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AUTHOR(S): Kim Manley and Glenn R. Scott.

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Preliminary geologic map of the Aztec 1° x 2° quadrangle, northwestern New Mexico and southern Colorado

By

Kim Manley and Glenn R. Scott

Open-file report 78-466

1978

DESCRIPTION OF MAP UNITS

Qal ALLUVIUM (HOLOCENE)--Stream deposited clay, silt, sand, and gravel on valley floor and in lowest terraces. Includes some fan and sheetwash alluvium. As much as 10 m thick

Qc COLLUVIUM (HOLOCENE)--Fine- to coarse-grained deposits on slopes; gravity transported. Includes some sheetwash alluvium. Thickness 1-3 m

Qes EOLIAN SAND (HOLOCENE AND UPPER PLEISTOCENE)--Loose to slightly consolidated sand as sheets or dunes. Thickness as much as 5 m

Ql LANDSLIDE DEPOSITS (QUATERNARY)--Hummocky, broken masses of bedrock and surficial deposits that have slid downslope as a mass

Qpg PEDIMENT AND TERRACE GRAVEL (PLEISTOCENE)--Includes both sheets of poorly sorted gravel on pediments and well-sorted gravel on terraces along major streams. Locally includes outwash. Thickness 3-17 m

Qt TILL (PLEISTOCENE)--Unsorted boulder gravel in moraines along Rio Chama and Wolf Creek

Qgs GRAVELLY SAND (PLEISTOCENE)--Stratified gravelly sand containing chert and quartzite pebbles. Thickness 3-7 m

Qb BASALT (QUATERNARY)--Basaltic cinder cones and olivine basalt flows at as many as six levels above modern drainage

Qct CERRO TOLEDO RHYOLITE (PLEISTOCENE)--Gray lithoidal rhyolite in volcanic domes and rhyolite tuffs and tuff breccias erupted from the Jemez Mountains. As much as 65 m thick

Qbt BANDELIER TUFF (PLEISTOCENE)--Gray nonwelded to densely welded ash-flow tuff consisting of rhyolite ash and pumice erupted from the Jemez Mountains. K-Ar age, 1.1-1.4 m.y. (Doell and others, 1968). Divided into two members: the Tshirege Member, 17-300 m thick, predominantly ash-flow deposits with the basal Tsankawi Pumice Bed; and the Otowi Member, 0-200 m thick, predominantly ash-flow deposits with the basal Guaje Pumice Bed

Qer EL RECHUELOS RHYOLITE (PLEISTOCENE)--Volcanic domes and a single small pumice cone

Qbg BRIDGETIMBER GRAVEL (PLEISTOCENE)--Bouldery gravel lying about 383 m above the Animas River. About 7 m thick

QTb BASALT (QUATERNARY AND TERTIARY)--Olivine-augite basalt flows, basaltic andesite flows, tuffs and scoriaceous vent materials, and cinder cones. As much as 500 m thick

Tp PUYE FORMATION (PLIOCENE)--Conglomerate and coarse sand with numerous interlayered lithic lapilli tuff beds and lahar deposits. Zircon fission-track age, 2.9 m.y. (Manley, 1976a). Thickness 17-235 m

Ts SERVILLETA FORMATION (PLIOCENE)--Alluvial gravel, sand, and clay interlayered with olivine tholeiite basalt flows. K-Ar age, 2.8-4.5 m.y. (Manley, 1976b; Ozima and others, 1967). More than 500 m thick

Tb BASALT AND ANDESITE (TERTIARY)--Undifferentiated flows and vent rocks including the Hinsdale Formation of Pliocene and Miocene age (4.4-26.8 m.y. [Lipman and Mehnert, 1975]) lava flows of fine-grained silicic alkali-olivine basalt and basaltic andesite (thickness 0-300 m) and the augite andesite of Archuleta Mesa

Tt TSCHICOMA FORMATION (PLIOCENE AND MIOCENE)--Predominantly coarsely porphyritic dacite, rhyodacite, and quartz latite. Thick massive flows and domes. Associated pyroclastics mapped as part of the Puye Formation. Thickness 0-1,000 m or more

