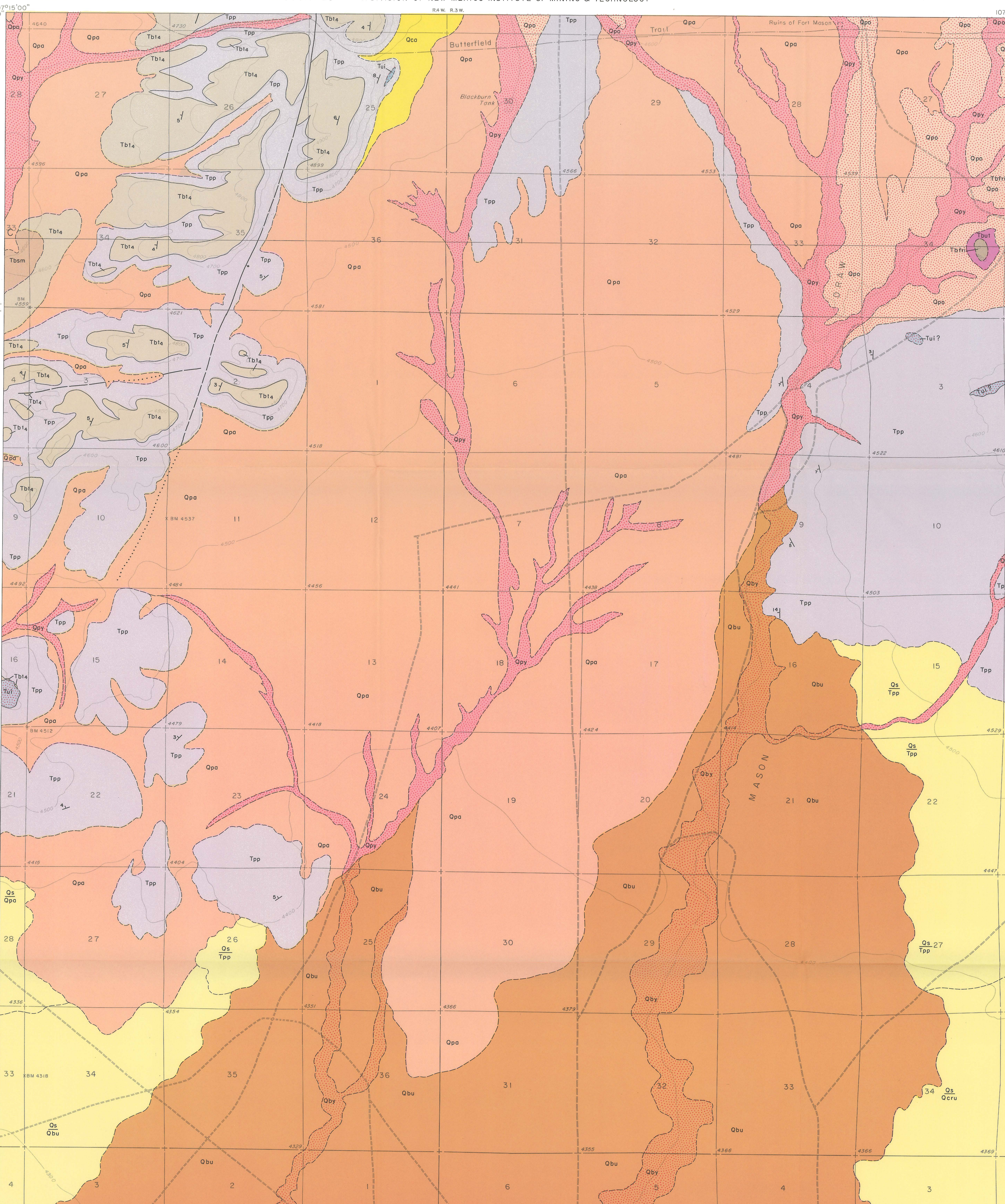


Base from U.S. Geological Survey

Geology by Russell E. Clemons, 1974–1975

GEOLOGY OF SOUTHWEST QUARTER, CORRALITOS RANCH QUADRANGLE, NEW MEXICO

by Russell E. Clemons, 1976

SCALE 1: 24,000

1 0 1 MILE

Qs — **Windblown sand**
Red, eolian sand dunes up to 10 ft high; underlain by caliche horizon. Forms cover over rock unit shown by symbol under the line (for example Qs/Qcru). Only present in southern part of sheet 2

