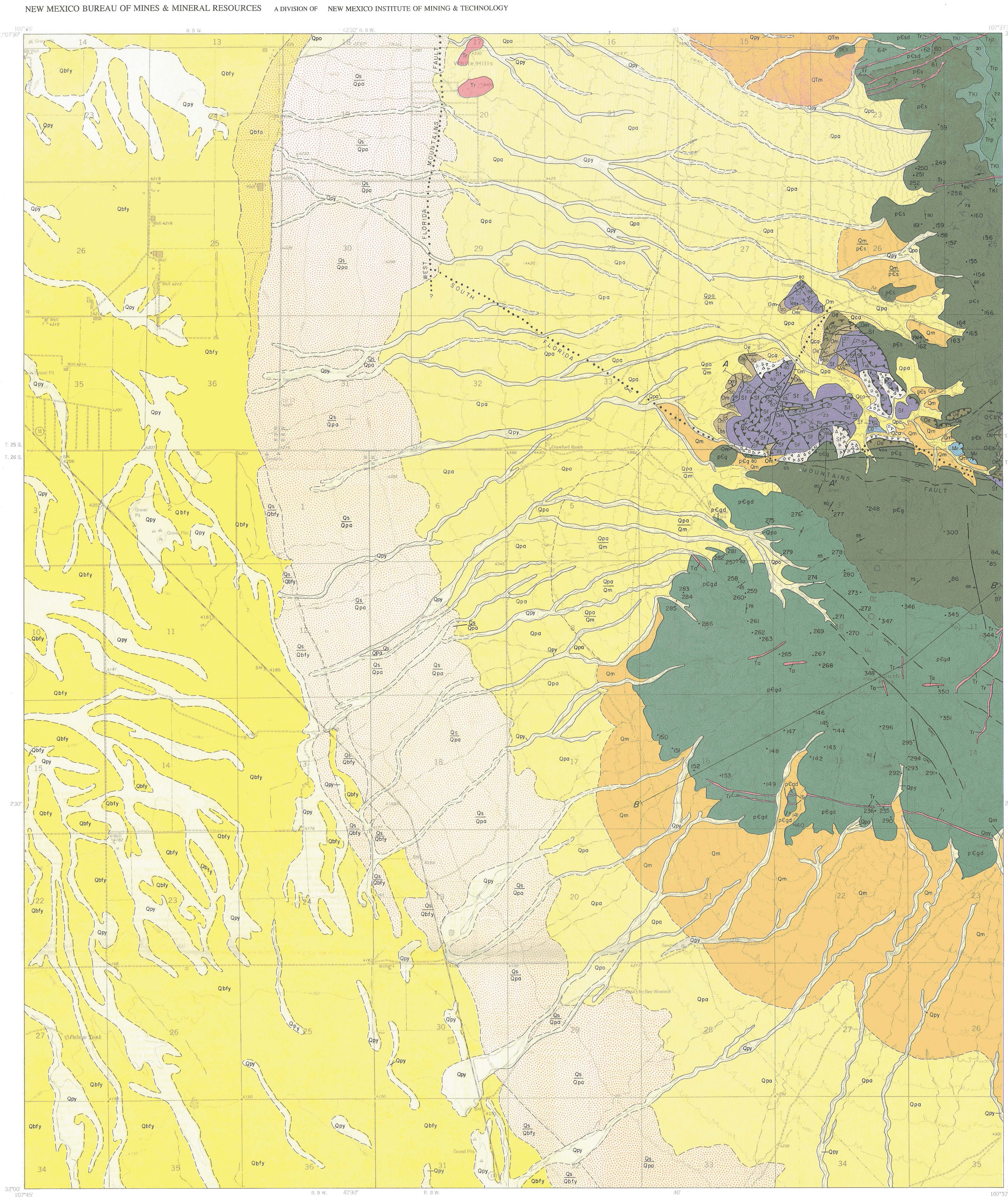
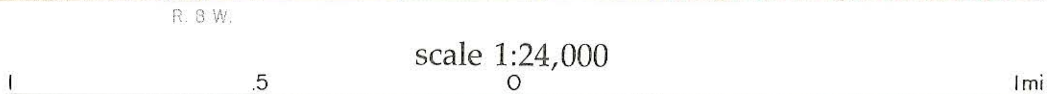
NEW MEXICO BUREAU OF MINES & MINERAL RESOURCES A DIVISION OF NEW MEXICO INSTITUTE OF MINING & TECHNOLOGY

GEOLOGIC MAP 59

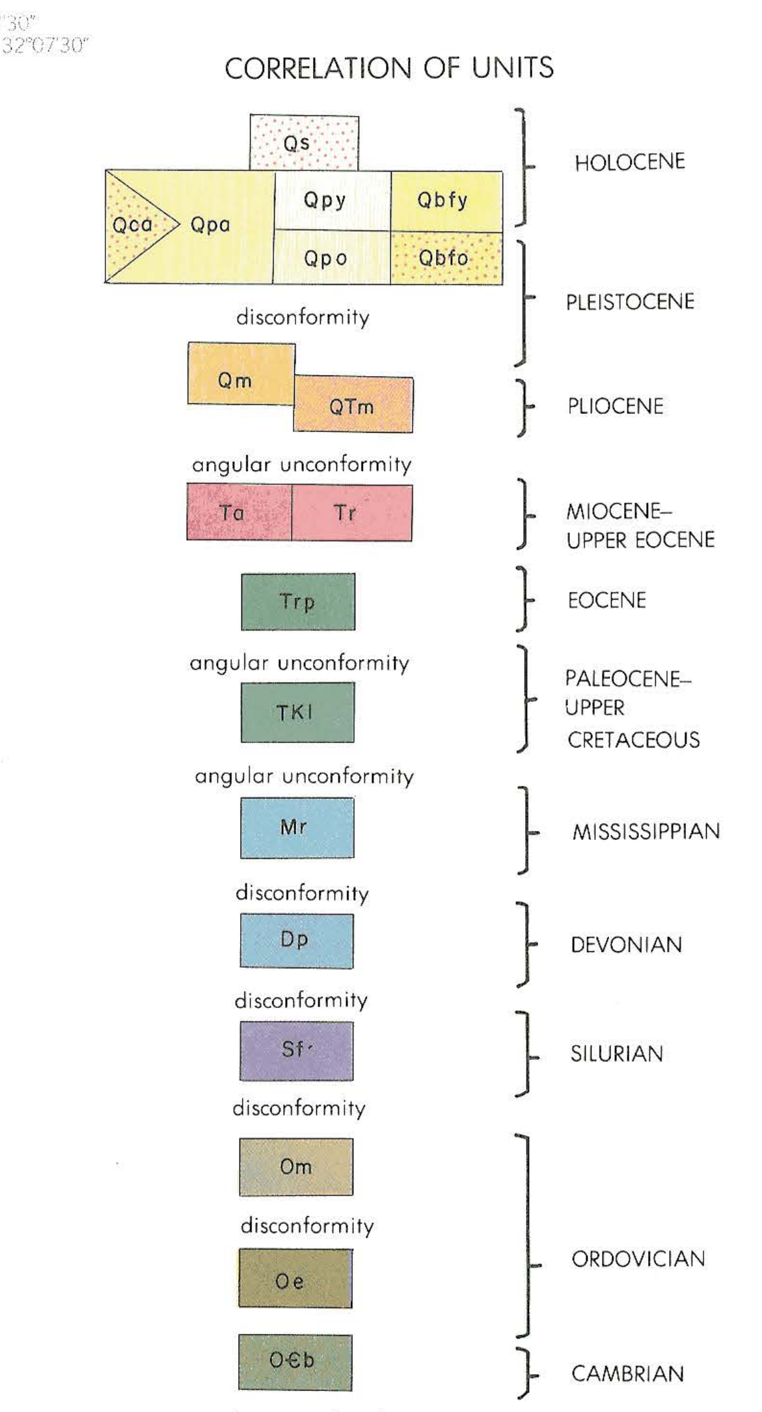


Geology by R. E. Clemons, 1982–83
Base from U.S. Geological Survey



Drafting and layout by Kathryn G. Campbell
Editing by S. D. Blodgett and J. C. Love

CORRELATION OF UNITS



DESCRIPTION OF UNITS

Qs **Windblown sand**—Unconsolidated dunes up to 10 ft high; mostly underlain by caliche horizon; forms cover over map unit shown by symbol under the line (for example, *Qs/Qpa*)

Qbfo **Older basin-floor sediments**—Predominantly nongravelly to slightly gravelly alluvium in the Mimbres Basin unaffected by arroyo incision; contain moderate amounts of pedogenic carbonate

Qbfy **Younger basin-floor sediments**—Predominantly nongravelly to slightly gravelly alluvium in the Mimbres Basin unaffected by arroyo incision; contain very little pedogenic carbonate

Qca **Undifferentiated colluvium-alluvium**—Thin talus-slope veneers and colluvial and alluvial fills on arroyo sideslopes; found in mountain canyons and on piedmont slopes

Qpa **Undifferentiated piedmont-slope alluvium**—Mixed older piedmont-slope alluvium and younger piedmont-slope alluvium (*Qpo* and *Qpy*)

Qpo **Older piedmont-slope alluvium**—Unconsolidated fan deposits, piedmont-valley fills, and erosion-surface veneers, associated with surfaces graded to closed basins; uppermost beds typically cemented with pedogenic carbonate

Qpy **Younger piedmont-slope arroyo alluvium**—Silty to gravelly sediments in shallow drainageways cut below older fan and erosion surfaces graded to closed basins

