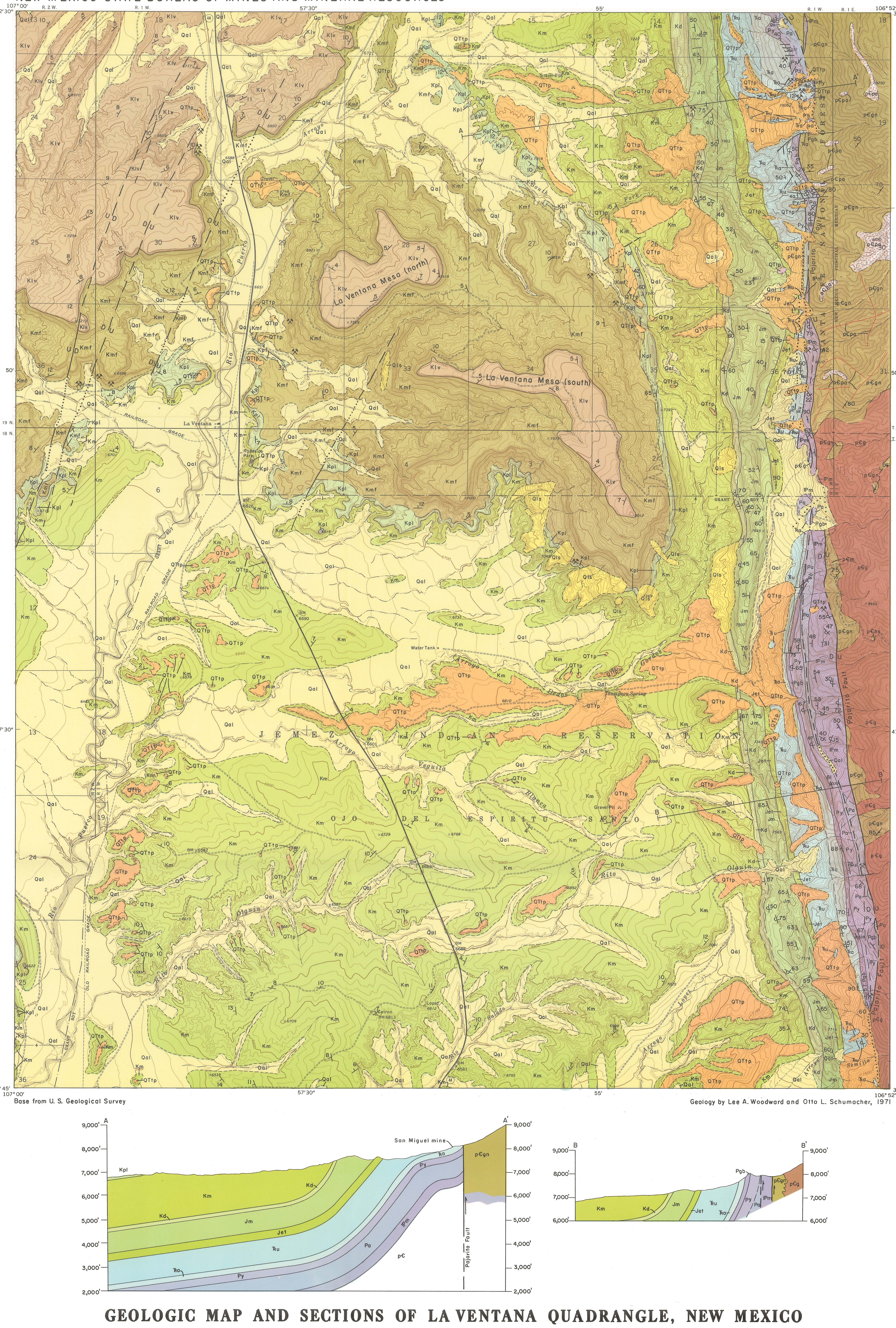


Base from U. S. Geological Survey

Geology by Lee A. Woodward and Otto L. Schumacher, 1971

EXPLANATION

Qal — Alluvium (QUATERNARY)
Clay, silt, sand, and gravel, mostly along valleys, includes some colluvium; 0 to 25(?) feet thick