Qca — **Colluvium-alluvium (undifferentiated)**
Erosion surface veneers, and thin colluvial and alluvial fill on slopes; to 5 ft thick

HOLOCENE

Qvy, Qpy, Qvo, Qpo, Qpa, Qbu, Qby — **Valley and piedmont-slope alluvium**
Younger alluvial fan and arroyo channel deposits of boulder gravel to silt-clay by interior drainage systems (Qpy) or tributary to Rio Grande (Qvy). Older alluvial fan and arroyo deposits of boulder gravel to silt-clay and/or minor playa silt-clay, locally cemented with caliche; deposited by interior drainage (Qpo) or tributary to Rio Grande (Qvo). Undifferentiated piedmont-slope alluvium (Qpa); to 20 ft thick. Younger basin-floor deposits of clayey to loamy alluvium by present day arroyos (Qby). Undifferentiated deposits of gravel to silt-clay and/or playa silt-clay toward the basin-floor center, nonindurated caliche horizon in older fill (Qbu); to 200 ft thick

LATE PLEISTOCENE TO HOLOCENE

Camp Rice Fm.

Qcru — **Camp Rice Formation**
Undifferentiated fan gravel interbedded sand and clay, and piedmont-slope deposits; to 100 ft thick. Only present in northeast corner of sheet 1

PLEISTOCENE

ANGULAR UNCONFORMITY

Uvas Basaltic Andesite

Tu, Tui — **Uvas Basaltic Andesite**
Basaltic andesite flows (Tu); includes interbedded red, fine sandstone on Magdalena Peak; to 200 ft thick. Plugs and dikes mapped as (Tui). Approximately 26 m.y.

MIOCENE

Bell Top Formation

Tbsu — **Upper sedimentary member**
Pale yellowish-brown and grayish-orange tuffaceous siltstone, sandstone, and conglomerate. Generally poorly sorted, poorly bedded, and poorly cemented. Some lenticular channel fills. Interfingers with lower Uvas flows; 200 to 550 ft thick. Only present in northern part of sheet 1

LOCAL UNCONFORMITY

Tbt_6 — **Tuff 6 member**
Porous to dense, pale-grayish red, vitric-crystal ash-flow tuff; to 100 ft thick. Approximately 36 m.y.

LOCAL UNCONFORMITY

Tbsm — **Middle sedimentary member**
Grayish-orange-pink tuffaceous mudstone, sandstone, and conglomerate; generally poorly sorted and poorly cemented; 260 to 350 ft thick

LOCAL UNCONFORMITY

Tbt_5 — **Tuff 5 member**
Porous to dense, grayish pink, crystal-vitric ash-flow tuff. Abundant slightly flattened, white to light-gray pumice fragments near top; to 200 ft thick. 35 m.y. Only present on sheet 1

LOCAL UNCONFORMITY

Tbt_4 — **Tuff 4 member**
Porous to dense, pale-grayish-red-purple, vitric-crystal ash-flow tuff. Abundant flattened, dark, devitrified pumice fragments to 1 ft diameter near Magdalena Peak decrease in size and abundance southward; 20 to 110 ft thick

LOCAL UNCONFORMITY

Tbfri — **Flow-banded rhyolite**
Well-foliated, slightly porphyritic rhyolite plug or dome. Only present in northeast corner of sheet 2

Tbut — **Upper tuffaceous sedimentary member**
White to yellowish-gray air-fall tuff and breccia, with interbedded volcaniclastic pebble sandstone. Few clasts of granite and gneiss; to 100 ft thick. Only present in northeast corner of sheet 2

Tbt_3 — **Tuff 3 member**
Porous, grayish-orange-pink, vitric ash-flow tuff. Abundant equant dark pumice fragments; to 300 ft thick. Approximately 38 m.y. Only present in northeast corner of sheet 1

LOCAL UNCONFORMITY

Tbb — **Basalt member**
Dense, black, vesicular, olivine-bearing basalt flow(s); to 70 ft thick. Only present in northeast corner of sheet 1

LOCAL UNCONFORMITY

Tbt_2 — **Tuff 2 member**
Porous, light-gray to pale-grayish-purple, vitric ash-flow tuff. Only present in northeast corner of sheet 1; to 70 ft thick. Approximately 39 m.y.