Qm **Mimbres formation, upper part**—Fan gravel and interbedded sandy lenses representing piedmont-slope facies; includes thin erosional-surface veneers near mountain fronts; upper layers contain carbonate accumulations (caliche) up to several feet thick; up to 100 ft thick

QTm **Mimbres formation, lower part**—Similar to *Qm* but found on higher terrace and alluvial-fan remnants; igneous-rock clasts are much more intensely weathered; up to 200 ft thick

Ta **Hornblende andesite and basaltic andesite**—Intensely altered and deeply weathered dikes and small irregular intrusions; exposed only in arroyos and on a few bare slopes and ridges

Tr **Rhyolite**—Very light gray dikes, ranging from 1 to 18 ft in thickness, and small stocks; holocrystalline, generally nonporphyritic; fractures commonly stained with manganese oxides

Trp **Rubio Peak Formation**—Grayish-purple and reddish breccias of polylithic volcanic clasts grading upward into greenish-gray breccias and conglomeratic sandstones; basal beds contain abundant granite and limestone clasts; upper beds are sand-sized volcanic arenites with abundant epidote concretions; entire section strongly propylitized everywhere; up to 1,600 ft thick

TKl **Lobo Formation**—Interbedded reddish-brown shale, chert-limestone conglomerate, calcareous gray siltstone, sandstone, and pebble-to-cobble conglomerate; this unit is Darton's (1916) Lobo Formation; up to 600 ft thick

Mr **Rancheria Formation**—Thin- to medium-bedded, dark-gray to black, fine-crystalline fossiliferous limestone; containing as much as 50% chert; up to 100 ft thick

Dp **Percha Shale**—Dark-gray to olive-gray fissile shale; up to 100 ft thick

Sf **Fusselman Dolomite**—Thin- to massive-bedded, alternating dark- and light-gray units (6), medium- to coarse-crystalline dolomite; several coral-rich zones; sparse chert in basal and uppermost beds; up to 975 ft thick

Om **Montoya Formation**—Basal, coarse sandy dolomite (Cable Canyon) overlain by dark-brown, coarse-crystalline dolomite (Upham), thin-bedded, medium-gray limestone and cherty limestone (Aleman), and medium-bedded limestone and dolomite; fossiliferous lower part; chert near top (Cutter); up to 330 ft thick

Oe **El Paso Formation**—Basal unit of dark-gray, medium-crystalline dolomite overlain by thick middle unit of thin- to medium-bedded, light- to medium-gray limestone and cherty limestone, and upper unit of thin- to medium-bedded, medium- to dark-gray limestone with abundant chert; middle and upper units are fossiliferous; up to 500 ft thick

O€b **Bliss Sandstone**—Thin- to medium-bedded arkosic to quartzose sandstone; grades up to calcareous sandstone and silty dolomite; up to 120 ft thick

p€g **Granite**—Fine- to coarse-crystalline, red to gray, alkali-feldspar granite; contains approximately 65% perthite and microcline, 28% quartz, 5% hastingsite, and 2% magnetite, zircon, sphene, and apatite; predominant bedrock type south of south Florida Mountains fault

p€gd **Granite with abundant xenoliths**—Fine- to coarse-crystalline alkali-feldspar granite (like *p-€g*) containing up to 50% hornblende and pyroxene hornfels xenoliths; predominant bedrock type in slopes and ridges south and west of South Peak.

p€s **Syenite and quartz syenite**—Predominantly coarse crystalline with many aplitic zones; unweathered rock is bluish gray but most outcrops are a yellowish-brown; composition ranges from alkali-feldspar syenite with only a trace of quartz to quartz alkali-feldspar syenite; hastingsite (typically altered) is common mafic mineral; predominant plutonic rock north of south Florida Mountains fault

p€sd **Syenite with abundant xenoliths**—Coarse-crystalline syenite (like *p-€s*) containing abundant hornblende and pyroxene hornfels xenoliths; small outcrop area in northeast corner of map.

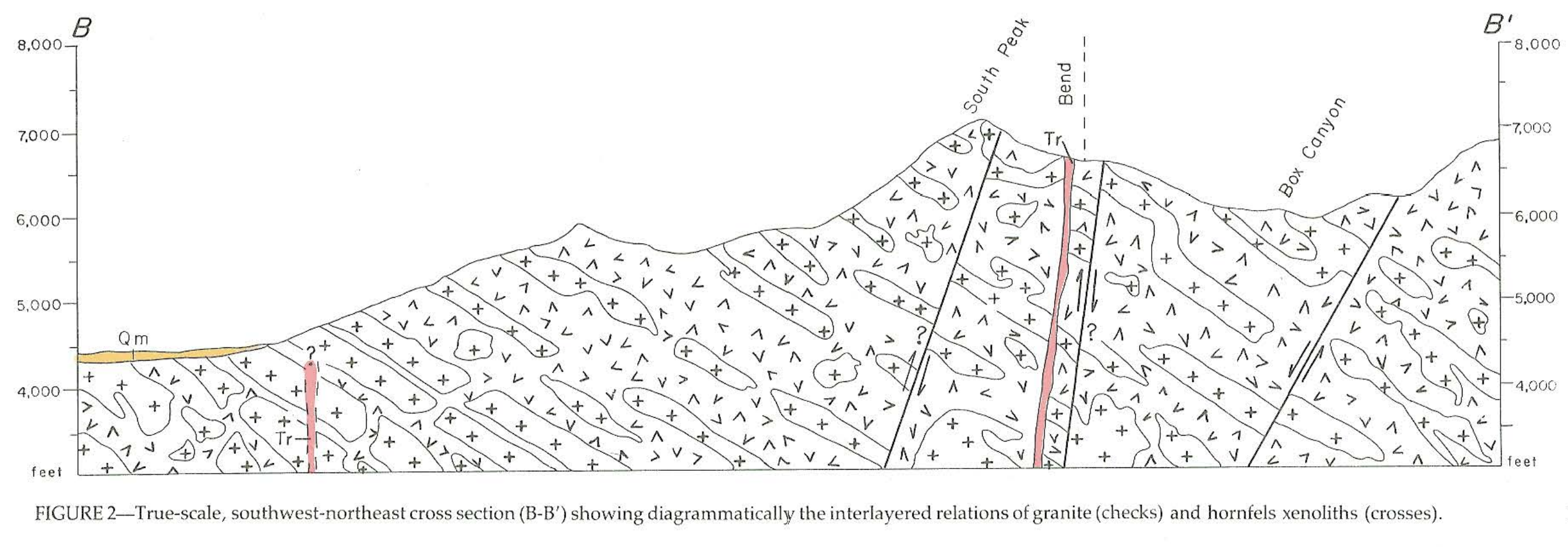


FIGURE 2—True-scale, southwest-northeast cross section (B-B') showing diagrammatically the interlayered relations of granite (checks) and hornfels xenoliths (crosses).

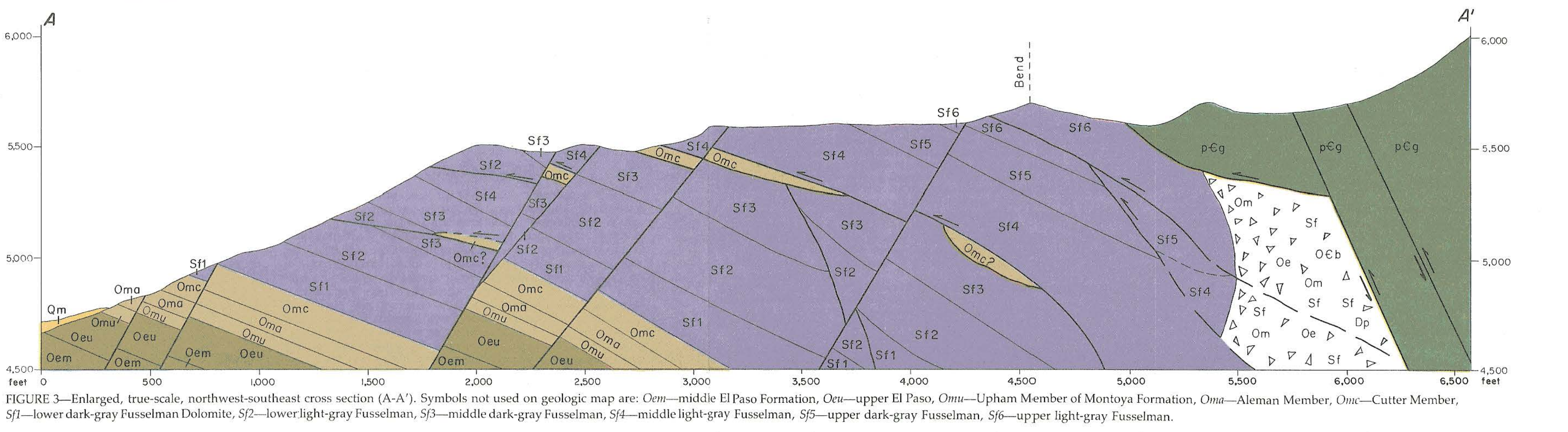
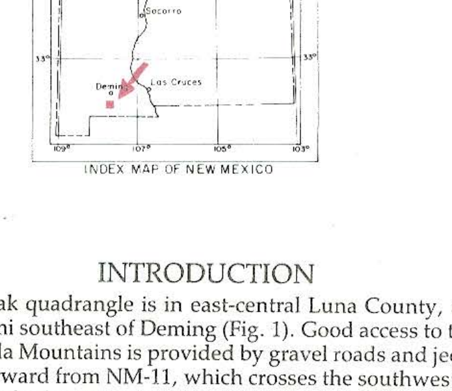
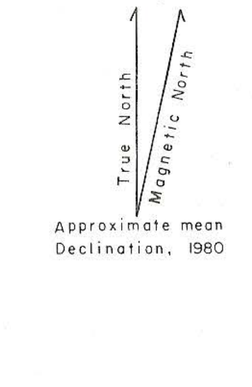


FIGURE 3—Enlarged, true-scale, northwest-southeast cross section (A-A'). Symbols not used on geologic map are: *Oem*—middle El Paso Formation, *Oeu*—upper El Paso, *Omu*—Upham Member of Montoya Formation, *Oma*—Aleman Member, *Omc*—Cutter Member, *Sf1*—lower dark-gray Fusselman Dolomite, *Sf2*—lower light-gray Fusselman, *Sf3*—middle dark-gray Fusselman, *Sf4*—middle light-gray Fusselman, *Sf5*—upper dark-gray Fusselman, *Sf6*—upper light-gray Fusselman.



