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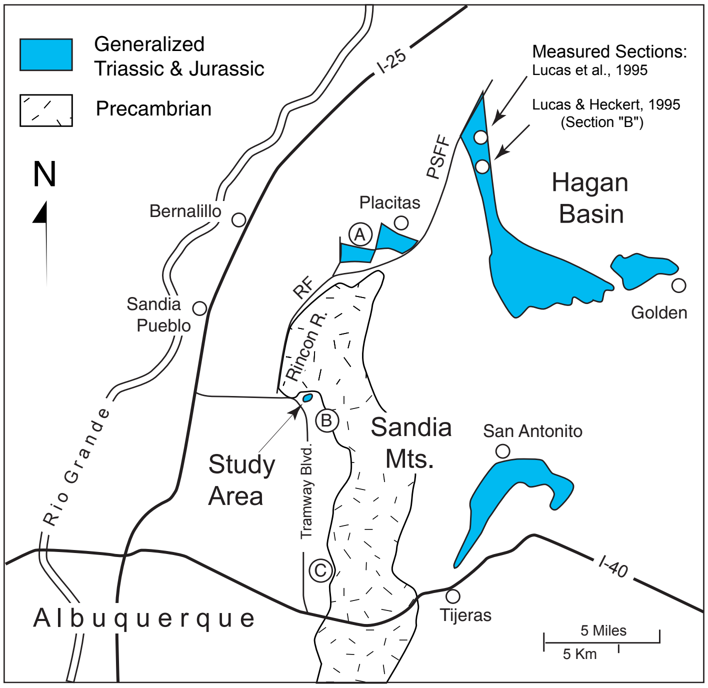

FIGURE 1—Regional location map of the Juan Tabó area. Locations "A," "B," and "C" are referred to in text. **RF** = Rincón fault; Rincón R. = Rincón Ridge; **PSFF** = Placitas–San Francisco fault.

Abstract

An assemblage of Upper Triassic to Upper Jurassic sedimentary strata crops out at the southern part of the Juan Tabó area in the northwest Sandia Mountains. The Mesozoic formations generally dip to the northeast and east. Bedrock outcrops are discontinuous and largely obscured by alluvium and colluvium. An incomplete sequence of the Petrified Forest Formation of the Upper Triassic Chinle Group occupies the southwest and central parts of the study area. The sandstone Correo Member, which is present at the top of the Petrified Forest Formation in the Hagan Basin to the northeast, is absent in the study area. Middle and Upper Jurassic rocks occupy the northeast part of the study area, and the distinctive Luciano Mesa Member of the Todilto Formation provides the key to the identification of the Jurassic section. The Entrada, Todilto, and Summerville Formations of the Middle Jurassic San Rafael Group are significantly thinner in the study area than in the Hagan Basin. The thinning is interpreted to be due to southward onlap onto the Mogollon Highland that extended across central Arizona and central New Mexico during Triassic and Jurassic time. An incomplete section of the Salt Wash Member of the Upper Jurassic Morrison Formation overlies the San Rafael Group in the northeast part of the study area.

Precambrian rocks are in fault contact with the Mesozoic section; however, the fault is everywhere covered. The fault location was investigated using a magnetometer carried along three traverses. The interpreted contact is marked by a sharp change in the magnetic readings on each of the three traverses, and the points of inflection indicate that the fault trace is convex to the north. A second fault zone is exposed in the bed of a deep gulch eroded into the poorly indurated Petrified Forest Formation. The zone incorporates boulder-size exotic blocks with affinities to Jurassic sandstone types. The intense deformation of the Petrified Forest Formation on either side of the zone and the exotic blocks suggest a fault with significant displacement. The relative age of the two faults is unknown.

Documented dip-slip faulting in the Placitas area to the north and low-angle deformation fabrics in granite to the southeast support the interpretation that the Mesozoic rocks in the study area were emplaced by low-angle faulting. The tectonic event probably occurred in the early stage of Rio Grande rift development during the late Oligocene to early Miocene when a high geothermal regime prevailed in the area. The Miocene Horse Camp Basin of the Basin and Range province in central Nevada may provide an analog for the fault-bounded Mesozoic rocks of the Juan Tabó area.

Introduction

The study area is located on the northwest flank of the Sandia Mountains (Fig. 1) within the Cibola National Forest. The area occupies the southern end of a topographic cul-de-sac informally referred to as the Juan Tabó area, a name taken from the Juan Tabó Picnic Ground, 2 km (1.3 mi) to the north. The study area is limited on the south by the Sandia Pueblo Grant, which should not be entered without permission. The objectives of this work were to identify the stratigraphic units present, map the units in detail, constrain the position of the boundary fault, suggest the mechanism of emplacement of the Mesozoic rocks, and demonstrate the usefulness of an inexpensive geophysical method in field mapping.

During the summer of 1921, R.W. Ellis, State Geologist and professor of geology at the State University of New Mexico (now the University of New Mexico), produced a 1:48,000-scale geologic map of the Sandia Mountains (Ellis, 1922); however, he made no mention of the Mesozoic outcrops in the study area. Read et al. (1944) recognized these rocks and believed that they belonged to the Triassic Chinle Group. Hayes (1951), in a study of the Precambrian metamorphic rocks, labeled the Mesozoic outcrop as "possible Triassic." Other workers (Kelley, 1963; Dane and Bachman, 1965) identified the exposures as Eocene Galisteo Formation. Kelley and Northrop (1975) in their classic memoir, "Geology of Sandia Mountains and vicinity, New Mexico," mapped this area and wrote (p. 56):

> "A small questionable outcrop with some Chinle shale and sandstone lies west of the Sandias in sec. 10, T. 11N., R. 4E. near the Juan Tabo road." And, "Although Galisteo beds have lithologies of all these beds in various parts we believe designation of this inlier as fault slices of Morrison and Chinle is more likely."

They recognized the significant structural problems (p. 79):

> "A fault separates the Chinle (west) from the Morrison (east). Vertical separation along the bounding faults must be at least 10,000 ft, and the structural implications are considerable."

