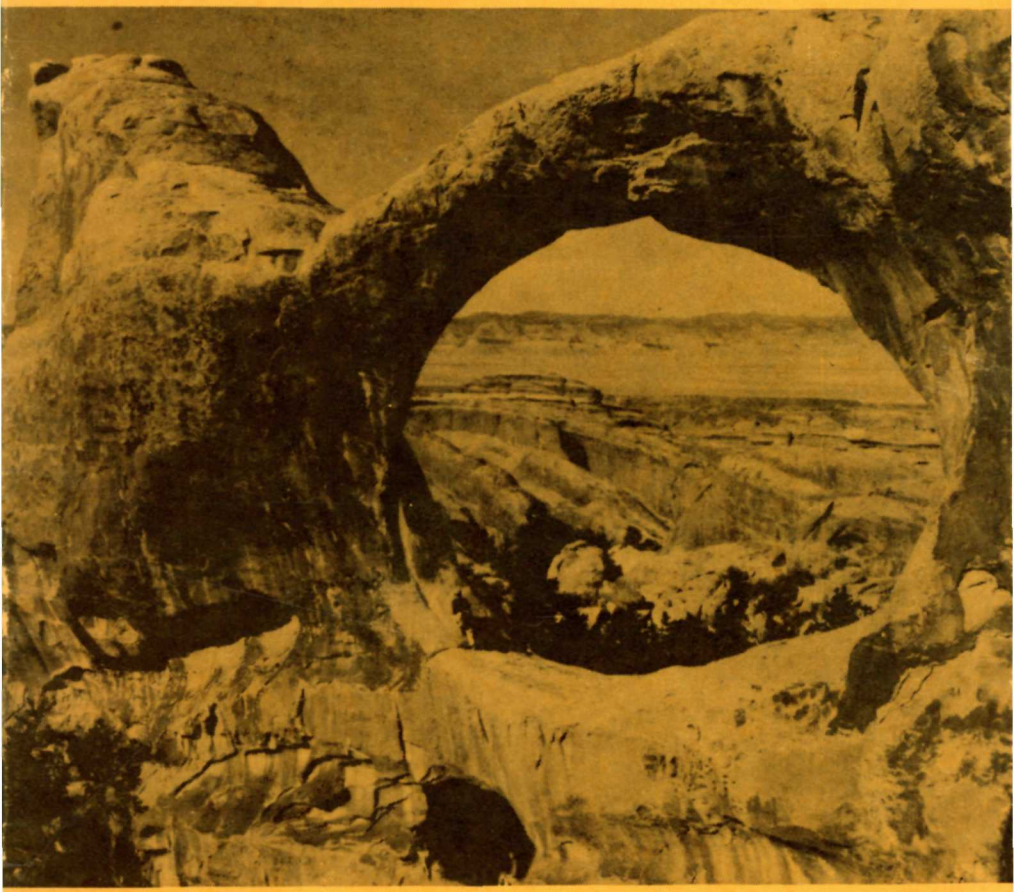
# devils garden trail guide



NATIONAL PARK SERVICE
Department of the Interior

## ARCHES NATIONAL PARK
UTAH

The Devils Garden trail leads to seven arches, provides views of several more, overlooks impressive Fin Canyon, and wanders through the habitat of interesting plants and animals that have adapted themselves to this arid climate.

Several routes can be taken, depending upon the time you wish to spend here --- and your ambition! The closest arches are Pine Tree and Tunnel Arches, which are .4 and .3 miles, respectively. Double O, the most distant, is two miles. See the sketch map and accompanying chart for mileages and time required to reach the various arches. To go to all seven arches and return to the parking lot requires several hours and good physical condition. You are advised to carry water on your walk, the amount depending on the time of the year and day and the length of your hike. There is NO water along the trail and little shade. Also included on the chart is a listing of the times when the various arches are best photographed. The trail is well maintained as far as Landscape Arch. After that, it is a more primitive trail, marked with stone cairns. Be sure to follow them! If you can't find the next one, go back to the last one you saw and LOOK. None of the overlooks are fenced; watch out for yourself and your children. Lug-type or rubber-soled shoes are recommended, especially beyond Landscape Arch. Wet rock is especially dangerous so use a little extra care after rains. With a little caution, you should have a pleasant and informative walk.