Geology of South Peak quadrangle, Luna County, New Mexico

by Russell E. Clemons, 1985



INTRODUCTION

South Peak quadrangle is in east-central Luna County, approximately 12 mi southeast of Deming (Fig. 1). Good access to the base of the Florida Mountains is provided by gravel roads and jeep trails leading eastward from NM-11, which crosses the southwest part of the quadrangle about midway between Deming and Columbus. The Nathan Crawford Ranch headquarters and several permanent dwellings are in the north-central to northwest parts of the quadrangle.

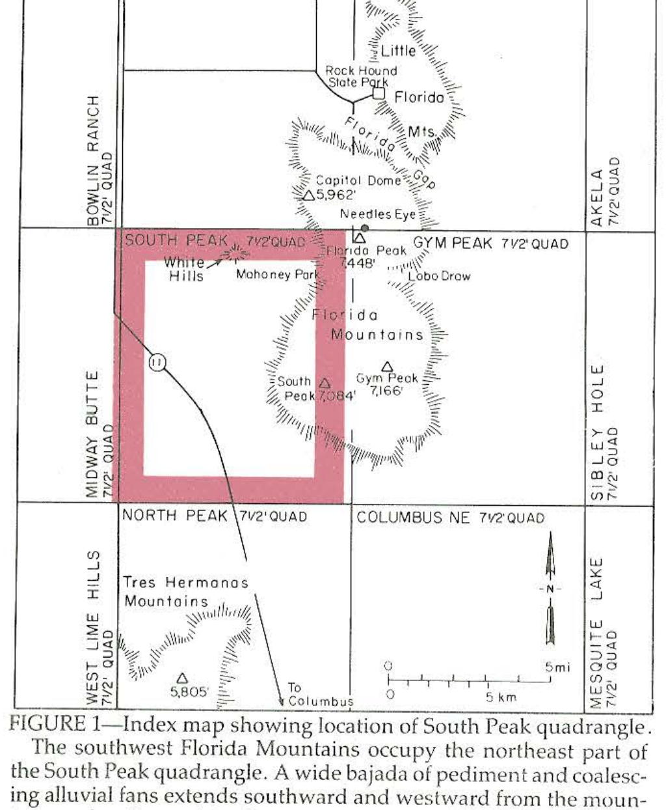


FIGURE 1—Index map showing location of South Peak quadrangle.

The southwest Florida Mountains occupy the northeast part of the South Peak quadrangle. A wide bajada of pediment and coalescing alluvial fans extends southward and westward from the mountains so that the combined mountains-bajada area covers the eastern two-thirds of the quadrangle. The western third contains part of the southern Mimbres Basin. Elevations range from 4,150 ft in the southwest corner of the quadrangle to 7,084 ft on South Peak and 7,104 ft on an unnamed peak 1 mi north of South Peak.

The South Peak quadrangle was included in Darton's (1916) geologic map of Luna County and in the Deming Folio (Darton, 1917b). Kelley and Bogart (1952), Bogart (1953), and Kottlowski (1957) provided descriptions of the Fusselman Dolomite exposed in Mahoney Park. Griswold (1961) included generalized descriptions of the geology and mines in his report on the mineral deposits of Luna County. Corbitt (1971) mapped the Florida Mountains, and other publications, based at least in part on this work, have been written by Corbitt (1974), Corbitt and Woodward (1970, 1973b), Brookins and Corbitt (1974), Brookins (1974a, 1974b, 1980a, 1980b), Brookins and others (1978), and Woodward and DuChene (1981). Brown (1982) mapped and described in detail the stratigraphy and structure of the Mahoney Park–Gym Peak area (Fig. 1), and Brown and Clemons (1983) discussed the major structures in the southern Florida Mountains. Discussions on the relationships of rocks exposed in the South Peak quadrangle to surrounding areas are also included in Armstrong and Mamet (1978), Clemons (1982a, 1982b), Darton (1917a, 1928), Flower (1953a, 1953b, 1965, 1969), Greenwood and others (1970), Hawley (1981), Howe (1959), Jicha (1954), Kottlowski (1963, 1965, 1971, 1973), Kottlowski and Foster (1962), Kottlowski and Pray (1967), Kottlowski and others (1969a, 1969b), Lemley (1982), LeMone (1969, 1974, 1976b), Lochman-Balk (1958, 1974), Loring and Armstrong (1980), Loring and Loring (1980), Lynn (1975), Thompson and Potter (1981), and Woodward (1970).

This report is the result of a detailed geologic study conducted during 1982 and represents the fourth phase of a comprehensive geologic and mineral-resource investigation of the Florida Mountains. Phase one is a geologic map of the Florida Gap quadrangle (Clemons, 1982a); phase two is a geologic map of the Capitol Dome quadrangle (Clemons, 1984); phase three is a geologic map of the Gym Peak quadrangle (Clemons and Brown, 1983). A comprehensive report of the geology of the Florida Mountains (phase 5) will be completed during 1983.

Names of igneous rocks used in this report follow the I.U.G.S. classification of Streckeisen (1976, 1979). Sedimentary rocks are named according to Folk (1962, 1974) and Dunham (1962).

ACKNOWLEDGMENTS—The New Mexico Bureau of Mines and Mineral Resources provided financial support for field work and petrographic slide preparations. G. A. Brown, H. Drewes, R. H. Flower, J. W. Hawley, G. H. Mack, W. R. Seager, S. Thompson III, and C. H. Thorman are acknowledged for field discussions that aided interpretations. C. E. Chapin, H. Drewes, A. K. Loring, and C. H. Thorman read the manuscript and made suggestions for its improvement. I am grateful to N. Crawford, L. W. Koenig, R. May, and all other land owners for allowing access to their lands.

STRATIGRAPHY

Precambrian rocks

Alkali-feldspar syenite, quartz alkali-feldspar syenite, and alkali-feldspar granite are the most extensively exposed bedrocks in the South Peak quadrangle. Syenite and quartz syenite are prevalent north of the south Florida Mountains reverse fault, and granite with abundant hornblende and pyroxene hornfels xenoliths occurs south of the reverse fault. Clemons (1982b) summarized previous work done on these rocks and presented evidence for their Early Cambrian or Precambrian age. The mineral compositions of the alkali-feldspar granites, quartz syenites, and syenites are the same except for quartz content, and the numerous aplite dikes in the syenites have compositions identical to the granites (Table 2). Therefore, I believe the alkali-feldspar rocks are consanguine and of similar age. They may belong to a shallow pluton, but this pluton had to be unroofed and partly eroded prior to deposition of the Bliss Sandstone (Late Cambrian–Early Ordovician or about 510 m.y. B.P.). Several well-exposed outcrops contain depositional contacts of Bliss Sandstone resting nonconformably on alkali-feldspar syenite. Karl Evans of the U.S. Geological Survey (oral communication, 1983), working on zircon separates from the Florida Mountains plutonic rocks, has determined preliminary Pb/Pb ages for the syenite of approximately 525 m.y. and approximately 550 m.y. for the granite. Alteration of the plutonic and overlying rocks (as young as Eocene) is widespread and pervasive.

TABLE 1—Comparison of thicknesses of Fusselman Dolomite units at Gym Peak and Mahoney Park.

Fusselman units	Thickness at Gym Peak	Mahoney Park (Kelley & Bogart, 1952)	Mahoney Park (this study)
Sf6—Upper light-gray dolomite	80 ft	262 ft	50+ ft (cut by several thrust faults)
Sf5—Upper dark-gray dolomite	165 ft	161 ft	160 ft
Sf4—Middle light-gray dolomite	610 ft	421 ft	280+ ft (base thrust faulted)
Sf3—Middle dark-gray dolomite	160 ft	205 ft	100+ ft (base & top thrust faulted)
Sf2—Lower light-gray dolomite	305 ft	68 ft	235+ ft (top is faulted)
Sf1—Lower dark-gray dolomite	160 ft	270 ft	150 ft
Total thickness	1,480 ft	1,387 ft	975+ ft

Braid and string perthite is the predominant mineral in the aplite, granite, and syenites. Microcline and orthoclase are locally common, but typically subordinate to perthite. All of these feldspars are kaolinized and most are also sericitized. Plagioclase more calcic than albite was observed in only one aplite thin section. Moderately to strongly undulose quartz content ranges up to a maximum of 36% (Table 2). Aplite (fine-crystalline hastingsite, alkali-feldspar granite) dikes are common throughout the syenite and quartz syenite. These dikes are a few inches to tens of feet wide, dip at all angles, and generally have gradational contacts. These rocks apparently represent late crystallization phases of the quartz-syenitic magma. The alkali-feldspar syenites beneath horizontal or nearly horizontal aplite dikes are much more altered than the aplites or alkali-feldspar syenites above the aplites. This may be due to damming of ascending hydrothermal fluids beneath the less porous aplites.

