A GUIDE TO THE MESA ARCH TRAIL

Welcome to the Mesa Arch Trail on the Island in the Sky, Canyonlands National Park. This short loop trail (about ½ mile round trip) winds its way through the pinon-juniper woodland to the edge of the plateau where one can view the high LaSal Mountains and a second arch, the Washer Woman, framed by the Mesa Arch at the trail's most distant point.

As you walk along the trail, imagine what it would be like to have this as your permanent home without the benefit of modern, man-made conveniences. What adaptations would you have to make to survive without heating in winter or air conditioning in summer, and without the great number of tools, implements and devices you use daily? Consider, too, the differences between plants and animals in your home area and those that live here. In most environments the roots of plants absorb much more water than the plant needs; the excess is given off through tiny pores in the leaves. In this area, water is in very limited supply and plants cannot survive if they do not control water loss. The plants that survive in arid areas have evolved some means of reducing water loss; they are adapted to their enviornment. Watch for these adaptations.

This trail and pamphlet may be different from other self-guided nature walks you may have experienced. This trail does not have any numbered posts that correspond with numbered paragraphs in the booklet. Instead,

it will be necessary for you to keep your senses alert to recognize the landmarks and to identify the features along the path as they are described in this guide. Each of the following paragraphs describes a feature (plant, view, arch, etc.) and its location. As each feature is introduced, it is shown in CAPITAL LETTERS.

The walk begins amongst the most characteristic shrub of the area, BLACKBRUSH (Coleogyne ramossima), which is particularly evident on the sandy hummock just to the left of the trail head. During the hot, dry summer months, the plant adapts to this climate by simply dropping many of its narrow leaves. When there is an ample water supply and no need to conserve moisture, the plant grows leaves. When water conservation becomes important, most of the leaves fall off and water losses are much reduced. A member of the Rose family, blackbrush has small yellow blossoms during May and early June. Note that its ashy-gray branches grow out opposite one another and are usually quite tangled. Blackbrush will be noticeable most everywhere along the trail.

After acquainting yourself with the blackbrush, walk on just a few steps between a relatively large live tree on your right and a dead one just across the trail on your left. Around the base of the dead tree and on up the trail to the right, notice the plants with the long, narrow, pointed leaves extending from their base and frequently

with a leafless flower stalk rising above the leaves from the center. These are HARRIMAN YUCCA (Yucca harrimaniae). In May and June, these members of the Lily family have showy, white, waxy, bell-shaped flowers hanging from the flower stalk. The yucca is dependent on the small Pronuba moth which is able to pollinate it by gathering pollen into a mass and pushing it into the tube of the stigma (female plant part). At the same time, the moth lays its eggs in the yucca flower. After hatching, the moth larvae eat some of the seeds produced in the yucca fruit. The yucca is fertilized only by Pronuba moths and the moths lay eggs only in yuccas. The plant and animal is each totally dependent upon the other; neither can reproduce if the other is absent. This is a splendid example of a mutualistic relationship in nature.

The yucca was one of the most important plants to the Indians of the Southwest. They ate the buds, young flowers and growing stalks, both raw and cooked, and chewed on the leaves. Fibers and leaf strips from the yucca were twisted into cord and rope. The roots of the yucca are also used as a laxative and for making soap (which resulted in a modern name: soapweed).

Just ahead, note the sign to the trail's right, warning of danger in the form of a sheer, unfenced cliff at the far point of the trail. Be sure to watch yourself and

the kids. To the left of the trail, across from the sign, is one of the two main plants in the pinyon-juniper woodland, the PINYON PINE (Pinus edulis). Note its scrubby form and short, waxy needles in groups of two. This pine is found almost exclusively between 4,500 feet and 6,500 feet elevation. Here the elevation is about 6,000 feet. Edible seeds, the pinyon "nuts", are a major food source for squirrels, chipmunks, and some birds like the short-tailed, bluish pinyon jay common to the park. Pinyon wood is rather straight grained and dead limbs weather to blunt rather than sharp, pointed ends.

