



Base from U.S. Geological Survey, 1:24,000
Questa, Red River, Red River Pass, Arroyo Seco, Wheeler Peak, and Eagle Nest, 1963

SCALE 1:50,000
1 2 3 MILES
1 5 0 1 2 3 KILOMETERS

Geology generalized from Reed, Lipman, and Robertson (in press)

- LIST OF MAP UNITS**
- Qe QUATERNARY DEPOSITS—Shown only along west margin of mapped area
 - Tv TERTIARY VOLCANIC ROCKS—Rocks of Latir volcanic field, ranging from basalt to rhyolite; includes sedimentary rocks beneath and interlayered with volcanic rocks
 - Tt TERTIARY INTRUSIVE ROCKS—Chiefly quartz monzonite, granite, and quartz latite; includes rhyolite and rhyolite porphyry
 - Xg PROTROZOIC GRANITIC ROCKS—Quartz monzonite, granite, and tonalite; generally has strong cataclastic foliation
 - Xm PROTROZOIC METAMORPHIC ROCKS—Includes amphibole gneiss, amphibolite, biotite gneiss, biotite-muscovite schist, quartzite, and metamorphosed volcanic rocks; locally includes marble, metachert, and iron formation
- CONTACT**
- NORMAL FAULT**
- TOPOGRAPHIC WALL OF QUESTA CALDERA—**Bordered where concealed; teeth on inner side
- APPROXIMATE BOUNDARY OF COLUMBINE-HONDO WILDERNESS STUDY AREA**
- ① AREA HAVING (1) HIGH POTENTIAL FOR STOCKWORK MOLYBDENUM DEPOSITS AND (OR) KNOWN MOLYBDENITE MINERALIZATION, AND (2) MODERATE POTENTIAL FOR STOCKWORK MOLYBDENUM DEPOSITS
- ② AREA HAVING MODERATE POTENTIAL FOR MASSIVE-SULFIDE DEPOSITS
- ③ AREA HAVING MODERATE POTENTIAL FOR SMALL, LOW-GRADE PRECIOUS-METAL VEIN DEPOSITS
- PATENTED MINING CLAIMS**

STUDIES RELATED TO WILDERNESS

Under the provisions of the Wilderness Act (Public Law 88-577, September 3, 1964) and the joint conference report on Senate bill 488, Congress, the U. S. Geological Survey and the U. S. Bureau of Mines have been conducting mineral surveys of wilderness and primitive areas. Areas officially designated as "wilderness," "wild," or "canon" when the act was passed were incorporated into the National Wilderness Preservation System, and some of them are currently being studied. The act provided that areas under consideration for wilderness designation should be studied for suitability for incorporation into the Wilderness System. The mineral surveys constitute one aspect of the suitability studies. The act directs that the results of such surveys are to be made available to the public and be submitted to the President and the Congress. This report discusses the results of a mineral survey of the Columbine-Hondo Wilderness Study Area in the Carson National Forest, Taos County, N. Mex. The Columbine-Hondo Wilderness Study Area was established by Public Law 96-550, December 19, 1980; it was earlier classified as a further planning area (83032) during the Second Roadless Area Review and Evaluation (RAE II), by the U. S. Forest Service, January 1979.

MINERAL RESOURCE POTENTIAL SUMMARY

Two areas, one adjacent to and one within the Columbine-Hondo Wilderness Study Area, have high potential for the occurrence of stockwork molybdenum deposits. These areas are bordered by regions of moderate potential for stockwork molybdenum deposits that include parts of the study area.

Two regions within the study area have moderate potential for massive sulfide deposits.

Two small areas, one within and one partially within the study area, have moderate potential for small, low-grade gold- and silver-bearing epithermal vein deposits.

