

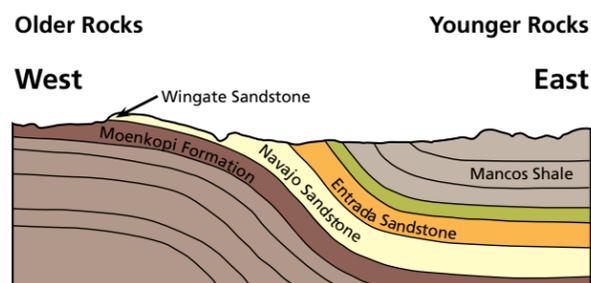
Geology Happenings

Capitol Reef National Park: Utah's Geologic Wonderland

by Allyson Mathis

To many people, a visit to Capitol Reef National Park means picking fruit in the historic orchards, hiking on the park's great array of trails, and viewing Fremont Indian petroglyphs along the Fremont River. Nonetheless, like Utah's other national parks, Capitol Reef is fundamentally a geological place; so much so that it is fair to describe Capitol Reef as Utah's geological wonderland, a rare gem even among the state's other geologic crown jewels. This history of referring to the Capitol Reef area as a wonderland goes back to the honorific "Wayne's Wonderland" given by local residents and early park boosters in Wayne County in the early part of the twentieth century.

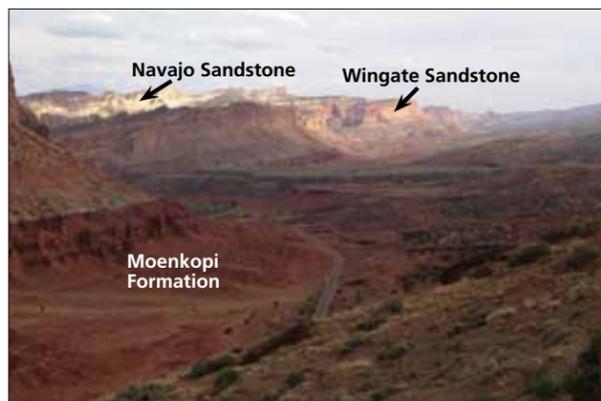
All five national parks in Utah have great geologic significance: the abundance of natural arches in Arches NP, the stone spires (or *hoodoos*) of Bryce NP, and the canyons of Zion and Canyonlands. However, two aspects of Capitol Reef's geology set it apart from these other spectacular parks.



The Waterpocket monocline showing uplift of the rocks on the west of the fold versus the east. Not all rock layers (formations) are labeled in this diagram due to space considerations.

The first is the Waterpocket Fold, the 100-mile long buckle in the earth's crust that defines Capitol Reef and is the park's *genius loci*. Literally, *genius loci* means the "spirit of the place," but in modern usage it indicates an area's distinctive atmosphere. The Waterpocket Fold is the central feature of Capitol Reef NP, as park boundaries were roughly drawn to encompass it. Beyond Utah and the national park system, geologists consider this fold to be the best-exposed example of its kind on the earth's surface.

The Waterpocket Fold is a *monocline*, a type of fold in the rock layers with a single steep limb or side. The same geologic events that uplifted the Rocky Mountains approximately 65 million years ago formed the Waterpocket Fold, as well as the other monoclines on the Colorado Plateau including the San Rafael Swell and Comb Ridge. These folds formed when the rock layers closer to the Earth's



surface were folded, or draped, over deeply-buried faults that moved upwards on their west sides. Except for along the trace of the Waterpocket Fold, rocks in the greater Capitol Reef area are nearly horizontal like in most areas of the Colorado Plateau. Monoclines allow rock layers to "step up," and can be thought of as half of a fold (although the layers do subtly roll over on the west side of Capitol Reef). At Capitol Reef, they have been uplifted approximately 7,000 feet on the west relative to their position to the east.

The other principle geological superlative of Capitol Reef is its huge thickness of sedimentary strata that provides a nearly comprehensive record of the Mesozoic Era (the Age of Reptiles) in Utah. A total of at least 18 different rock layers, known as *formations* to geologists, with a cumulative thickness of nearly 10,000 feet are exposed in the park. Capitol Reef's rock record approximately equals that of Canyonlands and Arches national parks combined. If Capitol Reef's rock layers were still stacked horizontally like those exposed in Grand Canyon, they would form a thickness nearly twice the canyon's depth.

Highway 24 cuts across the heart of Capitol Reef NP east-west, and driving across the park allows visitors to directly experience this spectacular geologic section. The Waterpocket Fold has effectively tilted Capitol Reef's layers so that people can travel from the oldest rocks to the youngest, simply by driving from west to east along the highway. At other sites like the Grand Canyon, hikers



Capitol Dome is in the Navajo Sandstone.

would have to ascend the trail from river to rim in order to achieve the same effect. On the west side of Capitol Reef NP, near the visitor center and along the Scenic Drive, the Moenkopi and Chinle Formations are capped by the Wingate Sandstone, e.g., the same units that at Canyonlands hold up the Island in the Sky. Younger rocks such as the Carmel Formation, Entrada Sandstone, and the Mancos Shale are exposed near the park's east boundary. These rocks are also exposed in Arches NP.

The Navajo Sandstone is the most prominent of Capitol Reef's rock layers. At Capitol Reef, the layer is approximately 1,000 feet thick and erodes into the park's iconic white slickrock domes – including the park's namesake, Capitol Dome, which is a rounded feature reminiscent of the U.S. Capitol building. The name "Capitol Reef" is the source of much curiosity for travelers in southern Utah, as many expect to encounter a coral reef similar to ones found in the Florida Keys, or at least see rocks formed in a coral reef. While not made of limestone nor formed by the growth of reef-building organisms, the Waterpocket Fold created a line of cliffs that created an impediment to travel across it, somewhat akin to the barriers caused by coral reefs. The park's name therefore reflects the two main components of its geologic story: the Waterpocket Fold and its signature sedimentary strata, including the Navajo Sandstone.

Capitol Reef NP is located approximately 150 miles west of Moab. To learn more about visiting the park, please visit www.nps.gov/care.

A self-described "rock nerd," Allyson Mathis is a geologist, informal geoscience educator and science writer living in Moab. A native of Florida, Allyson grew up close to actual coral reefs.



This column is dedicated to the memory of geologist and author Sarah Andrews, who had edited drafts of each previous Geology Happenings article. Sarah tragically and unexpectedly died in July.



Cliffs made up of the Wingate Sandstone near the Capitol Reef Visitor Center.



The Carmel Formation on top of the Navajo Sandstone. Looking west from the outside the east park boundary.



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