Methods

A survey marker is located at the corner of secs 2, 3, 10, and 11 T11N R4E, just north of U.S. Forest Service Road 333B (Fig. 2). From this base station a network of subsidiary mapping stations was established using Brunton compass and measuring tape, and the stations were temporarily flagged for easy sighting. From this network field locations were determined by triangulation with Brunton compass and/or measuring tape. The USGS 7½-min Sandia Crest topographic quadrangle (contour interval = 40 ft) provided general elevation control, and aerial photos refined the positions of the principal roads. Rock colors were based on Munsell color chips.

The boundary fault separating Mesozoic from Precambrian rocks is covered by alluvium, and its location was investigated with a hand-held, Geometrics G-858 cesium vapor magnetometer. The magnetometer measures the vector sum of the Earth's induced field plus the granite's remanent field. The induced field is proportional in magnitude, and parallel to, the Earth's ambient dipole magnetic field. At this latitude the ambient, induced field attracts

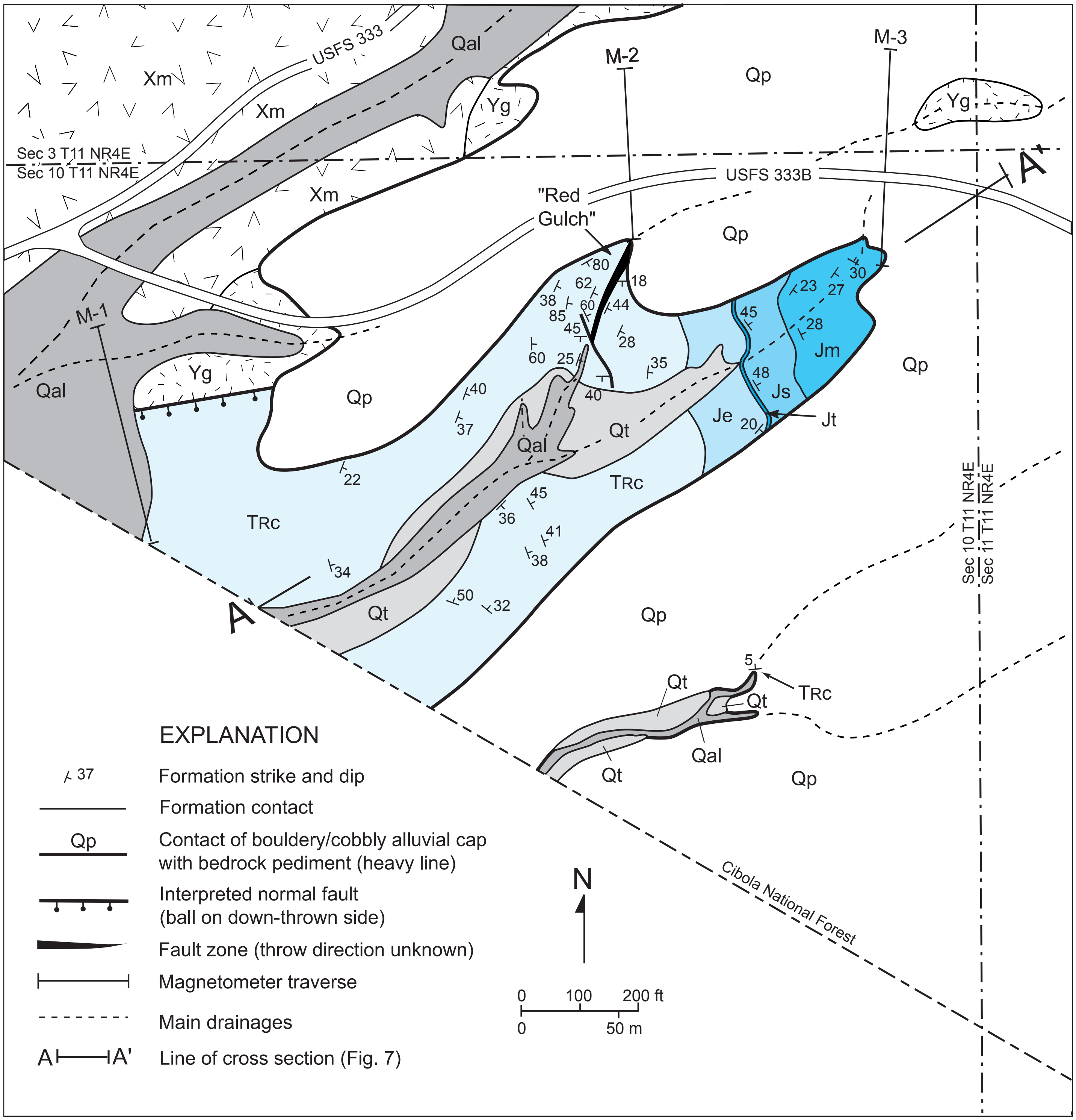

FIGURE 2—Geologic map of the southern Juan Tabó area. Lines M-1 through M-3 are magnetometer traverses. Geologic units: **Qp** = Quaternary pediment alluvium; **Qt** = inset Quaternary terrace alluvium; **Qal** = youngest Quaternary alluvium; **Jm** = Jurassic Morrison Formation, Salt Wash Member; **Js** = Jurassic Summerville Formation; **Jt** = Jurassic Todilto Formation, Luciano Mesa Member; **Je** = Jurassic Entrada Formation; **TRc** = Triassic Chinle Group, Petrified Forest Formation; **Yg** = Precambrian Sandia granite; and **Xm** = Precambrian metamorphic rocks of Rincón Ridge. Some of the bedrock shown is covered by colluvium.

the north-seeking compass needle toward magnetic north and downwards at approximately 60° from the horizontal. The remanent magnetic field is proportional to the magnetic susceptibility of the rock, which is in turn controlled by the content of magnetite and less so by other reduced-iron-bearing minerals. Oxidized-iron-bearing minerals such as hematite and limonite produce the reddish-brown colors of the Petrified Forest Formation but are effectively non-magnetic. The remanent field in granites is generally about an order of magnitude higher than the ambient field and in the Sandia granite has a direction and intensity fixed into the rock when the pluton solidified and cooled below the Curie temperature during the Precambrian. A general reading of the remanent magnetic-field polarity was taken with a Schoenstedt 72-Cd magnetic locator at a large protruding outcrop of granite bedrock located approximately 180 m (600 ft) east of the east margin of the study area shown in Fig. 2. The instrument indicated a polarity generally opposite to that of the present ambient field; i.e., the north-seeking compass needle is attracted upward at a high angle. Therefore, over shallow granite the remanent and ambient fields tend to partially cancel. Over deep granite the measured response of the granite's remanent field is attenuated by the greater vertical distance from the instrument, the destructive interference is minimized, and the resultant, measured field approaches the ambient intensity. Therefore, relatively low (partially canceled) and high (uncanceled) values are recorded over shallow and deep granite, respectively. The point of inflection that separates low values on the north from high values on the south is interpreted to mark the position of the boundary fault.

