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1962, pp. 107-108. <https://doi.org/10.56577/FFC-13.107>

in:

Mogollon Rim Region (East-Central Arizona), Weber, R. H.; Peirce, H. W.; [eds.], New Mexico Geological Society 13th Annual Fall Field Conference Guidebook, 175 p. <https://doi.org/10.56577/FFC-13>

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THE SIGNIFICANCE OF THE VOLCANIC ROCKS IN THE FOSSIL CREEK AREA, ARIZONA*

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The Fossil Creek area, which is that area south of West Clear Creek on Figure 1, is a jumble of volcanic rocks — cinder cones, basaltic lavas, pyroclastics, and tuffaceous sediments monopolize the landscape. This area is particularly interesting, because it shows the relationship of the volcanic rocks to others in Verde Valley and in Tonto Basin, a basin just southeast of the area shown on Figure 1, and because it provides a better understanding of the geologic history of the Basin and Range and Colorado Plateaus Provinces.

Creek near Fossil Springs, the uppermost beds are at an elevation of about 5,800 feet. For the most part, those rocks that form the steep canyon walls are horizontal or nearly so, and are unbroken by major faults; therefore the thickness given for the volcanic rocks probably is not exaggerated because of structure.

East of Fossil Springs, flat-lying Paleozoic rocks, which represent a part of the ancestral Mogollon Rim, are exposed to an elevation of more than 6,000 feet. Here the volcanic rocks are absent, or occur only as a thin cap rock.

The change from volcanic rocks west of Fossil Springs to sedimentary rocks of Paleozoic age east of the springs occurs in a lateral distance of less than 1 mile. The discordant contact between the volcanic rocks and the Paleozoic rocks, which also is well exposed in West Clear Creek canyon, is attributable primarily to erosional and depositional processes. Prior to accumulation of the volcanic rocks, the ancestral Mogollon Rim in the Fossil Creek area was a prominent escarpment of Paleozoic rocks (Fig. 2) rising more than 3,000 feet above the floor of the ancient Verde River valley, and was quite similar in appearance to the present rim near Sedona. Volcanic activity, which began in Miocene time and lasted to early Pliocene time (Twenter, 1961), resulted in the ancient valley being filled with basaltic lavas, tuffaceous sediments, and pyroclastics.

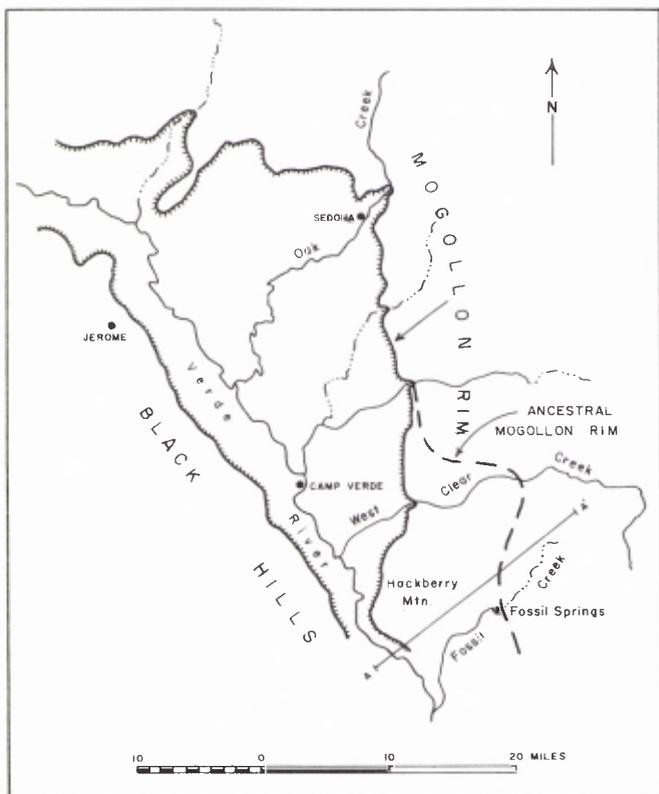


Figure 1. Map of Verde Valley showing Fossil Creek and the approximate trend of the ancestral Mogollon Rim in the Fossil Creek area.

The volcanic rocks in the Fossil Creek area are more than 3,000 feet thick, and may be as much as 4,000 feet thick. At the junction of Fossil Creek and the Verde River, the lowermost exposed volcanic rocks are at an elevation of 2,500 feet. On the small plateaus that border Fossil

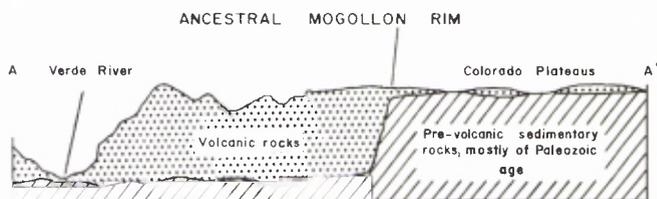


Figure 2. Diagrammatic section showing relations of rocks along section A-A', Figure 1.

The accumulation of volcanic rocks in the Fossil Creek area, which in the final stages may have been contemporaneous with uplift in the southern part of the Black Hills, impounded the southward-flowing Verde River (see Lehner, this guidebook). Several thousand feet of sediments that now form the Verde Formation were deposited in the newly formed basin and can be seen overlying the eroded surface of the volcanic rocks in several places in Verde Valley. A similar relation of the volcanic rocks to the Pliocene lacustrine and fluvial sediments can be seen in Tonto Basin (see Lance, et al., this guidebook).

In general, then, it can be established from the relationship of the volcanic rocks in the Fossil Creek area to other rocks that:

*Publication authorized by the Director, U. S. Geological Survey.

1. Volcanic rocks, correlative with those in the Fossil Creek area, are overlain by sediments that are, in part, of Pliocene age.
2. The volcanic activity that produced the volcanic rocks probably began in Miocene time.
3. The Mogollon Rim was carved prior to the volcanic activity.
4. In Miocene time, the part of the Colorado Plateaus Province along the Mogollon Rim must have been significantly higher than 3,000 feet above sea level if erosion of the magnitude indicated was to be accomplished.

From this sequence of events, the following inferences pertaining to the geologic history in other areas can be drawn. In general, they coincide with Hunt's (1956, p.

73-87) hypothesis concerning the Cenozoic history of the Colorado Plateaus Province.

1. During or prior to Miocene time, the entire Colorado Plateaus Province probably was elevated to an altitude that was more than 3,000 feet above sea level.
2. Uplift of the Colorado Plateaus Province probably resulted in the onset of canyon excavation by the Colorado River in Miocene time or before.

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