OLIGOCENE

UNCONFORMITY

Palm Park Fm.

Tpp — **Palm Park Formation**
Gray, red, and purple tuffaceous mudstone, sandstone, breccia, and conglomerate; consisting chiefly of andesite-latite detritus. Upper part contains whitish tuffaceous beds which thin to southwest; to about 3,500 ft thick. Ages range from 43 to 51 m.y.

EOCENE

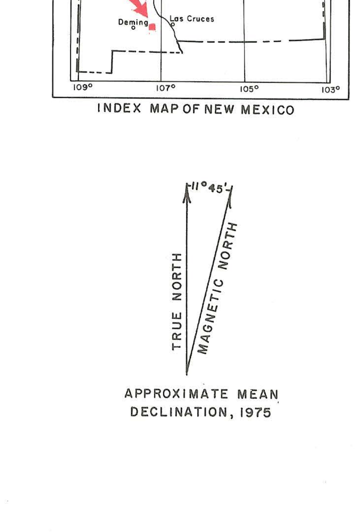
Geologic contact, dashed where approximately located

Normal fault, dashed where inferred or approximately located, dotted where concealed. Arrows show direction of dip. Ball on downthrown side

Landslide block, barbs on hanging wall

Strike and dip of beds

Line of measured section



INDEX MAP OF NEW MEXICO

APPROXIMATE MEAN DECLINATION, 1975

INTRODUCTION

The southeast corner of the map area is 21 mi west of Las Cruces (fig. 1). Access to the area is provided by: I-10, a gravel road to Blue Mesa Observatory on Magdalena Peak, and a ranch road northeast from Burris Ranch. Access to the northwest part of the area is provided by a ranch road up Pine Canyon from Martin Ranch, in the Uvas Valley southeast of Nutt. The entire area is sparsely vegetated grazing land without permanent habitations. The Butterfield trail passed by Fort Mason in the southern part of T. 22 S.

Elevations within the west half of the Corralitos Ranch quadrangle ascend from 4,300 ft in the southwestern corner to 6,623 ft on Magdalena Peak in the northeast. The area has two distinct topographic parts: the northwest half consists of southwest-trending cuestas of the Sierra de las Uvas; the southeast is a pediment grading to Mason Draw.

Adjacent areas to the north, northeast, and east have recently been mapped by Clemons and Seager (1973), Seager, Clemons, and Hawley (1975), and Clemons (1976a) respectively. These publications contain detailed descriptions of rock units exposed in, and underlying, the west half of the Corralitos quadrangle. The present text discusses the characteristics unique to the map area.

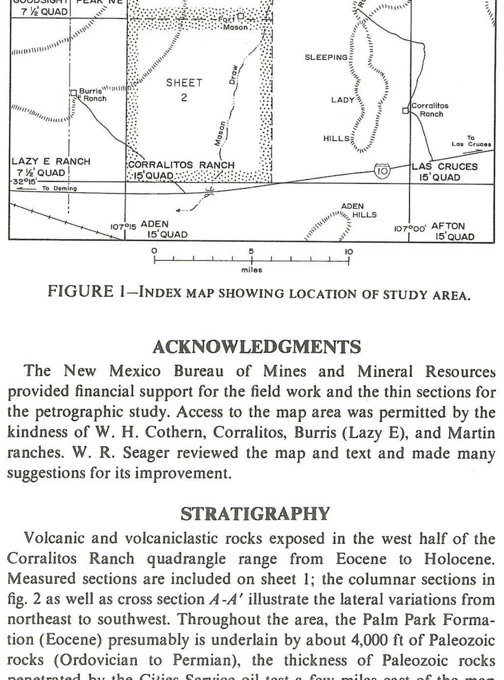


FIGURE 1—INDEX MAP SHOWING LOCATION OF STUDY AREA.

