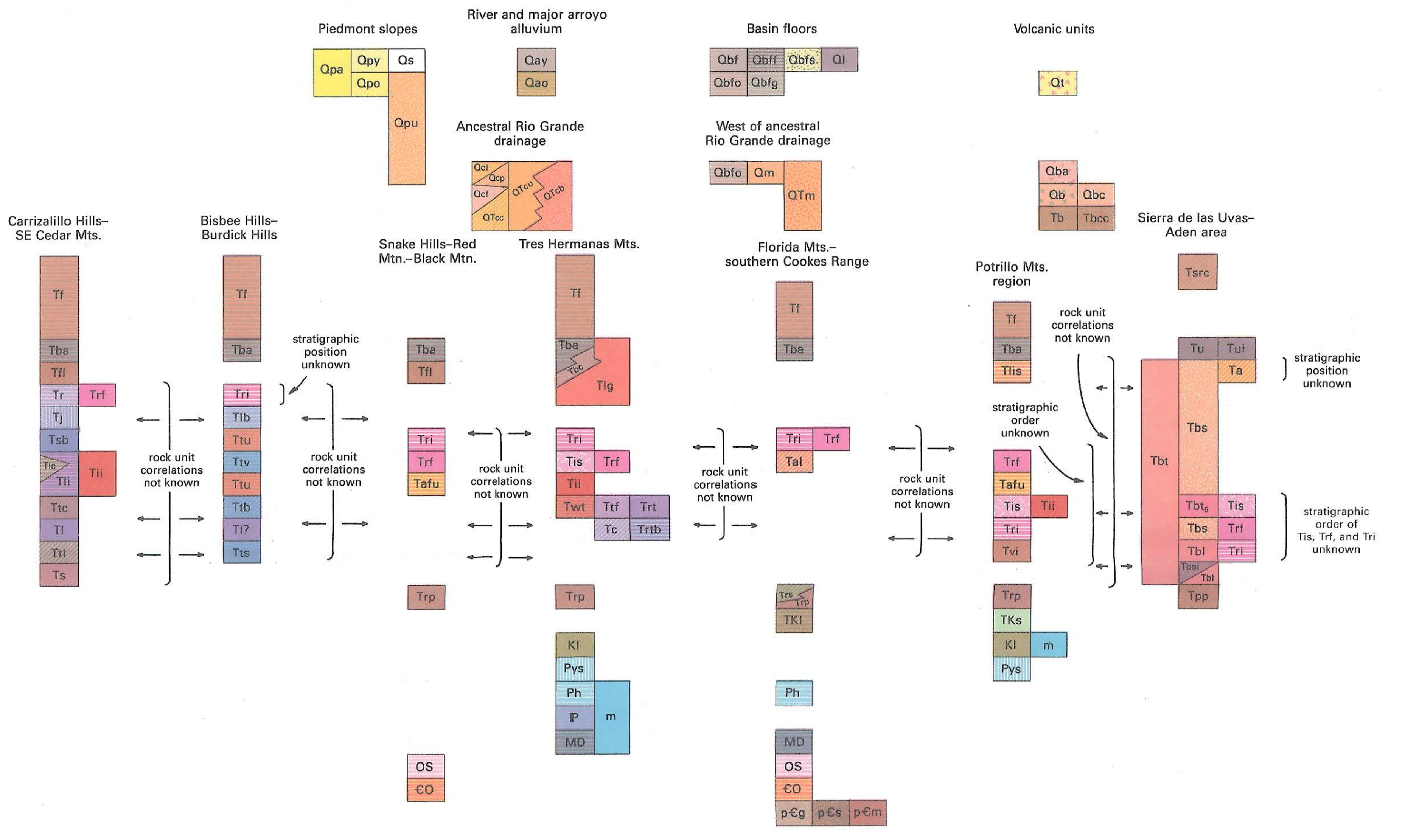
NEW MEXICO BUREAU OF MINES & MINERAL RESOURCES   A DIVISION OF   NEW MEXICO INSTITUTE OF MINING & TECHNOLOGY

CORRELATION OF UNITS

Latest Pleistocene to Holocene	<15,000 yrs.
Late Pleistocene	0.4 m.y.–15,000 yrs.
Early to middle Pleistocene	2.0–0.4 m.y.
Pliocene	5–2 m.y.
Miocene	26–5 m.y.
Late Oligocene	29–26 m.y.
Early to middle Oligocene	38–29 m.y.
Late Eocene–early Oligocene	43–36 m.y.
Late Cretaceous–early Tertiary	
Early Cretaceous	
Permian	Middle
	Early
Pennsylvanian	
Mississippian (M) and Devonian (D)	
Ordovician–Silurian	
Cambrian–Ordovician	
Precambrian–Cambrian	



