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Colorado

National Monument

National Park Service
U.S. Department of the Interior

Colorado National Monument
Fruita, Colorado

RIM ROCK DRIVE GEOLOGY

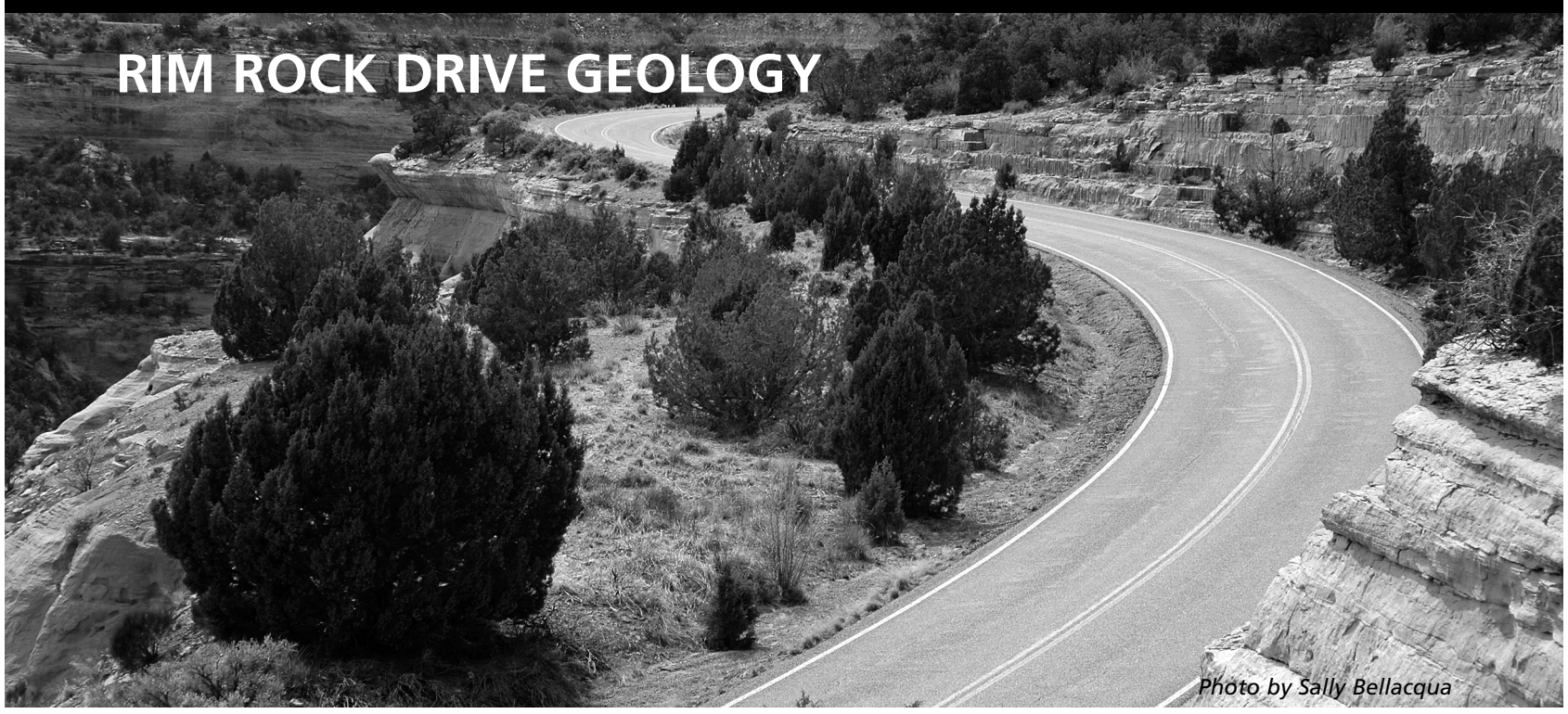

Photo by Sally Bellacqua

INTRODUCTION

Colorado National Monument was established in 1911 by President Taft to preserve "…extraordinary examples of erosion [that] are of great scientific interest, and it appears that the public interest would be promoted by preserving these natural formations as a National Monument…"

This guide describes many of the geological features of the Colorado Plateau that you will see while traveling the 23-mile Rim Rock Drive through Colorado National Monument. The sequence of recommended stops is from west (Fruita entrance) to east (Grand Junction entrance) starting at the Redlands View. If you enter the monument from Grand Junction, simply follow the stops in reverse, beginning with Cold Shivers Point 4-miles from the Grand Junction entrance.

REDLANDS VIEW

As you ascend the hill from the west entrance, you will pass through the Redlands Fault. A fault is a fracture in the earth's crust along which movement has occurred. The most recent major movement along the Redlands fault resulted in rocks on the uplifted side being elevated over 1,600 feet (488 meters) above the equivalent down-dropped side. If you look to the west, you will see the horizontal layers in the cliffs of Wingate Sandstone fold down to the east to become almost vertical. This fold is called a monocline – a fold with only one bent limb shaped like a lazy "S" in the cross section. The steep cliffs formed by erosion along the base of the fault dominate the skyline. Colorado National Monument, in partnership with the Mesa State College Center for Earthquake Research and Information Center, is monitoring this fault for tectonic activity. A seismograph is located in the Visitor Center.

BALANCED ROCK VIEW

Balanced Rock was once part of the canyon wall in front of you. When wind, water and chemicals act on the Wingate Sandstone walls of the canyons, the results are sometimes remarkable. Balanced Rock, a 600 ton (550 metric ton) boulder, has been left perched on a pedestal while most of the rock that once surrounded it has weathered away. Its sculptured form was determined by zones of weakness - vertical joints (cracks), horizontal bedding planes, and soft layers in the rock.

