The South Rim of Grand Canyon marks the northern edge of a high plateau whose gray-green forests stand out in vivid contrast to the arid lands below the rim. From here the cliffs of Grand Canyon drop 5000 feet to the Colorado River, crossing several biotic zones. This is a landscape characterized by abundant sunshine, extremes of temperature, and long periods of drought, punctuated by downpours in summer and snow in winter. Precipitation on the South Rim averages 15 inches per year, twice that received at the river but half that received on the North Rim, just 10 miles across the canyon. Even here at 7000 feet above sea level the climate is semi-arid.

It's not what most plants and animals would call a paradise. The soil is thin; bedrock lies just a few inches below the surface. The competition for moisture in this arid land is keen. All the plants and animals that live here show adaptations to the lack of moisture and extremes of temperature which characterize the region.

Rugged as it looks, it is a fragile land whose scars persist for many years. Walk softly. Be alert to the sights, sounds and smells that surround you, for there is much to experience here.

The plants and animals described here are common throughout the South Rim region and may be seen wherever you choose to walk along the rim trail. There are no numbered stops to follow. Use caution near the edge — humans are among the less sure-footed creatures at Grand Canyon!

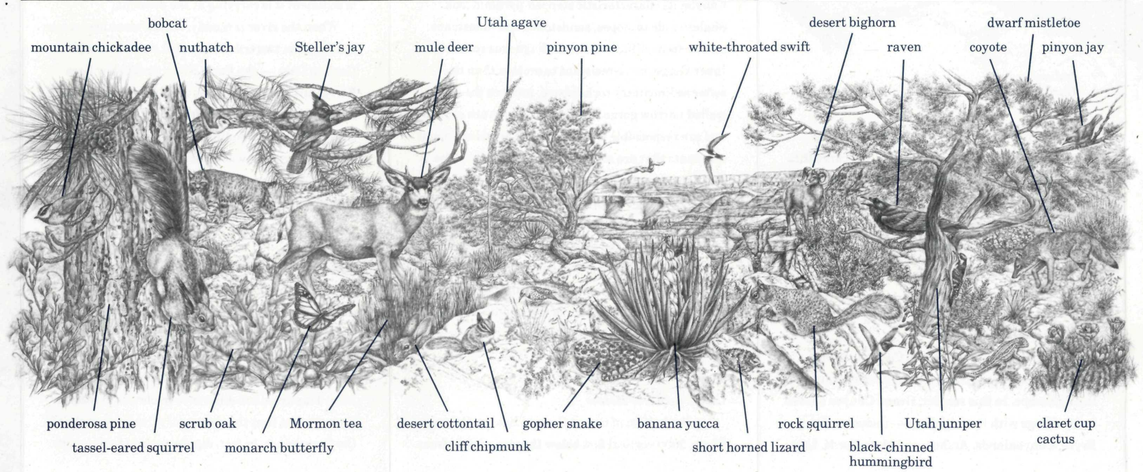
The tallest tree on the South Rim is the **ponderosa pine**. It has an extensive root system to acquire as much moisture as possible, and the stiff competition for water results in an open park-like forest. The bark on young trees is dark (hence the name "black jack" often applied to these younger trees), but by the time they mature, the bark is cinnamon in color and smells faintly of vanilla. This is the only long-needled pine in the park.

Wherever you see ponderosa pines, look for evidence of the **Abert squirrel**. It is one of two varieties of tassel-eared squirrels found in the park — the other being the Kaibab squirrel, found only on the North Rim. Both are entirely dependant upon ponderosa pines for food and habitat.

Scattered among the trees are a variety of drought-resistant shrubs. In late summer you will likely smell **cliffrose** before you see it. A member of the rose family, this evergreen shrub produces fragrant cream-colored flowers. These blossoms give way to seeds whose feathery white plumes allow the wind to scatter them some distance. Also common here is the **banana yucca,** one of the most common and useful plants in the American southwest. Native Americans have traditionally used it in the manufacture of soap, as a source of fiber for rope and sandals, and for its edible fruits which resemble small bananas.