The majority of the syenites east and northeast of Mahoney Park are jointed, sheared, and contain abundant hematite and limonite. The feldspars and quartz are commonly fractured, and alteration products of iron oxides, chlorite, epidote, and carbonate fill fractures and replace the primary mafic minerals. The least altered syenite is in the arroyo on the northeast side of the road in NE¼ sec. 35, T. 25 S., R. 8 W. Mafic minerals in this syenite are predominantly hastingsite and minor biotite (Table 2, samples 82–162 and FM4–2 through FM4–20; see reverse of sheet). Zircon, apatite, and magnetite are accessory minerals in the alkalic rocks.

The plutonic rocks south of the south Florida Mountains fault are chiefly granite that intruded a sequence of andesitic to basaltic volcanic rocks. Granite away from contacts with the mafic rocks is a coarse-crystalline, light- to medium-gray rock. Granite closely associated with the mafic rocks ranges from a fine- to medium-crystalline red rock. In thin section, these granites are mineralogically indistinguishable. Locally, rocks are hybrid types that are classified as quartz monzonites and monzodiorites. These hybrid rocks represent less than 0.1% of the plutonic rocks. They probably were formed by metasomatism associated with the intrusion of alkali granitic magma into the mafic rocks, assimilation of some mafic material by the granitic magma, or hydrothermal fluids associated with Tertiary intrusive and volcanic activity.

Large xenoliths of hornblende and pyroxene hornfels locally comprise up to 50% of the rocks exposed in the southwest end of the Florida Mountains. In general, the quantity of mafic rocks decreases upward on South Peak. In sec. 16, T. 26 S., R. 8 W., the hornfelses and granite appear to be interlayered, with layers dipping 25°–35° N.E. (Fig. 2). The hornfelses are less resistant to weathering and form slopes and saddles between granite ledges and ridges. Some of the fine-crystalline rocks look like diabase but mineralogically and texturally they are hornfelses. The hornfelses typically contain 40–45% each of intermediate plagioclase and hornblende. Biotite, pyroxenes, alteration products, and accessory apatite, sphene (?), magnetite, and zircon in varying proportions total 10–20%. Plagioclase is extensively altered to clays and sericite. Two float samples of pyroxene hornfels contain fresh plagioclase (sodic labradorite) and abundant hypersthene and olivine (Table 2).

Paleozoic rocks

BLISS SANDSTONE (*O€b*)—Bliss Sandstone crops out at the base of the Paleozoic section on the eastern edge of the South Peak quadrangle, southeast of Mahoney Park. It varies in thickness from zero to 100 ft due to relief on the erosional surface of underlying syenite and is conformably overlain by the El Paso Formation; at one locale, where the Bliss pinches out due to non-deposition, the El Paso was deposited on syenite.

Basal Bliss beds are typically arkosic, ranging from pebbly, coarse- to medium-grained, hematitic sandstone. Feldspar content decreases rapidly upward, and carbonate cement increases as hematite decreases. The upper beds are dolomitic sandstone and silty dolomite. The basal boundary of the overlying El Paso Formation is arbitrarily placed where dolomite predominates over sand content.

Regional aspects of the Bliss Sandstone, including its occurrence in the Florida Mountains, were described by Chafetz (1982), Flower (1953a, 1953b, 1958, 1965, 1969), Hayes (1975), Kottlowski (1963), LeMone (1969a, 1969b, 1969c), and Thompson and Potter (1981). The Bliss is diachronous; it appears to be younger to the east, owing to its regional onlap upon the Precambrian. In the Florida Mountains, the Bliss is believed to be Late Cambrian (Dresbachian–Tremplealeauan)–Early Ordovician (Canadian) in age.

EL PASO FORMATION (*Oe*)—The El Paso Limestone was named and redefined by Richardson (1904, 1909), and Darton (1916, 1917b) mapped El Paso Limestone in the Mahoney Park area. Kelley and Silver (1952) recommended raising the El Paso to group status, but no one has yet mapped the Sierrite and Bat Cave Formations in southern New Mexico. Numerous arguments have been presented against considering the El Paso as a group (Bachman and Myers, 1969; Jicha, 1954; Harbour, 1972; Jones and others, 1967; Kottlowski, 1963; Pratt, 1967; Zeller, 1965, 1975). Pray (1961) used El Paso Formation while mapping the Sacramento Mountains. Although Kottlowski and others (1956) tentatively accepted the El Paso Group status in the San Andres Mountains, they recommended different formations.

Lochman-Balk (1958, 1974) studied the El Paso Group at Capitol Dome in the northwest Florida Mountains and described lower, middle, and upper units. Brown (1982) was able to utilize these three informal units while mapping at a scale of 1:6,200; however, these units could not be mapped at smaller scales (Clemons and Brown, 1983; Corbitt, 1971). Flower (1965, 1969) and LeMone (1969b), in detailed stratigraphic studies, subdivided the El Paso Group into 10 formations. Their subdivisions could not be mapped even at 1:6,200 scale. The American Commission on Stratigraphic Nomenclature (1961) specified that formations must be mappable at about 1:25,000 scale and that a group must consist of two or more formations. Therefore, I recommend usage of El Paso Formation and that the formations named by Kelley and Silver (1952), Flower (1969), and LeMone (1969b) be regarded as members or biostratigraphic units. A formal recommendation, including descriptions of type and reference sections and localities will be presented in phase 5 of the Florida Mountains project.

El Paso Formation overlies the Bliss Sandstone on the eastern edge of the quadrangle, as thrust-plate remnants southeast of Mahoney Park, and in the lower slopes at the northwest ends of two ridges on the southwest side of Mahoney Park. Only partial sections are present at each outcrop due to tectonic brecciation and elimination of strata by low-angle thrust faults. Clasts of El Paso rocks, ranging in size from a few inches to tens of feet, are abundant in the breccia zone mapped along the south Florida Mountains fault. Thickness cannot be determined in the South Peak quadrangle due to the brecciated, chaotic characteristics.

The lower El Paso unit consists of thin- to medium-bedded, dark-gray, medium- to coarse-crystalline dolomite. The upper part of the unit contains abundant concretionary nodules (oncolites) believed to be of algal origin (Lochman-Balk, 1958). Some of the outcrops in the extreme southeast corner of sec. 35, T. 25 S., R. 8 W. include part of the lower El Paso unit. The middle El Paso unit consists of thin- to medium-bedded, light- to medium-gray limestones. Textural varieties include micrites, biomicrites, intrasparites, biosparites, and neosparites (mudstones, wackestones, and packstones). The upper El Paso unit is lithologically similar to the middle unit but is characterized by abundant chert in lenses and flattened nodules. Generally, more dark-gray limestone beds occur in the upper unit than in the middle unit.

Discussions of depositional environments and regional correlations are included in Flower (1953b, 1965, 1969), Hayes (1975), Kottlowski (1964), Kottlowski and others (1969), LeMone (1969a), and Lucia (1969). The El Paso Formation is diachronous; it evidently is younger from west to east (LeMone, 1974). In the Florida Mountains, deposition occurred in shallow marine seas, with probable subaerial exposure at times. The El Paso (Lower Ordovician: Canadian) is disconformably overlain by the Montoya Formation.

MONTOYA FORMATION (*Om*)—The Montoya Limestone was named by Richardson (1908) for a type locality at the southern end of the Franklin Mountains. Darton (1916) extended usage of the name westward through southern New Mexico including the Florida Mountains. Montoya Limestone was later subdivided into three members by Entwistle (1944). Kelley and Silver (1952) raised Montoya to group status and named four formations within it, in ascending order: Cable Canyon Sandstone, Upham Dolomite, Aleman Formation, and Cutter Formation. The various nomenclatures were summarized by Pratt and Jones (1961). Hayes (1975) argued that Kelley and Silver's terminology is well established and should be used despite the fact that Entwistle's names had priority.

The four subdivisions of the Montoya named by Kelley and Silver (1952) are easily recognized in the South Peak quadrangle. Brown (1982) mapped the Upham, Aleman, and Cutter at 1:6,200 scale, but other workers have found the units to be too thin to map at 1:24,000 scale (Bachman and Myers, 1969; Clemons and Brown, 1983; Harbour, 1972; Jicha, 1954; Jones and others, 1967; Kottlowski, 1963; Pratt, 1967; Pratt and Jones, 1961; Pray, 1961; Seager, 1981; Zeller, 1965). The Cable Canyon, Upham, Aleman, and Cutter are regarded as members of the Montoya Formation in this report. As in the case of the El Paso Formation, I intend to formally recommend this usage in the final phase of the Florida Mountains project.

