MINING DISTRICTS OF NORTHEASTERN NEW MEXICO

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INTRODUCTION

Northeastern New Mexico of this report comprises Colfax, Union, Mora, Harding, San Miguel, Quay and Guadalupe Counties (Fig. 1), and falls approximately between 34°30′ and 36°00′ N latitude and 103°00′ and 105°45′ W longitude.

The region includes parts of two major physiographic provinces: the Southern Rocky Mountains along its western border and the Great Plains. The Great Plains province in northeastern New Mexico can be further subdivided into the Raton section along the northern edge of the region, consisting of a deeply eroded peneplain surmounted by lava-capped plateaus and buttes, and the High Plains section in the central and southeastern parts of the region, characterized by extensive, gently rolling, slightly dissected, high-level fluviatile plains.

The Sangre de Cristo Mountains are a continuation of the Front Range. They extend southward from the Colorado-New Mexico border approximately 90 miles, terminating in foothills just north of the Glorieta-Rowe Mesa. In the northern half of New Mexico, the Sangre de Cristos are subdivided into two parallel ranges, the Taos Range on the west and the Cimarron Range on the east, separated by the north-south trending Moreno Valley. The western border of Colfax County is roughly coincident with the western margin of Moreno Valley. The main body of the mountains swings to the southwest along the western border of Mora County and is called the Santa Fe Range. A lesser ridge continues southward through western Mora and San Miguel Counties and is called the East or Las Vegas Range. The area between these two ranges forms the drainage basin for the upper Pecos River.

PREVIOUS WORK

The earliest detailed descriptions of the ore deposits and mining districts of northeastern New Mexico are found in U.S. Geological Survey Professional Paper 68, The Ore Deposits of New Mexico, by Lindgren and others (1910). Reports by Harley (1940) and Pettit (1946, 1966) provide much of the most recent information on mining activity and ore deposits in the region. The following accounts and descriptions draw heavily on these three sources.

Detailed studies of individual deposits or districts in the region include: Stott (1931) and Krieger (1932) on the Pecos Mines, San Miguel County; Jahns (1946) and Holmquist (1946) on the Elk Mountain pegmatite district, San Miguel County; and Tschanz and others (1958) on the red-bed copper and uranium deposits of the Coyote district, Mora County.

MINING HISTORY

The majority of past exploration and mining activity in northeastern New Mexico has been restricted to the Sangre de Cristo Mountains of western Colfax, Mora and San Miguel Counties. Nine of the twelve mining districts described in the following section (Table 1) are either totally within these mountains or in subsidiary ranges and foothills. The only economically significant exception is the Pastura district of west-central Guadalupe County, where the Stauber Mine has produced over 11 million lbs of sedimentary copper since 1925.

Intensive mining activity in Colfax County began in 1866 with the discovery of rich copper ore near the summit of Baldy Mountain along the eastern edge of the Moreno Valley. In that same year, gold-bearing stream gravels were discovered along the flanks of the mountain and the rush was on, resulting in the founding of Elizabethtown in 1867. By 1870 it had a population of approximately 7,000 and was the largest town in New Mexico. The district's small and uncertain water supply, coupled with the development of extensive placering operations, led to the construction of the "Big Ditch" in 1868-69. The ditch originated at a point along the Red River some 11 miles east of Elizabethtown. Forced to follow the contours of the local countryside, however, the completed ditch was slightly more than 41 miles long. In spite of its length and the engineering difficulties involved, the ditch was finished in a little over six months at a cost of just $230,000. Placer production through 1879 is estimated at over $2,000,000 (Pettit, 1946), and eventually accounted for almost $5,000,000, half the district's total output. Lode-mining, begun in 1867 with the opening of the Aztec Mine high on the eastern slopes of Baldy Mountains, was equally profitable, although much of the production came after 1900. Since 1948, the district has been idle.

