

Preliminary Geologic Map of the Thimble Canyon Quadrangle, Chaves County, New Mexico.

By

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Open-file Digital Geologic Map OF-GM 176

Scale 1:24,000

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Preliminary Geologic Map of Thimble Canyon Quadrangle, Southern Sacramento Mountains, in Chaves County, southeastern New Mexico

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INTRODUCTION

Thimble Canyon quadrangle is in the southeastern Sacramento Mountains of southeast New Mexico, is east of Artesia and named for a canyon in the northwestern corner of the quadrangle. The landscape is dominated in the west by steep-sided hills of Lower Permian San Andres Formation limestone dissected by narrow arroyo cuts and in the east by low rolling hills. Most of the land in the area is privately owned, with only a few sections of Bureau of Land Management property, which is leased for grazing purposes. The primary geologic features on Thimble Canyon quadrangle are a series of near-symmetrical synclines and anticlines and two faults. This report presents new data relating to the structural features in this area.



Figure 1. View up-dip (to the west) on Thimble Canyon monocline.

HISTORY OF STUDY

Vincent Kelley (1971) mapped the Sacramento Mountains, including Thimble Canyon quadrangle, though at a much larger scale than the current study. He described a series of anticlines and synclines, the Tinney anticlinorium, oriented northeast-southwest in the Elk and Thimble Canyon region, as well as mapping several faults with similarly oriented strikes. He was among the first to describe the lithostratigraphy of the San Andres Formation in detail and separated these strata into three members (in ascending

order): Rio Bonito, Bonney Canyon and Fourmile Draw. All three members of the San Andres Formation are exposed in the Thimble Canyon area. Because Kelley (1971) mapped the area at a large scale, details of the structures and Quaternary deposits were not included.

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GEOLOGY

Stratigraphy

The geology of the Elk area is dominated by the lower two members of the Lower Permian San Andres Formation: the Rio Bonito and Bonney Canyon Members, with limited outcrops of the upper Fourmile Draw Member. Kelley (1971) described these units in detail and the descriptions here pertain to what is seen in locally in Thimble Canyon quadrangle. Quaternary deposits are confined to the arroyo cuts and the Rio Peñasco and Little Felix River valleys.

Rio Bonito Member, San Andres Formation

The Rio Bonito Member of the San Andres Formation consists of dark gray, fetid, nonporous, micrite to packstone that is primarily medium-bedded, though the middle third of the unit is often thick bedded, forming prominent cliffs. The Rio Bonito Member is between 85 and 120 m (250 to 350 ft) thick (Kelley, 1971). Fossils found in the Rio Bonito Member include crinoids (<0.5 cm diameter), echinoid spines (up to 3 cm in length), low-spined gastropods (probably bellerophontids, up to 5 cm in diameter), high-spined turitellid gastropods (up to 10 cm in height), ammonites with straight septa walls (up to 15 cm diameter on average, can be much larger; Fig. 2), and productid brachiopods (up to 5 cm across). None of the fossils seen in Rio Bonito Member beds are preserved well enough to be identified positively. The lower Rio Bonito Member is dolomitized and locally contains two tongues of the Glorieta Sandstone, a medium-grained, well rounded, well sorted quartz arenite that is poorly cemented. Neither tongue of the Glorieta was identified on Thimble Canyon quadrangle.



Figure 2. Cliffs formed by thick beds in medial Rio Bonito Member, San Andres Formation.

Bonney Canyon Member, San Andres Formation

The Bonney Canyon Member is a medium-bedded wackestone to grainstone that is dolomitized and is pale tan to white in color. Fossils are not immediately obvious, and are often replaced by chert, with no details preserved. In contrast with the Rio Bonito Member, strata of the Bonney Canyon Member are nonfossiliferous and are porous, with numerous vesicles often visible to the naked eye. Exposed surfaces of Bonney Canyon strata are often weathered into vugs and sharp ridges. On air photographs, a prominent line of vegetation tends to occur where Kelley (1971) mapped the contact between the two members and he noted that the change in vegetation, in addition to differences in average bed thickness, were used to map the contact. On Elk quadrangle, a wavy laminated micrite bed proved to be a useful marker for the contact, but this bed is not consistently present in the Thimble Canyon area. The contact was mapped for this study by using both the change in vegetation on air photographs and the laminated micrite. Locally, the base of the Bonney Canyon Member is an intraclast conglomerate with white pebbles of limestone hosted in a darker matrix. The top of the Bonney Canyon member is a horizon dominated by large and abundant chert, some of which are laminated. Pieces range in color from gray and black to red, orange and yellow.