ACKNOWLEDGMENTS

The New Mexico Bureau of Mines and Mineral Resources provided financial support for the field work and the thin sections for the petrographic study. Access to the map area was permitted by the kindness of W. H. Cothern, Corralitos, Burris (Lazy E), and Martin ranches. W. R. Seager reviewed the map and text and made many suggestions for its improvement.

STRATIGRAPHY

Volcanic and volcaniclastic rocks exposed in the west half of the Corralitos Ranch quadrangle range from Eocene to Holocene. Measured sections are included on sheet 1; the columnar sections in fig. 2 as well as cross section *A-A'* illustrate the lateral variations from northeast to southwest. Throughout the area, the Palm Park Formation (Eocene) presumably is underlain by about 4,000 ft of Paleozoic rocks (Ordovician to Permian), the thickness of Paleozoic rocks penetrated by the Cities Service oil test a few miles east of the map area (Clemons, 1976a).

Palm Park Formation

The Palm Park Formation is exposed or overlain by only a thin veneer of valley-slope and piedmont-slope alluvium over the southeastern half of the area. The exact thickness of the formation has not been determined but probably is about 3,500 ft. It is predominantly conglomeratic volcanic arenite of andesite-latite composition, but contains rhyolitic, tuffaceous units near its top. These tuffaceous units pinch out to the southwest and are missing where tuff 4 of the Bell Top Formation directly overlies Palm Park cobble conglomerate 1 mi west of the map area, about 2 mi northeast of the Burris ranch (fig. 1). The tuffaceous units probably were derived largely from air-fall deposits preceding tuff 2 (Bell Top Formation) eruptions and thus should be included in the Bell Top. However, mappable contacts are better maintained by including them in the Palm Park as mapped in the Sierra Alta quadrangle (Seager, Clemons, and Hawley, 1975) and eastern Corralitos Ranch quadrangle (Clemons, 1976a).

Bell Top Formation

The Bell Top Formation has been described in detail by Clemons and Seager (1973), Seager, Clemons, and Hawley (1975), and Clemons (1975, 1976a, 1976b). Age dates have been reported for various members (Clemons, 1976). Ten of the 13 informally designated members of the Bell Top Formation are present in the west half of the Corralitos Ranch quadrangle (explanation on sheet 1). Five of those present cover a very small percentage of the map area. Tuffs 2 and 3 and the basalt members are present in small exposures shown in the northeastern corner of sheet 1 and pinch out within a couple of miles to the southwest. The upper tuffaceous sedimentary member and flow-banded rhyolite form one small outcrop located in the northeastern corner of sheet 2.

Tuff 4 and younger members form rather extensive exposures over the northwest part of the map area. Tuff 4 decreases in thickness from 80 ft in the northeast to 20 ft in the southwest, within the map area. Tuff 4 caps the long, low, west-dipping cuesta that outlines the southwest prong of the Sierra de las Uvas (fig. 3). In the northeast corner of sheet 1, tuff 4 is shown to overlie tuff 3 and is overlain by tuff 5. Throughout much of the extent of tuff 4 (in the map area) it unconformably overlies the Palm Park Formation; in the northwestern corner of sheet 2, tuff 4 is unconformably overlain by the middle sedimentary member. Tuff 5 also thins southwestward from about 200 ft near Magdalena Peak to zero in the southwest corner of sheet 1.

The middle sedimentary member is essentially all tuffaceous mudstone and sandstone in the northern part of the map area. Ten mi to the southwest, just west of the map area, the middle sedimentary member is about 50 percent mudstone and sandstone and 50 percent conglomerate. The conglomerate is composed of angular to rounded andesite-latite clasts to boulder size. The conglomerate units resemble the Palm Park conglomerate in lithology, and cannot be distinguished from it unless separated by tuff 4. Exposures of the middle sedimentary member are poor except in gullies on steep slopes below ledges of tuff 6 and become fewer to the southwest. Consequently, I have been unable to observe where and how the facies change occurs between the fine-grained and coarse-grained clastics of the member. Apparently the fine-grained tuffaceous sediments were derived in part, if not predominantly, from the ash-flow tuffs to the east and northeast; the conglomeratic sediments were derived primarily from the Palm Park or Rubio Peak (Elston, 1957) Formations exposed to the west. A similar facies change occurs in the upper sedimentary member. The middle and upper sedimentary members are difficult to distinguish unless separated by tuff 6.