Bedrock geology

Three intermittent creeks drain the study area from northeast to southwest (Fig. 2). The central of the three drainages contains most of the Mesozoic exposures. The short northern fork of this central drainage terminates in a steep gorge referred to informally as "Red Gulch." It contains the most continuous Mesozoic outcrop. The higher elevations of the study area are maintained by an extensive, gently southwest-sloping cap of Quaternary pediment alluvium consisting of sand, cobbles, and boulders. The cap and its derivative colluvium obscure most of the bedrock. Quaternary terrace alluvium and active-stream alluvium cover the bedrock in the lower elevations.

Precambrian units

The metamorphic rocks of Rincón Ridge crop out along U.S. Forest Service Road 333 and at scattered localities along the western of the three drainages (Fig. 2). These rocks consist of quartzite and quartz-mica schist (Kelley and Northrop, 1975). Field relations and chemical composition suggest that they were formerly a sequence of clastic sedimentary rocks and thin volcanic lenses, metamorphosed before and during the intrusion of the 1.4-Ga Sandia granite to the east (Berkley and Callender, 1979).

The Sandia granite is present as a grussified slope on the west side of the study area south of U.S. Forest Service Road 333B, and in a window cut by a stream through the bouldery Quaternary pediment cap on the northeast (Fig. 2). A covered boundary fault separates the Precambrian rocks from the Mesozoic units.

Mesozoic units

The Mesozoic exposures located along the central drainage are typically small and discontinuous due to the extensive colluvium, inset Quaternary terrace deposits, and late Quaternary stream alluvium (Fig. 2). The Mesozoic strata include, from bottom to top, the Petrified Forest Formation of the Upper Triassic Chinle Group, the Entrada, Todilto, and Summerville Formations of the Middle Jurassic San Rafael Group, and the Salt Wash Member of the Upper Jurassic Morrison Formation. Formation contacts are generally obscured by alluvium, and thicknesses are estimated from average dips and traverse lengths.

The Hagan Basin contains the most complete measured sections of Triassic and Jurassic rocks relevant to the study area (Fig. 1). Triassic section "B" of Lucas and Heckert (1995) is located in secs 13 and 14 T13N R5E, approximately 20 km (12.7 mi) northeast of the study area. At section "B" the Petrified Forest Formation contains 304.5 m (1,002 ft) of the red bed "lower member" and a 37.2-m (122-ft) sandstone cap of the Correo Member. Lucas and Heckert (1995) reported that the dominant mudstone color changes downward in the Chinle section from moderate reddish brown (10R 4/6) in the lower member of the Petrified Forest Formation to pale purple and grayish-red purple (5P 6/2 and 5RP 4/2) in the underlying Salitral Formation. In the southern and central part of the study area, mudstone colors are predominately dark, moderate to pale reddish brown (10R 3/4, 4/6, to 5/4), and reddish brown (10R 4/4), indicating that these rocks belong to the Petrified Forest Formation. Interbedded with the mudstones are moderate- to pale-brown (5 YR 3/4 to 5/2), very dusky red (10R 2/2), light brownish-gray to light olive-gray (5 YR 6/1 to 5Y 6/1), and gray-red (10R 4/2), lenticular, crossbedded, lithic sandstones and conglomerates. Some of the sandstones reveal alternating light- and dark-gray bands, a characteristic that resembles what Lucas and Heckert (1995) described as liesegang banding in the Jurassic Entrada Formation of the Hagan Basin.

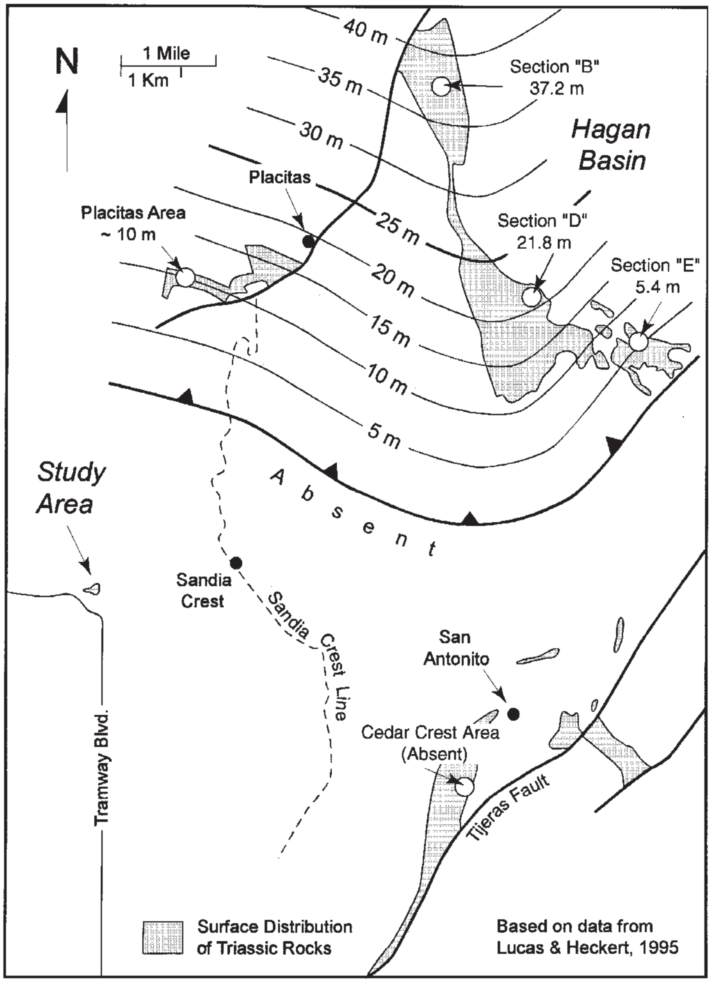

FIGURE 3—Isopach (contour interval = 5 m) of Correo Member of Triassic Petrified Forest Formation, Sandia Mountains area and Hagan Basin.

