

CANYONLANDS GEOLOGY INFORMATION

Canyonlands National Park offers the visitor a grand spectacle of what earth forces can do to once flat and uniform rock layers. The different rock formations here all have two things in common. One, they are all sedimentary rocks, and two, they have all been subjected to natural forces such as weathering, erosion, and faulting.

A major shaping force in Canyonlands has been a 3,000 foot thick deposit of salt and gypsum, known as the Paradox member of the Hermosa formation. The Paradox salts were left behind when the water evaporated from a large basin of sea water that once covered this area. The salt deposits provide an unstable platform for the countless millions of tons of rock that overlie them.

In the Needles district of Canyonlands is a series of parallel canyons known as the Grabens. Graben is a geological term for a canyon formed by a block of earth subsiding in relation to the rest of the area. The Grabens in Canyonlands formed as a result of the salt beneath the sandstone flowing away to areas of less pressure. The sandstone settled along pre-existing fault lines to create the Grabens.

The Needles themselves result from weathering and erosion along joint and fault lines. The Needles area is crisscrossed with such fractures in the rocks. You can hike right through one such crack on the Joint Trail, which leaves from the four-wheel drive parking area near Chesler Park and ends up at the edge of Chesler Park. At the present time the joint through which the trail runs is only a couple of feet wide, but in the not too distant geological future it will be many feet wide due to the constant work of weathering and erosion.

The distinctive red and white banding of the Needles and other features in the park is caused by two different rock formations interfingering. The red rocks are from the Organ Rock tongue of the Cutler formation. They were deposited in a riverbed, while the white Cedar Mesa sandstone, also of the Cutler formation, was deposited near the shore of an ancient sea as sand dunes.

Cedar Mesa sandstone is especially susceptible to pothole formation. Its sand grains are cemented together by calcium carbonate, which is soluble in very weak acids. Such acids form naturally from the reaction of carbon dioxide and water. This carbonic acid attacks the sandstone where it is weakest, and the loosened sand grains can easily be removed by wind or water, or can just fall away. Once a depression is made in the rock the forces of gravity, wind, and water can more easily work on the sandstone to shape it eventually into a pothole, cave, or arch. Numerous examples occur in Canyonlands, such as Angel Arch and Paul Bunyan's Potty.

Two other distinctive rock formations in Canyonlands are the Wingate and White Rim sandstones. The Wingate sandstone is a buff or orange color, but in most places it is covered with a coating of "desert varnish" - oxidized minerals that turn the surface of the rocks a dark red color. Areas where rocks have recently fallen from the 300 foot Wingate cliffs will show up as lighter than the surrounding rock. The entrance road to the Needles affords excellent views of Wingate cliffs near Dugout Ranch and Lavender Canyon.

White Rim sandstone also forms cliffs. These are best seen from Dead Horse Point and the Island-in-the-Sky. It forms and takes its name from the White Rim, a large plateau like area below the Island-in-the-Sky. White Rim sandstone contains ripple marks and cross beds, and is believed to have been deposited offshore of an ancient coastline.

Another interesting feature of the Island-in-the-Sky is Upheaval Dome. Salt is believed to play a major part in the structure of this dome, having been forced upward and causing the overlying strata to buckle and deform. Wingate sandstone forms the cliffs that ring the three mile diameter gape. The jumbled mass of rocks in the middle of the dome is White Rim sandstone.

Entrenched meanders are quite apparent in the canyons of the Green and Colorado Rivers in Canyonlands. In the distant past of geologic time these rivers may once have flowed across flat plains, but as they did so they cut their channels into the land, and are still cutting deeper today. The ancient courses of the rivers are still adhered to for the most part, but are hundreds of feet below their original levels. There have been some changes in the river courses, however. In past eons when a meander came back on itself and the river wore through the rock separating the two parts of the meander, the river was able to shorten its course. Such cut off meanders are now above the present level of the river channel, since the river has kept cutting down since the meanders were cut off. One such meander is at Anderson Bottom on the Green River. The next likely candidate for incision is the second meander of the Loop on the Colorado River (shown just north of the mouth of Salt Creek on the map in the park folder,) but cutting off an entrenched meander takes thousands or millions of years, so it will be up to our ancestors to note the date and time of the final cutoff.

A raft trip through Cataract Canyon is an excellent way to see much of the park that is otherwise inaccessible. The rapids in the canyon lend a unique excitement to the trip. A rapid forms in a river when the channel is constricted. The constrictions in the channel of Cataract Canyon are mainly formed by debris falling or slumping from the cliffs into the river, thereby partially damming the flow. The Paradox deposits and faults in the canyonwalls are the reason many of the slumps occur. The rapids today are much the same as Major John Wesley Powell described them when he first floated through Cataract Canyon in 1869, showing that nature is not in the same rush as man to alter the landscape.

For more detailed accounts of the above information read:

Geologic Story of Canyonlands National Park; Geological Survey Bulletin #1327, by S. W. Lohman, United States Government Printing Office, 1974.

Geology of Canyonlands and Cataract Canyon, by D. L. Baars and C. M. Molenaar, Four Corners Geological Society Sixth Field Conference, Cataract Canyon Expedition, 1971.