Geology of The Gila

AMERICA'S BYWAYS

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NATIONAL PARK SERVICE

Trail of the Mountain Spirits National Scenic Byway

www.tmsbyway.com

Funded in part by the Federal Highway Administration.


photo: Adriel Heise

View eastward along the Gila Hot Springs Graben

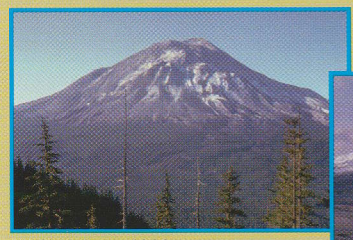
Supervolcanoes of the Gila Wilderness

About 30 million years ago, the land around this area was in volcanic turmoil as a series of violent eruptions changed the landscape dramatically. The term "supervolcanoes" has become popularized and used to describe the type that created the landscapes you will see as you drive along the Byway. Supervolcanoes are the largest volcanic eruptions known to occur on earth. They produce great quantities of ash and usually result in a large crater (caldera) rather than a cone.

The Bursum and Gila Cliff Dwellings calderas are the remnants of two supervolcanoes. These eruptions produced catastrophic amounts of ash and pumice with a force estimated at 1000 times the power of the 1980 eruption of Mount Saint Helens. A supervolcano eruption is so explosive that magma withdrawal causes the overlying mass to collapse and fill the empty magma chamber, leaving a large caldera. The Bursam caldera is 25 miles in diameter and extends from Hells Hole on the West Fork of the Gila River to the vicinity of Glenwood, New Mexico. Gila Cliff Dwellings National Monument is near the eastern margin of the slightly older and smaller (about 15 miles in diameter) Gila Cliff Dwellings caldera.

Copperas Creek Volcano and the Alum Mountain Eruptive Center

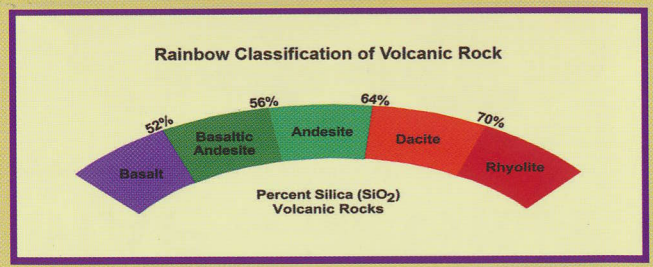
From the Clinton P. Anderson Overlook on NM 15, near the highest point along the Byway at 7340 feet elevation, the youngest eruptive center of the Copperas Creek Volcano is visible. The now colorful rocks of the Alum Mountain Rhyolite Dome are surrounded by a crater-like rim of lava flows, thus resembling Mt St Helens in the Cascade Mountains in Washington State.


Mt St Helens -1980


Mt St Helens -1984

After eruption, the rhyolite was altered by hydrothermal solutions that contained traces of silver, gold and pyrite (fool's gold). The area was also enriched with aluminum sulfate, known as alum.

As part of the Mogollon-Datil volcanic field, this area experienced prolonged volcanic activity from 40 to 24 million years ago. Each layer of igneous rock represents another episode of ash eruption or lava flow. Remnants of the Copperas Creek Volcano are, in part, covered by younger rock that erupted from the nearby supervolcanoes. Variations in magma chemistry and cooling speeds, millions of years ago, still influence how the rock weathers and appears today.



Hot Springs

There are two main sources for geothermal water: a magma body below the surface or an increase in temperature due to the deep circulation of rainwater.