Red Gulch contains the most extensive outcrop of Petrified Forest Formation strata in the southern Juan Tabó area (Fig. 2). The lower 3.7 m (12 ft) of the east wall displays contorted reddish-brown (10R 4/4) mudstones with streaks of very light gray mudstones. The west side of the gulch is a gentle slope largely obscured by bouldery colluvium. Eastward from Red Gulch in the east fork of the main drainage the sequence of Petrified Forest Formation channel sandstones, grayish-red (10R 4/2) siltstones, and reddish-brown (10R 4/4) mudstones is succeeded by poorly exposed, yellow-gray and pale yellow-gray (5Y 7/2 and 8/1), massive, subfriable sandstones (Fig. 2). A similar color change can be detected with difficulty on the opposite, southeast flank of the drainage. The color change is also obvious on color aerial photos (e.g. U.S. Forest Service EXG-1-32, June 4, 1971, scale 1:18,500). Kelley and Northrop (1975, p. 79) interpreted the change as a fault contact between the Triassic and the Jurassic. The absence of the Correo Member at the top of the Petrified Forest Formation in the study area is probably why Kelley and Northrop (1975) placed a fault at this position. Isopach mapping suggests that the Correo Member is absent in the study area (Fig. 3) and that the Triassic–Jurassic contact is conformable. The average formation dips and length of traverse along the central drainage indicate a minimum Petrified Forest Formation thickness in the study area of approximately 180

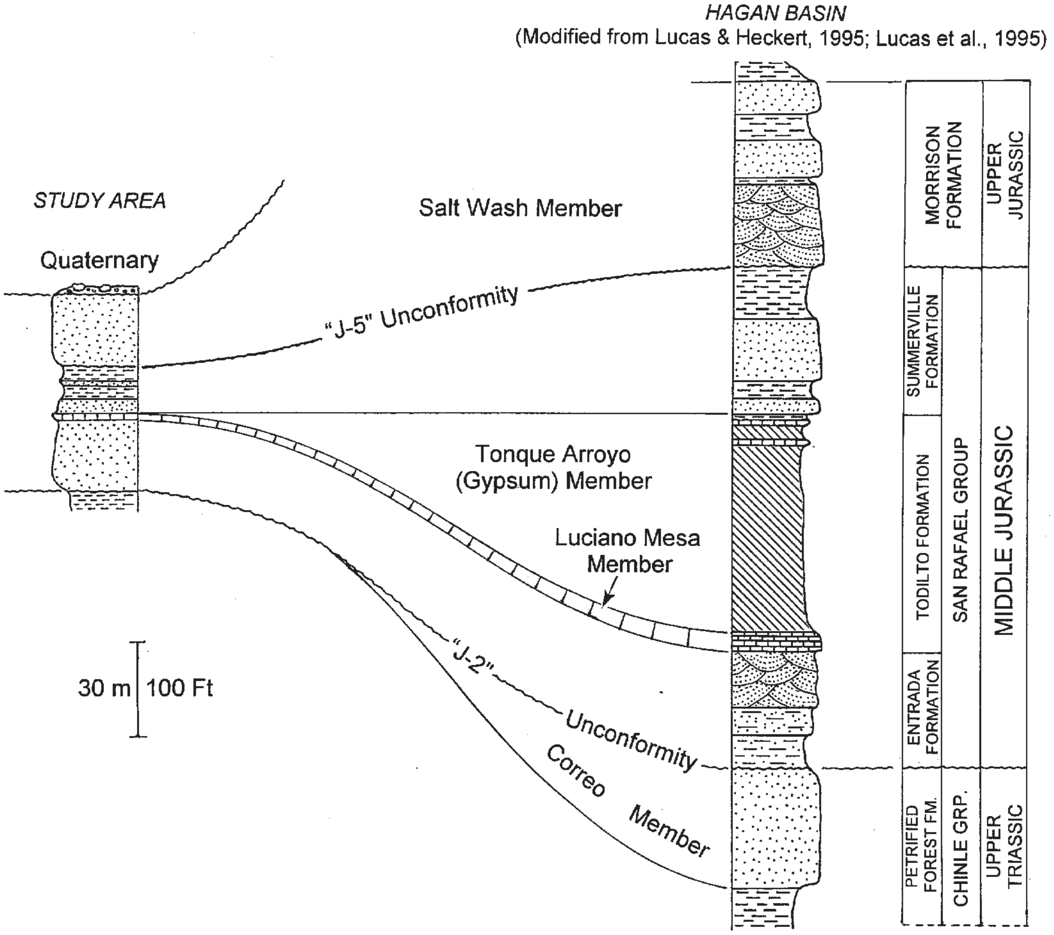

FIGURE 4—Correlation of uppermost Triassic and Jurassic stratigraphy in study area vs. Hagan Basin. Formation contacts in study area are covered and inferred.

m (600 ft).

A reference section for the Middle Jurassic San Rafael Group and the Upper Jurassic Morrison Formation is located in the Hagan Basin approximately 2.4 km (1.5 mi) north of Triassic section "B" in secs 1 and 12 T13N R5E (Figs. 1 and 4; Lucas et al., 1995). An exposure of the distinctive Luciano Mesa Member of the Todilto Formation facilitates the correlation of the Jurassic section in the study area to the reference section. In the Hagan Basin the Luciano Mesa Member is represented by a 5.7-m (19-ft) section of thinly laminated, kerogenic, dark- to light-gray and yellowish limestone, sometimes referred to as "crinkly limestone" (Lucas et al., 1995). In the study area the member consists of a 1-m (3-ft) section of finely laminated gray limestone (Fig. 2). A fetid odor is released when the laminae are crushed. In the Hagan Basin the Todilto Formation includes the distinctive cliff-forming massive gypsum of the Tonque Arroyo Member above the Luciano Mesa Member (Lucas et al., 1995). In the study area the Tonque Arroyo Member is absent. This area is evidently beyond the southern regional pinchout of the gypsum member, as suggested by Lucas and Anderson (1997, fig. 5). Presence of the Luciano Mesa Member constrains the Jurassic stratigraphy and allows identification of the older strata on the southwest as the Entrada Formation and the younger strata on the northeast as the Summerville Formation. The Entrada and Summerville Formation thicknesses are estimated to be 23 m (75 ft) and 15 m (50 ft), respectively, based on the length of traverse and an average dip of approximately 45°NE taken from the Luciano Mesa Member. The contact between the Summerville Formation and the overlying Morrison Formation is provisionally interpreted at a change from very light gray to variegated brown mudstone, with gray-orange pink (5YR 7/2), massive sandstones on the southwest, to yellow-orange to very pale orange (10YR 7/6 to 8/2), highly fractured, thickly bedded, medium-grained, subfriable sandstones on the northeast. The total thickness of the San Rafael Group is approximately 39 m (128 ft) in the study area compared to 161.7 m (531 ft) in the Hagan Basin. The Morrison Formation strata are assigned to the Salt Wash Member based on rock type and position relative to the Summerville Formation (Fig. 4). The observed average dip of approximately 30° and the length of traverse indicate an exposed Salt Wash Member thickness of approximately 26 m (85 ft).