DESCRIPTION OF UNITS

* indicates chemical analyses listed in Table 1

Qpy	**Younger piedmont-slope deposits**—Unconsolidated sand, gravel, and loamy sediments of drainageways that cross and are inset below or bury older piedmont surfaces and of fans constructed on distal piedmont slopes at lower end of such drainageways; as much as 15 ft (4.5 m) thick
Qay	**Younger axial river and major basin-floor arroyo deposits**—Axial river deposits of major streams (Mimbres, Macho) and major arroyos that cross basin floors (Seventysix Draw); mostly gravel and sand in stream systems and silt, fine sand, and clay in arroyo systems on basin floor; 25 ft (8 m) thick or less
Qbf	**Basin-floor deposits**—Generally undissected loam, silt, or clay of alluvial flats or low-gradient (<25 ft/mi) fans on topographic depressions, on basin floors, or at mouths of major river or arroyo systems; unit may include some sediment of middle Pleistocene age; as much as 15 ft (4.5 m) thick
Qbff	**Basin-floor, fluvial-fan deposits of Mimbres River, fine-grained facies**—Loam, silt, and clay of interdistributary "flats"; contains variable amounts of gravel and grades downward into gravel and sand lenses almost everywhere; weak saline soil is generally present in upper horizons; approximately 20–25 ft (6–8 m) thick
Qbfs	**Basin-floor, fluvial-fan deposits of Mimbres River, sand and gravel facies**—Sand and fine to medium gravel of distributary channels that cross fluvial plains and fans and that stand 2–3 ft (0.6–1 m) above the interfluve lowlands; generally less than 5 ft (1.5 m) thick, but unit grades downward into a complex sheet of intertonguing *Qbff* and *Qbfs* that is 20–25 ft (6–8 m) thick
Ql	**Playa deposits**—Loam, silt, and clay of small, nonalkaline playa lakes and depressions; as much as 15 ft (4.5 m) thick
Qs	**Eolian deposits**—Dunes and irregular hummocks of quartz sand, especially extensive on the western piedmont slopes of the West Potrillo and East Potrillo Mountains. The sand is derived largely from *Qbfs* and *Qbff* and from basin-floor facies of the Camp Rice Formation (*QTcb*); the symbol *Qs/Qb* or *Qs/Qcp* etc. shows the rock unit that the sand has buried; as much as 10 ft (3 m) thick
Qpu	**Older piedmont-slope deposits (*Qpo*) and correlative Camp Rice Formation, piedmont-slope facies (*Qcp*) and Mimbres Formation, younger piedmont-slope deposits (*Qm*), undifferentiated**
Qpo	**Older piedmont-slope deposits**—Fan and terrace deposits and erosion-surface veneers on piedmont slopes graded to Pleistocene closed-basin floors; mostly weakly consolidated gravel and sandy gravel grading downslope to gravelly loam; thin surficial and buried horizons of soil-carbonate and clay accumulation; gravelly carbonate horizons are commonly indurated and form thin pedogenic carbonate; at least two generations of *Qpo* fans are generally present; as much as 50 ft (15 m) thick
Qpa	**Younger (*Qpy*) and older (*Qpo*) piedmont-slope deposits**
Qao	**Older axial river deposits**—Mostly gravel and sand interbedded with sheets of pink and pale-orange basin-floor loam, silt, and clay; moderate to strong soil carbonate in gravelly zones, less strong in fine-grained facies; as much as 20 ft (6 m) thick
Qbfo	**Older basin-floor deposits**—Pink, tan, cream, and pale-orange silt, loam, and fine sand on basin floors that are graded either to *Qpo* (upper Pleistocene) or *Qm* (middle Pleistocene) piedmont slopes; soil carbonate is moderate to strong, and locally calcrete, a few feet thick, may have developed; as much as 200 ft (61 m) thick
Qbfg	**Older gypsiferous basin-floor deposits**—Light-gray to cream gypsiferous loam and silt locally with gray gypcrete soil; developed only locally in Seventysix Draw drainage; as much as 20 ft (6 m) exposed
Qt	**Maar-rim tuff and breccia**—Crossbedded juvenile basaltic lapilli, accretionary lapilli, and disaggregated sand and silt from the Camp Rice Formation on the rims of Potrillo, Mt. Riley, and Malpais maars; upper mantle and lower crustal xenoliths as well as fragments of upper crust conglomerate, limestone, and volcanic rocks compose a significant part of the Potrillo maar deposit; as much as 50 ft (15 m) thick; K–Ar radiometric age from associated Potrillo maar basalt of 0.18 ± 0.03 Ma (Seager et al., 1984) contrasts with age of 24 ka for the similar Kilbourne Hole maar determined by comparative soil studies (Gile, 1987)
Qba	**Aden Basalt**—Alkali-olivine basalt flows associated with Aden volcano (crater); flows overlie La Mesa surface; K–Ar radiometric age of 0.53 ± 0.04 Ma (Seager et al., 1984) contrasts with ^{3}He surface-exposure ages from 15.7 ± 2 to 18.2 ± 3 ka (Anthony and Poths, 1992)
Qcl	**Camp Rice Formation, sediments associated with La Mesa surface**—Basin-floor sediments, the constructional top of which is La Mesa geomorphic surface (shown on geologic map with diagonal line pattern). Consists generally of sand, silt, loam, or clay deposited in fluvial, playa, and alluvial-flat environments; commonly reworked by wind; surficial-carbonate accumulation (K) and locally reddish-brown horizons of clay accumulation (Bt); carbonate horizons are commonly indurated, forming pedogenic calcrete zones as much as 5 ft (1.5 m) thick; unit overlain by veneer of *Qs* or locally by upper Quaternary playa or alluvial-flat deposits (*Ql, Qbf*); as much as 50 ft (15 m) exposed