Figure 3. Laminated chert in top surface of Bonney Canyon Member, San Andres Formation.

Fourmile Draw Member, San Andres Formation

The Fourmile Draw Member is not well exposed in the Thimble Canyon area and is usually covered with colluvial debris where it is preserved. Only the lower 6 to 10 m (20 to 30 ft) are present and consist primarily of thin bedded dolomitized limestone that is brecciated and contains no chert. Brecciation may be a syn-diagenetic feature, as the clasts are laminated or thin bedded limestone. According to Kelley (1971), the upper Fourmile Draw Member contains abundant gypsum units, but these are not preserved in the mapping area. What little Fourmile Draw Member is present tends to be situated in the hinges of synclines.



Figure 4. Brecciation in lower Fourmile Draw Member, San Andres Formation.

Structure

Structurally, Thimble Canyon quadrangle is dominated by multiple anticline-syncline pairs that are mostly symmetrical and have gently dipping limbs. The syncline hinges are better defined and transitions between synclines are poorly defined and occur either as anticlines with gently dipping limbs, or as monoclines. These folds are the southeastern edge of the Tinney anticlinorium (Kelley, 1971), which is oriented north-

northeast to south-southwest. The southwestern-most corner of Thimble Canyon quadrangle is cut by the Six Mile Buckle, a dip-slip fault that is locally a right-lateral strike slip fault. A second fault is oriented northeast-southwest through the high topography in the western half of the map area. The fault is down to the east, with lower Bonney Canyon sitting adjacent to middle Rio Bonito Member. This fault dies out to the south and is represented only as a small flex in the cliffs near the Rio Peñasco valley. The most striking feature of Thimble Canyon quadrangle is a monocline that runs northeast-southwest through the center of the quadrangle and steps down to the east. This monocline brings the Bonney Canyon Member down beside the Rio Bonito Member and is evidenced by steeply tilted to near-vertical beds of Bonney Canyon.



Figure 5. View to north of northeast-southwest trending fault in the western half of Thimble Canyon quadrangle.

Reference

Kelley, V.C., 1971, Geology of the Pecos country, southeastern New Mexico: New Mexico Bureau of Mines & Mineral Resources, Memoir 24, 78 p.

DESCRIPTION OF UNITS

Quaternary

- Qal Alluvium** – Limestone pebbles and cobbles found in modern, active streams and arroyos. Also includes silts and muds of associated floodplain deposits. Thickness varies from 1 to 50 m (3 to 150 feet).
- Qt Young stream terraces** – Cemented limestone pebbles and cobbles occurring as flat-surfaced landforms occurring 3 to 5 m above modern floodplain surfaces. Thickness usually less than 3 m (10 feet).

Lower Permian

- Psf Fourmile Draw Member, San Andres Formation** – Dolomitized, thin bedded sandy limestone. No fossils evident in the few, poor exposures. Contains no chert. Upper Fourmile Draw Member is gypsiferous. 0 to 50 feet as preserved.
- Psb Bonney Canyon Member, San Andres Formation** – Dolomitized, medium bedded packstone to grainstone that is porous. Fossils replaced with chert. Usually caps ridgelines. Lower contact is placed at both a change in vegetation seen in air photographs and locally at wavy laminated bed. Upper contact is placed at thin bed of limestone with abundant, large, laminated chert pieces. 0 to 60 feet in thickness (Kelley, 1971).
- Psr Rio Bonito Member, San Andres Formation** – Micrite to packstone that is medium to thick bedded. Lower third is dolomitized, tan to ivory in color, and contains two tongues of the Glorieta Sandstone. Upper two-thirds is non-dolomitized and dark gray in color. Fetid when broken and nonporous. Abundant fossils are present and include crinoids, echinoid spines, bellerophontid and turitellid gastropods, and ammonites, brachiopods. 250 to 350 feet in thickness (Kelley, 1971). Glorieta Sandstone is a medium-grained, well sorted, well rounded quartz arenite that is red gold or white in color.