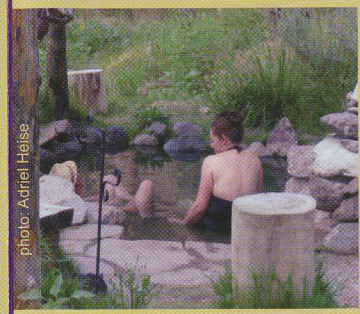


photo: Adriel Heise

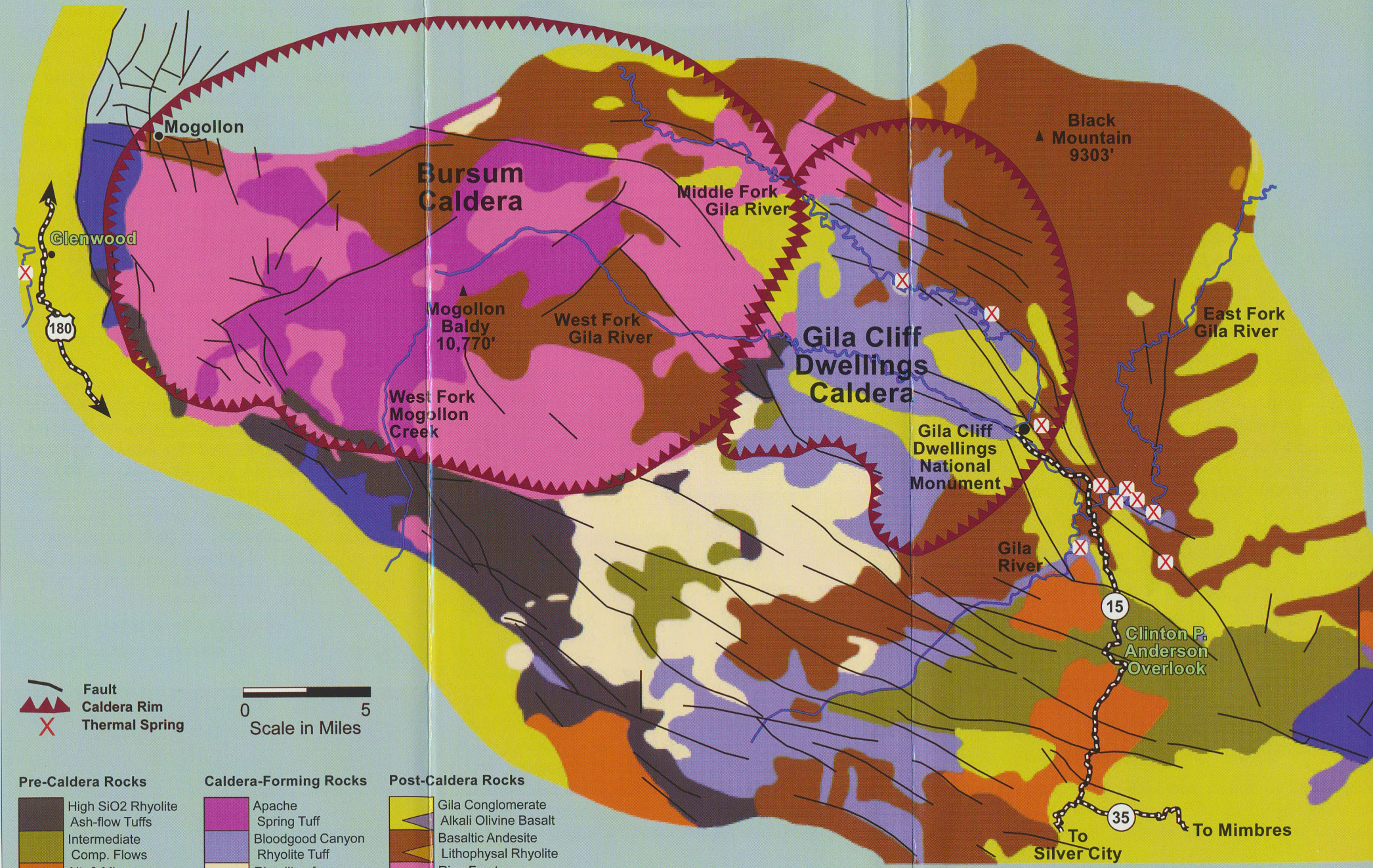
Gila Hot Springs found near the end of NM15

Within the wilderness, the water chemistry of the hot springs shows no evidence of a magma body. It is most likely that the water has seeped deep into the earth, been heated by the geothermal gradient and returned to the surface along faults and fractures.

Native peoples have used the Gila Hot Springs area in various ways for thousands of years. The Mimbres-Mogollon farmed the valleys. The Apache soaked in the soothing waters between battles and revered the springs for their medicinal and spiritual values. As the European settlers arrived and began to move north into the forest, they also discovered the benefits and comforts of the hot springs. The early mountain men and trappers used the valley, as did the miners and the soldiers who set up an outpost.


