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MINERALIZATION IN PRECAMBRIAN ROCKS IN THE MANZANITA-NORTH MANZANO MOUNTAINS, CENTRAL NEW MEXICO

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INTRODUCTION

Proterozoic supracrustal rocks of the Manzanita and North Manzano mountains include Cibola gneiss, Sevilleta metarhyolite, metaclastic rocks, Tijeras Canyon greenstone, Hell Canyon greenstone, and Lacorocah metatuff. These units are intruded by rocks of granitic composition including Sandia granite and Ojito quartz monzonite (Reiche, 1949). Precambrian rocks are unconformably overlain by Pennsylvanian sediments. The Proterozoic supracrustal rocks and some granitic rocks have been subjected to at least two episodes of deformation and middle greenschist to lower amphibolite facies metamorphism. Despite recent detailed studies, stratigraphic relations among the supracrustal units are not completely understood due to complex deformation (Cavin and others, this guidebook; Connolly, this guidebook).

In this paper we locate and describe the major prospects and mines of the Tijeras Canyon, Coyote Canyon, and Hell Canyon districts, interpret the origin and genesis of the deposits, and comment on their economic potential. The deposits are divided into those of Precambrian age and post-Precambrian age. Several mines have produced in the past but none are producing today, although exploration, development, and small-scale production have occurred sporadically in the Hell Canyon and Tijeras Canyon districts in the past few years (Woodward and others, 1978).

Figure 1 is a generalized geologic map of the Manzanita and North Manzano mountains with prospects located by number and keyed to descriptions in the text. Most of the deposits are on patented claims, Kirtland Air Force Base, or Isleta Pueblo lands, and permission should be obtained to examine them.

TIJERAS CANYON DISTRICT

The Great Combination mine (location 1, fig. 1) consists of an adit, driven in greenstone, that terminates at a fault contact with quartzite. A caved raise to the surface intersects the fault. Mineralization consists of gold-bearing quartz veinlets in sheared muscovite-chlorite-quartz schist together with disseminated pyrite, chalcopyrite, and malachite.

The Mary M mine (location 2, fig. 1) consists of an adit with a raise to the surface on patented claims and is controlled by Little Apple Mining Company of Albuquerque. Gold mineralization occurs in fissure veinlets with clays, hematite, calcite, and quartz. Pyrite and malachite occur locally in shear zones.

The York mine (location 3, fig. 1) consists of a decline that follows host-rock foliation at N20°E. The host rock at the surface is a laminated calcite-quartz-magnetite-hematite layer 1 m thick with minor malachite staining, enclosed within greenstone country rock. Although no sulfides are noted in surface outcrops, dump samples consist of banded, semi-massive pyrite-chalcopyrite in quartz-calcite -± tremolite ± sericite ± chlorite gangue.

The Cerro PeIon mine (location 4, fig. 1) consists of two tunnels in brecciated metaquartzite. The upper adit follows an arcuate fluorite-hematite galena vein up to 1.2 m wide. Overall direction of the vein is S16°E (Kelley and Northrop, 1975). The lower adit intersects barite-hematite stringers and the projection of the upper vein in a small stope and drift.

Numerous minor prospects in the Tijeras Canyon district include gouge and silicified fractures in the Cibola gneiss, small pegmatites with local quartz-tourmaline, malachite-bearing chlorite ± sericite shear zones and calc-silicate horizons in greenstone, and quartz-chlorite-pyrite veins (location 5, fig. 1).

COYOTE CANYON DISTRICT

Mineralization in this district consists predominantly of fluorite-galena -± barite ± calcite ± malachite veins and stringers usually hosted by brecciated granitic gneiss (Sevilleta metarhyolite of Reiche, 1949). Veins are nearly vertical, north- to northwest-trending, anastomosing in zones up to 3 m wide, and occur within 50 m of the Precambrian-Pennsylvanian unconformity. Mineralization occurs mainly in Precambrian rocks, but locally extends upward into Pennsylvanian beds. Lead and fluorspar ore were shipped between 1910 and 1923 and also during World War II (Elston, 1967). Major workings include the Red Hill (location 6, fig. 1), Blackbird (location 7, fig. 1), Eighty-five (location 8, fig. 1), and Galena King (location 9, fig. 1) mines as well as other unnamed prospects and mines (locations 10, 11, 12, in fig. 1). Minor prospects in the district include numerous veins as described above, malachite-bearing greenstone, and quartz-pyrite-malachite veins.

HELL CANYON DISTRICT

The Hell Canyon district consists of two important mines: (1) the Milagros-Star mine (location 13, fig. 1) and (2) the Cerro del Oro mines (location 14, fig. 1). The Milagros-Star workings consist of an open-cut, leach pad, shaft, and several prospect pits. It produced small tonnages of gold, silver, and/or copper ores in the 1880's, 1900's, 1910, and 1975-1976 (Woodward and others, 1978). The Cerro del Oro mines consist of several adits, shafts, trenches, and prospects. Exploration and small-scale development is being conducted by A & M Mining and Milling of Albuquerque. These mines are developed along a north-trending shear zone at least 600 m long in greenstone, argillite, and diorite. The zone and subordinate shears host much of the outcropping mineralization. The deposits are largely oxidized and consist of malachite-, chrysocolla, hematite, limonite, gold, silver, minor cuprite and azurite, and rare native copper and sulfur in a gangue of sintery quartz and metachert. Massive pyrite-jasper occurs locally on dumps and indicates shallow oxidation. Similar prospects containing copper stain, disseminated pyrite, sheared greenstone, and metachert pods occur throughout the district (Edwards, 1978; Parchman, 1980).