Qcp	**Camp Rice Formation, piedmont-slope facies**—Deposits associated with piedmont slopes that grade into or interfinger with ancestral Rio Grande fluvial deposits (*Qcf*); weakly to moderately cemented boulder to cobble fan deposits and erosion-surface veneers near mountain fronts grading to gravelly silt, loam, or clay on distal piedmont slopes; surficial layers, as much as 10 ft (3 m) thick, usually have prominent horizons of soil-carbonate accumulation (K); gravelly carbonate horizons are commonly indurated, forming pedogenic calcrete zones as much as 5 ft (1.5 m) thick; generally less than 80 ft (24 m) thick
Qcf	**Camp Rice Formation, fluvial facies**—Gray to yellow sand, pebble to cobble conglomerate, calcite-cemented sandstone and conglomerate, and gray, green, or red loam to clay deposited by the ancestral Rio Grande; subrounded to angular siliceous pebbles derived from upstream sources are common; unit intertongues basinward with *Qcl* or *QTcb*, mountainward with *Qcp* and *QTcu*, and downward with *QTcc*. Across the Mesilla Basin and northern part of the West Potrillo Mountains the constructional top of *Qcf* is La Mesa surface (shown on geologic map with diagonal lines); generally 100 ft (30 m) thick or less in map area; paleomagnetic and radiometric age determinations range from 0.73 to 3.4 Ma (Strain, 1980; Gile et al., 1981; Seager et al., 1984; Mack et al., 1993)
QTcc	**Camp Rice Formation, fanglomerate facies**—Calcite-cemented, brown to reddish-brown fanglomerate and conglomerate underlying *Qcp* or *Qcf*; mapped in most places with *Qcp* and included in *QTcu* map unit; at least 50 ft (15 m) exposed, probably much thicker in subsurface
QTcu	**Camp Rice Formation, piedmont-slope deposits, undifferentiated**—Camp Rice Formation, piedmont-slope facies (*Qcp*) and Camp Rice Formation, fanglomerate facies (*QTcc*), undivided
QTcb	**Camp Rice Formation, basin-floor deposits, undifferentiated**—Includes *Qcl* strata as well as somewhat older basin-floor sediments exposed in Camel Mountain escarpment; the older strata consist of yellow, tan, and pale-orange, moderately cemented sandstone and siltstone and red to gray mudstone, largely of eolian and alluvial-flat origin, respectively; a thickness of approximately 100 ft (30 m) is present in Camel Mountain escarpment but is mostly covered by *Qs*
Qm	**Mimbres Formation, younger piedmont-slope deposits**—Boulder to cobble fan deposits and erosion-surface veneers near mountain fronts grading to gravelly silt, loam, or clay on piedmont toeslopes; weakly to moderately cemented; surficial gravelly layers generally contain pedogenic calcrete as much as 5 ft (1.5 m) thick, whereas finer-grained facies may have thick red clay Bt horizons; *Qm* is correlative with *Qcp* of the Camp Rice Formation, the *Qm* symbol used west of ancestral Rio Grande drainage systems; generally less than 50 ft (15 m) thick
QTm	**Mimbres Formation, piedmont-slope deposits, undifferentiated**—Unit includes *Qm* as well as older well-cemented conglomerate and fanglomerate that may be as old as late Pliocene; unit is correlative with *QTcu* of Camp Rice Formation; 50 ft (15 m) or more exposed, probably considerably thicker in subsurface
Qb Qbc	**Basalt of West Potrillo Mountains**—Alkali-olivine basalt flows (*Qb*) and cinder cones (*Qbc*); K–Ar radiometric age of 1.2 Ma from flow on northern edge of Potrillo maar (Seager et al., 1984)
Tb Tbcc	**Basalt flows, cones, and dikes**—Black to gray alkali-olivine basalt flows (*Tb*) and cinder cones (*Tbcc*) of southern Tres Hermanas region and northern Palomas volcanic field; radiometric ages of 5.2 ± 0.1, 3.9 ± 0.2, and 3.0 ± 0.07 Ma (Seager et al., 1984)
Tf	**Fanglomerate**—Brown to reddish-brown boulder conglomerate and breccia and tan, gray, or purplish-gray to maroon-gray conglomeratic sandstone, sandstone, and siltstone derived from a wide variety of local volcanic rocks and, near the East Potrillo Mountains, derived from Paleozoic or Cretaceous sedimentary rocks and Precambrian granite; well cemented in lower parts and moderately cemented in upper part; unit intertongues downward with *Tba*; tilted; broken by range-boundary faults; locally silicified along faults; correlative with bulk of the Gila Conglomerate and Santa Fe Group; at least 1,000 ft (300 m) thick
Tsrc	**Santa Fe Group, Rincon Valley Formation**—Reddish-brown to tan fanglomerate, conglomeratic sandstone, and sandstone of Sierra de las Uvas–Sleeping Lady Hills area; derived from a variety of local volcanic rocks; unconformably overlies *Tu*; tilted; faulted; at least 500 ft (152 m) thick (Clemons, 1976)
Tu Tui	**Uvas Basaltic Andesite**—Brown, gray, and black basaltic-andesite, hornblende-latite, and andesite flows; vesicular, amygdaloidal to dense with platy jointing; includes thin tongues of brown sandstone and conglomeratic sandstone; intrusive masses thought to be correlative with Uvas Basaltic Andesite flows are labeled *Tui*; 200–500 ft (61–152 m) thick; radiometric ages of 25.9 ± 1.5, 26.1 ± 1.4, and 27.4 ± 1.2 Ma (Clemons and Seager, 1973; Clemons, 1976, 1979)