Qls — Landslide deposits
Mostly large, angular blocks of sandstone derived from the Mesaverde Group or the Dakota Formation

QTtp — Terrace and pediment deposits (TERTIARY)
Mostly boulder gravel with clasts of Precambrian or locally Paleozoic and Mesozoic rocks; includes minor sand and lag gravel; 0 to 30(?) feet thick

MESA VERDE GROUP (CRETACEOUS)

Klv — La Ventana Tongue of Cliff House Sandstone
Light-gray to brown, medium-grained, salt-and-pepper-textured sandstone with gray shale interbeds; total thickness about 900 feet; only lower part present in this quadrangle

Kmf — Menefee Formation
Light- to dark-gray carbonaceous shale, light-gray sandstone, and coal; 600 to 700 feet thick

Kpl — Point Lookout Sandstone
Light-gray, medium-grained, salt-and-pepper-textured sandstone, minor gray shale interbeds; 20 to 150 feet thick

Km — Mancos Shale
Black shale with minor, thin-bedded, light-gray sandstone and yellowish limy concretions; 2,000 to 2,200 feet thick

Kd — Dakota Formation
White, yellow, and buff, fine- to medium-grained, thick-bedded sandstone; black shale and locally coal near the middle; 210 feet thick

JURASSIC

Jm — Morrison Formation
In ascending order: brownish-maroon shale, siltstone, and very fine-grained sandstone with intercalated very fine-grained, white sandstone; yellowish to buff and reddish, medium-grained, calcareous, slightly feldspathic sandstone with intercalated brick-red mudstone; brick-red mudstone and interbedded gray, greenish, and yellowish, fine- to medium-grained sandstone; green shale; 735 to 900 feet thick

Jet — Entrada and Todilto formations, undivided
Todilto: basal black to brown, laminated limestone 5 to 10 feet thick, overlain by white gypsum; 100 to 150 feet thick. Entrada: light orange-tan white, and pale-yellow, fine- to medium-grained sandstone, massive bedded; 150 feet thick.

CHINLE FORMATION (TRIASSIC)

Ꞧu — Upper Member
Brownish-maroon and red-orange shale with minor green shale, reddish and green sandstone, brown pellet limestone, and small-pebble conglomerate; 1,000(?) feet thick

Ꞧa — Agua Zarca Member
White to buff, very thick-bedded, medium- to very coarse-grained, quartzose sandstone, grit, and locally conglomeratic sandstone; 120 to 210 feet thick

PERMIAN

Pgb — Glorieta Sandstone and Bernal Formation, undivided
Glorieta: white, fine- to medium-grained, thick-bedded, quartzose sandstone; 50 feet thick. Bernal: reddish-brown, very thin-bedded, very fine- to medium-grained sandstone; 65 feet thick

Py — Yeso Formation
Tan-brown and orange-buff, even-bedded, fine- to very fine-grained sandstone with very minor, gray, thick-bedded limestone and dolomite; 300 to 350(?) feet thick

Pa — Abo Formation
Reddish-brown mudstone and lenticular arkose and sandstone; subordinant light-gray sandstone, arkose, and nodular limestone; true stratigraphic thickness cannot be determined, probably about 750 feet thick

PENNSYLVANIAN

IPm — Madera Formation
Very coarse-grained to conglomeratic, thick-bedded arkose; reddish- to grayish- maroon shale; thick-bedded, gray limestone containing clasts of quartz and crystalline rock; true stratigraphic thickness cannot be determined, probably 0(?) to 600(?) feet thick