Gold and silver discoveries made in western Mora and San Miguel Counties in the early 1880's led to the establishment of the Mora and El Porvenir districts. The Rociada district is said to have been discovered in 1900 (Northrop, 1959).

San Miguel County has been the principal producer of metals in northeastern New Mexico, and the bulk of this production has come from one mine, the Pecos. The Pecos orebody was discovered in the early 1880's by a prospector named Case. A. H. Cowles attempted to develop the property in 1886, but soon abandoned the task when it became clear that the complex Cu-Zn-Pb ores were not amenable to treatment by available methods. Sporadic development work continued until 1916, when an extensive effort by the Goodrich-Lockhart Company succeeded in blocking out large tonnages of Zn-Pb ore. According to Harley (1940), the period of greatest development began in 1925 when the American Metals Company assumed charge of the property. A program of development and construction was begun which cost around $2,000,000, blocked out 1 million tons of ore and saw a mine plant, mill and 12-mile aerial tramway built by 1927. The mine operated from 1927 to 1939, producing more than 2 million tons of ore that yielded over 400 million lbs of zinc, 130 million lbs of lead, 18 million lbs of copper, 5 million oz of silver and 170,000 oz of gold. During this 13 year period, the Pecos Mine led the state in the production of Zn, Pb, Ag and Au. Rising mining costs, water problems and bad ground at depth all contributed to the mine's shut-down in 1939.