Tlb LOBATO BASALT (MIOCENE)--Olivine-augite and titaniferous augite basalts; predominantly flows. Includes one flow with a K-Ar age of 7 m.y. (Bailey and others, 1969). Thickness 0-200 m

Tsf SANTA FE GROUP (PLIOCENE AND MIOCENE)--Poorly consolidated buff, red, or gray arkosic sand, silt, clay, and pebble conglomerates. Contains minor, thin, white or green ash beds and interbedded basalt flows. Thickness 0-1,670 m or more

Ti INTRUSIVE ROCKS (TERTIARY)--Lamprophyre dikes and sills of probable Miocene age. The dikes extend for kilometers and are as wide as 10 m

Tl LOS PINOS FORMATION (MIOCENE)--Predominantly bedded conglomerate, sandstone, and mudflow breccia containing rhyodacite and quartz latite clasts derived from stratovolcanoes on the flanks of the Platoro caldera to the northwest and smaller volcanic centers to the north. Locally includes thin beds of ash-fall and nonwelded ash-flow tuff. Interfingers with basalt flows (Tb). K-Ar age is 5-25 m.y. (Lipman and Mehnert, 1975). Thickness 0-200 m. Probably equivalent to the Carson Conglomerate of Just (1937)

Ta ABIQUIU TUFF OF SMITH (1938) (OLIGOCENE)--Mainly white to light-gray tuffaceous sand and conglomerate; locally includes basal gravel 20-100 m thick and a thin chert bed, the Pedernal Chert Member of Church and Hack (1939). Thickness 400 m or more

Ttm TREASURE MOUNTAIN TUFF (OLIGOCENE)--Pyroclastic sequence erupted from Platoro-Summitville caldera complex; includes three widespread quartz latitic ash-flow sheets interlayered with more local quartz latitic to low-silica rhyolitic ash-flow and ash-fall deposits. As mapped includes Masonic Park Tuff (28.2 m.y. [Lipman and others, 1970]), a nonwelded gray to partly welded, yellow-brown quartz latitic ash-flow sheet containing about 50 percent phenocrysts. K-Ar age is 29-30 m.y. (Lipman and others, 1970). Thickness 0-100 m

Tc CONEJOS FORMATION (OLIGOCENE)--Upper unit composed of flows, flow breccia, and tuff ranging from basalt to rhyolite; lower unit is sandstone, tuff, and conglomerate containing volcanic clasts. K-Ar age is 30-35 m.y. (Lipman and others, 1970). Thickness 65-230 m

Tr RITITO CONGLOMERATE OF BARKER (1958) (OLIGOCENE)--Grayish-white, poorly sorted and poorly lithified conglomerate containing chiefly Precambrian quartzite clasts. Thickness 65-330 m

Te EL RITO FORMATION OF SMITH (1938) (EOCENE)--Sandstone and red to pinkish-red well-cemented conglomerate composed mainly of well-rounded Precambrian quartzite clasts. Thickness 3-135 m. Includes the interfingering Blanco Basin Formation (Eocene) north of Cañones Box; sandstone and arkosic pebble conglomerate chiefly derived from Precambrian plutonic igneous and metamorphic rocks. Thickness of Blanco Basin Formation, 85-125 m

Tsj SAN JOSE FORMATION (EOCENE)--Sandstone, shale, and minor conglomerate. Divided into 3 units in some areas. Thickness as much as 600 m

Tstl Tapicitos and Llaves Members--Red, tan, and white sandstone and shale

Tsjr Regina Member--Variegated shale and tan to white sandstone

Tsjc Cuba Mesa Member--Tan conglomeratic sandstone and shale

Tn NACIMIENTO FORMATION (PALEOCENE)--Gray to olive-gray shale and minor interbedded sandstone. Interfingers with the Animas Formation to the north. Thickness as much as 580 m

Toa OJO ALAMO SANDSTONE (PALEOCENE)--Brown crossbedded sandstone, containing conglomerate near base. Interfingers with the Animas Formation to the north. Contains much petrified wood. Thickness 25-65 m

TKa ANIMAS FORMATION (PALEOCENE AND UPPER CRETACEOUS)--Greenish-gray and tan andesitic conglomerate, sandstone, and shale. Thickness 400-1,000 m