Tba	**Basaltic andesite**—Brown, gray, red, and black tholeiite*, basaltic-andesite, latite, and andesite flows; vesicular, scoriaceous, amygdaloidal to dense with platy jointing; some glassy flows; local interbeds of brown sandstone, conglomerate, or conglomeratic sandstone; 100–500 ft (30–152 m) thick
Tfl	**Lower fanglomerate**—Gray to tan boulder conglomerate, tan tuffaceous sandstone and siltstone, and brown conglomeratic sandstone, consisting of a variety of local volcanic detritus; generally well cemented; probably correlative with "early Gila" strata; intertongues upward with *Tba* in the Cedar Mountains region; approximately 400 ft (122 m) thick
Tbc	**Basaltic-andesite conglomerate**—Brown to black basalt boulder conglomerate derived largely from *Tba*; poorly exposed in the Greasewood Hills where unit is associated with *Tba* and *Tlg*; 100 ft (30 m) or more thick
Tlis	**Intermediate- to silicic-composition lavas of West Potrillo Mountains**—Purple, maroon, and light- to medium-gray, porphyritic latite to dacite* flows; phenocrysts of sanidine, biotite, and plagioclase; local, well-developed flow banding; unit is probably correlative with latite and rhyolite of Greasewood Hills (*Tlg*); at least 500 ft (152 m) thick
Tlg	**Latite–rhyolite of Greasewood Hills**—Flow-banded to nearly massive, dense to vuggy rhyolite* to latite flows and intrusions(?); from medium- to dark-gray to purplish- or reddish-gray; slightly porphyritic; rocks of Midway Butte and Jog Tank Hill are probably correlative as is unit *Tlis* of the West Potrillo Mountains; age relationship of *Tlg* with *Tba* and *Tbc* in the Greasewood Hills is not clear; at least 300 ft (91 m) thick
Ta	**Andesite–latite flows**—Greenish-gray to brown andesite to latite flows; fine grained, aphyric to slightly porphyritic; only two outcrops at southwest end of Aden Hills; possibly correlative with *Tvi*; at least 300 ft (91 m) thick
Tal	**Andesite of Little Florida Mountains**—Medium-gray to brownish-gray flows and intrusions of andesite and dacite; aphanitic; aphyric; at least a few hundred feet thick
Tis	**Silicic plutonic intrusions**—Coarse-grained granite to quartz monzonite of Tres Hermanas stock; biotite-latite porphyry to monzonite of Providence cone; leucomonzonitic facies of the diorite–monzonite intrusion west of Camel Mountain
Tii	**Intermediate-composition intrusions**—Gray diorite to hornblende-monzonite porphyry of Camel Mountain area, hornblende-monzonite porphyry of Eagle Nest hills, diorite–andesite of northern Tres Hermanas Mountains, and porphyritic andesite of Mt. Riley–Mt. Cox; medium- to coarse-grained except for Tres Hermanas, Carrizalillo Hills, and Mt. Riley–Mt. Cox intrusions, which are fine to medium grained; coarse-grained intrusions are small stocks or thick dikes; Mt. Riley–Mt. Cox intrusion is probably a volcanic dome and Carrizalillo Hills intrusion (at the Calumet mine) a subvolcanic plug
Twt	**Tuff of Lonesome Canyon Draw**—Cream, light-gray, and pale-brown ash-flow tuff containing small volcanic lithic fragments and quartz and sanidine crystals; extremely welded and dense; aspect ratio of pumice is 12:1; found only in west-central Tres Hermanas Mountains; at least 300 ft (91 m) thick
Ttf Tc	**Tuff of Big Tank Draw**—Brownish-gray ash-flow tuff with abundant lithic fragments as much as 2 inches in diameter; welded; many cavities from weathered pumice and lithic fragments; platy foliation; basal conglomerate (*Tc*) consists of volcanic boulder clasts in mud–sand matrix; found only in west-central Tres Hermanas Mountains; *Ttf* and *Tc* total thickness at least 500 ft (152 m)
Trt Trtb	**Rhyolite of southern Tres Hermanas Mountains**—Yellow, cream, and gray, massive to delicately flow banded rhyolite to quartz-latite dome–flow(?) complex with basal purplish-gray tuff and breccia (*Trtb*); similar rocks in northeastern Tres Hermanas Mountains may be correlative with *Trt*; at least 1,000 ft (305 m) thick
Tafu	**Undifferentiated ash-flow tuff**—Gray to red, lithic–vitric ash-flow tuff in the West Potrillo Mountains and reddish-brown crystal ash-flow tuff west of Black Mountain; 50–100-ft-thick (15–30-m-thick) sections exposed in each area
Tri	**Rhyolite intrusions**—Tan, white, and cream, massive rhyolite generally lacking or with only weakly developed flow banding; contains abundant euhedral quartz phenocrysts in Bisbee Hills; unit is present as eroded dome–plugs in Bisbee Hills but elsewhere as dikes, small plugs, and irregular, small intrusive masses; age probably varies from place to place but probably is middle to late Oligocene; dikes in Florida Mountains are 29.1 ± 1.3 Ma (Clemons, 1985)
Tlb	**Dacite flows of Burdick Hills**—From medium- to light-gray to brown dacite* flows; aphyric to porphyritic; saussuritized plagioclase phenocrysts common in some flows; at least a few hundred feet thick
Ttv	**Vitric tuff of Burdick Hills**—Pale grayish-red, fine-grained, densely welded, vitric ash-flow tuff with scattered pumice; interbedded in *Ttu*; approximately 15 ft (4.5 m) thick
