

Dog Springs Member of the Spears Formation

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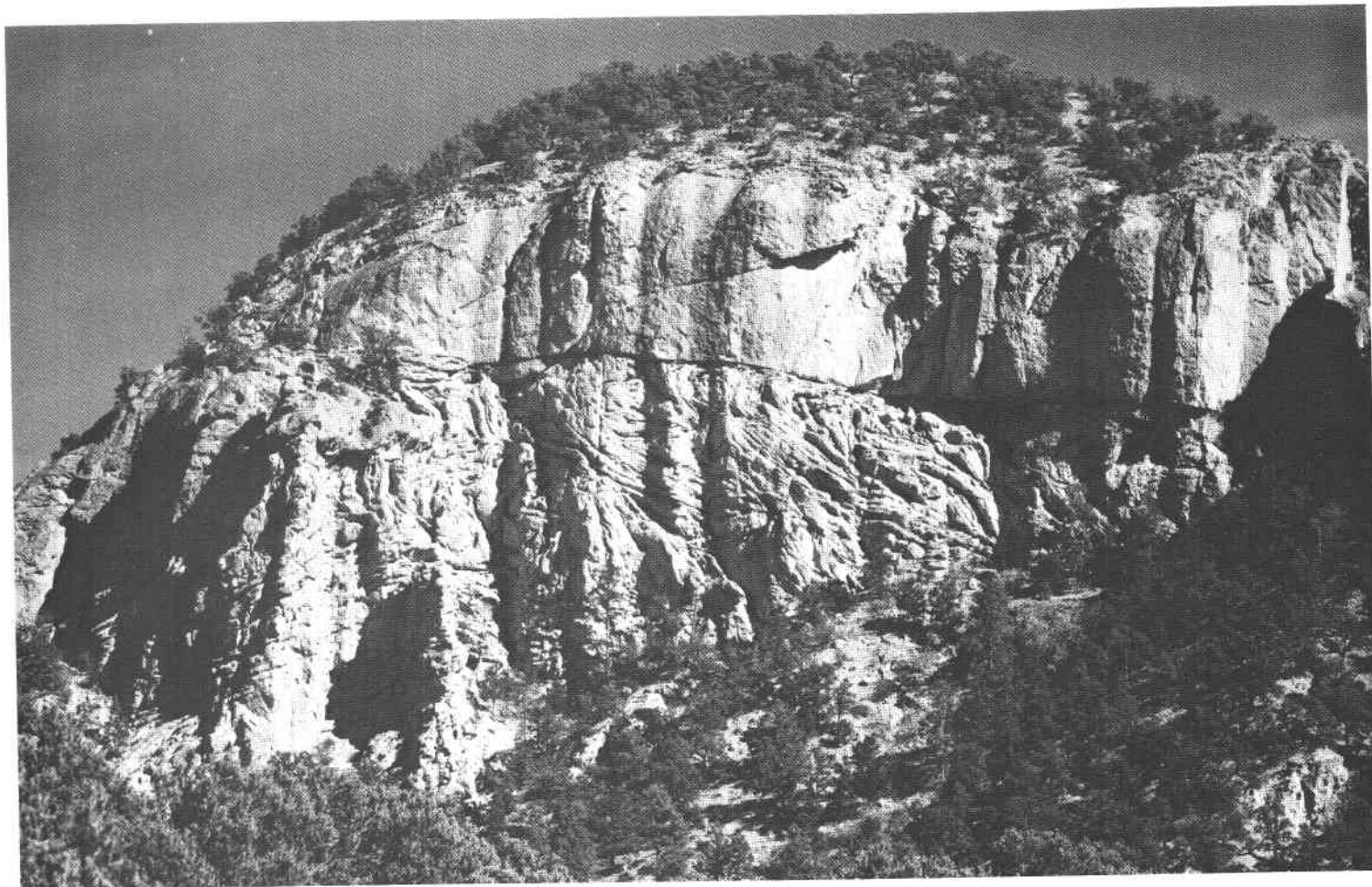


FIGURE 1—Relatively undisturbed debris-flow deposits overlie wildly contorted sandstones in the Sawtooth Mountains. View is to the east. Graded base of debris flow indicates a depositional contact and suggests a syndepositional origin of the deformation. Photo by Steve Cather.

Dog Springs Member of the Spears Formation

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Landforms displayed by the Spears Formation in west-central New Mexico amaze and inspire the geologist and tourist alike. This little-visited area, located along the southern margin of the Colorado Plateau in Socorro and Catron Counties, encompasses the Gallinas, Datil, and Sawtooth Mountains. These ranges stand high and usually have steep north-facing scarps despite being structurally lower than the Colorado Plateau to the north. The scenic cliffs and spires of this area (Figs. 1 and 2) owe their existence mainly to the great thickness and erosional resistance of these volcanoclastic rocks. Other more subtle and puzzling features become apparent as one examines the rocks in more detail. Attitudes are often steep and chaotic although the regional dip is gentle and consistently southward. Beds are often contorted into wildly complex folds (Fig. 1) and clastic dikes are well developed in some areas (Fig. 3). These features clearly formed near the time of deposition because they are sand-

wiched between gently dipping and undeformed beds. The deformation is apparently related both to the nature of the sediments and to the topography of the Eocene landscape.