All four members of the Montoya are well exposed in the southwest part of Mahoney Park. The Cable Canyon Member is represented by approximately 7 ft of mottled, sandy dolomite and limestone overlain by 21 ft of dolomitic sandstone and sandy dolomite. Well-rounded, frosted, quartz grains weather in relief on exposed surfaces. The Upham Member, which conformably overlies the Cable Canyon, consists of 36 ft of dark brownish-gray, coarse-crystalline dolomite. The Upham is disconformably overlain by 85 ft of Aleman Member that consists of interbedded dolomite, limestone, and chert. The carbonate:chert ratio is approximately 3:1 in the lower 20 ft and decreases to 1:1 in the upper 65 ft. The carbonates

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are laminated to thin-bedded, medium- to dark-gray pelmicrites and neosparites (mudstones). The abundant brachiopods present in the Aleman to the east in the Gym Peak quadrangle were not seen in the Mahoney Park sections. The Aleman appears to be disconformably overlain by 173 ft of Cutter Member. The basal Cutter is a thick-bedded, medium-gray limestone with abundant small, angular chert and dolomite pebbles. It grades upward into thin- to medium-bedded, medium-gray, dolomitic biosparite and packed biomicrite (packstones, grainstones). Biostromal brachiopod layers, a few inches to several feet thick, are abundant in the lower 75 ft. The limestones have a distinct mottled appearance on weathered surfaces due to selective dolomitization of burrow fillings and intraclasts. The upper 53 ft of Cutter is predominantly dolomite with prominent light-gray chert lenses and flattened nodules.

The Montoya Formation is assigned a late Middle Ordovician (Red River) to Late Ordovician (late Richmond) age (Flower, 1965; Hayes, 1975). It lies disconformably on a widespread, Middle Ordovician erosional surface representing a hiatus that resulted from gentle uplift and erosion of pre-Montoya strata. The Montoya is disconformably overlain by Fusselman Dolomite in the Florida Mountains.

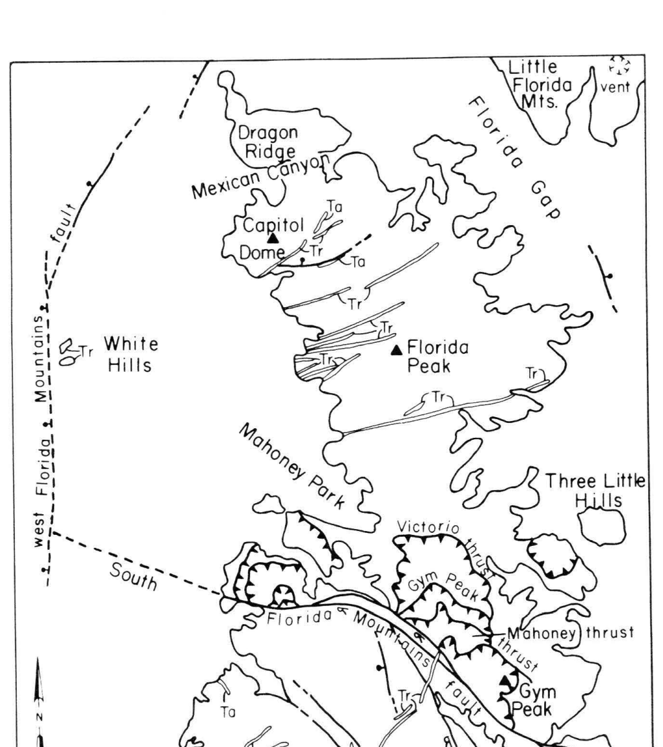

FIGURE 4—Generalized map of the Florida Mountains showing major geographic and structural features.

FUSSELMAN DOLOMITE (*Sf*)—The Fusselman Dolomite was named by Richardson (1908) for the type locality in the southern Franklin Mountains. Darton (1916, 1917b) extended usage of the name to Silurian rocks in Luna County, but misinterpreted Fusselman Dolomite in the Florida Mountains and included it within his Gym Limestone which was named for exposures at Gym Peak. Keyes (1940), Kelley and Bogart (1952), and Bogart (1953) reassigned most of the Gym Limestone as Fusselman Dolomite. The Fusselman Dolomite is Silurian, but further refinement of its age is hindered by poor fossil preservation due to extensive dolomitization.

Fusselman Dolomite, which forms the bulk of the hills in the southern part of Mahoney Park, is well exposed, but faulting complicates stratigraphic relationships (Figs. 3 and 4) and no complete section can be measured. Detailed comparison of six alternating dark- and light-gray Fusselman units in Mahoney Park with the complete Fusselman section at Gym Peak (Table 1) shows that the 1,387 ft of Fusselman measured by Kelley and Bogart (1952) includes repeated and faulted strata, as stated by Kottlowski (1957). Breccia zones along some thrust faults are up to 100 ft thick and contain chaotic mixtures of several Fusselman and Montoya rock types. Two slabs of the Cutter Member up to 60 ft thick and several hundred feet long appear to be interbedded with the Fusselman Dolomite due to tectonic emplacement.

The basal part of the lower dark-gray member of the Fusselman consists of about 65 ft of massive, dark-gray, medium-crystalline dolomite with scattered, silicified solitary cup corals and *Halysites* chain corals. Locally, one to three zones of long, thin solitary corals have not been silicified, but dolomitization has obliterated internal structure. The middle part of the lower dark-gray member is a distinctive, laminated dolomite with alternating light and dark layers resembling varves, and one or two zones of light-gray, long, narrow, solitary coral fragments near the base of the laminated sequence. The upper 65–75 ft is medium- to thick-bedded, dark-gray to black dolomite. The uppermost beds form a unit consisting of medium- to dark-gray dolomite with abundant silicified *Favosites* and *Halysites* colonial corals. Chert nodules and lenses in this top unit are mostly masses of these corals.

The lower light-gray member is thick- to massive-bedded, medium-gray, medium- to coarse-crystalline dolomite. Locally, small vugs are common and are elongated parallel to the bedding. A thickness of 120 ft was measured in sec. 34, T. 25 S., R. 8 W., but the top is eliminated by a thrust fault. A thickness of 235 ft was measured in the southeast corner of sec. 27, T. 25 S., R. 8 W.; the top is faulted.

The middle dark-gray member is thick- to massive-bedded, dark-gray to black, medium- to coarse-crystalline dolomite. A zone of abundant, silicified, long, slender, solitary corals is present near the base just northeast of the intersection of secs. 3 and 4, T. 26 S., R. 8 W., and sec. 34, T. 25 S., R. 8 W. This unit is extensively involved in thrust faulting in the Mahoney Park area; a minimum thickness of 100 ft is estimated.

The middle light-gray member is medium- to massive-bedded, mostly light- to medium-gray, coarse-crystalline dolomite with up to 10% of the total thickness consisting of sporadically interbedded medium-gray dolomite. It contains few scattered, silicified *Halysites* and closely resembles the lower light-gray member except that it weathers slightly lighter gray than the lower member. A maximum thickness of unfaulted section in Mahoney Park is about 280 ft, which is less than half of the thickness measured south of Gym Peak.

The upper dark-gray member, which is 160 ft thick, is thin- to medium-bedded, coarse-crystalline dolomite. The lower 60 ft is dark gray, with the top 10 ft laminated similarly to the middle part of the lower dark-gray member. The upper 100 ft is medium gray to medium dark gray with a distinctive bed of *Syringopora*-like corals at its base.

The upper light-gray member is thick- to massive-bedded, light medium-gray to light-gray, medium- to coarse-crystalline dolomite. Its basal beds contain a distinctive 1–2 ft sandy zone. The upper 10 ft contains abundant, large, light-gray chert nodules. Parts of this member are repeated several times by small thrust faults adjacent to the south Florida Mountains fault.

PERCHA SHALE (*Dp*)—Percha Shale is present, but poorly exposed, in south-central sec. 35, T. 25 S., R. 8 W. It is chiefly part of a tectonic breccia separating Fusselman (below) from El Paso (above) and is composed of olive-gray to dark-gray shale but is exposed only in prospect pits.

RANCHERIA FORMATION (*Mr*)—Laudon and Bowsher (1949) proposed the name "Rancheria Formation" for Rancheria Peak in the Hueco Mountains of west Texas and designated a type section in the Franklin Mountains, east of Vinton, Texas. Darton (1916, 1917b) used the name Lake Valley for Mississippian strata in mapping the Deming Folio, but did not recognize their occurrence in the Florida Mountains; Darton instead included the Mississippian beds as part of his Gym Limestone. Bogart (1953) recognized the occurrence of Mississippian rocks that he assigned, based on Mississippian-age fossils and lithologic similarity, to the Andrecito Member of the Lake Valley Formation. Kottlowski (1958, 1963) noted that the Mississippian in the Florida Mountains is similar lithologically to the Rancheria Formation, and Armstrong and Mamet (1978) referred to these Mississippian rocks as Rancheria.

Approximately 100 ft of thin-bedded, interbedded limestone and chert exposed as a small klippe in the extreme southwest corner of sec. 36, T. 25 S., R. 8 W., is tentatively assigned to the Rancheria Formation. The carbonate beds are silty micrite, pelneosparite, bioneosparite, and minor spicular biomicrite (mudstone, wackestone). They are lithologically very similar to the Rancheria south of Gym Peak (Clemons and Brown, 1983). One small exposure of a crinoidal biosparite (packstone) at the northern edge of the outcrop resembles the Hachita Formation in the Klondike Hills. Extensive faulting prevents determination of its stratigraphic relation to the remainder of the Rancheria.