Both the **mountain chickadee** and the **nuthatch** are small, acrobatic birds common in these coniferous forests. The mountain chickadee is easily recognized by its black bib and the white stripe over its eye. Gleaning insects from the outer branches of conifers, this small bird will often hang upside down in search of insects. The nuthatch similarly uses its slender bill to search for insects in the bark of trees but is unusual in that it will scurry down a tree headfirst.

Only the most observant and cautious hikers are likely to see the **bobcat**, a shy creature who frequents the north and south rims but is rarely seen. **Mule deer**, on the other hand, are among the most readily seen mammals on the South Rim. Sure footed and nimble, they travel in and out of the canyon with ease as food and water dictate. The earliest trails into the canyon were likely built along deer paths. Mule deer are readily distinguished by their large ears.



The **coyote** is relatively common and ranges throughout the park from rim to river, but you must be alert to spot one. This close relative of the domestic dog is primarily nocturnal; their late night or early morning howls are among the most distinctive songs of the canyon region. Their diet consists mainly of rodents and insects.

At elevations below 7000 feet the **pinyon pine** and the **Utah juniper** become the dominant members of the South Rim forest. The short-needled pinyon is prized for its edible seeds. The juniper with its shaggy bark is particularly well adapted to this arid climate: leaves have been reduced to scales covered by a waxy cuticle, both of which reduce water loss and insulate the tree against extremes of temperature. Many of these gnarled trees are a good deal older than they look. Both trees grow slowly in this arid climate and many of them are over 200 years old. Clumps of **dwarf mistletoe** are common in conifers throughout the forest. This parasitic plant draws nutrients and water from its host tree.

Although many people expect to encounter poisonous snakes at Grand Canyon, the handsome **gopher snake** is the only snake you are likely to see on the rim. A non-poisonous predator, it mimics the threatening behavior of poisonous species but kills its prey by squeezing it until it suffocates. Most of the water this snake needs is obtained from the rodents it consumes.

Among the reptiles commonly seen along the rim are the **eastern fence lizards**. Look for a blue patch on either side of their throat. They prefer open rocky areas along the rim and, like most reptiles, are very well adapted to arid environments.

While standing on the rim, listen for the "whoosh" of **white-throated swifts** and **violet-green swallows**. Swift, agile fliers, they dive through the air in relentless pursuit of insects. The large black bird commonly seen perched along the rim or soaring in the canyon below is the **raven**. Larger than crows, these birds are extremely intelligent and mimic a wide variety of animal noises.

Among the largest hoofed mammals in the park are the **desert bighorn,** but they are relatively scarce along the rim, preferring the rocky slopes of the inner canyon. They do not shed the long curved horns which continue to grow throughout their life. Like many mammals of the region, they are likely to be found near reliable sources of water: springs, seeps, or pools of summer rain.

In developed areas along the rim **rock squirrels** have lost their natural fear of humans and are often seen begging for handouts. It is dangerous and illegal to feed them. Please refrain from offering them food.

The bright red **claret cup** is the more common of two species of hedgehog cactus at Grand Canyon. At lower elevations its showy red blooms appear in April. Here on the rim it favors the sunny warm areas on the canyon's edge (blooming in May or June) and gives one a hint of the diversity and beauty that await those who venture beyond the world of the South Rim into the inner canyon.

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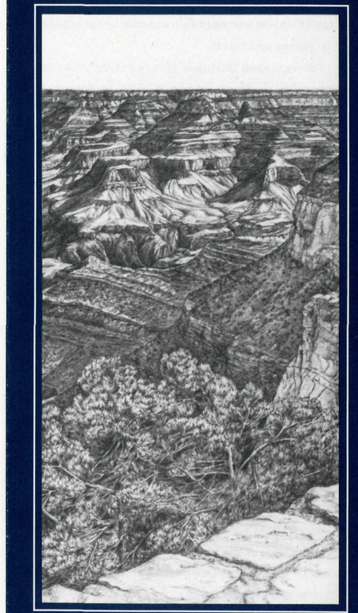
Grand Canyon Geology