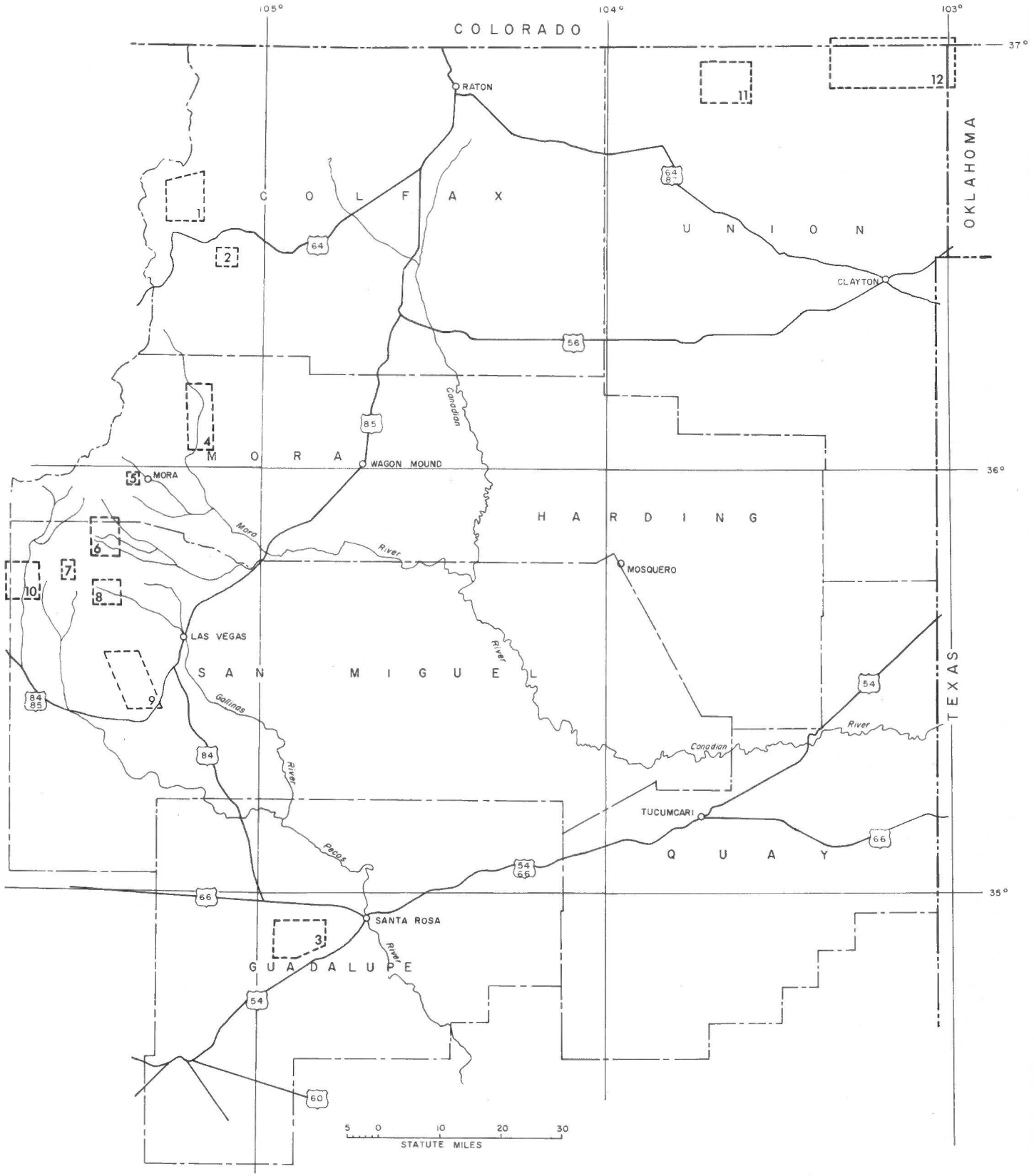

Figure 1. Location map of mining districts of northeastern New Mexico (see Table 1 for names and descriptions).

District	Metal(s) Recovered	Description
---------- COLFAX COUNTY ----------		
1. Elizabethtown-Baldy (Moreno, Willow Creek, Ute Creek, Ponil)	Au, Ag, Cu (Fe, Pb, W)	Au-placers; pyritiferous quartz veins and contact metamorphic deposits in calcareous shales of the Cretaceous Pierre Formation; Cu-oxides in quartz veins; magnetite-hematite replacements in calcareous sediments of the Pierre Formation
2. Cimarroncito	Au, Ag, Cu	Contact metamorphic deposits in Pennsylvanian limestones of the Magdalena Group
---------- GUADALUPE COUNTY ----------		
3. Pastura (Pintada Canyon)	Cu	Copper sulfides disseminated in carbonaceous sandstones and shales of the Triassic Dockum Group
---------- MORA COUNTY ----------		
4. Coyote Creek	Cu, U, V	Copper sulfides and oxides in nodules and veinlets in carbonaceous shales and sandstones, U and V in small pockets in carbonaceous arkosic sandstone of the Pennsylvanian & Permian Sangre de Cristo Formation
5. Mora	Au	Au-placers
6. Rociada	—	(see San Miguel County)
---------- SAN MIGUEL COUNTY ----------		
6. Rociada	Zn, Cu, Pb (Au, Ag, Mo)	Quartz-sulfide lenses & fissures in Precambrian schists & gneisses
	Ta, Li, Be	Precambrian pegmatites
7. Elk Mountain	Mica, Rare Earths	Precambrian pegmatites
8. El Porvenir	Mo, Cu, W, Bi	Pegmatites & quartz veins cutting Precambrian granite
9. Tecolote	Cu	Sulfides disseminated in Pennsylvanian & Permian arkosic sandstones; minor copper sulfides in pegmatitic dikes & quartz veins cutting Precambrian granite, gneiss, & schist
10. Willow Creek (Pecos, Tererro)	Zn, Cu, Pb Au, Ag	Sulfide replacement bodies in Precambrian schists & shear zones; sulfides in quartz-tourmaline veins
---------- UNION COUNTY ----------		
11. Folsom	Cu (Au)	Sulfides disseminated in sandstones of the Triassic Dockum Group; Au-quartz stringers cutting Tertiary-Quaternary basalts
12. Black Mesa	Cu	Copper carbonates; oxides & sulfides disseminated in sandstones of the Triassic Dockum Group

Table 1. Mining districts of northeastern New Mexico.