Mesozoic(?)–Cenozoic rocks

LOBO FORMATION (*TKl*)—The Lobo Formation was named by Darton (1916) for the type locality at Lobo Draw in the northwest Gym Peak quadrangle. Darton (1917b) also mapped the Lobo Formation in the Cooke's Range, Fluorite Ridge, and later in the Victorio Mountains (Darton, 1928). Jicha (1954) and Kottlowski (1958, 1963) recognized that the Lobo of the Cooke's Range was Abo Formation (Permian). The Fluorite Ridge section was reassigned by Clemons (1982c) also as Abo Formation because of proximity and similarity to the outcrops in the Cooke's Range. Lemley (1982) concluded that the Victorio Mountains section is not correlative with the Lobo Formation in the Florida Mountains and thus, the Lobo is restricted in known occurrence to the Florida Mountains area. It probably is present in the subsurface of adjacent areas.

The Lobo Formation crops out in the northeast corner of the quadrangle as part of a continuous outcrop band from Capitol Dome to the north (Clemons, 1984), over the crest of the Florida Mountains, to Lobo Draw to the east (Clemons and Brown, 1983). Its thickness ranges from less than 200 ft on the crest to 512 ft in Lobo Draw and 607 ft at Capitol Dome (Lemley, 1982), primarily due to the irregular topography upon which it was deposited.

The Lobo, which rests on Precambrian quartz syenite, syenite, and hornfels xenoliths, is overlain by Rubio Peak Formation volcaniclastic rocks of late Eocene age. Basal-channel conglomerates contain abundant limestone, chert, sandstone, and syenite clasts. Above the basal unit, the Lobo is thin- to medium-bedded, light-gray, calcareous siltstone and sandstone interbedded with yellowish-brown mudstone and sandstone, red mudstone, and pebble conglomerates. The lower beds are very coarse grained and arkosic, reflecting derivation from the underlying quartz syenite. The section shows a general fining-upward sequence in which siltstones and interbedded fine sandstones increase in abundance towards the top of the section, with a cap of massive, silty micrite. No fossils were found in the section, but a few small vertical burrows (1 cm in diameter) are present.

Darton (1916) tentatively assigned the Lobo a Triassic age. Kottlowski (1958) and Kottlowski and Foster (1962) believed that the type Lobo is probably of Early Cretaceous age. Griswold (1961) concurred with the Early Cretaceous age and Hayes (1975) referred to the Lobo as Cretaceous in age. Dane and Bachman (1965) considered the Lobo to be Early Cretaceous(?) or Tertiary(?) as did Corbitt (1971, 1974), although he favored a Tertiary designation. Clemons (1984) and Clemons and Brown (1983) consider the Lobo Formation in the Florida Mountains to be of Late Cretaceous–early Tertiary age. Lemley (1982) interpreted the Lobo Formation as a non-marine, syntectonic, clastic wedge that was deposited in response to Laramide deformation in the Florida Mountains. This interpretation is supported by the following field observations: 1) in the southeast Florida Mountains, Lobo rests unconformably on Permian Hueco strata that were homoclinally tilted, probably during early Laramide deformation; 2) clast composition trends in the Lobo reflect unroofing of uplifted Precambrian and Paleozoic rocks; 3) basal Lobo in the northern Florida Mountains contains clasts of sparry calcite veins that probably formed during Laramide deformation; 4) Lobo Formation conglomerates are displaced by the south Florida Mountains reverse fault, and thin-bedded shales and siltstones of Lobo near Capitol Dome are undeformed, whereas underlying Paleozoic beds are intensely deformed, presumably by Laramide stresses. Lemley (1982) reported an early Tertiary paleomagnetic assignment for a few samples collected from the Lobo at Capitol Dome.

RUBIO PEAK FORMATION (*Trp*)—Volcanic arenites assigned to the Rubio Peak Formation form the high, rugged crest of the Florida Mountains in the northeast corner of the South Peak quadrangle and the northwest corner of Gym Peak quadrangle. Approximately 1,600 ft of conglomerates, sandstones, and tuffaceous breccias rest unconformably on the Lobo Formation. The angular unconformity is represented in the South Peak quadrangle by a poorly indurated basal Rubio Peak boulder conglomerate lying on slightly channeled Lobo red mudstone. Rubio Peak rocks consist predominantly of material derived from andesitic to dacitic tuffs and lavas, with lesser amounts of basalt clasts. The beds are chiefly fluvial, but laharic and talus(?) deposits are common in the lower part.

The basal conglomerate is composed of subangular to well-rounded clasts, up to boulder size, of limestones, cherty limestones, dolomite, Bliss Sandstone, granite, syenite, and volcanic rocks in a tuffaceous, sandy matrix. The conglomerate is overlain by a thick sequence of interbedded sandstones and polylithic breccia, with volcanic clasts up to several feet in size. Bedding is commonly thick to massive and in many places obscure. Clast size decreases upward through the sequence so that the upper beds are fine- to medium-grained sandstones with a few interbedded pebble conglomerates. The sandstones are intensely propylitized, very poorly sorted, plagioclase-rich volcanic arenites with microcrystalline quartz cement. Epidote alteration is common throughout the Rubio Peak sequence.

Darton (1916, 1917b), Lochman-Balk (1958), and Corbitt (1971) mapped these rocks as Tertiary volcanic agglomerate. Clemons (1982a) tentatively correlated them with the informally named Starvation Draw member of the Rubio Peak Formation in the Massacre Peak quadrangle, about 20 mi north of the Florida Mountains. Evidence obtained while mapping the Florida Mountains and current study of the Lobo Formation by Greg Mack (oral communication, 1983) indicate that the Starvation Draw member in the Massacre Peak quadrangle and the Lobo Formation in the Florida Mountains are probably correlative. Both units were deposited in response to, and adjacent to, Laramide uplifts. Clast lithology in both units reflects unroofing of fault blocks, and sediment-size distributions indicate fining-upward and -basinward sequences. Volcanic detritus are absent in the basal beds but present in the upper parts of both the Lobo Formation and Starvation Draw member. Therefore, usage of the name Starvation Draw member should be dropped.

DIKES (*Ta, Tr*)—Basaltic-andesite, hornblende andesite-latite, and very light gray rhyolite dikes intrude Rubio Peak and older rocks in the northeast part of the quadrangle. Most of the dikes and small, plug-like rock bodies have been altered. Plagioclase is sericitized and saussuritized; hornblende(?) is replaced by chlorite, carbonate, epidote, and quartz. The rhyolite is aphanitic holocrystalline and is composed of orthoclase and quartz with minor muscovite, magnetite, and pyrite. Manganese-oxide coatings are pervasive on fracture surfaces.

The andesite and rhyolite dikes have predominant east and northeasterly trends. They are typically 4–8 ft thick, but pinch and swell from zero to as much as 20 ft. Apparently, they intruded en echelon fractures and faults. Rhyolite dikes are more abundant in the mountains due east of White Hills (Fig. 4) and probably connect in the subsurface to the same source material as the small rhyolite plugs that form White Hills near the north-central edge of the quadrangle.

The basaltic-andesite dikes have not been dated, but are thought to be probably correlative with youngest Rubio Peak Formation rocks (about 37 m.y.). A feldspar concentrate from rhyolite from White Hills yielded a K-Ar age of 29.1 ± 1.3 m.y.

MIMBRES FORMATION (*QTm and Qm*)—An informal name is used for this formation until current mapping projects in the Mimbres Basin are completed (Clemons, 1982a). The formation is part of a unit that has been previously mapped as Gila Group. The piedmont-slope facies of the Mimbres formation is composed of mostly alluvial-fan and coalescent-fan deposits, and includes thin, colluvial veneers on pediment surfaces. *Qm* is correlative with the Camp Rice Formation piedmont facies (Seager and Hawley, 1973) in south-central New Mexico and *Qlp* in part of southwest New Mexico (Seager and others, 1982). *QTm* is correlative in part with the basal Camp Rice Formation but includes some Pliocene-age strata. Remnants of colluvial veneers and well-developed alluvial fans cemented with caliche are present in the southeast and northeast parts of the quadrangle.

QUATERNARY ALLUVIUM—The geology of the western half of the South Peak quadrangle was in large part interpreted from aerial photographs and maps with soil descriptions in the Soil Survey of Luna County, New Mexico (Neher and Buchanan, 1980).

Older piedmont-slope alluvium (*Qpo*) is similar in composition to the Mimbres formation piedmont-slope facies in that it invariably reflects the lithology of local source areas. It includes arroyo-terrace and fan deposits and thin (less than 10 ft) veneers on erosional surfaces, generally of late Pleistocene age. Thin soil horizons and weak soil-carbonate accumulations are present in most sections. Arroyo-channel, terrace, and fan deposits associated with modern arroyos (*Qpy*) range in age from late Wisconsinan to the present (less than 25,000 yrs B.P.). These and the late Pleistocene deposits are the products of repeated episodes of arroyo-valley and partial backfilling (Seager and others, 1975). Zones of soil-carbonate accumulation are weak or absent in the Holocene (less than 10,000 yrs B.P.) deposits. An undifferentiated piedmont unit (*Qpa*) is used in areas where *Qpo* and *Qpy* deposits did not warrant mapping separately.

Colluvial and alluvial deposits (*Qca*) have been mapped on a few slopes in Mahoney Park, where they form a relatively continuous cover on older units. These deposits are generally less than 10 ft thick, and as expected, reflect the lithology of nearby higher slopes and ledges. Most of the mapping unit is an age equivalent of older and younger piedmont-slope alluvium (*Qpo* and *Qpy*). Locally, *Qca* may correlate with the younger piedmont-slope facies of the Mimbres formation (*Qm*).