Lightfeather Hot Springs on the Middle Fork of the Gila river

Geologic Map of the Gila Wilderness



* Modified from Ratte and Gaskill, 1975: U.S. Geological Survey Map I-886.

Santa Rita Copper Mine

Geology and Mining

The relationship between geologic riches and the economic development of this area is visible in many places along the Byway. You can see mining in progress at the Santa Rita Mine overlook today. Many old shaft-mining locations can also be seen from the road. Weathered head frames mark their entrances and remind us of mining activity in the past.

Early geologists accompanied military explorations of the western territories after the Civil War. Eastern entrepreneurs began to take an interest in Grant County in the 1870s and 1880s after word spread of the Pinos Altos gold strike and the abundance of copper at the Santa Rita Mine.

Mining companies sent geologists, mining engineers and smelter specialists to determine where mining could be done profitably and safely. Railroads extended and workers were recruited, settling in the area. Local Apache resisted these changes as they were being forced from their homelands. Fort Bayard was created as an army base to protect the mining industry that was beginning to expand rapidly. Prospectors, who were here before and after the big mining companies, continued to seek gold and silver independently.

Mining Along the Byway

Many of the towns on the Byway were established as a result of mining activity in the area. The landscape you see from the Byway, along the section of NM 152 near Bayard, contained world class ore bodies of copper, associated other heavy metals, and gold and silver. The Central Mining District, a 45 square mile area, sits on either side of the Byway, centered on the Santa Rita Copper Mine. Santa Rita is the oldest continually operated mine in the US as well as one of its largest open pit operations.

Commercial mining is largely concentrated on the Byway along the section of NM 152 near the towns of Bayard, Fierro and Hanover. There was more gold, silver, copper, lead, zinc, iron, manganese and vanadium produced here than all the other metal mining districts in NM combined.

Headframe of the Clum Flourspar Mine on Canyon Hill with the Gila Wilderness and mouth of the Gila River Canyon in the background

Mining in the Gila Wilderness

Mining in the Gila Wilderness is illegal as of the Wilderness Act of 1964. Before then, there was extensive mineral exploration, dozens of unpatented mineral claims, some patented claims, and minor production of gold, copper, lead, zinc, cadmium, tellurium and other metals. The rugged terrain and distance from towns made mining efforts extremely challenging in this isolated environment.

Meerschaum (Sepiolite) carves easily and is used to sculpt art pieces and pipes.

Alum (Halotrichite) is used in medicine, dyes and to tan hides.

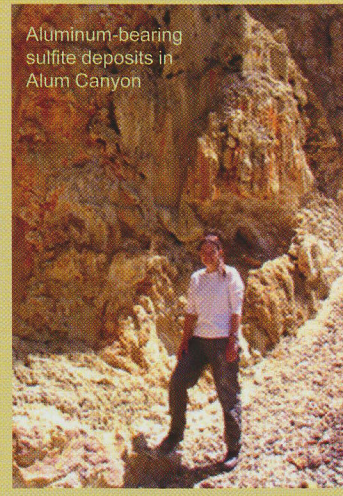
Meerschaum ore

Meerschaum and alum are two unusual minerals found here that were processed in a mining effort begun in the early 1900s.

The Meerschaum Mine is located in the Gila Wilderness, a couple of miles northeast of the junction of NM 15 and NM 35, in the Lake Roberts area. The mine was discovered in 1875, and produced meerschaum, which was primarily used for the carving of smoking pipes and also to cushion explosives brought into remote mining areas on pack mules. When dry, a piece of meerschaum will float. This mine's meerschaum was unsatisfactory because of the high level of impurities found.

Alum was discovered in 1890 about five miles down stream from Gila Hot Springs. Alum, which is used in medicine, tanning hides and in dyes, was briefly mined in the early 1900s. Alum was tested as a source of aluminum metal, however the recovery of aluminum proved to be too costly.

Maps and books on geology, mining and local history are available at the Gila Cliff Dwellings Visitor Center and Bookstore.