Ttu	**Upper tuffs and sedimentary rocks of Burdick Hills**—White, light-gray, and tan, rhyolitic air-fall tuff and tuffaceous sandstone, siltstone, and shale; forms two members separated by *Ttv*; upper member contains abundant agate, which has been quarried extensively in the Burdick Hills; lower member is mostly covered but may be as much as 500 ft (152 m) thick; upper (agate-bearing) member is approximately 100 ft (30 m) thick
Ttb	**Crystal tuff of Burdick Hills**—Pink to brownish-gray, rhyolitic to dacitic, crystal–vitric welded ash-flow tuff; phenocrysts include 2–11% quartz, 5–11% sanidine, 13–32% plagioclase, and 1–5% biotite in a matrix of pumice and devitrified glass; simple(?) cooling unit; at least 250 ft (76 m) thick
Tts	**Lower tuffs and sedimentary rocks of Burdick–Bisbee Hills**—Pink, cream, and gray, rhyolitic crystal ash-flow tuff and associated epiclastic, tuffaceous sandstone, shale, and conglomeratic sandstone; thin beds of travertine and fresh-water limestone appear to be interbedded with the unit but may be younger units related to major faults; approximately 300–400 ft (91–122 m) thick
Tr	**Megabreccia in rhyolite**—Boulders to house-size blocks of *Tj, Trf,* and other rocks in a matrix of greenish-yellow, devitrified rhyolite and rhyolitic glass and in air-fall tuff and breccia; small domes, plugs, and dikes of *Trf* locally intrude the unit or are graditional into the megabreccia; much of the unit probably represents a proximal tuff–cone facies; exposed thickness approximately 500 ft (152 m)
Trf	**Flow-banded rhyolite**—Pink, cream, brown, tan, yellow, or gray flow-banded rhyolite*, locally spherulitic, forming small plugs, moderate to large domes (Red Mountain), dikes, or irregular intrusive masses in the Carrizalillo Hills, Tres Hermanas Mountains, Florida Mountains, Sierra de las Uvas, and Potrillo Mountains. The rhyolite probably varies in age from place to place, but most is probably middle to late Oligocene
Tj	**Tuff of Johnson Mountain**—Pinkish-gray, dacitic* crystal ash-flow tuff containing 0–2% quartz, 1–6% sanidine, 2–5% biotite, and as much as 48% microperthite, the latter probably a product of potassium metasomatism; matrix is welded devitrified pumice and glass shards; at least 200 ft (61 m) thick
Tsb	**Younger tuffs, flows, and sedimentary rocks of Carrizalillo Hills**—Brown, yellow, tan, and red, rhyolitic volcaniclastic rocks, breccia, and minor tuff, all intensely altered (K-metasomatism) and complexly faulted and veined by quartz and carbonates; some intermediate-composition flows (*Tli*) are interbedded as is a single bed of fresh-water limestone approximately 20 ft (6 m) thick; 300–350 ft (91–107 m) thick
Tlc	**Limestone conglomerate**—Reddish-brown to gray limestone boulder conglomerate derived primarily from Paleozoic and Lower Cretaceous(?) rocks and to a lesser extent from Precambrian granite and intermediate-composition volcanic rocks; locally sandstone, siltstone, and mudstone dominated by volcaniclastic debris grade into limestone–granite conglomerate; unit appears to be a tongue within *Tli*; approximately 100 ft (30 m) or more thick
Tli	**Intermediate-composition volcanic rocks**—Light- to dark-gray, reddish-brown, purplish-gray, and maroon flows ranging in composition from andesite* to dacite* to latite; aphyric to moderately porphyritic; intensely altered (K-metasomatism) in the Carrizalillo Hills but relatively unaltered in the Cedar Mountains where andesine, pyroxene, and hornblende phenocrysts are in a trachytic matrix; at least 500 ft (152 m) thick
Ttc	**Tuff of Carrizalillo Hills**—Reddish-brown, rhyolite* crystal ash-flow tuff; 3–11% quartz, 8–17% sanidine, minor biotite, and as much as 11% xenocrystic K-feldspar in a matrix of pumice fragments and glass shards; extensive K-metasomatism; densely to moderately welded; unit has two members separated by a few feet of air-fall tuff or epiclastic rocks; the upper member, less than 100 ft (30 m) thick, is a simple cooling unit; the lower member, as much as 300 ft (91 m) thick, is a compound cooling unit
Tl	**Latite–dacite flows**—Gray to purplish-gray, slightly to moderately porphyritic latite, dacite*, or andesite* flows. Andesine and sanidine phenocryst laths are in a trachytic groundmass of plagioclase and devitrified glass; K-alteration in Carrizalillo Hills; similar, possibly correlative rocks in Burdick Hills are labeled *Tl?*; 30–70 ft (9–21 m) thick
Ttl	**Lower crystal tuff of Carrizalillo Hills**—Pale purplish-gray, medium-grained, welded crystal ash-flow tuff, dacite* in composition; 5% quartz, <1% sanidine, 2–3% bronze biotite, and as much as 37% altered xenocrystic K-feldspar in a matrix of devitrified glass shards; K-alteration in Carrizalillo Hills; at least 200 ft (61 m) thick
Ts	**Oldest exposed tuffs and sedimentary rocks of Carrizalillo Hills**—Cream, tan, pale-purple, and yellowish-tan air-fall tuff and breccia and epiclastic strata; rhyolitic in composition; variably silicified and altered; at least 100–200 ft (30–61 m) thick
	Bell Top Formation—*Tbt, Tbs, Tbt₆, Tbl, Tbai*; descriptions of individual units listed below