FRUITA CANYON VIEW

From this viewpoint, you see the beautiful Fruita Canyon below. This canyon was carved by flash floods cutting through the Wingate Sandstone cliffs into the dark gray Precambrian metamorphic rocks at the bottom. Floods roared through Fruita Canyon during the last 10 million years, triggered by thunderstorms that can bring sudden, torrential rains to the surrounding mesas. Flash floods are brief but incredibly erosive and do most of the canyon carving in the monument.

VISITOR CENTER

The Visitor Center is situated on a prominent sandstone ledge visible throughout the monument – the Kayenta Formation. This sandstone is more resistant to erosion than the rocks above and below, so it forms a ledge. The concave "smile" shaped layers in the Kayenta rocks are ancient stream channels which indicate the climate here at that time was much wetter than today. The Visitor Center offers exhibits, video programs, and books that tell the story of the Colorado Plateau and of erosion and canyon carving that shaped Colorado National Monument.

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INDEPENDENCE MONUMENT VIEW	Independence Monument is all that remains of what was once a continuous ridge that connected the mesa you are standing on to the massive rock called “The Island” to the east. Relentless erosion of the massive Wingate Sandstone has left this 450-foot (137 meters) high monolith with its protective sandstone caprock of Kayenta Formation. One of the most popular rock-climbing destinations is this free-standing “monument”. On July 4th, local climbers raise the American flag on top, carrying on a tradition started by John Otto in 1909.
MONUMENT CANYON VIEW	Monument Canyon was formed by a combination of erosional processes over the last two million years: flash flooding from thunderstorms cut the canyons and undermined the canyon walls; winter freezing and thawing cycles cracked the rocks; rockslides widened the canyons; and wind and rain scoured and smoothed alcoves, holes, towers and spires in the rocks. The same processes continue to erode the canyon today. While we may not witness these erosional forces in action, they remain relentless.
COKE OVENS OVERLOOK	The Coke Ovens are named because of their similar appearance to conical-shaped coke ovens built by early miners to convert wood and coal into charcoal and coke for industrial uses. Here, a ridge between two canyons has eroded into a series of rounded domes. These huge domes of Wingate Sandstone are the remnants of earlier monoliths that lost their protective Kayenta caprock. The vivid colors of red, orange, purple, and brown were created by iron and other minerals in the rocks.
ARTISTS POINT	Artists Point is named for the beautiful panorama of canyons, cliffs, and brightly colored rocks that you see in the foreground and hills adjacent to the overlook. Approaching Artists Point from either direction, most of the rocks on the above hillside are the Morrison Formation, exposing ancient stream channels and floodplain deposits. Morrison Formation rocks were deposited during a period of the earth’s history with a climate vastly different from the dry wind-blown desert just below.
LIBERTY CAP TRAILHEAD	On the morning of January 8, 2000, a section of cliff suddenly dropped onto Rim Rock Drive across the road from Liberty Cap Trailhead, completely blocking and shutting down the roadway for over a month. The rock fall is simply a continuation of the erosion that has carved the canyons of Colorado National Monument. Large rock falls occur frequently in geological time. It is a rare and exciting opportunity to see and study one during our lifetime. Some of these broken rocks last saw the light of day 140 million years ago when they were laid down in a streambed during the time of the dinosaurs.
FALLEN ROCK OVERLOOK	Fallen Rock, in the opposite wall of the canyon, is a striking example of how giant slabs of sandstone break loose from the cliff wall and slide down to rest on the debris slope below-all without falling over. Look closely and you can see the Kayenta Formation caprock on top of Fallen Rock. That tells us that it used to be connected to the mesa top and has slid down more than 100 feet (30 meters). It is likely that Fallen Rock slid thousands of years ago.
UTE CANYON VIEW	After crossing the highest point on Rim Rock Drive at 6,640 feet, (20 meters) the road descends to the Ute Canyon View. This is one of the most spectacular vistas in the monument. Here, Ute Canyon makes a sharp 90º bend to the right —probably following the trace of fractures or faults in the very old Precambrian rocks that are visible in the floor of the canyon. In the Wingate Sandstone cliff-face across the canyon to the left, look for two small arches in the rock. Arches and windows form in narrow ridges in areas where cracks cause blocks to fall out, leaving an arch or window behind. The dark brown to black stain on the cliffs opposite you is actually a coating of iron, manganese, and other minerals called desert varnish. Desert varnish forms when moisture evaporates from the surface of the rocks leaving mineral deposits behind.
RED CANYON OVERLOOK	From here you can see a broad U-shaped canyon with vertical Wingate Sandstone walls. Within this canyon is a smaller V-shaped cut in the canyon that gives the appearance of a “canyon within a canyon”. Carving waters scoured the dark gray Precambrian rocks to create this “canyon within a canyon”. Because the surrounding sandstone rocks erode much faster than Precambrian rocks, the V-cut will grow longer and wider rather than deeper.
COLD SHIVERS POINT	You are overlooking Columbus Canyon, one of the smaller canyons in the monument. The dark grey rocks at the bottom of the canyon are extremly old and hard Precambrian metamorphic rocks—rocks altered by intense heat and pressure deep in the earth. These rocks are very resistant to erosion. As the Colorado River continues to cut through the soft Mancos Shale in the Grand Valley, the difference in elevation between the top of the Precambriam rocks and the river valley will increase, and several of the monument’s canyons will be left behind as hanging valleys above the Grand Valley.