GRAND CANYON NATIONAL PARK

The Geologic Record

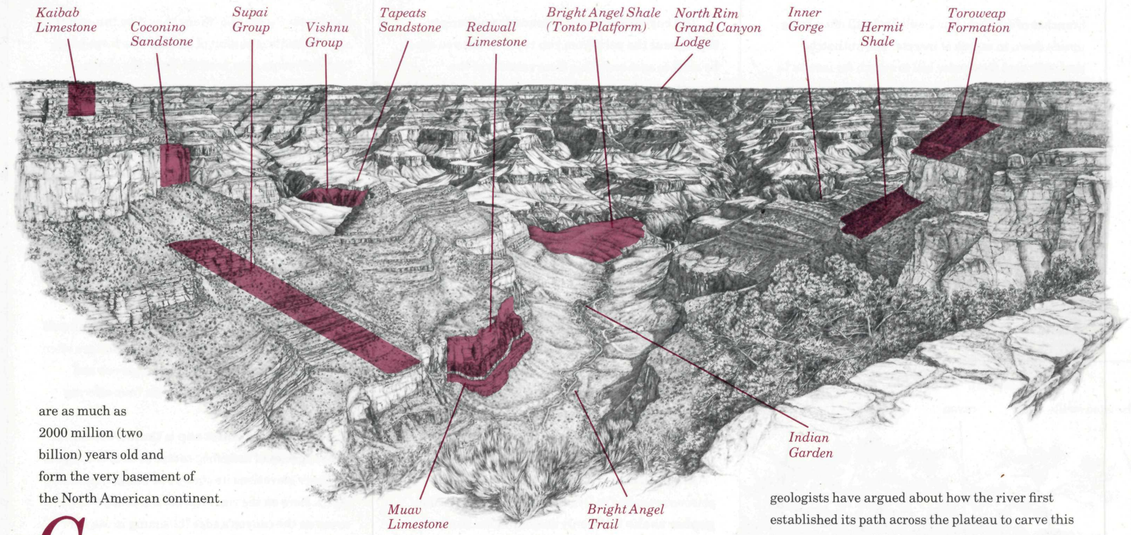
There are few places on this planet where earth history is as beautifully exposed as on the canyon walls before you. Rocks equivalent to these may be found scattered throughout the United States, but in Grand Canyon a remarkable assemblage is exposed in sequence and intact.

The measured thickness of rock in Grand Canyon approaches six thousand feet. Various rock units appear in some places within the Canyon and not in others. If all were present in one location the cumulative thickness would be much greater. Yet, the geologic record here is by no means complete.

Each layer represents an interval of time during which a particular environment of deposition prevailed, but many of the layers are separated by gaps of unrecorded time and missing rock layers referred to as "unconformities."

Most of the flat-lying rocks visible from the rim are Paleozoic in age, recording events that took place on the North American continent hundreds of millions of years ago, long before dinosaurs roamed the earth.

The youngest of these layers is the Kaibab Limestone on which you are standing, deposited in shallow warm seas at the end of the Paleozoic. Below the rim these layers become progressively older, reaching back into the early Paleozoic. Four thousand feet below the rim, in the walls of the Inner Gorge, are the oldest rocks of this region: the igneous and metamorphic rocks known as the Vishnu Group. Very different from the sedimentary rocks above them, these ancient schists and gneisses are as much as 2000 million (two billion) years old and form the very basement of the North American continent.



Canyon Origins

Although the origin of Grand Canyon is a complex issue, the forces that have shaped it are remarkably simple. Like all canyons in this part of the country, Grand Canyon is the result of erosion. The main agent of that erosion is water, and the Colorado River has played the primary role in bringing the canyon to its present depth. Also important in giving shape and size to the Canyon is the water which comes from other sources: runoff from rain and snow, and the streams that flow into the Canyon from either rim.

Compared to the rocks in which it is carved, Grand Canyon is geologically young. Excavation of the Canyon before you has occurred only in the past six million years or so. The Colorado River, of course, must be older, though in its early years it cannot have been the same river we see today.

