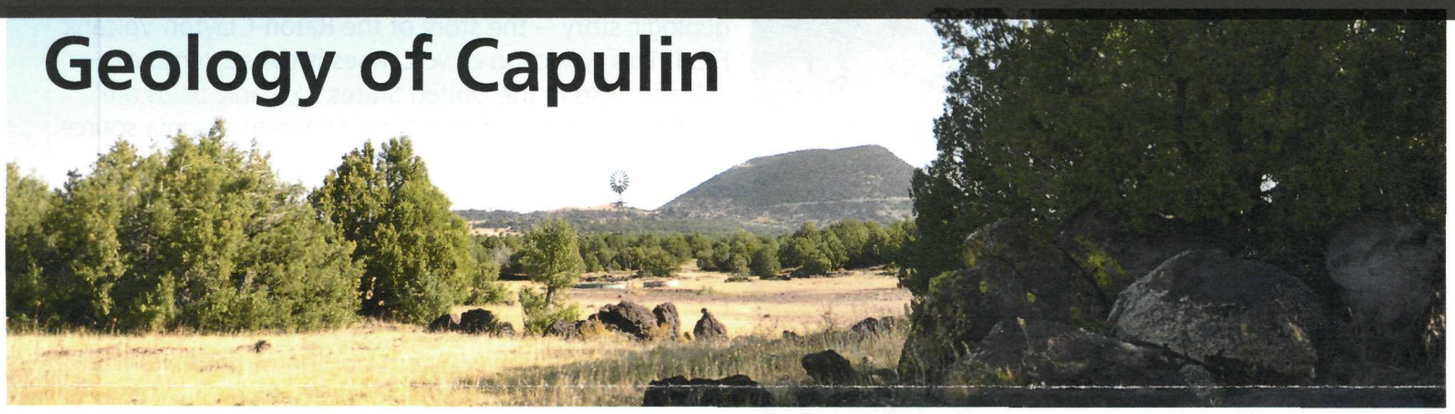
Capulin Volcano

National Monument
National Park Service
US. Department of the Interior

Geology of Capulin

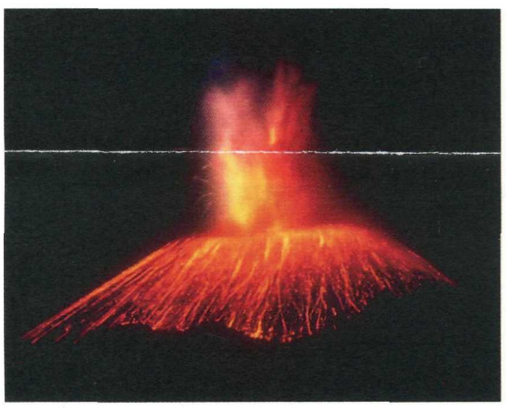


All geologic landforms and features are testaments to the forces that created them. Geologists observe the general shape of the feature, its make up, and study the processes that form similar features today. Through these investigations, a geologist is able to reconstruct the geologic events that produced the present landscapes. Geologic clues tell the story of Capulin Volcano's violent past.

The Eruption of Capulin Volcano

Today Capulin Volcano is a peaceful, forested mountain in the high plains of northeastern New Mexico. It stands approximately 1,000 feet above the surrounding prairie and is surrounded by an apron of lava covering 15.7 square miles.

The anatomy of the volcano reveals its explosive past. Capulin Volcano is a cinder cone-a conical pile of cinders and ash around a volcanic vent. These volcanic rock fragments were formed during the eruption by gases bubbling out of the pasty lava at the vent and shattering it: ash and lava fragments were propelled high into the air. The ash formed a small volcanic cloud and the cinders fell around the vent. As the cinders and ash piled up around the vent, they periodically avalanched down the over-steepened slopes. These avalanches produced the layers of ash and cinders that make up the volcano and that can be seen along the volcano road.

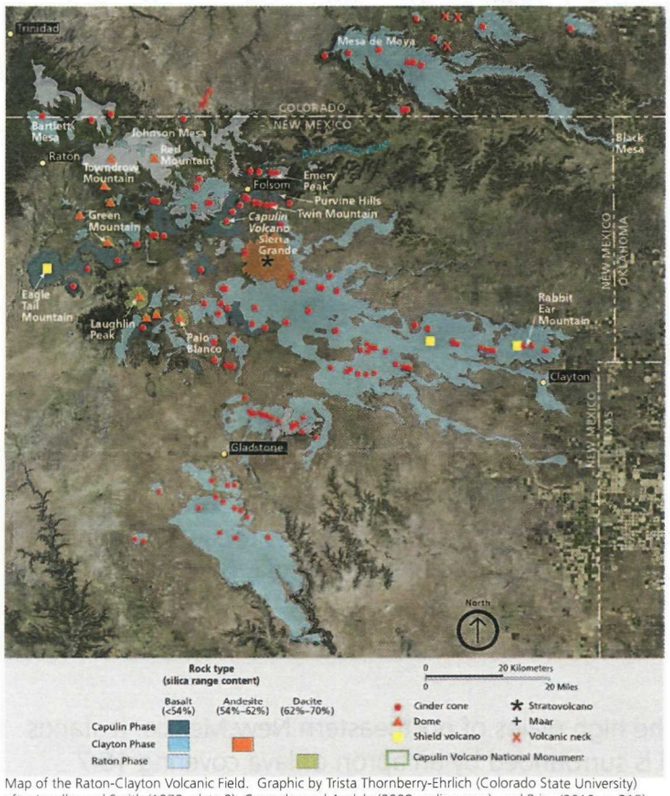


The crater was kept clear by the explosiveness of the eruption. As the eruption waned, the lava lost its fizz-in other words, most of the gas dissolved in the magma had already bubbled away. The eruption became less vigorous and formed larger chunks of lava that were still molten when they landed. These chunks welded together and covered the inside of the crater with a solid coating of rock which, in part, has slowed the erosion of the crater and preserved its shape. The eastern rim of Capulin Volcano is higher than the western rim indicating that prevailing winds during the eruption blew from the west.