Basin-floor sediments (*Qbfo* and *Qbfy*) cover an extensive area to the west of the South Peak quadrangle and extend into the western part of the quadrangle. They include loamy to clayey alluvium deposited by distributaries of the Mimbres River and the Florida Mountain arroyos in an area essentially unaffected by arroyo incision. The deposits are typically void of gravel, but sporadic, intertonguing gravelly lenses were deposited by flooded arroyos from the Florida Mountains as well as ancient Mimbres River floods. These units are approximately correlative with *Qpo* and *Qpy*, respectively.

Eolian sand (*Qs*) covers a long, narrow area along the margin of the piedmont slope and basin floor west and southwest of the mountains. The dunes are generally less than 10 ft high and most are somewhat stabilized by desert vegetation. Nearby exposures generally warrant using a double map symbol to indicate the underlying unit, such as *Qs/Qpa*.

STRUCTURAL GEOLOGY

South Florida Mountains fault

The most prominent structural feature in the quadrangle is the south Florida Mountains reverse fault that may have right-lateral displacement. Darton (1917b) described this fault as a thrust dipping 40–70° S. and displacing granite upon the upper beds of his Gym Limestone. Corbitt (1971, 1974) noted that this northwest-trending, steeply dipping, reverse fault is steep at deep structural levels but flattens abruptly upward. This appears to be true in Mahoney Park but close scrutiny of the fault zone in the northern part of sec. 3, T. 26 S., R. 8 W. indicates that this is more likely an illusion. Although the main fault is difficult to locate precisely in the massive, brecciated granite, it probably maintains a N. 80° W. strike through this area, with southerly dips of 65–80°. The apparent flattening to 18° between the granite and the Fusselman is actually on a small subsidiary thrust plate (Fig. 3). This is instantly seen, and is a much more striking feature than the thoroughly brecciated granite in the slopes to the south and southeast. After removal of Basin and Range northeast tilting of about 20–25°, the south Florida Mountains fault strikes N. 50° W. and is close to vertical.

The south Florida Mountains fault places Precambrian alkali-feldspar granite against various Paleozoic formations and Precambrian quartz alkali-feldspar syenite. Several other secondary reverse(?) faults that probably resulted in imbrication are located southwest of the main fault within Precambrian granite. Amount of displacement on these faults is unknown. Clemons and Brown (1983) assign the thickness of the Paleozoic section (4,100 ft) as a minimum stratigraphic separation on the south Florida Mountains fault. W. R. Seager (oral communication, 1982) pointed out that some field relations indicate that there may have been significant right-lateral movement on the south Florida Mountains fault. Early Paleozoic beds east and south of Gym Peak (Clemons and Brown, 1983) show a continuous change in strike from nearly due north, 2 mi northeast of the fault, to due east adjacent to the fault. A similar relationship in bedding attitudes in Mahoney Park suggests that the change in strike may have been caused by drag as the north block moved eastward relative to the south block. Petrographic study of about 250 thin sections (Clemons, 1982b; table 1) suggests that the Precambrian syenite and quartz syenite north (down) of the fault and granite and quartz syenite south (up) of the fault are consanguineous. Both syenites and granites contain abundant mafic xenoliths. The overall relation is more easily explained by lateral movement on the fault than by only vertical uplifting that juxtaposed the granite with syenite of the same pluton.

TABLE 2—Modal analyses of plutonic rocks (part 1) and hornfelses (part 2) in South Peak quadrangle (**Qz**, quartz; **Kf**, alkali feldspars; **Pl**, plagioclase (An > 5); **Bi**, biotite; **Am**, amphibole; **Al**, alteration minerals: chlorite, epidote, iron oxides, carbonates; **Ac**, accessory minerals: magnetite, zircon, apatite; **Py**, pyroxene; **Ol** olivine).

Part 1

Sample no.	Qz	Kf	Pl	Bi	Am	Al	Ac	Name
82-140	33	59				7	1	Aplite
82-142	33	37	27		2		1	Aplite
82-144	35	58		tr	3	1	3	Aplite
82-148	31	69			tr	tr	tr	Aplite
82-154	23	71			3	1	2	Aplite
82-155	21	79			tr	tr	tr	Aplite
82-250	28	66			4	2	tr	Aplite
82-252	27	70			2	1	tr	Aplite
82-261	23	74			2		1	Aplite
82-268	33	63			1	2	1	Aplite
82-283	21	60			17	2		Aplite
82-345	24	67			5	1	3	Aplite
82-347	30	65			1	2	2	Aplite
81- 85	23	65				12	tr	Granite
81- 86	28	63				9	tr	Granite
82-143	22	70			7	1	tr	Granite
82-147	20	73			7		tr	Granite
81-235	28	65			7	tr	tr	Granite
82-248	26	67			6	1	tr	Granite
82-258	27	67			1	4	1	Granite
82-259	37	59			2	2	tr	Granite
82-263	30	67			tr	3	tr	Granite
82-267	35	61			1	2	1	Granite
82-270	28	67			3	1	1	Granite
82-272	29	70			1		tr	Granite
82-273	20	78			2		tr	Granite
82-275	21	70			8	tr	1	Granite
82-276	29	64			6	1	tr	Granite
82-277	22	72			5	1	tr	Granite
82-278	28	61			10		1	Granite
82-279	32	62				3	3	Granite
82-280	23	72			5		tr	Granite
82-285	31	66			3		tr	Granite
82-290	38	59			1	2	tr	Granite
82-291	33	59				7	1	Granite
82-294	21	66			11	1	1	Granite
82-296	36	61				2	1	Granite
82-300	23	73				4	tr	Granite
82-346	27	62			10	1	tr	Granite
82-348	20	76			2	2	tr	Granite
82-350	27	70			1	2	tr	Granite
81- 57	5	87			7		1	Quartz syenite
81- 84	19	66				15	tr	Quartz syenite
81- 87	16	76			8		tr	Quartz syenite
82-165	5	87			7	1	tr	Quartz syenite
81-236	17	83					tr	Quartz syenite
82-257	15	80			4	tr	1	Quartz syenite
81- 59	3	92			4		1	Syenite
81- 64	4	73			7	15	1	Syenite
82-156	1	91			6	2	tr	Syenite
82-157	2	92			5	1	tr	Syenite
82-158	tr	89			9	1	1	Syenite
82-159	2	88			9	1	tr	Syenite
82-160	4	92			3	1	tr	Syenite
82-161	4	92			3	1	tr	Syenite
82-162	tr	83		4	9	2	2	Syenite
FM4- 2	2	83		2	7	4	2	Syenite
FM4- 9	2	80		3	12		3	Syenite
FM4-11	1	93		1	4		1	Syenite
FM4-16	1	90		1	6	1	1	Syenite
FM4-20	1	86		2	5	5	1	Syenite
82-164		84		3	2	10	1	Syenite
82-166	2	89		1	6	2	tr	Syenite
82-249	2	90			2	5	1	Syenite
82-251	3	89			6	tr	2	Syenite
82-256	2	89			7	1	1	Syenite
82-262	11	36	37		8	3	5	Quartz monzonite
82-284	5	43	31		16	3	2	Quartz monzonite
82-295	1	17	51		27	tr	4	Monzodiorite

Part 2

Sample no.	Pl	Bi	Am	Py	Ol	Al	Ac	Name
81- 60	47					53		Hornblende hornfels
81- 61	57	2	6			35		Hornblende hornfels
81- 62	30	1	21	17		22	9	Pyroxene hornfels
82-141	61		32			1	6	Hornblende hornfels
82-145	44	6	40	4		1	5	Hornblende hornfels
82-146	60		31			6	3	Hornblende hornfels
82-149	59		36	2			3	Hornblende hornfels
82-152	51	3	36	4		2	4	Hornblende hornfels
82-153	46	9	38			1	6	Hornblende hornfels
82-260	56	1	33			7	3	Hornblende hornfels
82-265	64	tr	25	1		5	5	Hornblende hornfels
82-269	41	1	54			2	2	Hornblende hornfels
82-271	44		49			2	5	Hornblende hornfels
82-281	43	11	34	9		1	2	Hornblende hornfels
82-282	43	13	28	7		7	2	Hornblende hornfels
82-293	45	1	46	2		2	4	Hornblende hornfels
82-344	62	17	8	9		2	2	Hornblende hornfels
82-351	46	2	45			1	6	Hornblende hornfels
82-274	33	19	22	7	14	1	4	Pyroxene hornfels
82-286	21	9	42	11	13	1	3	Pyroxene hornfels

The south Florida Mountains fault cuts rocks as young as Lobo Formation (Late Cretaceous–early Tertiary) in the southeast Florida Mountains (Clemons and Brown, 1983). South of the fault (in SE¼ sec. 2, T. 26 S., R. 8 W., Gym Peak quadrangle) a small outcrop of Lobo Formation or Rubio Peak Formation rests nonconformably on the upthrown Precambrian granite block. Additional study is being conducted to determine the stratigraphic unit to which this outcrop belongs in order to better understand the timing and magnitude of movement on the south Florida Mountains fault. Relations between the south and west Florida Mountains faults and regional tectonic features are shown in Fig. 5.