Structure

A fault zone is exposed within the Petrified Forest Formation in Red Gulch (Fig. 2). The floor of the gulch is strewn with granite-boulder float. Partly visible through the float is a chaotic assemblage of approximately 0.5–1.2-m (1.5–4-ft) exotic blocks including: (1) medium-gray to light brown-gray (N5 to 5YR 6/1), noncalcareous, brecciated and boudinaged sandstone; (2) gray-orange (10YR 7/4), fine-grained sandstone with crude striations on the sides of the blocks; (3) moderate orange-pink to yellow-gray (5YR 8/4 to 5Y 7/2), noncalcareous, brecciated sandstone; (4) gray-red (10R 4/2) and dusky-yellow (5Y 6/4) mudstone; and (5) yellow-gray (5Y 8/1), noncalcareous, friable, fine-grained sandstone. The blocks are interpreted to be exotics caught up in a fault zone that is at least 3–3.5 m (10–12 ft) wide (the width of the gulch bed). The fault zone and the east wall of the gulch trend approximately N30°E and N25°E, respectively. The east wall therefore converges with the fault zone northward and provides a cross-sectional view of increasing deformation of the Petrified Forest mudstones with increasing proximity to the fault zone. Near the zone the mudstones are intensely contorted, sheared, and replete with microslickensides. Immediately east of the zone near the head of the gulch is a deformed block of sandstone (rock

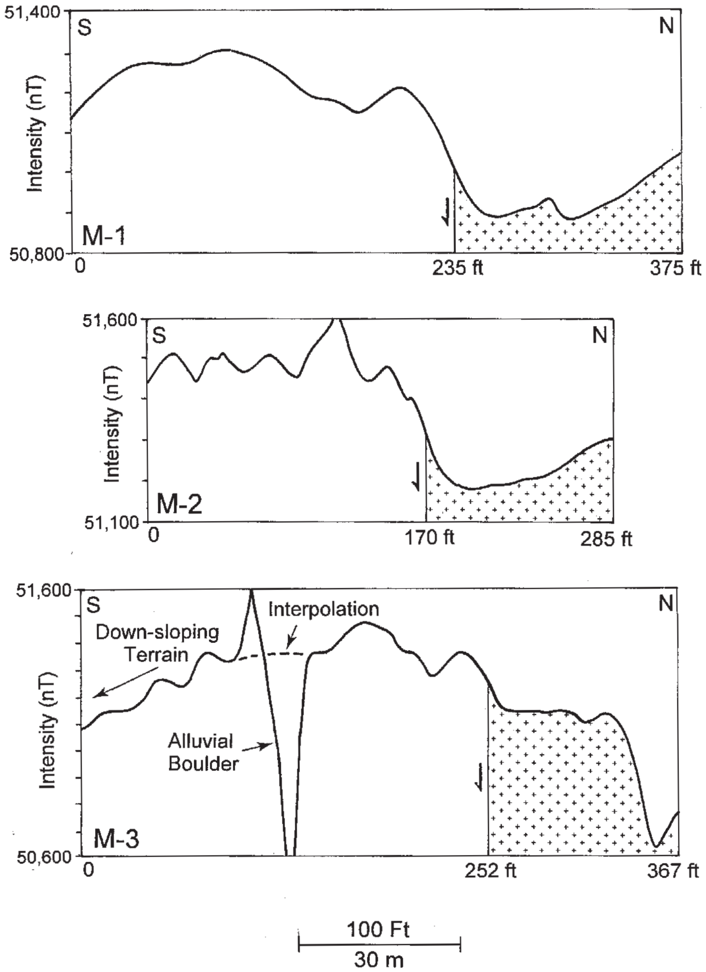

FIGURE 5—Reconnaissance magnetometer lines M-1, M-2, and M-3. Vertical axis values are in gammas (= nano-Teslas). Interpreted Precambrian depicted as pattern.

type #5 above) that is incorporated into the sheared fabric of the mudstone. In the head of the gulch the exposed fault zone dips approximately 60° to the east, and the Petrified Forest Formation sandstones proximal to the zone on the gentle west slope of the gulch dip mainly 60°–85° to the east. The subparallel relationship of the fault zone and stratal dip suggests a significant dip-slip component to the fault movement. Approximately 40 m (130 ft) south–southwest from the head of the gulch in the drainage bed is a north–northeast-striking zone of intense bed contortion and crushed, brecciated competent units (Fig. 2). This disturbed zone is interpreted to be a continuation of the fault zone described above. From here the disturbed zone veers to the southeast and passes beneath Quaternary alluvium.

The boundary fault separating the Precambrian from the Mesozoic is everywhere obscured by alluvium. The fault is suggested at the surface on the west side of the study area (Fig. 2). The weathered mantle exhibits a subtle color change from a tannish cast of the grussified granitic terrane on the north to a reddish-brown cast of what is interpreted to be the Triassic Chinle Group on the south. The color change is devoid of topographic expression.