MINING DISTRICTS

Colfax County

Elizabethtown-Baldy district: This district includes Baldy Mountain and the Moreno Valley in western Colfax County. The Maxwell Land Grant Company divided the area into four sub-districts: Moreno, along the west flank of Baldy Mountain; Ponil, along the northeast slopes of Baldy Mountain; Ute Creek, east of the mountain and encompassing the headwaters of Ute Creek; and Willow Creek, along the south flank of Baldy Mountain. Elizabethtown, located along Moreno Creek, was the main mining camp for the district.

Primarily a gold producer, the district has also yielded silver, copper and iron in economic quantities along with lesser amounts of lead and tungsten. Discovered in 1866, the area experienced its greatest growth and production in the 1870's when almost $3,000,000 in gold and silver were recovered. Another $3,500,000 were produced from 1880 to 1909. Between 1912 and 1920, production, mainly from the Aztec Mine, totaled just over $2,000,000. The Aztec continued to operate intermittently until 1940 at a much reduced output.

Where it crosses the Elizabethtown-Baldy district, the Cimarron Range is a north-south trending, tilted fault-block composed of Cretaceous and Tertiary sediments that have been intruded by a number of Tertiary monzonite and quartz-diorite porphyry plugs, sills and dikes. Most of the intrusives

occur within the Cretaceous Pierre Shale, although many of the sills are localized along the contact between the Pierre and the overlying Raton Formation. Numerous north-south striking normal faults cut the eastern and western flanks of the range offsetting both the sediments and igneous rocks.

Ore bearing solutions, apparently related to the later phases of Tertiary igneous activity, moved upward along the normal faults and outward along sill-shale contacts. The primary gold deposits that resulted are of two types, quartz-pyrite veins that cut both sill margins and adjacent sedimentary country rocks and contact metasomatic zones in calcareous shales. The veins have produced most of the primary gold, which occurs in the free state and intimately intergrown with pyrite. Principal contact metasomatic minerals are diopside, hornblende, epidote, garnet and scapolite. Ore mineralization consists of magnetite, hematite and much lesser amounts of pyrite, chalcopyrite and gold. Most of the gold is intergrown with or included in the magnetite.

Placer deposits derived from the quartz veins and contact metasomatic bodies occur on both sides of Baldy Mountain, although a majority of the production has come from the western or Moreno Valley side. These deposits have accounted for slightly more than half the district's total production.

Cimarroncito district: The Cimarroncito district is located about 15 miles southeast of Baldy Mountain at the head of the middle fork of Cimarroncito Creek. It lies within the Philmont Ranch owned by the Boy Scouts of America. The district was reportedly discovered in the 1890's (Pettit, 1946) and sporadic development work continued until about 1940. Total production was exceedingly small.

Dikes of quartz monzonite porphyry, similar to those at Baldy Mountain and probably contemporaneous with them, intrude Precambrian granite and overlying Pennsylvanian sedimentary rocks along Cimarroncito Creek. Gold, silver and copper mineralization occurs in contact metasomatic zones in limestones of the Pennsylvanian Magdalena Group adjacent to many of the intrusive porphyries. A typical mineral assemblage includes andradite garnet, epidote, quartz, calcite, specularite, magnetite, pyrite and chalcopyrite.

Guadalupe County

Pastura district: The Pastura or Pintada Canyon district is located 17 miles southwest of Santa Rosa and 7 miles northeast of Pastura in central Guadalupe County. Two mines have been worked in the district, the Stauber and the Pastura. The Stauber, the older and larger of the two, was discovered in 1915 (Stauber, 1930) and has subsequently accounted for over 90 percent of the district's total production. Operating from 1925 to 1930, 1940 to 1945, and intermittently since 1949, the Stauber has yielded over 11 million lbs of copper and 7000 oz of silver.

The geology of the district consists mainly of gently dipping Triassic sediments of the lower Dockum Group. Underlying units of the Permian Artesia Group are exposed over a small area in the bottom of Pintada Canyon. All of the sediments have been mildly deformed into a series of gentle anticlinal and synclinal flexures. The Stauber deposit occupies one of these synclinal depressions.