Beyond the sign and the pinyon, on up the trail about 50 feet, note the soil down among the blackbrush on the right--see that "black crusty stuff"? That nondescript looking surface crust is a very important plant community here in Canyonlands. The crumbly, dark material is a complex mixture of soil and several kinds of algae, fungi, bacteria and other minute plants, which are called CRYPTOGAMS (because they reproduce by spores rather than seeds). The soil is technically called cryptogamic soil. The plants all benefit from the association. The algae tap the air for a nitrogen supply. The fungi help hold water. Some secrete a sticky sheath that helps cement the crust and retard erosion. The cryptogamic crust is very important in providing a stabilized, fertile soil in which other higher plants

can survive. The cryptogamic soil exemplifies the fragile nature of this seemingly rugged land. One passage by cattle or human beings can turn crust to dust, vulnerable then to the first windstorm or downpour. Soil, in place, is the great bridge between the living and the non-living -- and as such, is the principal natural resource of any country.

Now walk on up the path to the base of that sandstone cliff you see straight ahead. You'll walk into a small gully, and as you do so, you'll pass between two examples of the other main character of the pygmy forest. UTAH JUNIPERS (Juniperus osteosperma). ofen called "cedars", can easily be identified by the scalelike, yellow-green foliage and by the bluish-grey, waxy berries (which actually are modified cones). These berries, more abundant on some trees than others, have been used historically both to flavor gin (note their smell) and to make tea. The bark of the juniper is easily broken into thin, fibrous strips and was used by Indians to make various articles of clothing. Like the pinyon, the juniper is typical of dry, rocky or gravelly soils. Unlike the pinyon, juniper wood appears quite twisted and dead limbs weather to sharp points.

From the bottom of the hill, now follow the trail up the escarpment and around to the left as it bends eastward toward the LaSal Mountains. Directly on the left as you make

the turn on top of the hill is a bed of MORMON or BRIGHAM TEA (Ephedra viridis) -- so named because eraly Mormon pioneers, as well as others, made a tea from its stems. Use of this plant to make tea continues today. Due to the plant's high content of tannin, Indians also used it for medicinal purposes. The jointed segments of the stems identify this plant as a member of the Joint-fir family, primitive relatives of the Pine family. The leaves of the Mormon tea are simply small scales at the joints, which minimizes surface area. Evaporation loss is thus lessened and the plant can flourish in this dry region.

Beyond the Mormon tea, the trail swings back to the right in front of three dead trees, one leaning to the left, one to the right and one upright in the middle. Are these pinyon, junipers or both? Remember now -- are their limb's weathered to sharp points or are they blunt? Is the wood twisted?

Around the base of the dead trees you'll note another plant well known for its adaptation to desert life, the PRICKLY PEAR CACTUS (Opuntia hystricina). The fleshy stems or pads of the prickly pear store water and produce food. One can usually tell if the recent months were wet or dry by noting how plump the prickly pear pads are, as they shrink and swell depending on the availability of water. These pads can be

eaten in an emergency if the spines are burned off or peeled away. The spines are modified leaves which serve to discourage animals from eating the cactus except when food is very scarce. Prickly pear also sport clusters of exceedingly tiny spines or glochids at the base of the more easily avoided large spines. Removal of the tiny glochids from your skin can be a real pain -- so watch out! In May and early June, especially after a wet winter, the prickly pear blossoms in fantastic shades of red, pink, and yellow. Due to the presence of refractive cells in the petal surfaces of these flowers, the prickly pear blooms have a quality which is difficult to capture on film.

Notice the make-up of the trail here; it's almost like pavement. You are standing on the exposed surface of bare NAVAJO SANDSTONE -- "SLICKROCK". Beyond the cactus and those three dead trees you looked at a moment ago, (which are two pinyons with a juniper in the middle), the path leaves the slickrock and becomes sandy as it turns to the left. For 200 feet, the trail is in a good example of pygmy forest and then curves to the right as it drops down through sandy, slickrock drainage. Halfway down the drainage, look up to the right at the exposed Navajo sandstone cliff. This sandstone, about 180 million years old, is the youngest rock in Canyonlands. Before the Navajo formed, this region was a flat, low-lying desert with

mountains to the north. As the mountains were worn down, winds blew the eroded sediment into this area, forming sand dunes which accumulated to great depths. Later, the sand dune deposits were covered by an inland sea. Calcium carbonate from the sea water filled the spaces between grains of sand, cementing them together and forming the sandstone we see today. Over a great expanse of time, other layers were deposited above the sand dune deposits until another great change occurred. About 70 million years ago, this region was gradually forced upward by stresses and pressures in the Earth's crust. As the area rose, deposition stopped and erosion began to strip away the accumulated sediments. Here, those ancient sand dunes are exposed at the surface after 150-200 million years of burial. As erosion gnaws away the sandstone, it does not simply reveal the rounded contours of the old dune but cuts through them exposing their internal structure. One can thus see the CROSS-BEDDING-that exists within sand dunes. As wind blows sand over a dune, the sand settles on the sheltered side, forming many thin parallel layers. As the wind shifts or the shape of the dune changes, the layers are deposited at different angles. Cross-bedding of this type is certain evidence that the rock originated as sand dunes.