About 100 yards from the trailhead on your right you will see several trees. One right beside the trail looks like two separate trunks growing from one spot. This is the pinyon **[Pinus edulis]**, one of the dominant plants in this area. The short, stiff needles are in clusters, or fascicles, of two's and sometimes three's.

Historically, throughout the Southwest in late fall the pinyon nuts -- actually seeds from the roundish pine cones -- have been gathered by Indians for food. The nuts are eaten raw or ground into meal. Many Indians still collect the nuts, and sometimes then can be found for sale in modern grocery stores.

On the sand bank to the right and behind the pinyon is another dominant plant of this high desert environment the Utah juniper [**Juniperus osteosperma**]. It has minute yellowish-green "scales" that are actually the leaves, reduced in size so as to conserve water. The fruit is a modified cone with fleshy scales merging to form a small (about ¼" in diameter) bluish berry containing a single seed. Juniper berries, sometimes called cedar nuts, are an important food of some of the birds and other small wildlife in this area. Indians made great use of this valuable tree. The thin, shaggy bark was used for sandals and other clothing. The berries were eaten and (dried or fresh) used for flavoring and the wood was used for fuel and lumber.

As you continue along the trail note the abundance of pinyon and juniper trees. They typify the dominant plant community in this section of Arches National Park, the pinyon-juniper woodlands, or as it is sometimes called, the "pygmy forest." Other smaller shrubs associated with the pinyon and juniper are common in the dry, rocky soil throughout the pasrk and a few will be pointed out along the trail.

In the open area just past the trees mentioned is a grayish-green or silvery-green shrub called Old Man Sage [**Artemesia filifolia**], one of several species that grows in canyon country. A member of the sunflower family, it grows up to about three feet high and is very leafy. The leaves are about one

half inch long, almost thread-like. The flowers are small and rather inconspicious, in long, densely-leaved panicles.

The yellow blooms appear in late autumn. The Mexicans use a tea made from the leaves as an intestinal worm remedy and for stomach ailments. Another species of sage from this part of the country has a three lobed leaf (A. tridentata) and often grows to the size of a small tree with a woody stem. This species forms extensive sage flats in some areas, and provides good browse for wildlife.

At **PINE TREE ARCH** notice the rock surface to the left and through the opening. The large flakes look as though they could almost be peeled off. This is an example of exfoliation -- the cracking and peeling off of layers of rock. This is just one of the many erosional processes that contribute to the formation of arches. Water, freezing and thawing in the cracks, gradually pushes the flakes off, one by one, over many years, and enlarges the opening of the arch. Note the great mass of rock on top of the opening. The rock remaining on top is actually thicker than the height of the arch; the opening is 30' high, while the top thickness is 50'.

You may notice several kinds of plants very common to Devils Garden and the entire park. Just past the first junction (to Pine Tree and Tunnel Arches) and to the right of the trail you will see a good stand of the stringy, green-stemmed plant, Mormon tea [**Ephedra sp.**]. In late spring and early summer it bears clusters of small, yellow flowers. This yellow-green shrub is a member of the primitive Joint-fir family. The small brown "scales" found at each joing along the stem are actually the leaves of Mormon tea. Their size has been reduced through ages of evolution to prevent unnecessary moisture loss. Mormon tea is usually three to four feet tall, but sometimes reaches a height of twelve feet with a thick, woody stem. It is frequently found growing in this sort of pinyon-juniper forest, often one of the first plants to establish a foothold on loose sand dunes. Pioneers brewed a palatable drink from the stems and certain Indian tribes considered the brew a tonic beneficial for treatment of disease.

