Colorado National Monument

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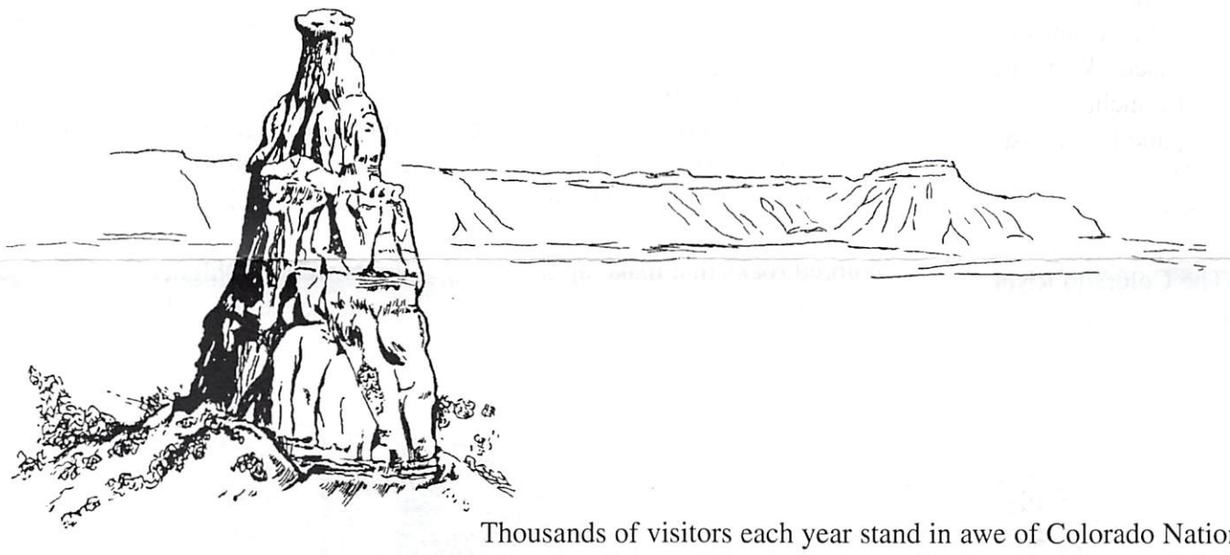
National Park Service/ U.S. Department of the Interior

CARVING THE CANYONS



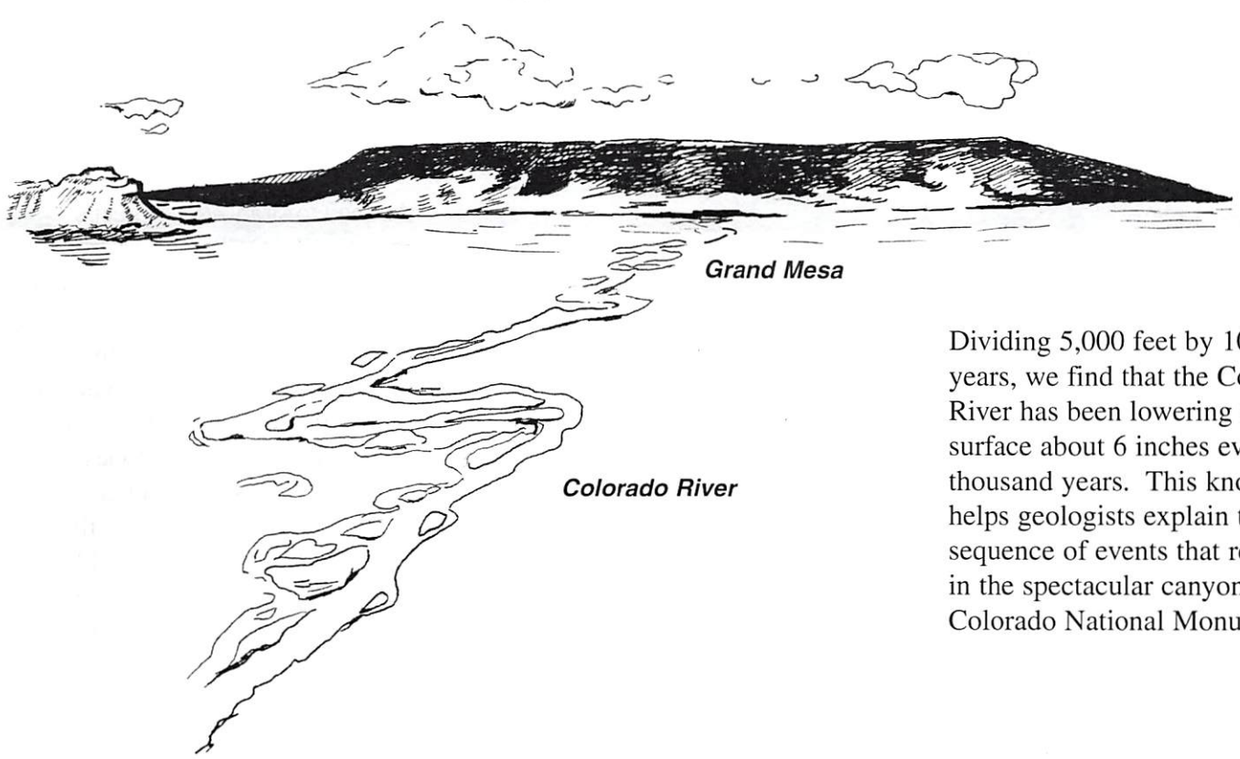
Independence Monument with Mt. Garfield in the distance

Thousands of visitors each year stand in awe of Colorado National Monument's magnificent canyons and red sandstone monoliths. Few, however, know how these features came to be, and how the monument differs from the valley below. The story of how and when the canyons were carved is an intriguing one. Part of the story involves some ancient events that occurred many miles away.