Tbt	**Bell Top Formation, undifferentiated**
Tbs	**Sedimentary rocks and tuffs**—White, tan, and gray tuffaceous sandstone, mudstone, and conglomerate and rhyolitic air-fall tuff above and below *Tbt₆*; 0–300 ft (0–91 m) thick in southern Good Sight Mountains and Sleeping Lady Hills (Clemons, 1979, 1976)
Tbt₆	**Ash-flow tuff 6**—Grayish-red, densely welded crystal–vitric ash-flow tuff; 0–7% quartz, 2–13% sanidine, 0–15% plagioclase, 0–3% biotite plus hornblende; simple cooling unit; 0–100 ft (0–30 m) thick; radiometric age of 33.5 ± 0.12 Ma (McIntosh et al., 1991)
Tbl	**Lower tuffs and epiclastic rocks**—In descending order the unit includes 1) ash-flow tuff 4; porous to densely welded, pale grayish-red vitric–crystal ash-flow tuff; 0–180 ft (0–55 m) thick; radiometric age of 34.96 ± 0.04 Ma (McIntosh et al., 1991); 2) white to yellowish-gray air-fall tuff and breccia with interbedded epiclastic sandstone; 0–300 ft (0–91 m) thick; 3) ash-flow tuff 3; moderately to poorly welded, pinkish-gray, vitric ash-flow tuff; 0–350 ft (0–107 m) thick; radiometric age of 35.7 ± 0.02 Ma (McIntosh et al., 1991); and 4) white to brownish-gray and pale yellowish-brown air-fall tuff and breccia with interbedded conglomerate and sandstone, as much as 100 ft (30 ft) thick. In the southern Good Sight Mountains only unit 1 is present; all units are well developed in the Sleeping Lady Hills (Clemons, 1976)
Tbai	**Basaltic andesite within *Tbl***—Gray, vesicular basaltic-andesite dikes and flows below ash-flow tuff 4 of *Tbl*
Tvi	**Intermediate-composition volcanic rocks**—Gray, purplish- to maroon-gray latite, dacite, and andesite flows, intrusions(?), and laharic(?) breccia; aphyric to moderately porphyritic; generally fine grained; locally includes epiclastic rocks derived from *Tvi*; exposures are limited to Mt. Riley and Camel Mountain region, but correlative rocks may be units *Ta* and *Tal*; at least several hundred feet thick
Tpp	**Palm Park Formation**—Gray, red, and purple, tuffaceous epiclastic rocks including lahar breccia and minor flows of intermediate composition; correlative laterally with Rubio Peak Formation; maximum thicknesses approximately 3,500 ft (1,067 m) (Clemons, 1979, 1976, 1977); K–Ar radiometric age of 37–43 Ma (Clemons, 1979)
Trs	**Sugarlump Formation**—Grayish-pink vitric–crystal ash-flow tuff with 7–30% plagioclase, sanidine, quartz, and biotite phenocrysts; abundant white, flattened pumice; crops out in Little Florida Mountains; 200 ft (61 m) thick
Trp	**Rubio Peak Formation**—Gray, purple, and maroon lava flows, lahar breccia, and epiclastic rocks of intermediate composition; generally propylitized; 1,600 ft (488 m) thick in Florida Mountains (Clemons and Brown, 1983), at least 2,000 ft (610 m) thick in the Good Sight Mountains (Clemons, 1979), and as much as 6,500 ft (1,980 m) thick in the subsurface near Deming (R. E. Clemons, pers. comm. 1984); K–Ar radiometric ages of 44.7 ± 1.9, 38.0 ± 1.5, 38.0 ± 1.9, 37.6 ± 2.0, 36.4 ± 2.3, and 32.6 ± 2.1 Ma (Clemons, 1979, 1982b)
TKs	**Lower Tertiary–Upper Cretaceous sedimentary rocks, undifferentiated**—Gray, purplish-gray, maroon, tan, brown, and olive-brown sandstone, shale, and siltstone and pale-red mudstone derived in part from intermediate-composition volcanic rocks; also gray to reddish-gray cobble to boulder conglomerate consisting of clasts ranging from Precambrian to Lower Cretaceous; exposed in Mt. Riley–East Potrillo Mountains area; correlative with Love Ranch Formation and probably with basal parts of the Rubio Peak Formation; at least 300 ft (91 m) thick
TKl	**Lobo Formation**—Reddish-brown to grayish-red cobble–boulder conglomerate containing clasts of Paleozoic limestone, chert, and sandstone and Precambrian–Cambrian granite, syenite, and quartz syenite. Syntectonic to posttectonic with Laramide orogeny; approximately 100–500 ft (30–152 m) thick in Florida Mountains (Clemons and Brown, 1983; Clemons, 1995); *TKl?* in Tres Hermanas Mountains, approximately 250 ft (76 m) thick, probably is Lobo but could possibly be Lower Cretaceous Glance equivalent. At Granite Hill near Eagle Nest, the Lobo Formation consists of approximately 787 ft (240 m) of sandstone and conglomerate that overlies Precambrian granite nonconformably (Seager and Mack, 1990)
m	**Marbleized limestone**—Formation unknown
Kl	**Lower Cretaceous rocks, undifferentiated**—In the East Potrillo Mountains the section includes, from top down, **Mojado(?) Formation**: gray, crossbedded quartzite at least 50 ft (15 m) thick; **U-Bar Formation**: calcareous siltstone at least 50 ft (15 m) thick, gray, massive limestone 435 ft (133 m) thick, calcareous siltstone and limestone 268–298 ft (81–90 m) thick, rudistid limestone 20–45 ft (6–13 m) thick, arkosic sandstone and pebble conglomerate 85–220 ft (25–66 m) thick, and oolitic limestone 45–110 ft (13–33 m) thick; and **Hell-to-Finish Formation**: calcareous siltstone and fine sandstone 400–550 ft (119–168 m) thick and limestone cobble conglomerate 3–133 ft (1–40 m) thick. Total thickness is approximately 1,000 ft (305 m). Correlative partial sections include approximately 900 ft (274 m) of mostly U-Bar Formation at Eagle Nest and approximately 200 ft (61 m) of mostly Hell-to-Finish Formation at West Lime Hills. Strata are largely Aptian and Albian in age (Seager and Mack, 1994)