PRECAMBRIAN

pЄpa — Pegmatite and aplite
Dikes and irregularly shaped intrusive bodies of pink alkali feldspar and quartz with minor plagioclase and muscovite

pЄm — Mafic dike
About 5 feet wide; fine-grained hornblende and biotite with subordinant plagioclase and minor quartz

pЄg — Granite
Pink, fine- to medium-grained with minor biotite; locally porphyritic with medium-grained pink microcline phenocrysts

pЄgn — Gneiss
Moderately to strongly foliated, lenticular, fine- to coarse-grained, quartzo-feldspathic gneiss with minor biotite; local inclusions of fine-grained biotite-quartz-feldspar schist and fine-grained hornblende schist

pЄhs — Hornblende schist
Fine- to medium-grained hornblende-plagioclase schist

Contact of surficial deposit

Bedrock contact
Dashed where approximate

Fault
Dashed where approximate, dotted where concealed; U up; D down

Strike and dip of bedding

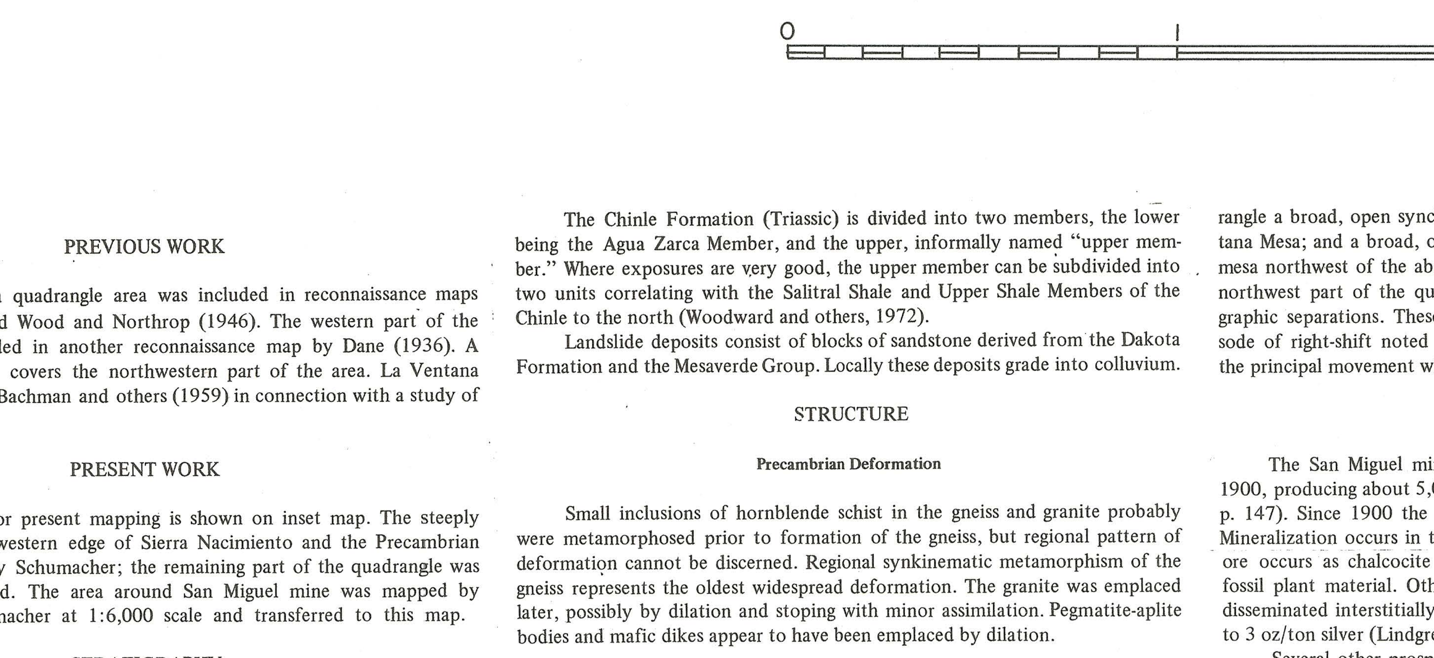
Strike and dip of schistosity or foliation

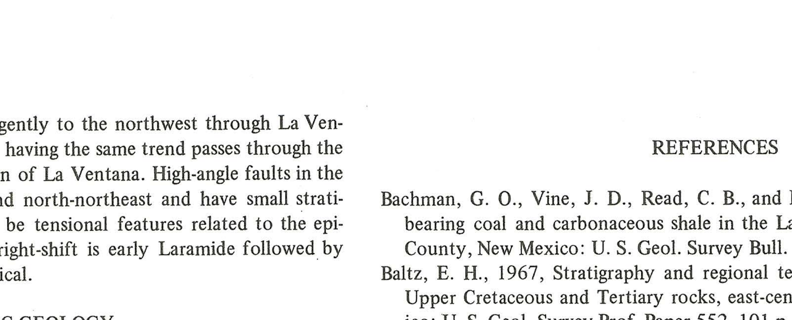
Strike of vertical schistosity or foliation