Regardless of the season of your visit, you may see many different kinds of wildflowers in bloom. The best time for flowers is spring and summer, especially if there have been good rains early in the season. But no matter when you visit, you are sure to see some colorful annuals and other plants in bloom.

In late spring any of the numerous **cacti** in the area may be in bloom, with their brilliant yellow, red or purple blossoms. The small cup-shaped orange **globemallow** is abundant throughout the Park. The three-petaled white **Mariposa lily**, which is the state flower of Utah, is often seen in among the sagebrush and occasionally along this trail the large white flower of the **evening primrose** is often seen along the roadsides and in Devils Garden; the flower blooms in the evening and wilts by about noontime the next day, usually becoming pink at the same time.

Midsummer flowers include the brilliant red or orange **Indian paintbrush**, which doesn't look like a "regular" flower; the flowers themselves are actually very small and the red or orange part is the floral bract. Also blooming in summer is the **prince's plume**, with the showy yellow flower spike similar to that of the **bee plant. Skyrocket gilia**, or **foxfire gilia**, has a long, tubular red flower from which the individual petals separate.

In the fall, common plants in bloom are a purple **aster** with a yellow center (it looks like a daisy, except to a botanist!) and **rabbitbrush**, a small, straggly shrub with an unpleasant odor, but pretty clusters of small yellow flowers.

Many, many other plants bloom with colorful diaplays from late winter through late fall. More detailed information regarding names can be found in various books sold at the Visitor Center, or by talking with a Ranger.

Continuing along the trail to **Landscape Arch**, let's consider how the arches were formed. There are many other ways that holes in the rocks can be formed, but there has been no universal scientific method developed for classifying them. Most geologists and naturalists do agree on the difference, though, between a natural **bridge** and an **arch.**

A natural bridge is formed when a stream or river cuts across one of its meanders, through the rock, and forms a new path for itself. The span of rock beneath which water may still flow (but not necessarily) is a natural bridge. Arches are formed by other erosional processes, the most common being frost, rain, wind and the pull of gravity. In most cases, the arch begins in a fractured or otherwise weakened portion of the rock.

Many arches have formed as a result of a particular sequence of events: (1) Deposition of sand that hardened into a massive and relatively strong layer of rock; (2) development of thousands of parallel, vertical cracks in the rocks; (3) widening of the vertical-walled canyons separated by thin rock slabs or fins; and (4) perforation of the fins by weathering to produce arches.

Weathering, as indicated here, includes water from rain and snow melt, which follows along the cracks or joints. As the sandstone dissolves, soil is formed. The soil helps retain what moisture is available, and plants become established. The plants help in widening the cracks by holding the soil, which in turn retains moisture, hence bringing about additional removal of cementing material of the sandstone by solution. Freezing, thawing, and the roots of plants play their parts in the widening of cracks, also. The wider the cracks, the more easily the loose sand is carried away by running water and wind.

Each year plants or plant parts die. As the organic matter decays, it tends to make the soil more acidic. Increased acidity, although very slight, encourages additional plants and more rapid breakdown of the sandstone.

Cracks eventually widen into narrow canyons separated by fins. More rapid weathering of softer areas in some of these vertical walls result in undercutting. Erosional effects of water and frost persist, penetrating the fins and smoothing the contours for the perforation, forming the arches you see today.

The process of weathering continues, eventually resulting in the collapse of the arch. A newly formed arch, a "young" one, consists of a relatively small opening, surrounded by a great mass of rock. An "old" one has had much of the surrounding rock eroded away; hence, the hole appears larger in relation to the thin span of rock over it. As you walk along the trail, think about the relative ages of the arches you see: compare Landscape Arch with others, particularly Pine Tree or Navajo Arch.

**Landscape Arch**, with its 291' span, is the longest known natural stone span in the world. Because of its great width and the sand dune rising beneath it, it is hard to photograph -- the best time being in the morning. Some evidence of prehistoric Indian activity has been found in this vicinity. The chunks of chalcedony, a hard, red rock found here, were used for arrow points and possible other stone tools.