Cinder cone eruptions are commonly accompanied by emission of lava flows from vents located at the flank of the volcano. Several of these vents make up the "Boca" at the western base of the cone. From the Boca, lava flowed down cascades, between levees, and in lava tubes away from the volcano. Near the volcano, the lava flowed as pahoehoe, or fluid, ropy lava: typical pahoehoe features such as collapsed lava tubes and tumuli are found today. Away from the vents the lava flowed as aa, or rough, blocky lava as evidenced by the typical blocky piles of lava found at flow margins.

The eruption of these flows from the Boca must have occurred near the end of the cinder cone eruption as they are not covered by a mantle of ash and cinders. An earlier flow, which is covered by a layer of ash and cinders, occurred prior to the start of the cone-building phase of the eruption and flowed from vents now buried under the cinder cone.

The Raton-Clayton Volcanic Field



Map of the Raton-Clayton Volcanic Field. Graphic by Trista Thornberry-Ehrlich (Colorado State University) after Luedke and Smith (1978, plate 2), Crumpler and Audele (2008, online map), and Price (2010, p. 315). Silica range content is from Luedke and Smith (1978, plate 2).

Capulin Volcano is one of many volcanic centers in northeastern New Mexico and is part of a larger geologic story -- the story of the Raton-Clayton Volcanic Field. This collection of volcanoes is the easternmost volcanic field in the United States. Volcanic fields are clusters of volcanoes that tap a common magma source.

The Raton-Clayton Volcanic Field (RCVF) covers approximately 8,000 square miles and has been active during the last 9 million years. There were three main phases of volcanic activity:

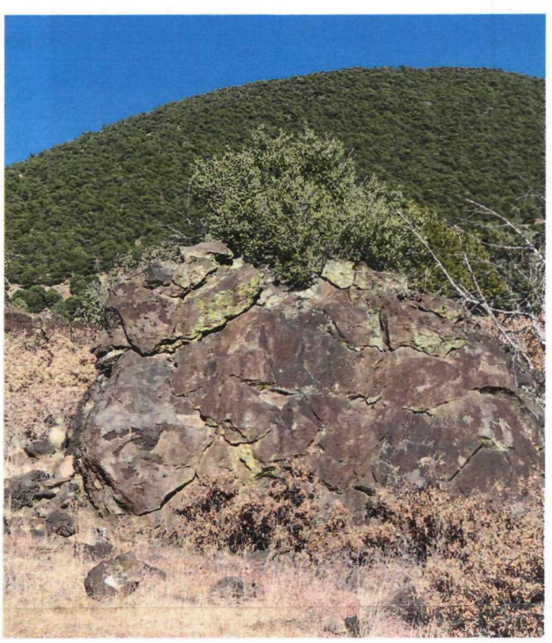
- Raton Phase (western portion of the field) from 9.0-3.5 million years ago
- Clayton Phase (eastern portion of the field) from 3.0-2.25 million years ago
- Capulin Phase (central portion of the field) from 1.7-0.04 million years ago

A chemically diverse volcanic field, the RCVF consists of numerous basaltic lava flows and cinder cones, some rhyolitic and dacitic volcanic domes, and Sierra Grande, a large andesite shield volcano. The eruption of Capulin Volcano is one of the more recent eruptions in the field.

The Raton-Clayton Volcanic Field is presently dormant with no activity since about 30,000 or 40,000 years ago. Almost all cinder cones only display one period of activity and individual volcanoes within the field, such as Capulin Volcano, are extinct. This doesn't mean no volcanoes will erupt in the RCVF in the future. A future eruption would most likely not occur from an existing volcano, but create a new one. It is not likely that this would happen within a human timespan.

The Age of Capulin Volcano

A geologic event such as a volcanic eruption can be dated in two ways: by relative dating and by absolute age dating. Relative dating compares the age of an unknown event or feature to the age of a something that is known, or determines the order of a sequence of events. Absolute age dating obtains a numeric age for a feature, using a variety of analytical methods, most of which utilize naturally-occurring "atomic clocks" within the rock itself.



At one time, only a relative age was available for Capulin Volcano. Clearly the volcano is young: the crater is well preserved and erosion has not softened the grade of the slopes. The relative age was based on an outcrop of alluvium (stream deposits) exposed below a Capulin lava flow. This alluvium was assumed to be the same age as the alluvium at the Folsom Archaeological Site, which had been dated at 10,000 years old by Carbon-14. Additional Carbon-14 analyses have since demonstrated that the alluvium under the Capulin lava is much older that the Folsom alluvium.

In the 1970s, two absolute dating techniques applied to Capulin Volcano demonstrated that the volcano is much older. One technique revealed the time of eruption and another dated the length of time the volcano has been exposed to cosmic radiation (sunlight). The two analyses yielded analytically indistinguishable ages of between 56,000 and 62,000 years ago. These dating techniques do not have the resolution to pinpoint exactly when the short-duration eruption of Capulin Volcano occurred, which likely lasted only a few years.

Careful study of the current landscape of Capulin Volcano has revealed events that have occurred well in the past. The mountain itself, the layers of ash and cinder, and the lava flows eloquently tell the story of lava fire-fountains, lava cascades, and black volcanic clouds.

As an outstanding example of a cinder cone, Capulin Volcano is an icon that helps us learn about events that have shaped the Earth-the planet we call home.