# Rio Grande del Norte National Monument: Where volcanoes and rivers collide!


To many people, New Mexico is one of the best places on Earth to study and explore geologic processes. From the picturesque sedimentary rocks and related fossils of the Colorado Plateau to the uplifted granites and the Great Unconformity of the Sandia Mountains, New Mexico seems to have it all. But if you are interested in the combination of young volcanoes and the relentless power of flowing water, perhaps no place is better than Rio Grande del Norte National Monument of northern New Mexico. The monument, designated on March 25th, 2013, is one of the newest public lands in the state—second only to Organ Mountain and Desert Peaks National Monument outside of Las Cruces. Located directly south of the New Mexico–Colorado border and with much of the land elevation near or above 7,000 feet, the monument is a great place to escape the summer heat.

Aerial image (facing south) of the confluence of the Red River (gorge on the left) and Rio Grande (gorge on the right) at Wild Rivers Recreational Area. Layers of lava flows are well exposed in the gorge walls. All of the topographic high points on the mesa are extinct volcanoes.

Two world-renowned New Mexico geologic features are on spectacular display in the monument, the Taos Plateau volcanic field and the Rio Grande gorge. Within the monument nearly every peak or mountain that towers over the high plateau is an extinct volcano. For example, San Antonio Mountain and Ute Mountain are both extinct volcanoes. The volcanic field is located in the Rio Grande rift, where the Earth's crust is spreading and thinning. Similar to other rift zones around the world (such as the East African rift or the West Antarctic rift), this process results in widespread volcanism and faulting. Eruptions of the Taos Plateau volcanic field began around 10 million years ago. The youngest eruption occurred approximately 1 million years ago, originating from the Mesita vent in south-central Colorado. The current hiatus in eruptions indicates that the field is probably extinct or, alternatively, in a very long dormant period. The volcanoes erupted a wide-range of lava types, from rhyolite to basalt, although the latter seems to be the most abundant. To the east of the volcanic field, the uplifted flank of this part of the Rio Grande rift forms the Sangre de Cristo or "Blood of Christ" Mountains. Light from a typical sunset turn the mountains a deep reddish color, which is the inspiration for their name.

View of Big Arsenic Spring as it enters the Rio Grande. For more information on the springs of the area check out this article (www.geoinfo.nmt.edu/publications/periodicals/nmg/32/n1/nmg_v32_n1_p26.pdf) or follow this link to an informative slideshow of the unique hydrogeology of the area (www.geoinfo.nmt.edu/repository/index.cfml?rid=20100001).

Slicing through the heart of the volcanic field (and the monument) is the Rio Grande gorge. The gorge varies in depth throughout the monument from a couple hundred feet deep in the north to almost a thousand feet deep near the confluence of the Rio Grande and Red River. Exposed within the walls of the gorge are layered lava flows from the volcanic field. If you look closely you will find lenses of sediments between the flows that were deposited in between eruptions. The sediments are commonly an orange-red color, which is due to the intense heat the sediments experienced when the overlying flows were emplaced. Numerous hot and cold springs are located throughout the gorge, commonly found along faults or where groundwater seeps out along the top or bottom of lava flows.

In addition to the spectacular geology, the monument is occasionally the site for geologic training of NASA astronaut candidates (also known as ASCANs). The volcanoes and erosional features found within the monument are similar to what we think might exist on other planets. For a week in June 2018, four bureau geologists (Paul Bauer, Mike Timmons, Adam Read, and Matt Zimmerer), along with instructors from the University of Texas at El Paso and at Austin, Hamilton College, the USGS, and NASA participated in training the 2017 astronaut candidates. The 14 members of the 2017 ASCAN class are from a variety of backgrounds, including


Photo of the 2017 astronaut candidate group after completing the 2018 geologic mapping exercise at Wild Rivers Recreational Area.
*Photo by Paul Bauer.*

aviation, military, medicine, biology, engineering, and even geology. Prior to their arrival at the monument, the ASCAN class spent a week reviewing satellite and remote sensing images of the field area, imagery similar to what they might see and acquire from the International Space Station. After developing hypotheses related to the geologic history of the area, their time in the monument was spent making field-based observations to test their hypotheses and constructing geologic maps and cross-sections. The training helps the future astronauts understand fundamental geologic processes and may even play a role in mission planning for future trips to the Moon, and possibly even Mars.

You don't have to be an astronaut, however, to explore this wonderful monument. Much of the monument can be accessed by car, such as the Wild Rivers Recreational Area and the Rio Grande Gorge Bridge. Numerous trails, which lead to both the highest peaks and the bottom of the gorge, provide hiking and horse-back riding opportunities. Arguably one of the best ways to explore the monument, particularly in the summer, is by rafting or kayaking down the Rio Grande.

**More information can be found following these links:**

Information about the monument, including hiking, camping, and alerts.
**www.blm.gov/visit/rgdnnm**

Geology and River Guide for the upper Rio Grande.
**geoinfo.nmt.edu/publications/guides/riogrande/home.cfml**