This is a good place to stop and think about the great time span and erosional forces involved in the formation of arches. The rock in which most of these arches are formed was deposited as sand 150 million years ago, in the Age of the Reptiles. Can you imagine what it was like here 150 million years ato? What stage of development do you think Landscape Arch was "only" 150 million years ago? Did it look anything like it does today? What will it look like in another million years, or even a thousand years? Will it still be yawning there, seemingly suspended in mid air, or will there simply be a pile of broken rocks that now are over a hundred feet agove the ground? The answers to these and many other questions remain to be seen sometime in the future -- long after your lifetime or that of your grandchildren.

As you approach Landscape Arch, you can see another arch above and to the right; these are actually the two holes that form **Partition Arch**. Another ½ mile along the trail will lead up to this arch, through which there is a magnificent view of the area in which you are now standing.

As you walk from Landscape Arch to Partition and Navajo and on to Double O, just a few specific features will be pointed out. The following discussion points out some conditions of life in this desert area, and what various plants and animals have done to adapt to it. You may wish to read this section before continuing the hike (there's a good rest spot near Wall Arch) or as you go ahead. If you don't have the time or energy to continue along the trail, read it here and be on the lookout for features that are mentioned.

Obviously, this is a desert. But why **obviously**? What makes it a desert? It is certainly different from the hardwood forests of the East or the conifer forests of the Pacific Northwest. Buy why? The lack of water is pretty evident: how many lakes or flowing streams have you seen in Arches National Park? There is also heat: mid-summer temperatures often reach 100 degrees and above every day for several months. And there is cold: at an altitude of about 5200' (compared to about 4000' at the Visitor Center and in Moab), winter nights may drop to zero or below, and even summer nighttime temperatures are in the 40's and 50's. Considering these extremes, living conditions seem pretty severe. How can the plants and animals survive without air conditioning and heating, water faucets and shelter?

Living things must be specially equipped to survive in this forbidding environment. A "desert" is defined as a region in which annual rainfall is less than 10" and rain is unevenly distributed throughout the year. Simply having only 10" of

annual rainfall would not make a desert; 10'' of annual rainfall, if distributed evenly over the year could support a lush grassland. In an area where ten inches of rain falls all in one or two months, desert conditions may exist because plants can use only a certain amount of rain at a time. Rain that falls in torrents only a few months a year usually runs off or sinks into the ground before it can be used by plants.