LOCATION AND ACCESS

The Columbine-Hondo Wilderness Study Area (fig. 1), in north-central New Mexico, covers about 46,000 acres (186 km²) of the Carson National Forest in Taos County. The area extends from the mountain front on the east side of the Rio Grande Valley to the crest of the Sangre de Cristo Mountains. Elevation ranges from 12,711 ft (3,874 m) on Gold Hill to about 7,800 ft (2,380 m) at the point where the Rio Hondo emerges from the mountains. Access is via New Mexico Highway 38 up the Red River on the north and New Mexico Highway 150 up the Rio Hondo on the south, both paved. A U. S. Forest Service road skirts the eastern margin of the area, and several U. S. Forest Service roads provide access to the western margin from New Mexico Highway 3.

GEOLOGIC SETTING

The study area lies in the Sangre de Cristo Mountains, an uplifted block which is bounded on the west by a series of structural depressions which make up the Rio Grande rift. On the east, the area is separated from the high plains by several lower uplands and mountain blocks. Present relief and topography is due largely to Miocene and post-Miocene uplift.

In the study area, the range is composed primarily of Precambrian rocks, partly mantled by mid-Tertiary volcanic rocks. Both the Precambrian rocks and the Tertiary volcanic rocks are intruded by rocks of Tertiary age that exhibit a wide range of compositions.

The Precambrian rocks are of volcanic, sedimentary, and intrusive origin, and of medium to high metamorphic grade. They are believed to be of early Proterozoic age (1.7 to 1.8 billion years), though no radiometric ages are available.

Along an approximately 5-mi (8-km) wide northeast-trending zone, centered approximately on the Rio Hondo, some of the metamorphic rocks exhibit

retrograde greenschist facies assemblages and cataclastic textures. These features may be related to the Jemez zone of crustal weakness of Precambrian ancestry that has been an important control of late Cenozoic plutonism and tectonics (Lipman and Mohr, 1979).

The Tertiary igneous rocks include parts of the Latir field; they range in composition from basalt to rhyolite and form plutons, dikes, and sills. The major features are the Columbine-Hondo pluton, a monzonitic intrusion of quartz monzonite, and a large, predominantly rhyolitic, dike swarm.

MINES AND PROSPECTS

Mining in the vicinity of the Columbine-Hondo Wilderness Study Area dates from 1866. The highest level of activity related to precious metals was from about 1890 to 1905, with minor periods of renewed activity about 1910, 1920, and 1930 (Schilling, 1960). The value of production between 1900 and 1930 was less than \$20,000 from placer and lode mining, during that period 485 oz (15,100 g) of gold and 5,486 oz (171,000 g) of silver were recovered (Briggs, 1982).

Within the study area, 1,000 unpatented and 60 patented mining claims. Current significant mining activities consist of the large Questa molybdenum mine (fig. 2), just north of the study area, that has been in nearly continuous production since 1922 (Briggs, 1982).

The study area comprises the northern half of the Rio Hondo mining district and the southern half of the Red River mining district.

A total of 473 samples were collected from lode workings. All but a few contained less than 0.1 oz/ton (3.4 g/t) gold and less than 1 oz/ton (34 g/t) silver. With a few exceptions, copper, lead, and zinc values did not exceed 0.05 percent. Of 27 placer samples, 7 contained more than 0.1 oz/ton (3.4 g/t) gold. Most of the higher values for both lode and placer samples came from the Placer Creek-Tiomeer Creek locale (fig. 3, and Briggs, 1982).

ASSESSMENT OF MINERAL RESOURCE POTENTIAL

Stockwork molybdenum deposits

Stockwork molybdenum deposits in the Questa area are found in and above the apical portions of evolved, post-caldera granites and rhyolites, and the best mineralization is often found in mafic-to-intermediate-composition volcanic or metavolcanic wall rocks.

Two areas in the Columbine-Hondo Wilderness Study Area have these characteristics (see fig. 2 and map). One is an east-northeast trending band, mostly north of the study area, that is parallel to a belt of known molybdenite mineralization and has high potential along the Red River. This band contains plutons and dikes of granite and rhyolite and is known to contain sporadic low-grade mineralization. It has moderate potential for stockwork molybdenum deposits.