The westward facies change from fine to coarse clastics, combined with the similarity of the clasts to the underlying Rubio Peak rocks to the west, implies that the Goodsight Mountains area was a topographic high during the Oligocene. This high joined the western margin of the Goodsight-Cedar Hills volcano-tectonic depression (Seager, 1973) and restricted the westward flow of the Bell Top ash-flow tuffs. Subsidence of the eastern part of the depression following the voluminous eruptions of tuffs 4, 5, and 6 caused renewed influxes of debris from the ancestral Goodsights.

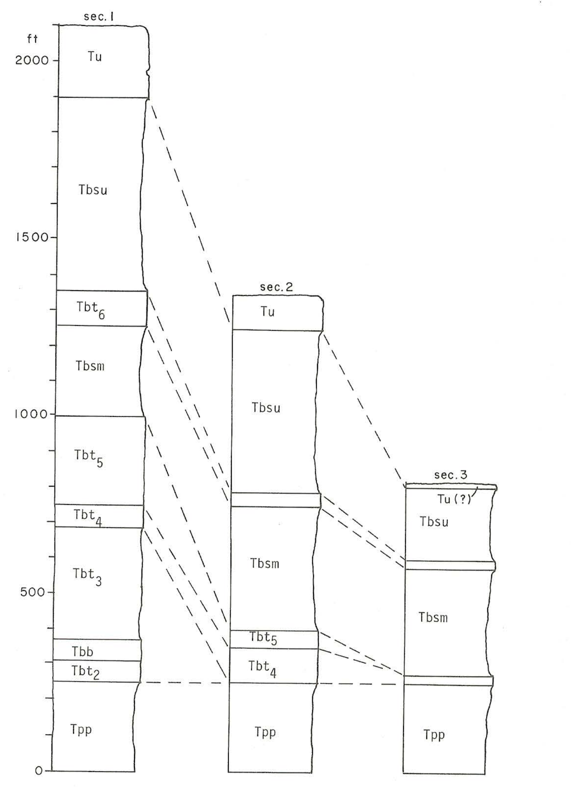


FIGURE 2—COLUMNAR SECTIONS ILLUSTRATING CHANGES IN EXPOSED ROCK UNITS FROM NORTHEAST TO SOUTHWEST ACROSS STUDY AREA. SECTION 1 IS ACTUAL SECTION AT MAGDALENA PEAK; SECTION 2 IS A COMPOSITE, RESTORED SECTION WESTWARD FROM SHORTY SWOPE TANK; SECTION 3 IS A COMPOSITE, RESTORED SECTION WESTWARD FROM NEAR SOUTHWEST CORNER OF SHEET 2.

Uvas Basaltic Andesite

Uvas Basaltic Andesite caps Magdalena Peak and the west-dipping cuestas on the western slope of the Sierra de las Uvas (northwest part of sheet 1). This unit consists of 1 to 3 flows conformably(?) overlying the upper sedimentary member of the Bell Top Formation. The maximum thickness of Uvas is about 200 ft near Magdalena Peak, thinning to less than 100 ft at the western edge of the map area. Dates for Uvas of 26.1 ± 1.4 m.y. (whole rock) and 25.9 ± 1.5 (whole rock) have been determined (Clemons 1976b). In the extreme northeast corner of the map area (sheet 1), landslide blocks of Uvas and tuff 7 (Bell Top Formation) debris rest on tuff 5 and the middle sedimentary member of the Bell Top Formation.

A small basaltic andesite plug in sec. 16, T. 23 S., R. 4 W. intrudes Palm Park and tuff 4. The plug is mapped as Uvas (*Tui*) because no other rocks of this lithology are known in the region between the ages of tuff 4 and Uvas Basaltic Andesite. Two small outcrops of basaltic andesite in sec. 3, T. 23 S., R. 3 W. are probably exposures of a large body that intruded and domed the Palm Park in this area and is more extensively exposed to the east. The outcrops are mapped as Uvas (*Tui*?) on the basis of a whole rock K-Ar age of 27.4 ± 1.2 m.y. (Clemons, 1976a). Similar rocks form a northeast-trending set of dikes that intrude Palm Park beds from west of Blackburn Tank (sheet 2) to north of Little Mills Wells (sheet 1).