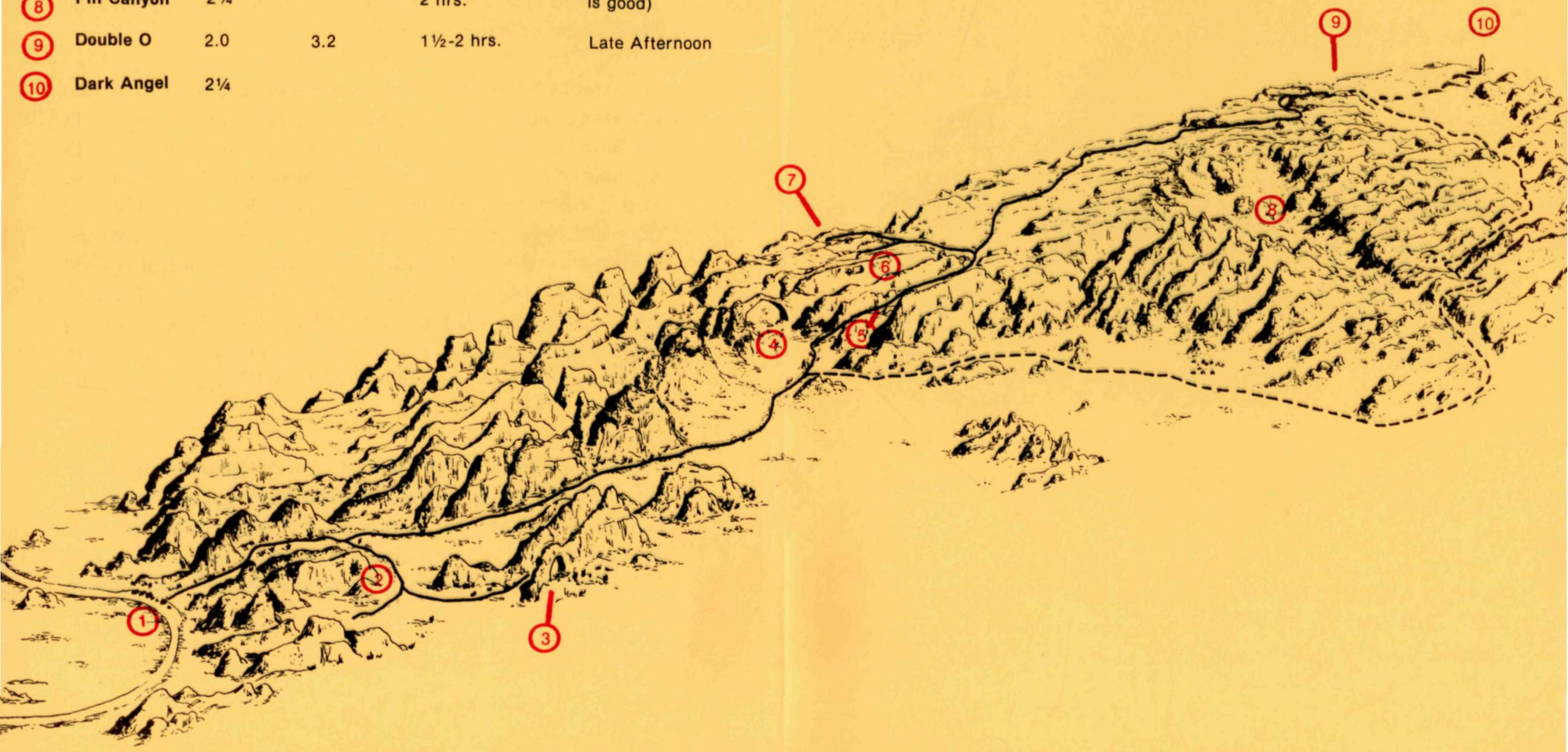
Another problem the rainfall encounters in its journey from cloud to earth is evaporation. High temperatures on the ground and the nearly constant desert winds sometimes prevent the rain falling from the clouds from ever reaching the earth's parched surface. Much of it may be driven back up into the atmosphere as water vapor.

Arches National Park receives about seven inches of rain per year -- most of it falling during the late summer months in the form of sudden cloudbursts, not lasting very long, but with substantial results. As the storm breaks, rain falls in a torrent. Little rivulets form on the ground, snaking in and out among the rocks and plants. The rivulets join, cascades roll across the slopes, sheets of water gather in the flats and in just several minutes the arroyos, dry stream channels that have not carried water for months, are full and bubbling. If you happen to visit Devils Garden during or soon after storms, you will see the reason for the numerous culverts and small bridges built along the trail.

It is a vicious circle: Because desert vegetation is sparse there are few dense deposits of decaying vegetable matter to capture the rainfall and, hence, the soil becomes hardpacked. Because the soil is hardpacked the rainfall runs off easily and the soil remains dry. Because the soil remains dry, plant growth remains sparse.