Indirect, geophysical methods were employed to investigate the position of the boundary fault. Three north–south traverses, M-1, M-2, and M-3, were made across the northern part of the fault with a magnetometer (Fig. 2). The survey was intended to be qualitative; i.e., no attempt was made to correct for elevation or to tie lines. The data profiles are shown in Fig. 5. Line M-1 passes normal to and less than 30 m (100 ft) west of the ground-surface color change cited above, and the inflection point of the magnetic profile lines up well with the change (Fig. 2). The surface geology and magnetometer data are synthesized by a map of the extrapolated bedrock geology (Fig. 6). The alignment of the three magnetometer inflection points indicates that the trace of the boundary fault is convex to the north. The broad synclinal flexure shown in Fig. 6 is based on a single north dip in the southern part of the study area (Fig. 2). Fig. 7 is a southwest-to-northeast cross section across the main area of Mesozoic outcrop.

Discussion

The uppermost Upper Triassic and the Middle Jurassic rocks are significantly thinner in the study area than in the Hagan Basin (Fig. 4). This observation is consistent with a regional paleogeographic model in which Triassic and Jurassic units thin southward onto the positive Mogollon Highland (Lucas and Anderson, 1997; Grant and Foster, 1989). The Upper Triassic Correo Member of the Petrified Forest Formation is absent in the study area, compared to 37.3 m (122 ft) thick in the Hagan Basin (Fig. 3; Lucas and Heckert, 1995). The unit was probably removed by southward truncation at the overlying "J-2" unconformity before deposition of the Middle Jurassic San Rafael Group (Fig. 4).

The fault zone in Red Gulch is characterized by intense crushing, incorporation of exotic blocks, and lack of an obvious sense of displacement. These features suggest a complex history of movement, possibly involving significant dip slip.

Relative to the study area, approximately 3,050 m (10,000 ft) of down-to-the-west vertical separation exists at the projected base of the Morrison Formation from the crest of the Sandia Mountains to the east and a minimum of 1,220 m (4,000 ft) of down-to-the-east stratigraphic separation from the Rincón Ridge area to the west. The angle of dip on the boundary fault is unknown but essential to the interpretation of the tectonic history of the Sandia Mountains. Kelley and Northrop (1975, map 4, cross section C–C′) interpreted the Mesozoic rocks as part of a high-angle fault block at the intersection of an east–northeast-trending cross fault and the north-trending Sandia fault zone. This interpretation has a problem with conservation of mass. Lateral transport along low-angle faults would minimize the space problem and possibly explain the widespread distribution of Mesozoic rocks in the western Sandia Mountains extending from the exposures of the Placitas area to the study area and to a small outcrop of undifferentiated Mesozoic rocks located at the west foot of Rincón Ridge (Fig. 1; Connell, 1995, plate III).

Low-angle deformation is suggested at three locations on the west side of the Sandia Mountains. In the Placitas area (Fig. 1, Location "A") low-angle faults are subparallel to bedding in the Paleozoic and Mesozoic sections (Woodward and Menne, 1995). Kelley and Northrop (1975, p. 90) cited a granite outcrop, roughly 0.4 hectares in extent and approximately 1.6 km (1 mi) southeast of the study area along Sandia Road west of the lower Sandia Peak tram terminal (Fig. 1, Location "B"). The granite exhibits intense low-angle shearing. Rhoades and Callender (1983) studied this outcrop and concluded that a headwall block had been transported north and west along a listric fault above the shear zone in the granite. They also inferred that the Mesozoic rocks of the study area had likewise been transported via low-angle slip in the granite. Finally, Kelley and Northrop (1975, p. 90) cite a hill, approximately 5.7 hectares (2.3 acres) in extent and 13 km (8 mi) south of the study area near the base of the Sandia Mountains (Fig. 1, Location "C"). Limestones of the Madera Group rest directly on Sandia granite, and the normally intervening Sandia Formation is absent. The Madera Group limestones may have been emplaced via low-angle faulting. A low-angle interpretation of the boundary fault in the study area is consistent with these three observations.

One tectonic hypothesis is that the boundary fault was formed by early Tertiary Laramide compression and that subsequent extension and retrograde normal slip exploited the same fault plane. Examples of retrograde normal-fault movement along Laramide thrust faults are cited in the southern Albuquerque Basin