Once down the drainage, turn to the left on a spur of the trail toward the east. Before

you is MESA ARCH, a span of Navajo sandstone hanging precariously on the face of the cliff. Cliff hanging arches are relatively common in southeastern Utah, where many exposed deposits of resistant sandstone are underlain by softer, more easily eroded deposits. The less resistant layers erode out from underneath, removing support from the upper layers. Usually the unsupported rock simply collapses, but sometimes parts of the resistant layers remain as arches like the one you see here.

Through the arch, one can obtain a striking view of the LaSal Mountains some 35 miles distant, the Colorado River gorge some 2,100 feet below, and the White Rim, some 1,400 feet below. Looking down and to the left, you can see a rugged sandstone fin with an irregular hole piercing it -- the "WASHER WOMAN". The feature very strongly resembles a woman leaning over her washtub. A pinnacle on the right of the structure suggests to some her husband looking on.

Moving back about 30 feet from the arch, take some time to look at the small gray-green plants on the little sandy hummocks. Bend down and smell the plant. Recognize it? It's SAGEBRUSH (Artemesia bigelovei), amd the aroma is familiar to many. Another characteristic that helps identify it is the three-toothed, downy leaves on the lower portion of the plant. After a rain, the rich aroma of sage is particularly

noticeable.

Just to the left as you look toward the arch is a Utah juniper. At the root of the juniper, find another "new" plant. This woody shrub with shiny deciduous leaves that are divided into three leaflets is commonly called SQUAWBUSH (Rhus trilobata). The leaves have a strong odor and hence the bush is also called skunkbush. Although this plant is closely related to poison ivy, it is not poisonous. The leaves, which are browsed by some animals, turn a beautiful rich red in autumn. The fruit of the squawbush is a sticky, bright orange-red berry, pleasantly acid to taste and can cut the dryness of a thirsty tongue. A lemonade-like drink may be made from the berries and Indians used them for food and dye-making. The squawbush is one of the most common shrubs of the pinyon-juniper woodland.

Between the juniper above the squawbush and the arch is a third "new" plant. Look for narrow, leathery leaves, the edges of which are slightly curled. This is CURLLEAF MOUNTAIN MAHOGANY (Cercocarpus ledifolius), a member of the Rose family. The seeds of the mountain mahogany are quite distinctive, having long single plums making them particularly adapted for scatter by wind, The mahogany is a good browse plant and aids in the prevention of erosion.

Walk back along the spur now to the main trail and continue on around the loop to the west toward the cliff. As you pass to the left of the corner of the cliff, observe the surprising little holes drilled by insects into the soft cross-bedded sandstone of the cliff. Many factors contribute to the breakdown of the Sandstone back into sand. This is an unusual one of them. This portion of the sandstone was already comparatively soft, allowing it to be hollowed out with ease to provide good protection from the weather for the insects. Please do not disturb the burrows.

Now follow the trail on ahead as it begins to climb up on top of the Navajo sandstone. Just as it makes a sharp turn to the left to skirt some of the crossbedded sandstone, note the small deciduous tree directly in front of you. This small member of the olive family, whose lilac-like leaves betray its close relation to that well-known ornamental, is a SINGLE - LEAF ASH (Fraxinus anomala). This ash is an anomaly among ash species, being small and haveing single, simple leaves rather than the compound leaves with several leaflets like other ashes. The long-stalked, broadly oval leaves are thin but have a leathery covering which prevents excessive water loss. The single-leaf ash is the principal deciduous associate of the pinyon-juniper belt and is typically found in dry, rocky soils. The trail takes you out on top of the Navajo

Sandstone -- the bedrock which weathers into the sand that covers most of the trail you've followed. Encrusted on top of some of the slickrock here, you'll find the colored blotches which are primitive plants called LICHEN, a complex of two plants, an algae and a fungus. Their intimate association provides them mutual benefit. The algae manufactures food and the fungus has the ability to retain moisture. Both processes are essential for plant life and neither of these component plants could live alone under the conditions in which the lichen can survive.