Quaternary Sediments

Alluvial fan deposits on an erosion surface (in part rock pediments) have been mapped as undifferentiated Camp Rice Formation (*Qcru*), shown in the northeast corner of sheet 1 and southeast corner of sheet 2. Seager, Clemons, and Hawley (1975) and Clemons (1976a) have described these deposits to the northeast and east in relation to other Santa Fe Group units.

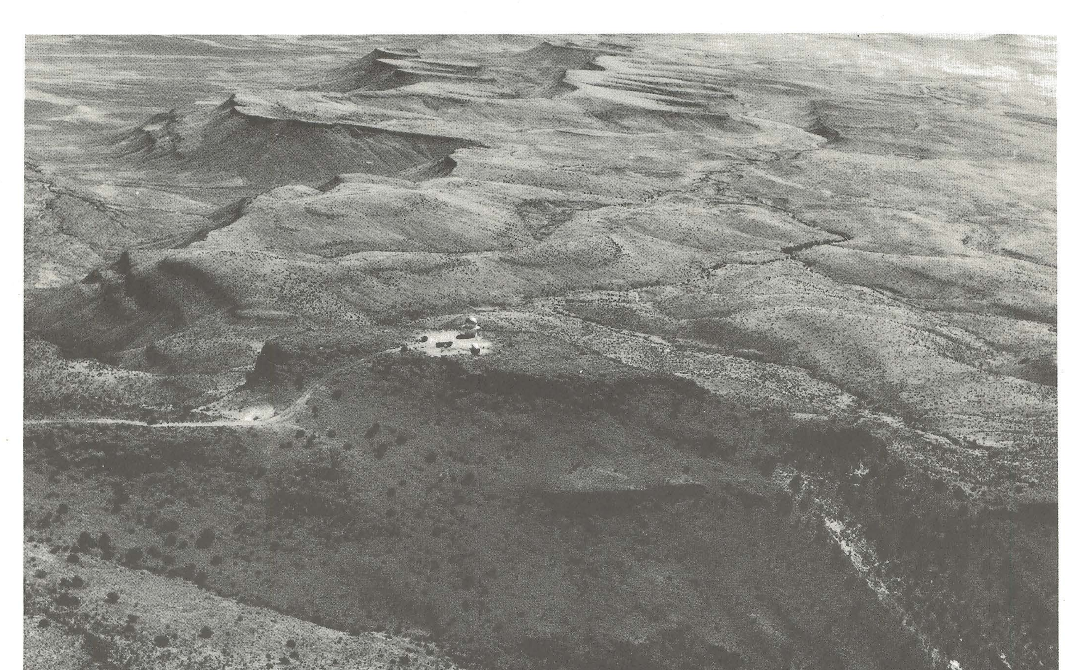
Post-Santa Fe Group sediments consist of thin veneers on erosion surfaces, alluvial fan, arroyo channel, basin-floor (bolson), and eolian deposits. The following map units have been used to correlate with similar units assigned in the Rincon quadrangle by Seager and Hawley (1973).

Arroyo-valley and piedmont-slope facies units (*Qpy, Qpo, Qpa*) are similar in composition to the Camp Rice Formation piedmont facies to the extent that they include a wide range of textures and rock types reflecting local sources. The older parts of the *Qpo* and *Qpa* units were probably deposited by closed-basin drainage systems, contemporaneously with the Camp Rice Formation by the Rio Grande and its tributaries. The drainage divide between Broad Canyon and Mason Draw tributaries (northeast corner of sheet 1) separates Camp Rice from the other arroyo and piedmont-slope units. Camp Rice, covered by windblown sand, was probably deposited by ancient Rio Grande distributaries (southeast corner of sheet 2). Thus, the mapping criteria between Camp Rice and "post"-Santa Fe Group sediments is spatial rather than strictly chronologic.