Pys	**Yeso Formation–San Andres Formation, undifferentiated**—Upper beds (San Andres) are massive to medium-bedded, gray limestone with local chert, pelecypods, crinoids, and corals. Lower beds (Yeso?) are light- to dark-gray, fine- to medium-grained dolomitic limestone, with silty laminations, spar-filled vugs, and limestone breccia, interbedded with minor brown siltstone and yellow, fine-grained siltstone. Approximately 1,000 ft (305 m) thick in East Potrillo Mountains (Seager and Mack, 1994); a few hundred feet are exposed in the West Lime Hills, at Eagle Nest, and northwest of Camel Mountain
Ph	**Hueco Limestone**—Medium- to thick-bedded, dark- to light-gray, fossiliferous to oolitic limestone with minor shale and, at the top in the Florida Mountains, approximately 30 ft (9 m) of red shale. In the Tres Hermanas Mountains the base is marked by approximately 10–15 ft (3–4.5 m) of red-brown chert pebble–cobble conglomerate with similar conglomerates recurring higher in the section; algal limestone, crinoidal debris, and gastropod faunas are typical of Hueco beds; at least 550 ft (168 m) thick in the Tres Hermanas Mountains (Kottlowski and Foster, 1962) and at least 430 ft (131 m) thick in the Florida Mountains (Clemons and Brown, 1983)
IP	**Pennsylvanian rocks, undifferentiated**—Light- to medium-gray, yellowish-gray, and brownish-gray fossiliferous limestone and micrite with shale partings; 60 ft (18 m) of brown, fine-grained, crossbedded sandstone is prominent below middle of unit. Approximately 560 ft (170 m) thick in the Tres Hermanas Mountains (Kottlowski and Foster, 1962); absent in the Florida Mountains; Middle Pennsylvanian (Desmoinesian–Missourian) according to Kottlowski and Foster (1962) and Balk (1961)
MD	**Mississippian and Devonian rocks—Rancheria Formation (Mississippian)**—In the Florida Mountains the Rancheria includes interbedded fossiliferous limestone, micrite, shale, and chert, the latter comprising as much as 50% of the upper part of the formation; approximately 220 ft (67 m) thick in the Florida Mountains (Clemons and Brown, 1983). **Escabrosa Group**—In the northern Tres Hermanas Mountains the Escabrosa Group consists of an upper unit, the Hachita Formation, consisting of crinoidal limestone and a lower unit, the Keating Formation, which is thin- to medium-bedded, gray fossiliferous limestone with abundant chert layers and nodules. The Escabrosa is approximately 360 ft (110 m) thick in the Tres Hermanas Mountains (Kottlowski and Foster, 1962). **Percha Shale (Devonian)**—Black to olive-gray shale with minor thin limestone beds; approximately 250 ft (76 m) thick in the Florida Mountains
OS	**Montoya Dolomite and Fusselman Dolomite—Fusselman Dolomite (Silurian)**—Medium- to thick-bedded, light- to dark-gray, fine- to coarse-grained dolomite in alternating layers; 1,400–1,500 ft (427–457 m) thick in the Florida Mountains (Clemons and Brown, 1983). **Montoya Dolomite (Upper Ordovician)**—Upper 180 ft (55 m) of nearly chert-free, medium- to light-gray, fine-grained Cutter dolomite and limestone; medial 125–200 ft (38–61 m) of cherty, gray Aleman limestone and dolomite; and basal 50–70 ft (15–21 m) of massive, dark-gray Upham dolomite (with basal Cable Canyon Sandstone)
€O	**Bliss Sandstone and El Paso Formation—El Paso Formation (Lower Ordovician)**—Upper unit of thin- to medium-bedded, dark-gray, cherty limestone overlies a middle unit of thin- to medium-bedded, gray limestone and cherty limestone and a basal unit of dark-gray dolomite; 1,200 ft (365 m) thick in the Florida Mountains (Clemons and Brown, 1983). **Bliss Sandstone (Cambrian–Ordovician)**—Interbedded sandy limestone, black shale, and white quartzite grades down into a basal brown arkose and coarse sandstone; 50–185 ft (15–56 m) thick in the Florida Mountains (Clemons and Brown, 1983)
p€g	**Granite**—Fine to coarse-grained, red to gray to brown granite containing, in the southern Florida Mountains, as much as 50% hornblende and pyroxene–hornfels xenoliths. U–Pb age of granite and hornfels in the Florida Mountains is 503 ± 10 Ma and 504 ± 10 Ma, respectively (Evans and Clemons, 1988; Clemons, 1995), but other published ages range from 371 Ma to 1,600 Ma, indicating uncertainty in the age of these rocks
p€s	**Syenite and quartz syenite**—Coarse-grained, bluish-gray syenite and quartz syenite in the southern Florida Mountains containing many aplitic zones and large masses and xenoliths of hornblende and pyroxene hornfels. Pb–Pb and U–Pb ages on the syenite are 533 Ma and 460–471 Ma, respectively, but other reported ages range from 371 Ma to 1,600 Ma (Evans and Clemons, 1988; Clemons, 1995)
p€m	**Metamorphic rocks**—Gneissic granite, gneiss, and biotite schist in the northwestern part of the Florida Mountains; unit also includes small exposures of cobble–boulder conglomerate described as diamictite by Corbitt and Woodward (1973) that nonconformably overlie gneiss and may be a basal conglomerate of the Bliss Sandstone (Clemons, 1995)