How fast do rocks erode?

About 10 million years ago, when this area was much flatter and considerably lower than now, a volcanic eruption occurred at what is now the Grand Mesa, about 25 miles east of the monument. Lava poured out, covering the land with a rock called basalt. The erosion-resistant basalt has protected the soft rocks and the 10-million year old land surface below it from erosion.

Between one and five million years later, the entire Colorado Plateau and Rocky Mountain regions began to rise, increasing in elevation as much as 10,000 feet. The uplift began a period of vigorous erosion, still going on today, during which the Colorado River sliced its way 5,000 feet below the level of the basalt-protected old land surface on Grand Mesa.

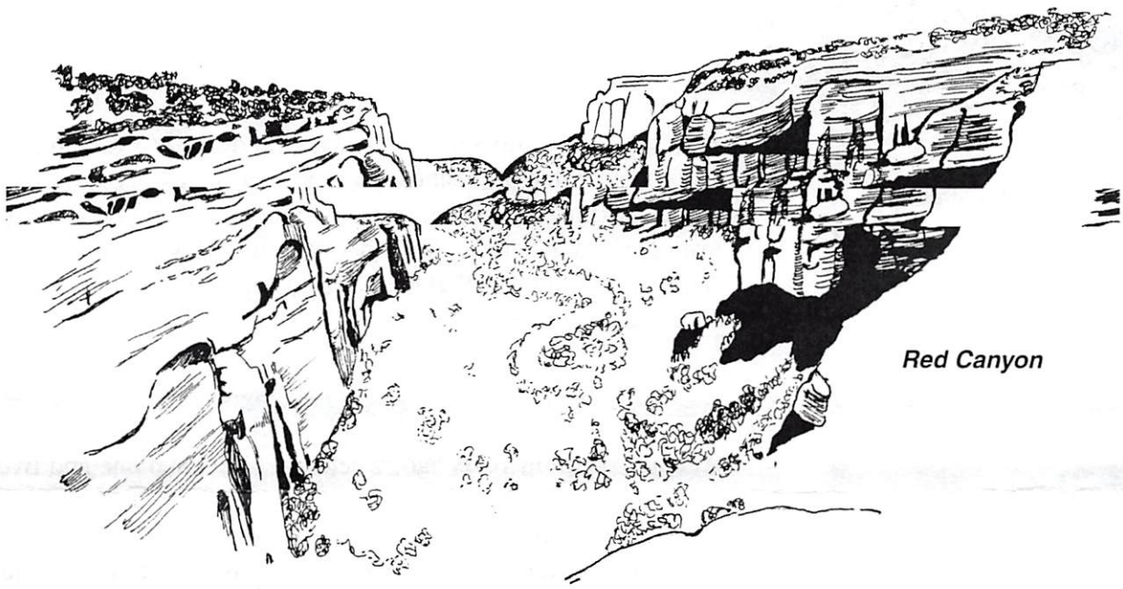


Dividing 5,000 feet by 10 million years, we find that the Colorado River has been lowering the land surface about 6 inches every thousand years. This knowledge helps geologists explain the sequence of events that resulted in the spectacular canyons of Colorado National Monument.

How did the monument begin?

The story began when erosion stripped the thick, soft Mancos Shale off of this part of the Uncompahgre Plateau, and more resistant sandstones were exposed. With erosion removing about 6 inches every thousand years, and the sandstones being about 1,000 feet above the Colorado River valley floor, this would have happened about 2 million years ago. The Colorado River continued to erode away the soft Mancos shale in the Grand Valley, but the harder sandstones of the monument eroded much more slowly. The elevation difference between the sandstones in the monument and the Colorado River valley became greater and greater as the river cut down, giving the small streams in the monument a bigger and bigger drop to get to the river. This gave them the energy to erode into the sandstones and begin to cut the canyons. By 800,000 years ago, erosion had reached the hard, dark-colored rocks that make up the canyon floors.

When the canyon streams finally cut down to the extremely tough rocks of the canyon floors, downward erosion almost stopped. Only a couple of the streams have had enough energy to cut into these hard rocks. The other streams have cut their canyons longer and wider, but not deeper. Outside of the monument, the Colorado River continued its relentless downward erosion. The little streams in the monument, which are usually dry, couldn't keep pace, and so the canyon floors were left higher above the Colorado River.



Red Canyon

High, flat-bottomed canyons

What next?

As the Colorado River keeps relentlessly eroding, the canyon floors will get even higher above the Grand Valley since the small streams can only very slowly cut into the tough underlying rocks. The valley will gradually get longer, wider, and shallower as sandstones and overlying rocks are eroded away. If you come back a few million years from now, you probably won't recognize the place. So don't wait that long. Enjoy it now.