| | ARCH | DISTANCE TO (Miles) | DISTANCE TO (Kilometers) | WALKING TIME* | BEST TIME TO PHOTOGRAPH |
|---|---|---|---|---|---|
| 1 | *Trailhead* | | | | |
| 2 | Tunnel | .3 | .5 | 15 min. | Morning |
| 3 | Pine Tree | .4 | .6 | 20 min | Anytime |
| 4 | Landscape | .8 | 1.3 | 30 min. | Morning |
| 5 | Wall | 1.0 | 1.6 | 35 min. | Morning |
| 6 | Partition | 1.4 | 2.3 | 1¼ hrs. | Anytime |
| 7 | Navajo | 1.5 | 2.4 | 1½ hrs. | Anytime |
| 8 | Fin Canyon | 2¼ | | 2 hrs. | (Midday is good) |
| 9 | Double O | 2.0 | 3.2 | 1½-2 hrs. | Late Afternoon |
| 10 | Dark Angel | 2¼ | | | |

*Walking times are approximate and based on a one-way trip directly to the point named without taking any side trails.



Although plant life is sparse, there are few truly baren patches of earth. Desert plants have evolved a remarkable array of adaptations for surviving water shortages. Cacti, for instance, resist drought by hoarding water when it is plentiful, then drawing on their reserve when it is scarce. The prickly pear (**Opuntia sp.**) is a cactus with oblong pads, which swell when there is excess moisture and shrivel up as the plant uses up its supply of water. Of course, the cactus' spines help protect it from animals that may want to eat it and get that moisture.

Some plants endure the effects of drought by remaining as dormant seeds during dry weather.

Other plants evade drought by shedding their leaves, thereby reducing water usage to a minimum. One plant in this area that drops it leaves is blackbrush (**Coleogyne ramosissima**), a small scrubby plant with ashy-grey branches

that grow out opposite one another and are often quite tangled. The blackbrush has small yellow blossoms during May and June.

Animals, too, must take advantage of the sudden gift of water. The tadpole, or "fairy shrimp," lives out its short life in temporary pools created by desert rainstorms. Hatching from an egg as soon as water collects in a small puddle or depression in the rock, it must reach adulthood, mate and lay new eggs before the pool dries up. The eggs deposited in the mud or soil will lie in the sand, living but dormant, waiting years, if necessary, for the next puddle to form and the cycle to begin again.

Other creatures in the desert respond to sudden moisture, also, such as the spadefoot toad. They get their name from their spadelike hind feet with which they dig themselves into the sand. They go in backwards and can disappear in a few seconds.

During the hottest, driest weather, the spadefoot spends a good deal of time buried beneath the surface ground, coming out only at night to hunt insects. The coming of rain signals a change in its behavior, though -- it is the time for mating.

Soon after the rain has gone, clusters of spadefoot eggs can be found in the temporary pools of water that remain. In two or three days tadpoles appear; as many as 200 from a single cluster. They in turn are transformed into toads in four to six weeks.

Other species of toads which live in regions where water is more abundant, may require more than two months for the transformation from tadpole to adult. If you are in the area after a good rain, check the small pools of water near Fin Canyon for the spadefoot toad.

Another interesting species that has made the necessary physiological adaptions is the kangaroo rat. Chances are slim that you'll see one at midday along the trail. You may see them around the campground at night or in the headlights of your car on the road. What you can see on the trail are its small burrows -- little holes dug under a sheltering bush or small tree. Kangaroo rats are extremely important to the life of the desert for they are a staple in the diets of many predators: snakes, owls, foxes, coyotes, bobcats and badgers.

You might think that one of the kangaroo rat's adaptations would be the ability to withstand heat, but such is not the case. In tests, a group of rats was subjected to controlled temperatures. At 100 degrees several rats died in less than three hours. At 105 degrees, most rats could last no longer than 1½ hours. Since the surface temperature of the desert often rises to as much as 150 degrees, kangaroo rats could obviously not long endure in the open on an average day. The solution to the problem is simple enough: the kangaroo rat merely stays in

its burrow during the hottest part of the day, which is why you probably won't see him out along the trail. Tests have shown that the temperature inside a kangaroo's rat's burrow, even with a rat in it, seldom rises above 85 degrees Fahrenheit.