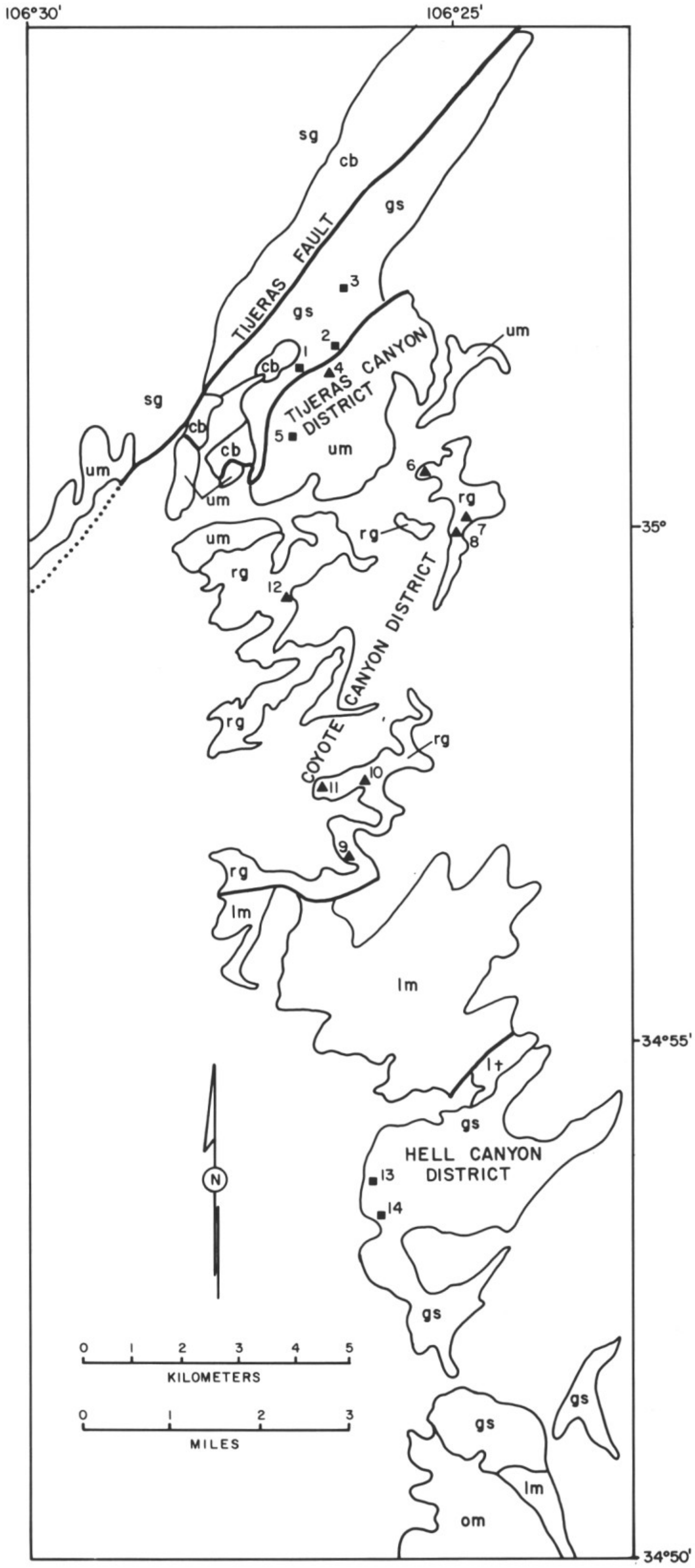

Figure 1. Precambrian geology of the Manzanita–North Manzano mountains. Numbers indicate mines discussed in the text. Modified from Reiche (1949) and Kelley and Northrop (1975). sg—Sandia granite; cg—Cibola gneiss; om—Ojito quartz monzonite; rg—Sevilleta metarhyolite and granitic gneiss; um—upper metaclastic series; lm—lower metaclastic series; gs—greenstone; lt—Lacorocah metatuff; ■—Precambrian-age deposit; ▲—post-Precambrian-age deposit.

ORIGIN, GENESIS, AND POTENTIAL OF THE DEPOSITS

Precambrian Deposits

Deposits of Precambrian age are interpreted as syngenetic, exhalative gold-copper deposits. Much of the world's gold reserves are contained in this class of deposits in metamorphosed mafic volcano-sedimentary sequences, with interlayered iron-carbonate-silica chemical precipitates hosting the ore. Examples include Homestake, Kirtland Lake, MOITO Velho, and the Rhodesian deposits. Structural and metamorphic processes commonly concentrate and redistribute the ore. Deposits may occur in concordant, stratabound horizons (York mine), vein systems (Great Combination and Mary M mines), shear zones (Milagros-Star and Cerro del Oro mines), and saddle reefs. Semi-massive pyrite ± chalcopyrite ore at some of these mines and abundance of mineralized metachert lenses in the greenstone indicate high potential for gold-copper, massive-sulfide deposits in the Tijeras and Hell Canyon districts.

Post-Precambrian Deposits

The fluorite-galena-barite fissure vein deposits are post-Pennsylvanian, as mineralization locally extends into Pennsylvanian sediments. It appears that intersection of Precambrian northeast-trending shear zones and north-trending breccia zones and the Precambrian-Pennsylvanian unconformity controlled mineralization. Although the exact timing is uncertain, Laramide to late Tertiary mineralization seems likely. The potential for economic deposits is deemed low because of small size and low grade of the known prospects.

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