The deposit is a typical "red-bed" copper occurrence with the ore confined to a single bed in the Santa Rosa Sandstone of the lower Dockum Group. Chalcocite, bornite, malachite, azurite, chrysocolla and tenorite fill fractures and intergranular spaces or replace feldspar grains, organic detritus and carbonate cement. The ore had an average grade of 4 to 5 percent Cu.

Harding County

Harding County has no mining districts, although at several times in the past mild excitement has been generated by alleged gold discoveries. Quartz stringers in the Tertiary-Quaternary basalts of north-central Harding County are reported by Harley (1940) to have yielded a few moderate to rich single assays for gold, but no significant amounts of gold-bearing material have ever been found.

Mora County

Coyote Creek district: The Coyote Creek district is situated in the valley of Coyote Creek 12 miles northeast of Mora near the small village of Guadalupita. The district was first prospected before 1900 (Lasky and Wootton, 1933). Two small mines made trial shipments in 1907, and 37 tons of ore were shipped to El Paso in 1917 yielding 6,315 lbs of copper and 40 oz of silver. There has been no other production, although the district experienced some renewed interest in 1950, when a number of the copper deposits were found to contain uranium (Zeller and Baltz, 1954). The reserves and uranium content of the copper-bearing sediments proved too small to justify any attempt to recover the uranium. Subsequently, several small, higher-grade uranium-vanadium deposits were discovered in nearby sandstones (Tschanz and others, 1958). These too are currently subeconomic.

The copper and uranium-vanadium deposits are confined to the lower 2,000 ft of the Sangre de Cristo Formation of Pennsylvanian and Permian age that crops out in a narrow, steeply-dipping belt along the west side of Coyote Creek. Uranium-vanadium deposits occur in sandstone and micaceous siltstone. The mineralization is commonly concentrated in sandstone lenses containing abundant clay, rock fragments and carbonized wood. Most of the ore pockets are less than 2 ft thick and 10 ft long. The main ore minerals are metatyuyamunite, uraniferous hematite and black micaceous vanadium minerals similar to roscoelite. The copper deposits occur in several rock types, but most of the larger and richer ore bodies are in black carbonaceous shales. The average ore lens is 2 or 3 ft thick, 100 to 300 ft in diameter and contains about 1.5 percent copper. The principal copper minerals are chalcocite, malachite and azurite.

Mora district: This district is located just west of Mora, near the village of Cleveland, and close to the junction of Rio la Casa with the Mora River. Placer gold was discovered in the area in the 1880's (Northrop, 1959) and several small placering operations were subsequently conducted on one of the old Mora River terraces. There are no production records for the district. The gold most likely originated in quartz lenses and veinlets that cut Precambrian metamorphic rocks exposed to the northwest along the upper reaches of Rio la Casa.

Quay County

Like Harding County, Quay County has no recognized mining districts. "Red-bed" copper occurrences have been located and prospected in several places near Logan, on the Canadian River northeast of Tucumcari, where chalcocite, malachite and azurite are disseminated in shaly sandstones of the Dockum Group. The mineralization, although similar to

that of the Pastura district in Guadalupe County, is lower grade.

San Miguel County

Rociada district: The Rociada district lies along the eastern flanks of the Las Vegas Range in northwestern San Miguel County with a northern extension into southwestern Mora County. It is approximately 20 miles northwest of Las Vegas and includes the villages of Rociada and Upper Rociada. The district is said to have been discovered in 1900 (Harley, 1940), but only a small amount of development work was attempted prior to 1930. During the 1930's considerable work was done by Dr. W. G. Smith of Tererro, New Mexico, on the more promising copper showings, but no ore bodies of commerical grade were discovered (Anderson, 1957). In 1946 and 1947 there was very limited production of lithium and tantalum ores from the Pidlite pegmatite in the northwest corner of the district. No further mining was done until 1961, when the operation was reactivated for the extraction of rare-earth and tantalum-bearing minerals. A small mill was constructed and several thousand tons of rock processed, the final tantalum concentrate was not of marketable grade and the operation is now inactive (Sheffer and Goldsmith, 1969).