Kk KIRTLAND FORMATION (UPPER CRETACEOUS)--Undifferentiated upper transitional sandstone, upper greenish-gray shale, Farmington Sandstone Member, and lower greenish-gray shale. Thickness 25-30 m

Kf FRUITLAND FORMATION (UPPER CRETACEOUS)--Gray, brown, and black shale, yellowish-brown crossbedded sandstone, and coal. Thickness 25-45 m

Kpc PICTURED CLIFFS SANDSTONE (UPPER CRETACEOUS)--Upper part is yellowish-gray to grayish-orange marine sandstone and lower part is interbedded brown sandstone and gray shale. Thickness 0-78 m

Kfp FRUITLAND FORMATION AND PICTURED CLIFFS SANDSTONE, UNDIVIDED

Kkf KIRTLAND AND FRUITLAND FORMATIONS, UNDIVIDED

Kl LEWIS SHALE (UPPER CRETACEOUS)--Olive-gray sandy marine shale in upper part, shale in middle part, and shaly sandstone in lower part. Thickness 165-630 m

Kmv MESAVERDE GROUP, UNDIVIDED (UPPER CRETACEOUS)--Composed of three formations

Kch Cliff House Sandstone--Tan fine- to medium-grained marine sandstone and minor shale; mapped separately in southwestern part of area. La Ventana Tongue occurs in central part of area but not mapped separately. Thickness 12-420 m

Kmf Menefee Formation--Tan and brown sandstone, gray and brown claystone and shale, coal, and layers of large ironstone and limestone concretions; mapped separately in southwestern part of area, but not in central part. Thickness 115-700 m

Kpl Point Lookout Sandstone--Tan and brown marine sandstone and lesser amounts of gray shale; not mapped separately. Thickness 35-65 m

Km MANCOS SHALE (UPPER CRETACEOUS)--In the central part of the quadrangle contains lower part of Pierre Shale (Dane, 1948), Niobrara Shale Member, and recognizable Greenhorn and Graneros Carlile equivalents. Thickness ranges from 570 to 770 m

Kmu Upper shale member--Consists of gray and dark olive-gray calcareous shale and sandy shale containing limestone concretions and in the upper part a sandstone transitional to the Mesaverde Group

Kn Niobrara Shale Member--Hard to soft calcareous shale and some hard gray limestone beds

Kml Lower shale member--Contains in descending order the Carlile Shale, Greenhorn Limestone, and Graneros equivalents:

Beds of Carlile age--Dark-gray shale in the upper part and beds of platy, sandy limestone or calcareous sandstone; the lower part is dark shale that contains large septarian concretions

Greenhorn-equivalent--Alternating beds of light-gray dense limestone and darker gray calcareous shale

Graneros-equivalent--Gray and black evenly bedded shale

Kd DAKOTA SANDSTONE (UPPER AND LOWER CRETACEOUS)--Gray and grayish-orange, well-cemented, massive sandstone, locally conglomeratic, dark-gray carbonaceous shale, and thin coal beds. Thickness 60-70 m

Jmte MORRISON FORMATION, TODILTO FORMATION, AND ENTRADA SANDSTONE, UNDIVIDED (JURASSIC)

Morrison Formation (Upper Jurassic)--Grayish-orange, fine- to medium- grained sandstone, greenish-gray and red mudstone, red claystone, and some conglomerate in upper part. Thickness about 270 m

Todilto Formation (Middle Jurassic)--Gray, medium-grained limestone and platy shale that grades upward locally into very pure gypsum. Thickness 0-20 m

Entrada Sandstone (Middle Jurassic)--White, yellowish-gray, and tan-brown fine- to medium-grained, well-sorted, massive, cross-bedded sandstone. Thickness 30-100 m

ℛc CHINLE FORMATION, UNDIVIDED (UPPER TRIASSIC)--Consists of four members

Upper shale member--Interbedded variegated red, green, and maroon shale and red siltstone and lenticular sandstone. Thickness 150-200 m

Poleo Sandstone Lentil--Greenish-gray very fine to coarse-grained micaceous conglomeratic sandstone with subordinate green and reddish-maroon shale and minor pellet limestone. Thickness 7-80 m

Salitral Shale Tongue--Maroon shale with subordinate green shale and locally, minor very coarse grained green calcareous sandstone. Thickness 100-110 m