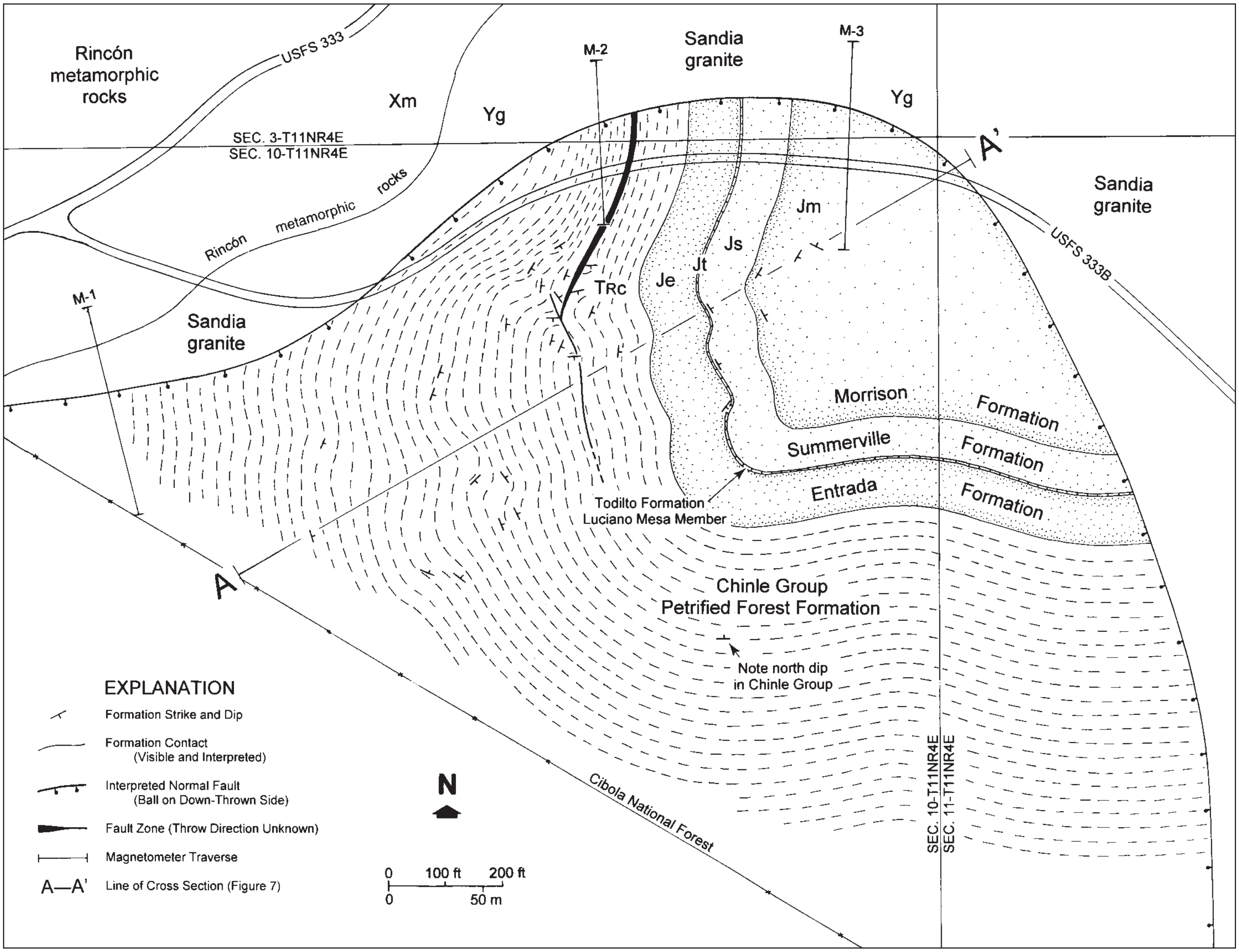

FIGURE 6—Extrapolated bedrock geologic map of study area. Geologic unit map symbols same as in Fig. 2. (Note map extends farther east than Fig. 2)

(Kelley, 1977, fig. 20; Cabezas, 1991). Laramide-age deformation has been documented in the northern Sandia Mountains west of Placitas (Connell et al., 1995), but direct evidence of Laramide movement on the west side of the Sandia Mountains is lacking.

A second hypothesis is that the boundary fault was formed during an early phase of Rio Grande rift extension during the waning of Oligocene to early Miocene (ca 36–20 Ma) volcanic activity and attendant thermal uplift (Morgan and Golombek, 1984). Elevated temperatures during the Oligocene are indicated by the extensive Ortiz porphyry belt intruded east of the Sandia Mountains between about 36 and 26 Ma and indirectly by the volcanogenic Espinaso Formation in the Hagan Basin (Bachman and Mehnert, 1978; Kautz et al., 1981). The abundant lamprophyric dikes that intrude the Sandia granite (Kelley and Northrop, 1975) may mark the same event, although the dikes can be dated only as Tertiary-age based on field relations (Shomaker, 1965). Morgan and Golombek (1984) proposed that early extension occurred along low-angle faults, which resulted in broad, shallow basins. A corollary would be that the accompanying uplifts were broad and that the vertical movement was moderate. It is therefore not necessary to invoke significant vertical relief of the Sandia Mountains to trigger low-angle faulting. Baldridge et al. (1984) maintained that early-stage, late Oligocene to early Miocene low-angle faulting, followed by late-stage, late Miocene to Pliocene high-angle faulting, are common features along the Rio Grande rift and are consistent with regional Basin and Range styles. They postulated that high heat flow facilitated crustal stretching along low-angle detachments, perhaps aided by rise of the brittle-ductile transition zone in the lower crust. Apatite fission-track data indicate that uplift of the Sandia granite through the 100°C isotherm occurred at a rate of approximately 81 m (266 ft) per m.y. during the late Oligocene to middle Miocene, ca 30–15 Ma (Kelley and Duncan, 1984; Kelley et al., 1992). This was followed by vertical uplift along high-angle faults at a rate of approximately 230 m (755 ft) per m.y. during the late Miocene and Pliocene, which resulted in the development of the modern Rio Grande rift (Kelley and Duncan, 1984). These constraints suggest that the boundary fault is a low-angle feature that was active most likely during early Rio Grande rifting in the late Oligocene to early Miocene (ca 30–20 Ma).

A possible structural analog for the study area is provided by the Miocene Horse Camp Basin in the Basin and Range province of Nevada (Horton and Schmitt, 1998). This "basin" is interpreted to be the hanging-wall block of an early-phase product of Miocene extension along a low-angle, west-dipping detachment fault. During the late Miocene the hanging-wall block was cut by the relatively high-angle Railroad Valley fault. The Horse Camp Basin thus became part of the footwall block of the Railroad Valley fault. Basin and Range subsidence of the Railroad Valley west of the Railroad Valley fault was attended by uplift and exhumation of the Horse Camp Basin on the footwall block to the east. If the analogy is valid, the surface trace of the detachment fault of the Horse Camp Basin is the counterpart of the boundary fault in the study