The deposits in the Rociada district are apparently all of Precambrian age and consist primarily of lenses and fissures in the gneisses and schists that have been filled with quartz and varying proportions of pyrite, chalcopyrite, sphalerite, galena and minor amounts of gold and molybdenite. The quartz-sulfide bodies are generally parallel to the foliation of the enclosing country rock. Some disseminated copper carbonates occur locally in the basal Paleozoic sediments. Lithium-bearing pegmatites, with minor tantalum, cut amphibolitic rocks in the northern part of the district. Lepidolite is the major lithium mineral; most of the tantalum occurs in microlite.

Elk Mountain district: This district is located high along the eastern slopes of the Las Vegas Range in northwestern San Miguel County. The occurrence of mica-rich pegmatites was known for some time prior to 1936 when the first claims were filed in the district (Holmquist, 1946). In 1942, the International Minerals and Chemical Company of Carlsbad, New Mexico, began mining the Elk Mountain or Kept Man deposit. Production during 1943 and 1944 amounted to several hundred pounds of trimmed mica and a little more than 20 tons of scrap. There are no records of more recent production from this property. According to Jahns (1946), the Guy No. 1 deposit, 2½ miles southeast of Elk Mountain, produced several tons of scrap mica and more than 500 lbs of tantalum, uranium and rare-earth minerals between 1930 and 1945.

The ore deposits are Precambrian and consist of a number of elongate pegmatitic pods or lenses that trend roughly north-south and dip steeply. The pegmatites generally occur in quartz-mica schists and cross-cut the host rock foliation. They are composed of quartz, microcline, albite and mica, with minor amounts of spessartite, fluorite, tourmaline, beryl, monazite, columbite, uraninite, samarskite and other uranium and/or rare-earth bearing species.

El Porvenir district: The El Porvenir or Hermit Mountain district lies about 15 miles northwest of Las Vegas along the eastern edge of the Las Vegas Range. Much of the district is now within the Pecos Wilderness Area. The area was first prospected in the 1880's as a result of gold and silver discoveries in the Rociada district to the north and at Mineral Hill to the south (Northrop, 1959). The chief mineral sought by the early prospectors was gold, but showings of copper, molybdenum, tantalum and bismuth are numerous. The Bert Hoover Mining Lode No. 1, located high in a saddle on the south side of Hermit Mountain, is apparently the major prospect in the district. It contains a molybdenite deposit in a pegmatitic gangue of quartz, orthoclase and muscovite. The molybdenite occurs in small scattered pockets and blebs associated with chalcopyrite, scheelite, bismuthinite and malachite. There is no record of production from the property.

A coarse-grained pink Precambrian granite makes up the main mass of Hermit Mountain and is the host rock for the sulfide-bearing pegmatite dikes and quartz veins. The granite intrudes a metamorphic complex composed mainly of quartz-feldspar schists and gneisses.

Tecolote district: This district is located about 8 miles southwest of Las Vegas in the foothills and southeastern slopes of the Las Vegas Range. According to Lindgren and others (1910), sedimentary copper occurrences in the area were known long before serious development and mining attempts began in the early 1900's. Through 1905, about 5000 lbs of copper had been recovered from a local leaching operation. No further production has been reported from the district. The copper occurs as sulfide and oxide disseminations and fissure-fillings in arkosic sandstones of Pennsylvanian and Permian age where these rocks form a north-south trending belt along the eastern edge of the Las Vegas Range.