Agua Zarca Sandstone Member--White to light buff fine- to coarse-grained very thick bedded quartzose sandstone, conglomerate, and conglomeratic sandstone. Thickness 0-40 m

Pc	CUTLER FORMATION (PERMIAN)--Reddish-brown crossbedded arkosic sandstone, shale, and purple-orange mudstone. Thickness at least 500 m
Pm	MADERA FORMATION (PENNSYLVANIAN)--Light-gray, commonly fossiliferous limestone; gray to buff orthoquartzite; pink arkose; reddish and minor light-gray shale; arkosic limestone. Thickness 250-510 m
Yqm	QUARTZ MONZONITE (PRECAMBRIAN Y)--Pink, fine- to medium-grained massive biotite-muscovite quartz monzonite. Underlies San Pedro Peaks where it is deeply weathered to a sandy soil. Intrudes Xgd in northern part of Brazos Peak quadrangle
YXqmp	QUARTZ MONZONITE PORPHYRY OF SAN PEDRO MOUNTAINS (PRECAMBRIAN Y or X)--Pink to gray, medium-grained porphyritic biotite quartz monzonite with euhedral to ovoid feldspar phenocrysts as much as 2 cm in diameter. Some microcline phenocrysts are rimmed by sodic plagioclase in rapakivi texture. Blue-gray quartz in groundmass. Locally fine grained equigranular to porphyritic
YXqd	QUARTZ DIORITE OF SAN PEDRO MOUNTAINS (PRECAMBRIAN Y or X)--Dark-gray medium-grained massive biotite quartz diorite with conspicuous blue-gray quartz. Intrudes meta-quartz latite (Xvs), and contains pink microcline megacrysts near contacts with YXqmp
YXtg	GRANITE AT TUSAS MOUNTAIN (PRECAMBRIAN Y or X)--White to pink, fine- to medium-grained porphyritic granite, massive to weakly foliated. Phenocrysts are rounded gray quartz and pink subhedral perthitic microcline 1-5 mm in diameter. Muscovite and fluorite are common accessory minerals
Xgd	GNEISSIC GRANODIORITE (PRECAMBRIAN X)--Pink to reddish-orange, fine- to medium-grained foliated biotite granodiorite to granite. Includes Tres Piedras Granite of Barker (1958)
Xmq	MAQUINITA GRANODIORITE OF BARKER (1958) (PRECAMBRIAN X)--Dark-gray, fine- to medium-grained biotite quartz diorite to granodiorite. Generally well foliated and lineated; locally strongly sheared, approaching a flaser gneiss. Intrusive into Xvm

Xtb TRONDHJEMITE OF RIO BRAZOS (PRECAMBRIAN X)--Light-gray, fine- to medium-grained foliated leuco-quartz diorite with conspicuous ovoid quartz "eyes" as much as 2 cm in diameter. Rb-Sr isochron age, 1,724±34 m.y. (Barker and others, 1974)

Xq VITREOUS QUARTZITE (PRECAMBRIAN X)--White to bluish-gray, fine-grained vitreous to pebbly quartzite with minor hematite, kyanite, and muscovite. Generally well laminated, with cross-bedding locally preserved. Pebble beds contain elongate to rounded pebbles of milky quartz, red and black quartz, and dark-gray phyllite. Includes Ortega Quartzite (Just, 1937) and upper quartzite member and Jawbone Conglomerate Member of Kiawa Mountain Formation (Barker, 1958)

Xvs SILICIC METAVOLCANICS AND ASSOCIATED METASEDIMENTS (PRECAMBRIAN X)--Metamorphosed ash-flow tuffs and shallow plutons of rhyolite and quartz latite, with interlayered quartz-mica schist, feldspathic schist, and minor conglomerate. Thin amphibolite layers are locally present. Includes Burned Mountain Metarhyolite of Barker (1958) and the lower quartzite member and Big Rock Conglomerate Member of the Kiawa Mountain Formation. Meta-quartz latite of San Pedro Mountains gives Rb-Sr age of 1,800±50 m.y. (Brookins, 1974)

Stippled pattern in areas of extensive metasomatic alteration (Gresens and Stensrud, 1974) associated with numerous pegmatites, where country rock has been converted to quartz-muscovite or quartz-sericite schist (Petaca Schist of Just, 1937, and Barker, 1958)