This area was part of the Eocene Baca Lake basin (Cather and Johnson, 1984) until volcanism began about 39 m.y. ago. The lake persisted as volcanoes grew to the south and sand-sized volcanoclastic material accumulated as subaqueous fans (Brouillard, 1984). Eventually coarser material reached the area, mainly as very large debris flows. Shear at the base of these debris flows deformed some areas, perhaps contributing most of the observed distortion. In other areas, the debris flows rapidly accumulated to great thicknesses, and slumping occurred as their weight exceeded the strength of the underlying, relatively weak, water-saturated sediments. Miles-wide masses apparently detached and slid basinward. The toe areas of these slides

became intensely deformed, whereas areas farther back probably moved as relatively undisturbed blocks. These contrasting deformational styles as well as the differing strength of sediments apparently account for the juxtaposition of strongly contrasting deformational styles as seen in Figure 1. Erosion has since produced the cliffs and pinnacles that display the complex geology of the area so well. This set of photographs illustrates some of the more spectacular and easily photographed features of this area; however, other features of scenic and geologic interest abound. More detail on this area is provided by Brouillard (1984) in his recently completed M.S. thesis and by Harrison (1980) and Coffin (1981). Additionally, Steve Cather is currently completing a Ph.D. dissertation on these rocks throughout Socorro County, which will contain more information on depositional and deformational mechanisms.

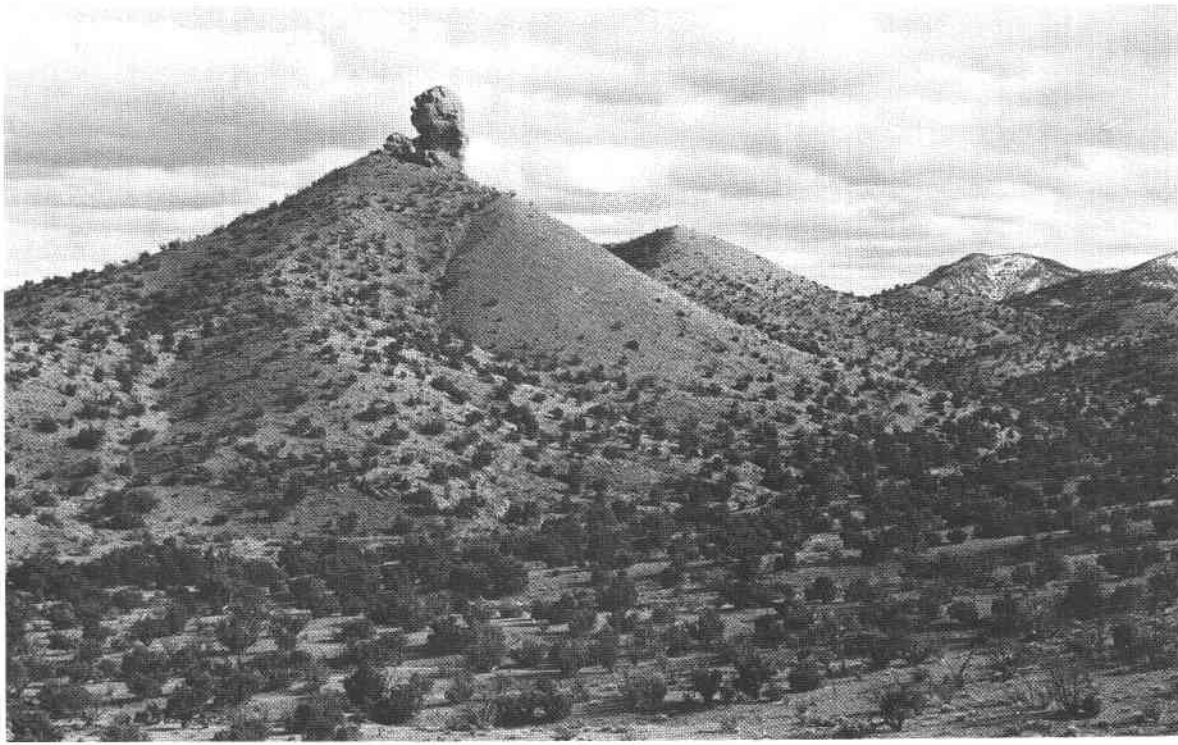


FIGURE 2—Head-like pinnacle in western Gallinas Mountains is commonly seen by those driving west from the Alamo Indian Reservation. This perspective from the southwest emphasizes the head-like form, which is composed of debris-flow deposits of the Dog Springs Member of the Spears Formation.



FIGURE 3—Sandstone dike that cuts volcaniclastic debris-flow deposits near Dog Springs Canyon. The debris-flow materials are andesitic and largely quartz free, whereas the dike contains abundant quartz grains. The high quartz percentage and the metamorphic nature of some of the quartz suggests that this material is derived from the underlying Baca Formation. The Baca is not usually involved in Spears-age slumping; however, here it was apparently liquified and injected into the overlying volcaniclastic rocks. It is located in the first small east-trending drainage north of the southern edge of the D-Cross Mountain quadrangle along the main north-south road. Rich Harrison, Chuck Chapin, and Gregg Coffin were included for scale.

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