Geologic sections and gravity profiles through the southwest quarter of Las Cruces and northwest El Paso 1° × 2° sheets (scale 1:125,000), New Mexico

by William R. Seager, 1995

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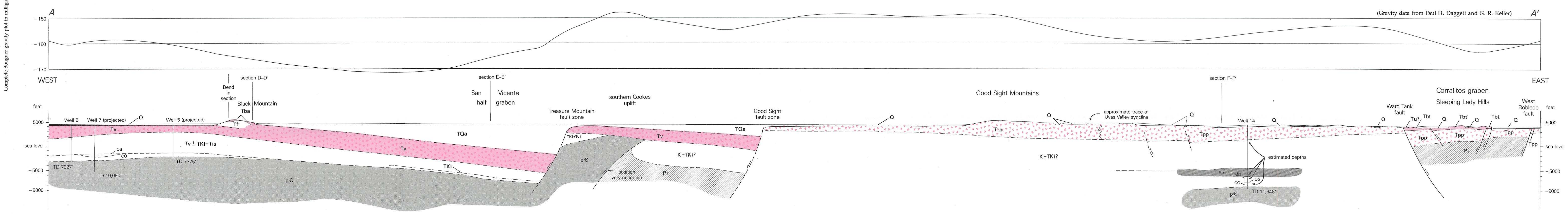

no vertical exaggeration

MAP SYMBOLS

Contact—Dashed where inferred

Normal fault—Ball on downthrown side; dashed where inferred, dotted where buried

Thrust or reverse fault—Barbs on upthrown side; arrow indicates direction and amount of dip

Synclinal axis—Dashed where inferred

Axis of overturned anticline

Axis of overturned syncline

Strike and dip of bedding or of foliation in ash-flow tuffs

Strike and dip of foliation in flow-banded rhyolite

Selected oil test hole—Number adjacent to symbol corresponds to well listed in Table 2 (Sheet 5); data from Kottlowski et al. (1969) and Thompson (1982)