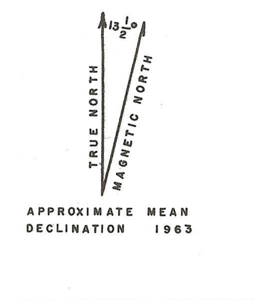
Strike and dip of overturned beds

Strike and dip of vertical beds

Mine or prospect



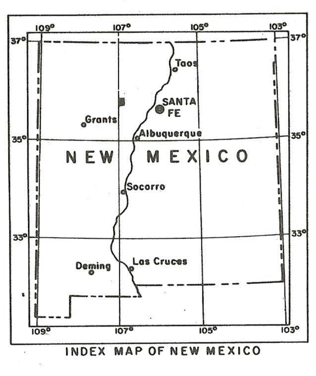




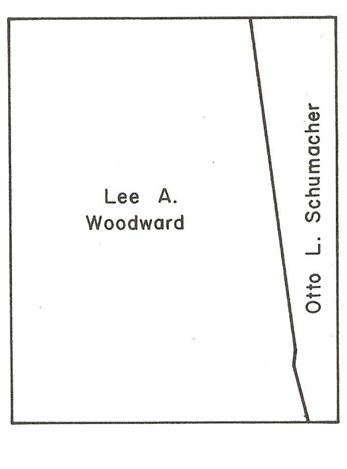
GEOLOGIC MAP AND SECTIONS OF LA VENTANA QUADRANGLE, NEW MEXICO

by Lee A. Woodward and Otto Schumacher 1973

0 — 1 — 2 Miles



INDEX MAP OF NEW MEXICO



PREVIOUS WORK

The La Ventana quadrangle area was included in reconnaissance maps by Renick (1931) and Wood and Northrop (1946). The western part of the quadrangle was included in another reconnaissance map by Dane (1936). A map by Parry (1957) covers the northwestern part of the area. La Ventana Mesa was mapped by Bachman and others (1959) in connection with a study of uranium resources.

PRESENT WORK

Responsibility for present mapping is shown on inset map. The steeply dipping beds at the western edge of Sierra Nacimiento and the Precambrian rocks were mapped by Schumacher; the remaining part of the quadrangle was mapped by Woodward. The area around San Miguel mine was mapped by Woodward and Schumacher at 1:6,000 scale and transferred to this map.

STRATIGRAPHY

The crystalline rocks, overlain unconformably by Mississippian strata a few miles to the south (Fitzsimmons and others, 1956), are probably of Precambrian age as suggested by regional evidence (Muehlberger and others, 1967).

Small inclusions of hornblende schist are present in both the gneiss and the granite. Only the largest inclusion is shown because most are too small to show at this scale. The gneiss, intruded by the granite, is the next younger unit. The youngest Precambrian rocks are the mafic dike and the pegmatite-aplite bodies, but their age relations to each other are not known.

The Madera Formation (Pennsylvanian) is the oldest Paleozoic unit. This formation thins northward and is absent about two miles north of this quadrangle where the Abo Formation (Permian) rests directly on the Precambrian. In this quadrangle the contact between Precambrian and younger rocks is tectonic; whether the Madera is tectonically or unconformably missing in the northern part of the area is not known.

The Glorieta Sandstone and Bernal Formation, undivided, was not mapped north of San Miguel mine; however, some Glorieta may be present directly beneath the Agua Zarca (Triassic), with the Bernal missing. The lithologic similarity between the Agua Zarca and Glorieta makes their contact difficult to map. Thus, the Agua Zarca, as mapped north of San Miguel mine, may include some Glorieta Sandstone at the base.