In actuality, the kangaroo rat's problem is not heat but dryness. Here, too, the kangaroo rat has adapted to desert conditions in a unique manner. Kangaroo rats often live many miles from water, as does the majority of all desert animals. However, the kangaroo rat is not known to dig for water, nor does it depend upon juicy plants that contain a high percentage of moisture. Their diet is chiefly dry seeds, small plant parts and an occasional insect or lizard. Unlike many small animals they do not drink the dew that forms on plants. Can they get along without any water at all? By no means! Every animal needs water because every animal loses some of its body fluides regularly. But the kangaroo rat has reduced this loss over thousands of years of evolution to such a low point that it can stay alive with very little intake of water -- so little that the casual observer thinks there is no water consumption at all.

Several physiological adaptations contribute to reducing this water loss. First, kangaroo rats lose little water through evaporation from the skin or breathing tracts. They do not sweat and they do not pant; they keep cool by avoiding the heat. Secondly, they have kidneys five times as efficient as those of man, and hence can produce urine so highly concentrated that the bodily wastes contain very little moisture. In the third place, kangaroo rats lose much less water than many other animals in their feces, or droppings, which are produced in small, black pellets, hard and dry. Finally, the kangaroo rat belongs to the rather large group of animals, including rabbits and shrews, that eat part of their droppings. Essential vitamins that have been produced by the fermentation of food materials in the

lower digestive tract are obtained in this way. But at the same time, when this material is eaten, a certain amount of moisture that otherwise would be lost is reabsorbed.

By all these methods, the kangaroo rat reduces its loss of body fluids and hence its need for fresh supplies of water. But it still needs some water. All animals produce a small amount of water within their own bodies when food is digested. The amount of this metabolic is very small; in most animals, it has almost nothing to do with maintaining the balance of body fluids. But the kangaroo rat has reduced its need for water so successfully that it can get along on the tiny amount of metabolic water created from its diet of dry seeds. Thus, the kangaroo rat lives - as if by magic - without drinking water.

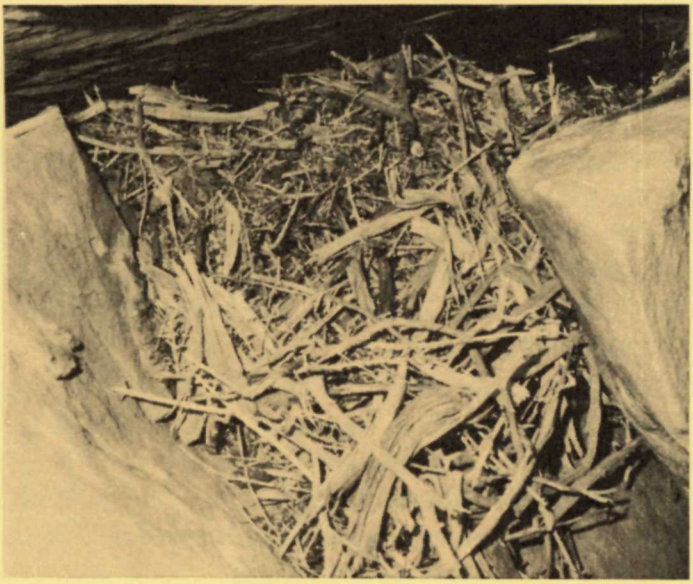
Many other animals, of course, live successfully in the desert too. They obtain water from water holes, from dew, from juicy plants and from the bodies of animals they capture and eat.

Some of the small animals you may see or see evidences of along the trail include the Colorado chipmunk, antelope ground squirrel and the pack rat. Despite its excellent climbing ability, the Colorado chipmunk is most often seen on the ground. Physically, they have characteristics of both ground squirrels and tree squirrels. A field mark that is a positive identification of the chipmunk group is the striped face. In addition to facial stripes, chipmunks are also striped on the back. Their diet varies widely according to habitat. Chipmunks of the foothills eat a great variety of grass seeds, berries and cactus fruit. In the Devils Garden area, favorite foods, as with many of the animals here, are pinyon nuts and juniper berries. Breeding habits of the chipmunk are not too well-known. The number of young averages from four to six. Like the ground squirrel, the young are able to leave the burrow when they are but little more

than half grown. This is a time of great danger for the youngsters are easily caught by predators which would be eluded with little difficulty by a mature individual. Principal predators of the chipmunk are bobcats, hawks, foxes and coyotes.