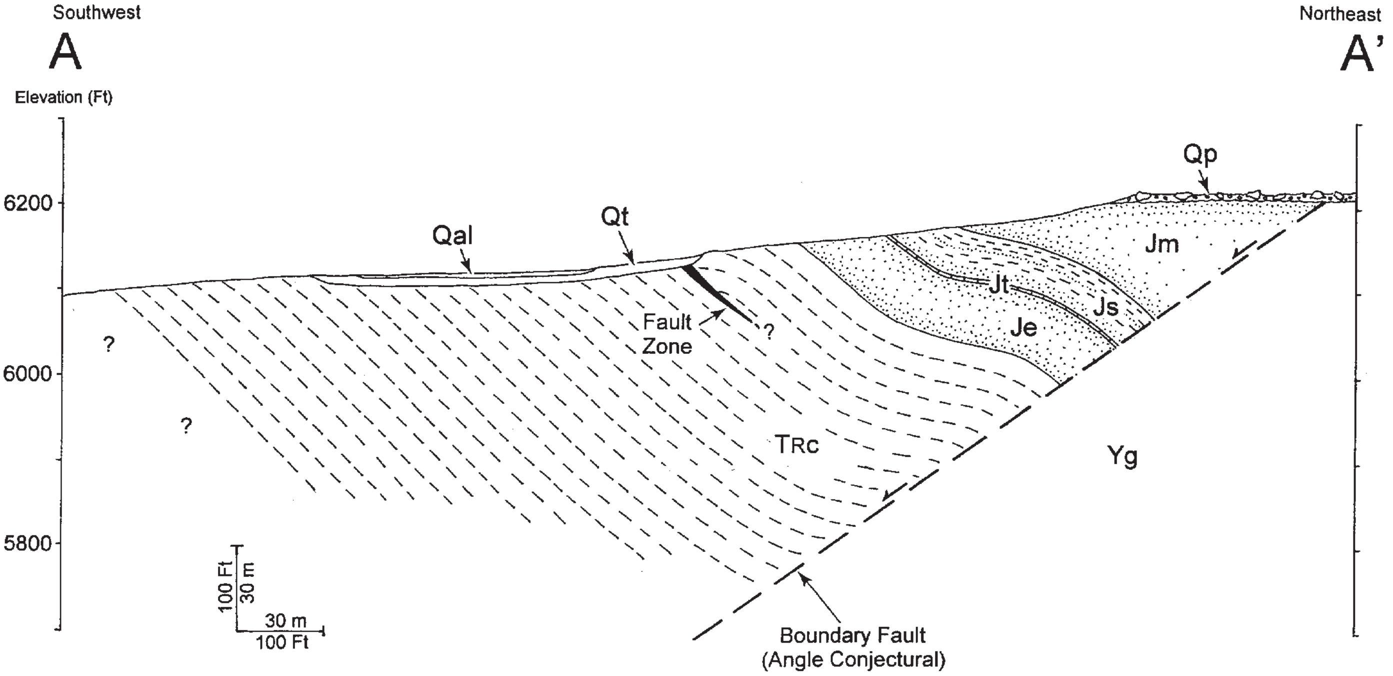

FIGURE 7—Southwest–northeast geologic cross section A-A'. Geologic map units: **Qp** = Quaternary pediment alluvium; **Qt** = inset Quaternary terrace alluvium; **Qal** = youngest Quaternary alluvium; **Jm** = Jurassic Morrison Formation, Salt Wash Member; **Js** = Jurassic Summerville Formation; **Jt** = Jurassic Todilto Formation, Luciano Mesa Member; **Je** = Jurassic Entrada Formation; **TRc** = Triassic Chinle Group, Petrified Forest Formation; and **Yg** = Precambrian Sandia granite. The low fault angle is conjectural but suggested by the curved fault trace.

area, and the Railroad Valley fault on the west margin of the Horse Camp Basin is the counterpart of the Rincón fault on the west margin of Rincón Ridge (Fig. 1) and its southerly projection.

Conclusions

Discontinuous outcrops of the Petrified Forest Formation of the Upper Triassic Chinle Group, the Entrada, Todilto, and Summerville Formations of the Middle Jurassic San Rafael Group, and the Salt Wash Member of the Upper Jurassic Morrison Formation are exposed in the Juan Tabó area of the northwestern Sandia Mountains. The Mesozoic strata generally dip to the east and northeast. Field data reveal a zone of significant faulting within the Mesozoic section. A boundary fault separates the Precambrian rocks to the northwest, north, and east from the Mesozoic rocks to the south and southwest. Magnetometer data suggest that the trace of the boundary fault is convex at least to the north. A low-angle, normal-fault interpretation of the boundary fault is consistent with observations elsewhere on the west side of the Sandia Mountains. Direct evidence for the timing of fault movement is lacking, but comparison to other uplifts along the Rio Grande rift supports the hypothesis that the Mesozoic strata were emplaced by late Oligocene to early Miocene low-angle faulting. The polyphase Miocene Horse Camp Basin of the Basin and Range province of Nevada provides a possible analog.

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New Mexico Geological Society
51st Annual Fall Field Conference, October 18–21, 2000

The 51st annual field conference of the New Mexico Geological Society will be held in the Basin and Range province of southwestern New Mexico, north and east of the Bootheel in a region encompassing the Pyramid, Little Hatchet, Victorio, and Florida Mountains. Conference hosts will be New Mexico State University and the New Mexico Bureau of Mines and Mineral Resources. Conference participants will spend two nights in Lordsburg and one in Deming. This conference, launching the second demi-centennial, will honor James Lee Wilson, an outstanding contributor to the geology of New Mexico and understanding of carbonate rocks in Earth history.

The field conference is designed to appeal to a wide range of geologic interests. The theme is "Southwest Passage" a title intended to highlight the region as a geologic, geographic, and human crossroads. The conference itinerary covers the geology of southwestern New Mexico from the Cambrian to the Quaternary. As such, potential authors are encouraged to think broadly in terms of manuscript preparation; we invite the whole spectrum of geology. The tentative itinerary is as follows:

Day 1. Mid-Tertiary ash-flow tuffs of the Pyramid Mountains, calderas of southwestern New Mexico, and economic resources of southwestern New Mexico.
Day 2. Mid- to upper-crustal transect of Little Hatchet Mountains, including Cambrian plutonism, Jurassic sedimentation and magmatism, Laramide volcanism, ore deposits, and deformation, and mid-Tertiary plutonism. Mining geology and structure of the Victorio Mountains en route to Deming.
Day 3. Igneous petrology, stratigraphy, and structure of lower Paleozoic rocks in Victorio Canyon, Florida Mountains. Optional stop to see magma mixing in the Florida Mountains.

Authors are asked to send an intent to submit a manuscript and/or minipaper, which includes (1) the manuscript title, (2) estimated number of double-spaced manuscript pages, and (3) estimated number of figures, to Guidebook co-editors Drs. Tim Lawton, Nancy McMillan, Virginia McLemore, or William McIntosh on or before **December 1, 1999,** by email (preferred), phone, FAX, or letter. We ask that authors observe the current 25 page (double-spaced) manuscript limit (about 7 printed pages without figures). Papers longer than 10 printed pages will be considered on a case-by-case basis and will require page charges. Minipapers will be limited to 1,500 words and one figure. Only minipapers pertaining to geological or related natural science topics will be considered. Authors are required to secure two external reviews for each paper. Final manuscripts, complete with clean figures and reviews, will be due on **February 15, 2000.** More information regarding specific page limits and manuscript preparation will be sent out in November of 1999.

Please direct all communications regarding manuscript submission to:

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