The Chinle Formation (Triassic) is divided into two members, the lower being the Agua Zarca Member, and the upper, informally named "upper member." Where exposures are very good, the upper member can be subdivided into two units correlating with the Salitral Shale and Upper Shale Members of the Chinle to the north (Woodward and others, 1972).

Landslide deposits consist of blocks of sandstone derived from the Dakota Formation and the Mesaverde Group. Locally these deposits grade into colluvium.

STRUCTURE

Precambrian Deformation

Small inclusions of hornblende schist in the gneiss and granite probably were metamorphosed prior to formation of the gneiss, but regional pattern of deformation cannot be discerned. Regional synkinematic metamorphism of the gneiss represents the oldest widespread deformation. The granite was emplaced later, possibly by dilation and stoping with minor assimilation. Pegmatite-aplite bodies and mafic dikes appear to have been emplaced by dilation.

Paleozoic Deformation

Isopach maps by Wood and Northrop (1946) indicate that the Nacimiento area was a positive structural element during Pennsylvanian time; and continued to show positive tendencies during Permian time, as evidenced by thinner strata here than in adjacent areas.

Laramide Deformation

The major structural features are Laramide in age. They consist of the Nacimiento uplift in the eastern part of the quadrangle and the San Juan basin to the west, separated by a belt of steeply dipping and complexly faulted beds at the western foot of Sierra Nacimiento (structure sections A-A' and B-B'). The Pajarito fault is the principal range-marginal fault and appears to be nearly vertical. The structural relief between the highest part of the uplift and the lowest part of the basin is at least 9,200 feet.

Several small east-west trending faults appear to be related to development of the uplift and the range-marginal fault system.

Evidence of right-shift between the uplift and basin during their early development is seen in several northwest-plunging en echelon folds along the eastern margin of the San Juan basin (Kelley, 1955; Baltz, 1967). In this quadrangle a broad, open syncline plunges gently to the northwest through La Ventana Mesa; and a broad, open anticline having the same trend passes through the mesa northwest of the abandoned town of La Ventana. High-angle faults in the northwest part of the quadrangle trend north-northeast and have small stratigraphic separations. These faults may be tensional features related to the episode of right-shift noted above. The right-shift is early Laramide followed by the principal movement which was vertical.

ECONOMIC GEOLOGY

The San Miguel mine was worked extensively between 1884 and about 1900, producing about 5,000,000 pounds of copper (Lindgren and others, 1910, p. 147). Since 1900 the mine has been operated sporadically (Elston, 1967). Mineralization occurs in the Agua Zarca Member of the Chinle Formation. The ore occurs as chalcocite replacing, or in close association with, carbonaceous fossil plant material. Other minerals are malachite, azurite, and chrysocolla (?) disseminated interstitially in the clastic host rock. The ore reportedly carried 2½ to 3 oz/ton silver (Lindgren and others, 1910).

Several other prospect pits (shown on map) in the Madera, Abo, and Agua Zarca have minor copper mineralization.

Uranium in coal, carbonaceous shale, and carbonaceous sandstone at the base of the La Ventana Tongue of the Mesaverde Group has been reported by Bachman and others (1959, p. 295) who estimated that 132,000 tons of coal and carbonaceous shale containing an average of 0.10 percent uranium are present near La Ventana Mesa. The mineralized zone occurs in three lenticular beds and is several feet thick. Uranium content ranges up to 1.34 percent. A uranium prospect in the base of the Dakota Formation occurs near structure section A-A'.

Lenticular beds of subbituminous coal up to six feet thick are present in the Menefee Formation of the Mesaverde Group. Detailed descriptions of the coal occurrences are given by Dane (1936, p. 142-150). At present coal is not mined commercially in this quadrangle; locations of former mines are shown on the map.

Gypsum is found in the Todilto Formation (Jurassic), but steep dip and thickness of overburden prevent large-scale open-pit mining.

Tertiary-Quaternary terrace and pediment deposits are an excellent source of aggregate. The clasts consist mostly of Precambrian crystalline rocks and range up to 2 feet in diameter. Thickness of these deposits is mostly 2 to 10 feet, but locally may be up to 30 feet. These deposits have been used for road surfacing and pit-run sub-base.

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