The lichens produce a weak acid which slowly dissolves the cementing agent in the sandstone. This is an inconspicuous process but is important in building soil. The lighter round patches on the slickrock nearby are often places dissolved by lichens.

Here on top of the Navajo sandstone, rest awhile in the shade of a pine or a juniper, looking back down to the arch and canyon. Think back about the things you've seen along the trail. The bedrock, laid down as sand dune deposits of eroding mountains, is now in the process of breaking down and with the help of the Colorado River and its tributaries, being redeposited somewhere far downstream. The evidence of agents aiding in the breakdown of the bedrock have been many along the trail -- water in the form of rain and snow has filtered and

flowed through the weaknesses in the rock, extreme temperature changes cause expansion and contraction which causes cracks, roots of plants push through the cracks and fractures, and lichens eat away at the sandstone surface.

Cryptogams stabilize the sand, building soil and providing for the growth of a more complex plant community. All the plants you have seen are adapted to the conditions of this harsh environment. It is not that the plants are especially tough or tolerant, but that they have evolved in this environment and are conditioned to it. Indeed, the high desert plant communities are typically very fragile; the plants cannot tolerate disturbance and many could not survive in an environment we might consider less harsh. You have seen some of the more obvious adaptations that have evolved -- the prickly pear cactus, the silvery down covering of the sagebrush leaves and the leathery nature of single-leaf ash and mountain mahogany slowing moisture loss, the scale-like design of the juniper and Mormon tea foliage, the ability of the blackbrush to drop all its leaves if the threat of moisture loss becomes too great, the waxiness of the yucca leaves and flowers, and needles of the pinyon.

The wildlife in the community adapt to the extremes of desert climate as well. In the heat of summer, the snakes, mammals and

most birds rest quietly in shaded places during the hottest parts of the day. They feed actively early and late in the day (some only at night) and avoid exertion at other times. The insect-eating lizards dart from shelter to shelter, never lingering for long in the open places. Even domestic livestock have the sense to take it easy in the heat of the day -- relaxing in the shade. Only man insists upon strenuous activity in the heat of the day. Man, too, would be well advised to adapt his schedule for optimum enjoyment of the warm months in the desert by freeing himself from his usual self-imposed slavery to the clock and take the cues for his times of greatest activity from the examples of nature itself.

Another way to seek relief from the heat of the summer desert, if one cannot nocturnalize one's schedule, is to migrate to higher elevations. Off to the east, the LASAL MOUNTAINS can provide just such relief. Rising to elevations over 12,000 feet, the LaSals are like islands of rock surrounded by a sea of desert. Like the Abajos to the south and Henrys to the west, the LaSals are "laccoliths" - an unusual type of mountain. Long ago, molton rock was forced up through layers of older rock and in many cases spread out sideways between layers. In the process, overlying layers were forced up into a broad dome. The molton rock cooled and solidified

underground, and erosion stripped away the upwarped layers. The central mass of igneous rock is now exposed at the surface and, because it resists erosion, stands high above the remnants of softer rock.

Over there, at elevations two to seven thousand feet higher than here, it seems like a different world. Plant communities are very different and the animal life is much unlike that which we see here. There, other stories are told in the rocks, the lakes, the streams, the meadows, and the forests. Those "other stories", however, are really just parts of the long continuing tale of the one world we all share. The mountains and desert, and all other features of our one world, are very intimately linked through geologic cycles, weather patterns, and other phenomena. Our existence is interdependent with all the living and non-living things which share their world with us. Our past looms large in our eyes, but we are newcomers to the world. The Navajo sandstone you walked on today was forming almost <u>two million</u> centuries before men appeared on Earth -- and the Navajo is the youngest rock in the area. When the Navajo has worn away and the underlying Kayenta is exposed here, who -- or what -- will walk upon it? How will they view us, and just how important will we appear?

From this point, the trail curves around and rejoins itself near those three dead trees you looked at earlier. As you head back toward the road, consider the points we have discussed and look for other examples of those features and processes noted along the trail. You may have picked up some new knowledge on your walk today, but more important, we hope that you also gained a deeper feeling for this wild, beautiful, arid land and the wonders it would share with you.

HAVE A NICE DAY!