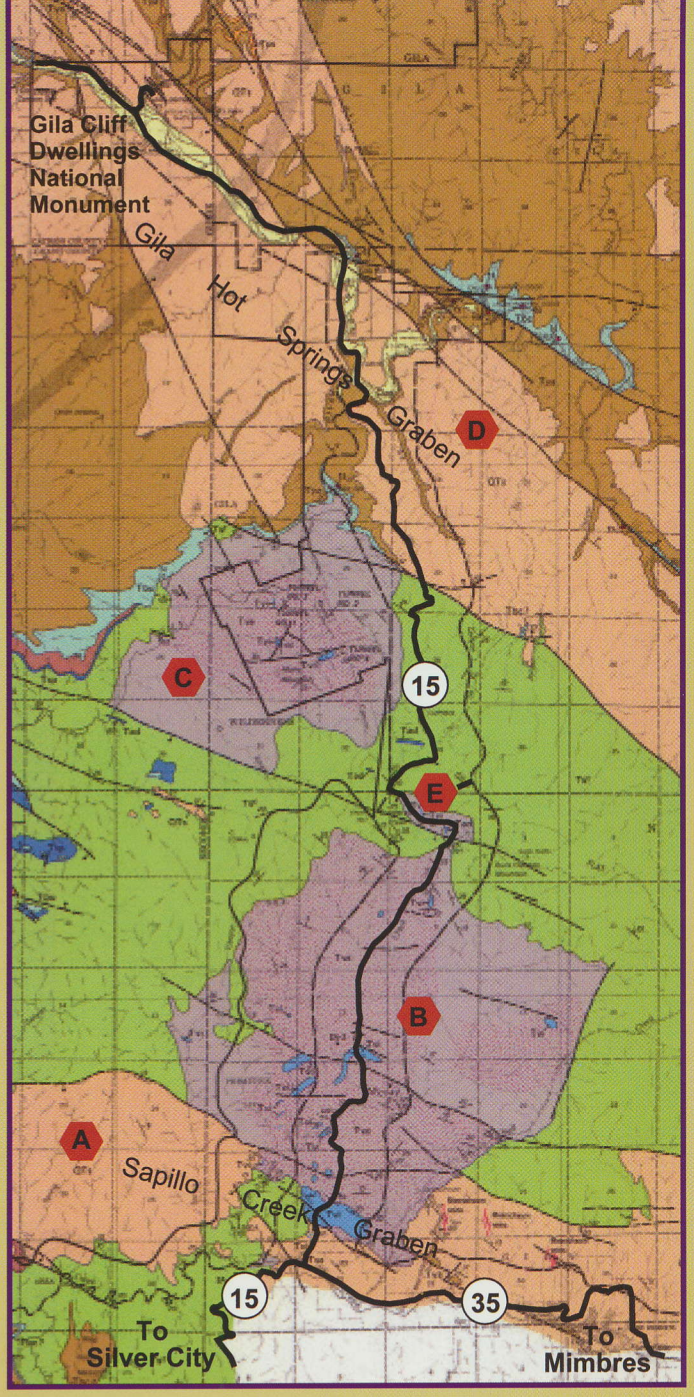
Aluminum-bearing sulfite deposits in Alum Canyon

Geologic Trip: Sapillo Creek to Gila Cliff Dwellings

New Mexico Highway 15 between Sapillo Creek and Gila Cliff Dwellings National Monument climbs over and winds through a complex geologic story that presents some of the Byway's most striking scenery.

Panoramic vistas allow you to survey the remnants of once active volcanoes. Close inspection of road cuts reveal layers of colorful ash flows and even evidence of a once Yellowstone-like hot springs environment.

The area's youngest rock formation, dominant at both the beginning and end of this section, is the Gila Conglomerate. This sedimentary rock marks the time when the older volcanic rocks began to break down. Over time, large fault blocks called grabens and the waters of rivers and creeks helped to shape the topography and carve deep canyons into the already dramatic landscape. The geology along the Byway provides the ecological basis for the plants and animals that inhabit the area; the volcanic rocks break down to form the soils that nurture the plants that feed the animals.



Geologic Map along NM Hwy 15 between Sapillo Creek and Gila Cliff Dwellings National Monument.

- A Sapillo Creek Graben
- B Copperas Canyon Eruptive Center
- C Alum Mountain Eruptive Center
- D Gila Hot Springs Graben
- E Clinton P. Anderson Overlook

For more information on the geology of the Gila Wilderness, stop and read the various geologic interpretive signs along Highway 15.