Much of the uncertainty regarding the geologic history of the Canyon centers around the fact that we have only scattered bits of evidence by which to date it precisely. Of greater interest is the question of how the Colorado River has evolved; for years geologists have argued about how the river first established its path across the plateau to carve this immense chasm. While there is little general agreement as to the exact way in which this happened, we know the history of the Colorado River is complex, and will continue to fascinate geologists for years to come.

The Landscape

The uniqueness of the Grand Canyon lies not only in its size but in the remarkable appearance of the landscape. In this respect, Grand Canyon shares many things with its neighbors — including Zion, Bryce, Canyonlands, Arches, and Mesa Verde. Like Grand Canyon, these neighboring parks lie within that geologic province known as the Colorado Plateau, a region characterized by relatively flat-lying rocks of great thickness that have been raised thousands of feet above sea level in a series of plateaus.

Landforms here are beautifully sculpted and remarkably well exposed, due in part to climate. The semi-arid climate which predominates in this part of the country allows erosion to proceed in a very dramatic fashion. The sparse vegetation below the rim has given the canyon walls a unique look they would not otherwise have.

Each of the rock layers within the Canyon responds to erosion in its own manner, giving the Canyon its characteristic stepped-pyramid look. Shales erode to slopes, sandstones and limestones tend to form cliffs, and the dark igneous rocks of the Inner Gorge, more resistant to erosion than the softer sedimentary rocks above, produce the steep-walled narrow gorge. Vertical fractures are common and are responsible for the tall pillars and erosional remnants that are so common along the rim. The flat-topped mesas and buttes you see here are common throughout the arid southwest where flat-lying sedimentary rocks are present.

Color is one of the most remarkable features of this landscape. Much of this color is due to the presence of small amounts of iron and other minerals which stain the surface of the canyon walls and mask the true color of the rock.

The River Below

At the bottom of Grand Canyon lies the Colorado River, 5000 vertical feet below the rim, visible from only a few spots along the trail. From its origins high in the Colorado Rockies, the river flows more than 1400 miles toward the Gulf of California and passes through a series of remarkable canyons, of which Grand Canyon is only one.

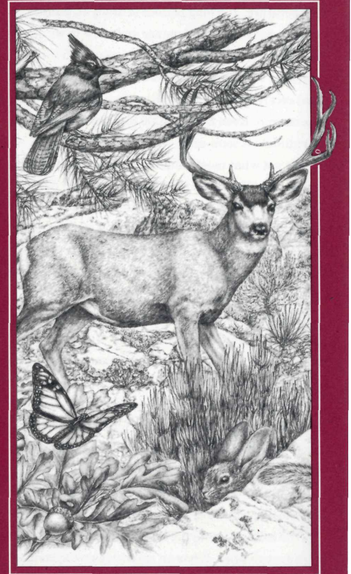
Grand Canyon officially measures 277 river miles from Lees Ferry to the Grand Wash Cliffs. Today the Colorado River through Grand Canyon is bracketed at either end by dams — Glen Canyon Dam (Lake Powell) on the upstream end and Hoover Dam (Lake Mead) at the lower end. As a result, the dynamics of the Colorado River have changed considerably. If you glimpse the river below, you will see either a clear blue-green ribbon of water or a muddy brown stream, depending upon the amount of sediment it is carrying at the moment.

When the river is muddy, its sediment load comes mainly from two tributaries that enter below Glen Canyon Dam — the Paria River (just below Lees Ferry) and the Little Colorado River (60 miles downstream from Lees Ferry). Prior to its impoundment the river carried a sediment load many times what it carries today. But wherever one sees the river from the rim, its appearance is deceptive. In this portion of the Canyon the river averages 300 feet in width.

The North Rim

On the far side of the Canyon lies the North Rim, ten miles away as the raven flies. Although it is not apparent, the north wall of the Canyon rises a thousand feet above the South Rim, giving the North Rim nearly twice the annual rainfall received here. This dramatic difference in elevation results from the fact that the apparently flat-lying rocks of the Canyon are, in fact, dipping gently to the south.

Life Along the Rim



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