Xvm MAFIC TO INTERMEDIATE METAVOLCANICS AND ASSOCIATED METASEDIMENTS (PRECAMBRIAN X)--Amphibolite (meta-basalt) and meta-andesite with interbedded phyllite, greenschist, and minor conglomerate. Local concentrations of magnetite in Cleveland Gulch and north of Hopewell Lake. Includes Moppin Metavolcanic Series of Barker (1958) and amphibolite member of Kiawa Mountain Formation

Xgnb BIOTITE GNEISS (PRECAMBRIAN X)--Gray, fine-grained biotite-quartz-plagioclase gneiss, well-layered and locally migmatitic. Boundaries for the Miocene are 2.6 m.y. and 5 m.y. in this report.

CONTACT--Dashed and (or) queried where relationships are unknown

FAULT--Bar and ball on downthrown side. Dashed where approximately located; dotted where concealed

INTRUSIVE DIKE

References

Barker, Fred, 1958, Precambrian and Tertiary geology of Las Tablas quadrangle, New Mexico: New Mexico Bur. Mines and Mineral Resources Bull. 45, 104 p.

Barker, Fred, Peterman, Z. E., Henderson, W. T., and Hildreth, R. A., 1974, Rubidium-strontium dating of the trondhjemite of Rio Brazos, New Mexico, and of the Kroenke Granodiorite, Colorado: U.S. Geol. Survey Jour. of Research, v. 2, p. 705-709.

Brookins, D. G., 1974, Summary of recent Rb-Sr age determinations from Precambrian rocks of north-central New Mexico: New Mexico Geol. Soc. Guidebook 25, p. 119-121.

Church, F. S., and Hack, J. T., 1939, An exhumed erosion surface in the Jemez Mountains: Jour. Geol., v. 47, no. 6, p. 613-629.

Dane, C. H., 1948, Geologic map of part of eastern San Juan Basin, Rio Arriba County: U.S. Geological Survey Oil and Gas Prelim. Map 78.

Doell, R. R., 1948, Dalrymple, G. B., Smith, R. L., and Bailey, R. A., 1968, Paleomagnetism, potassium-argon ages, and geology of rhyolites and associated rocks of the Valles Caldera, New Mexico, in Studies in volcanology--A memoir in honor of Howell Williams: Geol. Soc. America Memoir 116, p. 211-248.

Gresens, R. L., and Stensrud, H. L., 1974, Recognition of more metarhyolite occurrences in northern New Mexico and a possible Precambrian stratigraphy: Mountain Geologist, v. 11, p. 109-124.

Just, Evan, 1937, Geology and economic feature of the pegmatites of Taos and Rio Arriba Counties, New Mexico: New Mexico School of Mines Bull. 13, 73 p.

Lipman, P. W., and Mehnert, H. H., 1975, Late Cenozoic basaltic volcanism and development of the Rio Grande depression in the southern Rocky Mountains: Geol. Soc. America Memoir 144, p. 119-154.

Lipman, P. W., Steven, T. A., and Mehnert, H. H., 1970, Volcanic history of the San Juan Mountains, Colorado, as indicated by K-Ar dating: Geol. Soc. America Bull. 81, p. 2329-2352.

Manley, Kim, 1976a, Tephrochronology of the Tesuque, Ancha, and Puye Formations of the Santa Fe Group, Española Basin, New Mexico: Geol. Soc. America Abs. with Programs, v. 8, no. 5, p. 606-607.

Manley, Kim, 1976b, K-Ar age determinations on Pliocene basalts from the Española Basin, New Mexico: Isochron/West, no. 16, p. 29-30.

Ozima, Minoru, Kono, M., Kaneoka, I., Kinoshita, H., Kobayashi, K., Nagata, T., Larson, E. E., and Strangway, D. W., 1967, Paleomagnetism and K-Ar ages of some volcanic rocks from the Rio Grande gorge, New Mexico: Jour. Geophys. Research v. 72, no. 10, p. 2615-2621.

Smith, H. T. U., 1938, Tertiary geology of the Abiquiu quadrangle, New Mexico: Jour. Geology, v. 46, no. 7, p. 933-965.