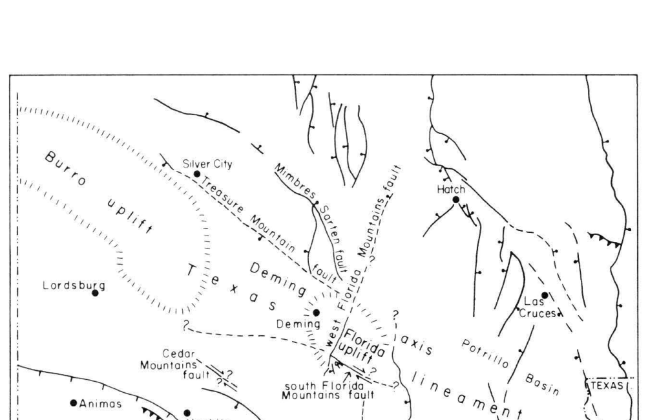

FIGURE 5—Map of southwest New Mexico showing some tectonic features.

Thrust faults

Numerous small thrust faults that formed penecontemporaneously with the south Florida Mountains fault displace Precambrian and lower Paleozoic rocks south of Mahoney Park (Fig. 6). Most of these faults involve intensely deformed, locally brecciated, complex sheets that placed younger strata over older rocks, but locally older rocks were placed over younger rocks (Fig. 3). Large slabs of Cutter limestone-dolomite lie within thrust-faulted Fusselman Dolomite in the SE¼ sec. 34, T. 25 S., R. 8 W. Many of the thrust faults can only be mapped with confidence by using a map scale large enough to plot offsets of the six Fusselman Dolomite units.

Several of the thrust faults were probably once continuous with the Victorio, Gym Peak, and Mahoney thrusts mapped to the east by Brown (1982) and Clemons and Brown (1983). Brown mapped the Gym Peak thrust under klippen of Rancheria and El Paso rocks near the intersection of secs. 35 and 36, T. 25 S., R. 8 W. and sec. 2, T. 26 S., R. 8 W. This is probably the same thrust that continues northwestward as the northernmost fault exposed in Mahoney Park (Fig. 4).

Normal faults

The Florida Mountains block has been uplifted and tilted northeastward about 23° since deposition of late Eocene Rubio Peak strata. Most of this movement is assigned to the west Florida Mountains fault that is buried by alluvium in the north-central South Peak quadrangle but exposed in the Capitol Dome quadrangle to the north (Clemons, 1984). This range-bounding, high-angle normal fault probably was activated during the Miocene (post-29 m.y., White Hills rhyolite) and remained active, at least intermittently, into Pleistocene time, as evidenced by offset of pediment units in the Capitol Dome quadrangle. Total vertical displacement on the west Florida Mountains fault is estimated to be about 4,000 ft. This fault may continue southward and swing southeastward between the Florida and Tres Hermanas Mountains, or intersect another northwest-trending fault to the south.

Several smaller, northerly trending normal faults transect the west ends of ridges south of Mahoney Park. They are all down-to-the west faults and probably part of the Basin-and-Range system of faults that formed contemporaneously with the west Florida Mountains fault. Small easterly trending normal faults in the thrust-faulted complex are believed to be related to megabrecciation during thrusting adjacent to the south Florida Mountains fault.

ECONOMIC GEOLOGY

Plutonic and volcaniclastic rocks in the Florida Mountains have undergone regnant hydrothermal alteration. Unaltered mafic minerals in the syenites and granites are rare. The entire Rubio Peak sequence has been intensely propylitized, and epidote concretions up to 12 inches in diameter are abundant. Joints and fractures in the Paleozoic rocks and Lobo Formation are locally coated with epidote and other secondary minerals. Syenites beneath horizontal or nearly horizontal aplite dikes are much more altered than the aplites or syenites above the dikes. This may have resulted from damming of ascending hydrothermal fluids beneath the less porous aplites. Petrographic study of the plutonic rocks shows that microscopic as well as megascopic breccia veins are abundant. These veins typically contain iron oxides, carbonate, fluorite, and locally some pyrite and chalcopyrite.

No work has been done on the paragenesis of the ore deposits in the Florida Mountains. Age of the mineralization is unknown but believed to be post-Eocene because of extensive alteration in the Rubio Peak rocks. The hydrothermal fluids could have been associated with the rhyolite dikes that cross the range (29.1 m.y.), the Little Florida Mountains rhyolite (23.6 m.y.), the Little Florida Mountains dacite (post-23.6 m.y.), or a monzonitic rock that forms small, poorly exposed outcrops in the western Gym Peak quadrangle. This monzonitic rock is referred to as fine-grained diorite (andesite) by Clemons and Brown (1983). Alteration of the feldspars prevents precise classification. The monzonitic rock intrudes the Paleozoic rocks and is believed to be post-Laramide in age.

Although low-grade mineralization is widespread in the Florida Mountains, no significant deposits have been found in the South Peak quadrangle. The Park (Hilltop) mine is located in the SE¼ sec. 35, T. 25 S., R. 8 W. Griswold (1961) reported that A. J. Malin staked the Hilltop claim over the deposit in 1958, but most of the development had been done many years before. Thoroughly oxidized veins in Fusselman Dolomite contain dry bone smithsonite and minor cerussite. No production records are available, but the small dump indicates total production was no more than a few tons. Many small prospect pits in the Fusselman hills south of Mahoney Park were excavated along thin, irregular veins. Small amounts of galena were seen on a couple of dumps.

A small prospect in the small northwest-trending canyon in the NW¼ sec. 9, T. 26 S., R. 8 W. is in hornfels and granite. No ore minerals were seen, but probably traces of copper mineralization similar to the Stenson and Copper Queen mines to the north (Clemons, 1984) attracted prospectors. In general, propylitization is not as pervasive in the southern Florida Mountains as it is in the syenites to the north. Locally, the granite contains disseminated gossan zones.

Angelus No. 2 oil test with TD of 3,365 ft, reported by Kottlowski and others (1969, p. 191) in the NE¼ SE¼ sec. 8, T. 26 S., R. 8 W. is approximately ¼ mi southwest of the above described prospect. Examination of records at the New Mexico Bureau of Mines and Mineral Resources disclosed the existence of two Angelus No. 2 wells. The other one was only 180 ft deep and reported gravel to TD. I believe that this 180 ft hole was drilled about 1920(?) in search of mineralization in the granite under pediment gravels.

The New Mexico Highway Department periodically operates a crusher in a gravel quarry in SW¼ sec. 21, T. 26 S., R. 8 W. Similar alluvial gravels are abundant under caliche caps all around the southwest end of the Florida Mountains. Abandoned gravel pits near NM–11 have provided materials from unconsolidated arroyo distributary deposits.

Probably the chief and most valuable resources of the western South Peak quadrangle are its ground water and fertile soil in the southern Mimbres Basin. Darton's (1916) study of Luna County evaluated and documented the ground water and soil of the area. McLean (1977) made another study of the hydrology of the Mimbres Basin, and Neher and Buchanan (1980) made a soil survey of Luna County.

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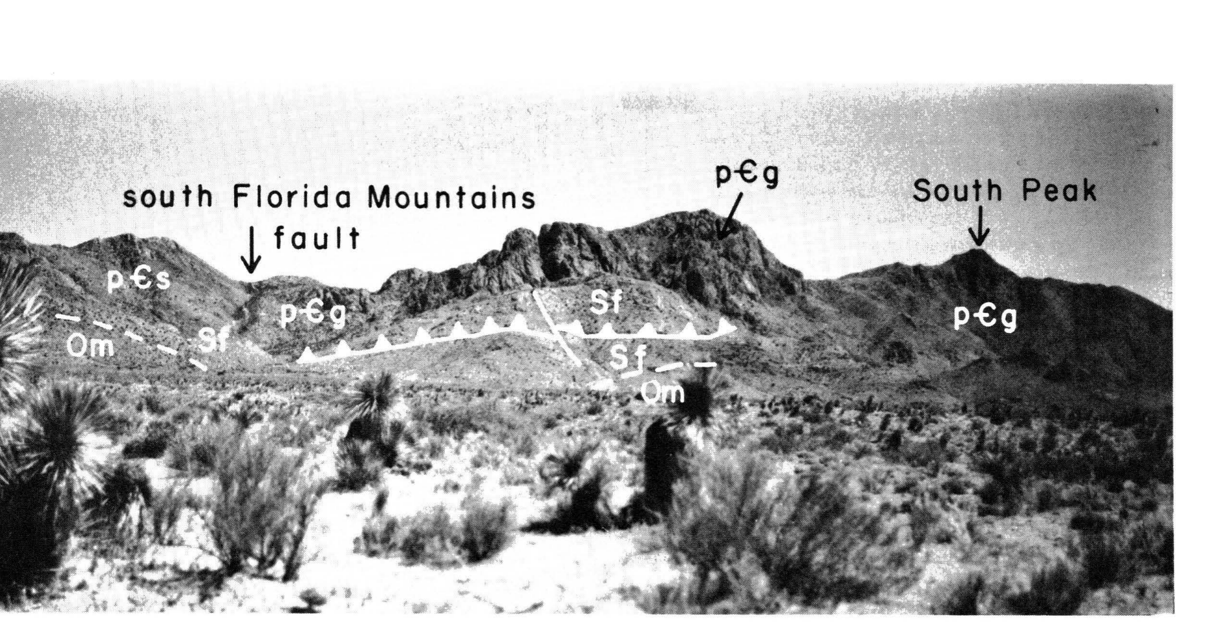

FIGURE 6—View to southeast from west side of Mahoney Park. One of several small thrust faults is shown in the hill in the foreground, and the south Florida Mountains fault is in the small canyon approximately parallel with the road to the Mahoney mines. Units exposed are: *p€g*—Precambrian granite, *p€s*—Precambrian syenite, *Om*—Montoya Formation, *Sf*—Fusselman Dolomite.