Another common small animal of the canyons and rocky areas is the antelope ground squirrel. It is so named because it has a white ventral surface on its tail, similar to the patch of white hairs on the rump of an antelope; this patch of hair may or may not act as a warning signal when flipped about. Its nesting and eating habits are similar to those of the Colorado chipmunk.

Another rodent of this area, often found nesting in crevices in cliffs and among rockslides is the pack rat, or desert wood rat. It is rarely seen since it is a nocturnal animal (coming out at night to feed and wander about), but evidence of it, in the form of nests in cracks and crevices, is common.



Many names are applied to this interesting animal -- "mountain rat," "trade rat," and pack rat are a few of the common ones. Some of these names stem from the supposition that when the animal takes an article that suits its fancy, it always replaces it with something which it supposes to be of equal value. These animals are continually carrying things about and often drop one in favor of another, more to their liking. The fact is that the most attractive items usually are carried to the vicinity of the nest. Usually nests are built far back in some deep crevice. These natural fortresses are further reinforced by the addition of a pile of sticks and miscellaneous material piled helter-skelter over the next. Look in small cracks and niches along the trail for this nest. In this desert climate, favorite foods of the pack rat are pinyon nuts and juniper berries.

While looking for these small animals, you may be surprised to see a larger one -- there are deer and porcupine in quite abundant numbers throughout the area. Since these animals rarely venture close to human activity, and are often out feeding in early morning and late afternoon, you will probably see more evidence of them than the animals themselves.

Porcupines often eat the bark of pinyon trees, so you may see trees with large amounts of bark removed and the chisel-like marks of teeth. As they feed in a rather aimless manner, porcupines may remove the bark all the way around a tree limb or trunk. This "girdling," when it occurs, will kill the affected tree or limb.

Porcupines usually eat tender shoots and leaves in spring and summer, and then dry vegetation and bark in fall and winter. It often appears that porcupines are causing great damage, but under natural conditions, they are unlikely to cause serious long-term problems. Where predators (coyotes, great horned owls, wolves) are reduced by man, porcupines may increase to abnormal numbers and become a serious nuisance.

The most common, obvious evidence of the long-eared mule deer are the heart-shaped hoofprints in the sand right beside the trail. They occasionally may be seen in the open areas from Wall Arch to Double O or in the general vicinity of Landscape Arch. Often the tracks can be seen in the sand beside the trail. Keep your eyes open and see if you can spot some tracks.

The main trail ends at Double O Arch, through which you can get a good view of the Book Cliffs to the north. Off to the left (west) of Double O you can see Dark Angel, a towering rock pinnacle. Primitive trails continue from this point. One goes to Dark Angel and another back to Lanscape Arch through Fin Canyon. These trails are rough (somewhat rougher than the one you just walked) and marked with stone cairns. If you decide to take this alternate trail back, please watch for the trail markers and take necessary precautions. It is 2.1 miles (3.4 kilometers) back to Landscape Arch on this alternate route, then another mile to the parking area. Several large arches may be seen along this trail, as well as a closer view of Fin Canyon.

Although the trails and this guide to them ends at this point, your enjoyment of the trails need not end now. Let your return to your car be leisurely. Take time to look again at the things you passed on the way up the trail. Many will seem different from a changed perspective; others will be things you missed earlier. Some may seem different because you have learned something new and thus have changed yourself!

HAVE A NICE DAY!

—Times-Independent Printing, Moab, Utah—

Published by the Canyonlands Natural History Association, a non-profit organization cooperating with the National Park Service in an effort to enhance your visit to Arches National Park.