Precambrian pegmatites have been worked for mica and associated minerals in the Ribera area in the southwestern corner of the Tecolote district. The most persistent and productive operation has been at the Old Priest Mine about 6½ miles north of Ribera. The mine reportedly supplied mica to the Spanish settlers for use in windows (Anderson, 1956). In 1955, the property produced $10,000 worth of beryl, columbite, tantalite and monazite. It is now inactive.

Willow Creek district: The Willow Creek (Pecos, Tererro) district is in the extreme northwestern part of San Miguel County and extends along the Pecos River both above and below the point where Willow Creek joins the main stream. The Pecos Mine, at the junction of Willow Creek and the Pecos River, was the only productive mine in the district. Formerly known as the Hamilton, Cowles or Tererro Mine, the Pecos was discovered in 1882. In 1927, several owners and developers later, the American Metals Company brought the property into production. It operated until 1939, yielding over 2 million tons of Zn-Pb-Cu-Ag-Au ore. The main mining camp at Tererro on the Pecos River had a population of around 3,000 at the height of mining activity.

The ore deposits occur as replacement bodies in highly sheared Precambrian rocks, mainly quartz-chlorite and quartz-sericite schist, and consist of a complex mixture of sphalerite, galena, chalcopyrite, gold, silver and pyrite. Minor chalcopyrite and gold occur in quartz-tourmaline veins that cross-cut the main ore zones.

Southwest of the Pecos Mine about 4 miles, on the eastern slopes of the Santa Fe Range where Precambrian rocks are widely exposed, are a number of small prospects that are mineralogically similar to the Pecos. Except for the Johnny Jones Group, development work has been minimal and none of the prospects has had any recorded production.

Union County

Folsom district: This district is located about 12 miles northeast of Folsom, along the Cimarron River, in northwestern Union County. Reports of gold strikes along the Cimarron River date back to 1897 (Harley, 1940). Sedimentary copper occurrences are also known along the river canyon. A few prospect holes, tunnels and open cuts were dug in the late 1930's, but there is no record of any actual mining or production from the district.

The Folsom district is in an area of basaltic lavas that originated from the Capulin volcanic cone and related lesser vents to the west. At scattered localities small stringers of quartz cut the lavas and some have been reported to carry gold values. At no place have such occurrences proved economic.

Copper-bearing sandstones are exposed in several places along the Cimarron River in the eastern part of the district. Chalcocite nodules, coated with malachite and azurite, occur in gray sandstone beds of the Dockum Group. No deposits of commercial size have been found.

Black Mesa district: The Black Mesa district lies in the steep, narrow valley of the Cimarron River some 35 miles north of Clayton in the northeastern corner of Union County. Sedimentary copper occurrences are exposed in several places along the bottom of the river valley and were reportedly first prospected about 1900 (Harley, 1940). The copper is generally associated with clastic plugs of late Triassic age, although some mineralization is found in sandstones of the uppermost Dockum Group. Chalcocite, malachite and azurite constitute the major ore minerals and replace both carbonate cement and organic detritus (Baldwin and Muehlberger, 1959).

Most of the development work was restricted to a single property in the central part of the district. By 1913, when work was finally discontinued, this property had been owned by four different companies that had invested over $5,000,000 of their stockholders' money in its "development." No ore was ever mined. H. J. Stevens (1911, p. 818-819) assessed the reliability of the Fort Pitt Copper Company, the last "developer" of the deposits, in The Copper Handbook:

> "Organized Jan. 22, 1907, under the laws of Delaware, with capitalization $2,500,000, shares $5 par, being said, in the press, to have been organized 'to acquire mines of gold, silver, copper, brass, etc.' No brass mine is needed, however, as the president has all the 'brass' that any one stockjobbing concern ever could utilize. . . . The prospectus of the company, written by a cheerful liar, states that not one of the great mines of the United States has as great a percentage of copper as the Fort Pitt, and that there is greater value back of this stock than any stock on the market, and that it is as safe as real estate, with ten times the earning power, all of which statements are unmitigated prevarications. By reason of its bad antecedents and willful lies, the company is considered a swindle."

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