The *Qpy-Qpo-Qpa* units mapped in the west half of the Corralitos Ranch quadrangle have thicknesses generally less than 10 ft and rarely exceeding 25 ft. *Qpo* deposits include gravelly sediments on piedmont slopes grading to the closed-basin floor of Mason Draw. A zone of strong to weak soil-carbonate (caliche) cementation is present in the upper part. Caliche accumulation is weak or absent in the younger arroyo deposits (*Qpy*). The younger deposits are chiefly fills of shallow present-day drainageways on piedmont slopes. An undifferentiated piedmont unit (*Qpa*) is used in areas where *Qpo* and *Qpy* deposits are not mapped separately.

Bolson or basin-floor units (*Qbu* and *Qby*) occupy a rather large area as shown in the southern part of sheet 2. The *Qby* unit consists of fill deposits in the larger present-day arroyo channels on the basin floor. For the most part, older and younger deposits have not been identified, but mapped as undifferentiated *Qbu*. These fine-grained to medium-grained sediments were deposited as a composite fan unit by Mason Draw arroyos. A few lenses of gravel represent channel fills but the sediments are predominantly loamy to clayey alluvium. A strong, but nonindurated, horizon of soil-carbonate accumulation is generally present in the upper part of the older fill. *Qbu* and *Qby* sediments are transitional to the *Qpo-Qpy-Qpa* alluvium where the basin floor merges with the piedmont slope.

Reddish, eolian sand covers the southwest and southeast corners of the map area in sheet 2. Southwesterly winds have locally drifted the sand into coppice dunes to 10 ft high. The sand is underlain in most places by a thick caliche zone on older rocks and sediments.



(*Photograph by James Cuffey*)

FIGURE 3—VIEW SOUTHWESTWARD OVER MAGDALENA PEAK. PROMINENT WEST-SLOPING CUESTAS ARE CAPPED BY TUFF 4. MASSACRE PEAK (LOCATED 1 MI WEST OF SOUTHWEST CORNER OF SHEET 1) IS IN EXTREME UPPER RIGHT CORNER.

STRUCTURE

The map area covers the south-central part of the Goodsight-Cedar Hills volcano-tectonic depression (Seager, 1973). The area is part of the Sierra de las Uvas fault block which was uplifted along the north-trending Ward Tank fault 2 to 3 mi east of the map area (Clemons, 1976a). The east front of the Sierra de las Uvas has been eroded westward 4 to 7 mi as the Bell Top Formation and part of the underlying Palm Park strata were removed from the southeastern half of the map area. Original extent of the Uvas Basaltic Andesite is unknown; some of it has been eroded. The prevailing gentle westerly dips continue westward to the axis of the north-plunging Uvas Valley syncline about 5 mi to the west.

Two sets of high-angle normal faults are mapped in the Sierra de las Uvas section of the map area. Additional faults are probably present in the southeast part but were not detected in the poorly exposed and largely covered Palm Park Formation. Displacements on the northwest-trending set range from a few feet to about 200 ft. The larger offsets are on faults down to the northeast (southwest of Magdalena Peak) and on faults down to the southwest (northeast of Magdalena Peak). Most faults in this set are part of the axial graben system of the Sierra de las Uvas dome (Seager, 1973, 1975). One, possibly both, of the down-to-the-southwest faults shown in the extreme northeast corner of sheet 1 have displaced landslides of Uvas Basaltic Andesite resting on tuff 5 and middle sedimentary members of the Bell Top Formation. Erosion of about 1,000 ft of Uvas (upper and middle sedimentary members) and tuff 6 required a significant amount of relief and time, implying that 1) doming did not immediately follow eruption of the Uvas, 2) these faults are axial graben faults that were reactivated, or 3) these faults are younger, unrelated to the doming.

Displacements of north-trending faults range from a few feet to 100 ft and, with few exceptions, are down to the east. Although age and origin of these faults are unknown, they may be related to greater subsidence of the eastern part of the Goodsight-Cedar Hill depression following eruption of the ash-flow tuffs and deposition of thick sedimentary units. More probably they are related to the younger Ward Tank fault and other basin and range faulting.

Nine landslides south and southeast of Magdalena Peak resulted from erosion of the soft sedimentary units and slumping and sliding of the more resistant ash-flow members. The slides decrease in size and abundance to the south as the height of the scarp decreases.

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Measured sections are on Sheet 1.