Natural Bridges National Monument

Geology

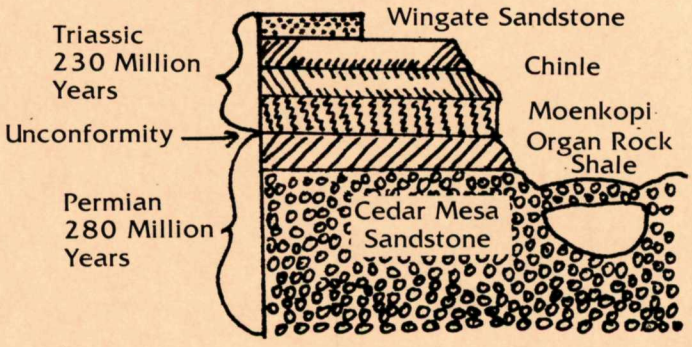
The logical place to start with the geology of the Natural Bridges area is with what is directly beneath our feet. The strata upon which we stand is known as Cedar Mesa Sandstone. A whitish layer here, this is the stone into which White Canyon has cut to create the three natural bridges within the Monument.

The sandstone was deposited as massive sand dunes in off-set layers, each slanted at a different angle, known as crossbedding. The thin red-colored bands seen from the canyon rims, are siltstone layers, laid down as sand and mud accumulations amongst the forming sand dunes.

You may have noticed the bold streaking on the rock. This is called "desert varnish". It is a thin deposit of an iron-manganese solution which runs down the rock with rain or melted snow. The longer the process has been going on, the darker the streaks. No one knows exactly how the process works, but it requires a hot, dry climate, the proper minerals, and plenty of time. A dark coat of desert varnish might take 2,000 years to form.

The three natural bridges in the Monument are the product of erosion on the Cedar Mesa Sandstone, mostly by the actions of water. As White Canyon was carved down into the sandstone, it developed bends, or meanders. These meanders, with time, become more and more twisted, bending back upon themselves, until just a thin fin of stone separates them. The soft siltstone layers form a weak spot in the canyon wall which flash-flood waters periodically pound against. Eventually, water cuts all the way through the meander, forming a natural bridge. At first the bridge is thick and massive, but erosion attacks it on all sides, the bridge gets thinner, and some day it will collapse.

The reddish brown layers directly above the Cedar Mesa Sandstone are know as the Organ Rock Shale and the Moenkopi formations. These two formations are difficult to distinguish from one another because they are both comprised of fine grained mudstone, siltstone, and marine shales. The Organ Rock Shale tends to form gentle slopes while the Moenkopi usually forms walls and towers. Ripple rock is one of the more distinctive features of the Moenkopi formation.



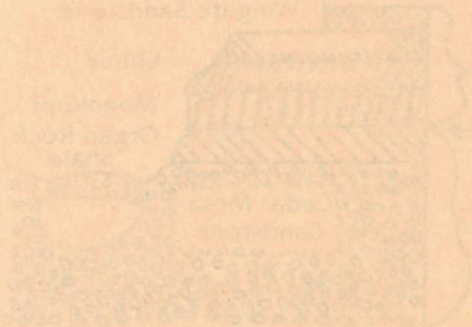
Above the Moenkopi formation is a whitish strata known as the Shinarump member of the Chinle formation. It is comprised mostly of stream deposited shale, sand, and gravel. It also contains uranium, petrified wood, and both plant and animal fossils of a wetter climate.

The red section above the Shinarump is known as the Moss Back member, yet another member of the Chinle formation. Made up of siltstone, sandstone, and conglomerate, it was laid down by streams. A good example of this strata may be seen just under the top of the Bear's Ears, below the red cliffs.

Above the Moss Back is Wingate Sandstone. A very impressive strata of reddish color, it is composed mainly of small, rounded quartz grains. It is cross-bedded, and cliff-forming. The top of Sundial Butte and Bear's Ears are capped with Wingate Sandstone.

Other strata of more recent geological time was deposited, then eroded long before the arrival of man on the scene. The area is very stable seismically, but the constant, patient actions of erosion -ice, water, wind, plant life - are at work wearing the scenery away.

The erosion of the area is an on-going process. There are at least two sites in the monument where there is strong evidence of natural bridges formed, eroded, and fallen. Likewise, there are other sites in the area of potential future bridges - Natural Bridges in the making.



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