

# Geologic Map of the Cloudcroft Quadrangle, Otero County, New Mexico.

By

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**May 2006**

**New Mexico Bureau of Geology and Mineral Resources**  
*Open-file Digital Geologic Map OF-GM 135*

**Scale 1:24,000**

This work was supported by the U.S. Geological Survey, National Cooperative Geologic Mapping Program (STATEMAP) under USGS Cooperative Agreement 06HQPA0003 and the New Mexico Bureau of Geology and Mineral Resources.



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# Geologic Maps of the Cloudcroft, Bluff Springs, and Rogers Ruins

## Quadrangles

Mapped and compiled by Benjamin Hallett

### EXPLANATION OF MAP UNITS

#### Quaternary and Tertiary Surficial Deposits

**Qal – Alluvium** – Holocene and older stream and minor terrace deposits. This unit fills valley floors and active stream channels and is characterized as a silty, sandy gravel composed of mainly carbonate and minor quartz sandstone clasts.

**Qtrav – Quaternary Travertine** – Layered and often incised travertine deposits associated with active and dry springs and spring-fed streams. Most prominent at Bluff Springs (Bluff Springs quadrangle) and in Monument canyon (Rogers Ruins quadrangle).

**QTg – Gravels** – Quaternary and Tertiary gravel surface deposits filling the broad Sacramento River valley in and near the developed area of Timberon in the southern part of the Rogers Ruins quadrangle. Generally composed of sandy and silty gravels with a predominantly carbonate clast composition.

## **Paleozoic Sedimentary Rocks**

**Psa - San Andres Formation (middle to upper Permian)** - Light to dark gray and bluish or brownish gray limestone and dolomite. This unit occurs on slopes and ridge tops across map area. Limestones and dolomites range from thin to very thick bedded, and are carbonate mudstones, wackestones, and grainstones. Freshly broken surfaces are darker gray than weathered surfaces and occasionally fetid. Beds are often silty or sandy. Dark brown irregular chert nodules are sparse. Fossils are sparse and are dominantly crinoid stem fragments and ammonites. Intraformational solution breccias and paleokarst features such as collapsed caves occur in this unit, but are more common to the north in the Ruidoso area. They are characterized by red soil and red and yellow stained breccia fragments. Delineation of the San Andres into the lower thick-bedded Rio Bonito member and upper thin-bedded Bonney Canyon member (Kelley, 1971) was not possible due to steep topography, heavy vegetation, and sparse outcrop.

Near the base of the San Andres Formation occur lenses of fine-medium grained rusty quartz arenite sandstone, believed to be equivalent to the Glorieta sandstone (Kelly, 1978). The Glorieta sandstone is not entirely continuous, but it can generally be found along strike within 500 feet of where it pinches out. As this is the only documented and recognized non-carbonate lithology within the San Andres

formation, it was generally utilized to map the contact between San Andres and carbonate-bearing Yeso formation. The Glorieta sandstone commonly occurs 60-120 feet (20-40 m) above the base of the San Andres formation (Pray, 1961). As little outcrop occurs in much of the map area, the location of this contact was generally estimated relative to the highest float blocks of Glorieta sandstone. The entire section of the San Andres formation is not exposed in these quadrangles, yet its thickness is estimated at ~700 feet (Kelley, 1978).

**Py – Yeso Formation (middle Permian)** - A very thick and heterogeneous unit of mudstone, fine sandstone, limestone, dolomite, and evaporates. The Yeso occurs mainly in canyon bottoms and lower slopes across the map area. Yellow to tan siltstone and fine sandstone, red to pink muddy siltstone and fine sandstone, gray to tan silty limestone and dolomite, and white to gray gypsum. Siltstone and sandstones are thin to medium bedded and friable. Muddy siltstones and sandstones are laminated to very thin bedded. Limestones are very thin to thin bedded, rarely medium to thick bedded. In general, they are thinner bedded than overlying basal San Andres beds. Meter scale interbedding of carbonate, siltstone, and sandstone is common. Evaporite lithologies, mainly gypsum in surface exposures, are less common in the upper part of the Yeso exposed in canyon bottoms across the map area. Evaporites are prevalent in the lower part of the full Yeso section exposed only in the southwestern part of the Rogers Ruins quadrangle. Bedding dips are commonly chaotic due to dissolution of gypsum and (and carbonates?) and individual beds are generally not traceable laterally for more than a few 10's of meters in more

mudstone-rich parts of the Yeso. Exposures are poor and the upper contact is usually mantled by colluvium from overlying San Andres Formation. Thickness: ~1800 feet (~550 meters) based well data from Cloudcroft Unit #1 well (1991) in northwestern Bluff Springs quadrangle.

**Pa – Abo Formation (early to middle Permian)** - The Abo formation is composed of medium to dark reddish brown mudstones with minor coarse arkosic sandstone lenses. Sandstones are commonly cross-bedded and individual grains are subangular to angular. In the middle of the Abo section occurs an argillaceous and variably dolomitic limestone unit, defined by Pray (1961) as the Pendejo tongue of the Hueco formation. Only about 1 km<sup>2</sup> of the Abo formation is found along the southwestern edge of the Rogers Ruins quad, and the Pendejo tongue of the Hueco formation was lumped in with the Abo for this mapping, due to poor outcrop in this area.

### **Structure**

A tilted fault block of the Rio Grande rift system, the southern Sacramento range was uplifted along the Alamogordo fault. The map area is east of the range crest, and characterized by a generally shallow (3-5°) regional southeast dip. Minor undulations are in some places recognized as poorly defined low-amplitude folds in the San Andres formation with variable orientations. Due to the very low angle dips across much of the map area, fold axes were not generally defined well enough for mapping. Within the Yeso formation and the lowest part of the San Andres formation, highly variable dips on

the 1 – 100 meter scale, mainly defined by carbonate beds, are attributed to volume changes due to gypsum dissolution and leaching.

A series of southwest dipping normal faults occur in the Sacramento River canyon in the western part of the Rogers Ruins quadrangle. These faults, poorly exposed but defined by minor fault breccia and slickenlines, form a steep escarpment, repeating the upper Yeso / lower San Andres section on the northeastern wall of the canyon. To the southeast of these faults, a large monoclinial dip slope forms the eastern wall of the Sacramento River canyon north of Timberon. Low amplitude fold axes occur along the Sacramento River and west of the canyon and are better defined than in the rest of the mapping area. These folds trend parallel to the strike of these normal faults, and are probably related to extensional deformation. The broad Sacramento River syncline, mapped by Pray (1961) to the west, can be traced for over 10 km.

The southeast continuation of the high angle Wild Boy fault, mapped to the west by Pray (1961), occurs near the southwest corner of the Rogers Ruins quadrangle. This fault places the Abo formation directly against the Yeso, suggesting that the fault may have accommodated strike slip deformation at one time, though no indication of fault kinematics was recognized.

#### **REFERENCES CITED AND SELECTED REFERENCES**

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