The other area is in the southern part of the study area, in a region containing many dikes and small plutons of similar granite and rhyolite and moderately abundant favorable wall rock. The dikes and small plutons probably represent the upper part of a larger granitic body at depth. The central, most intensely intruded area, which is most likely to overlie the apex of a buried pluton, has high potential for stockwork molybdenum deposits, and is bordered by a larger area of moderate potential.

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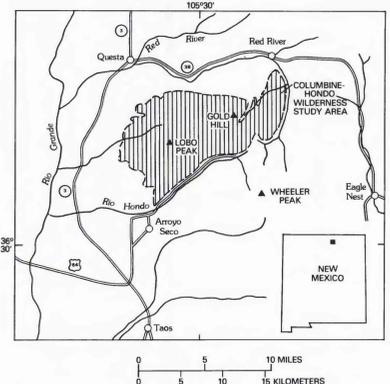
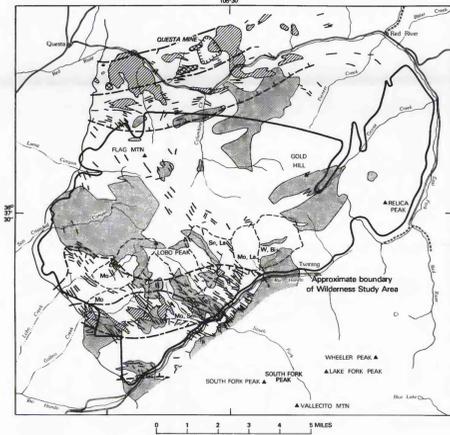
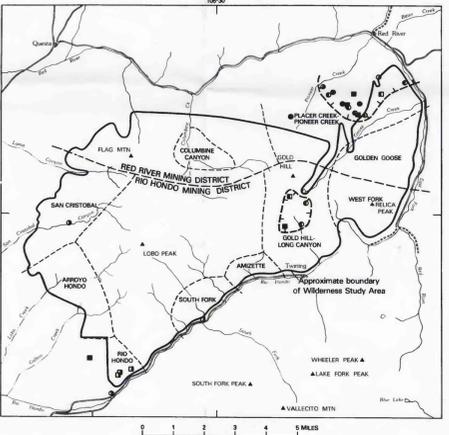


Figure 1—Index map showing location of the Columbine-Hondo Wilderness Study Area.



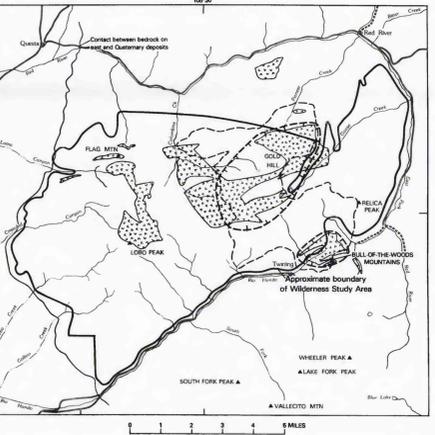
- EXPLANATION**
- EXISTING OPEN PIT FROM WHICH MOLYBDENITE HAS BEEN MINED
 - RED RIVER VOLCANIC DEPOSITS
 - POST-CALDERA GRANITE AND RHYOLITE DIKES
 - PRECAMBRIAN AMPHIBOLITE
 - BOUNDARY OF WILDERNESS STUDY AREA
 - BOUNDARY OF AREA HAVING HIGH POTENTIAL FOR STOCKWORK MOLYBDENUM DEPOSITS AND (OR) KNOWN MOLYBDENITE MINERALIZATION
 - BOUNDARY OF AREA HAVING MODERATE POTENTIAL FOR STOCKWORK MOLYBDENUM DEPOSITS
 - DRAINAGE BASIN ANTEPALEOZOIC IN ELEMENTS INDICATIVE OF SERVICED STOCKWORK MOLYBDENUM DEPOSITS—ELEMENTS WHICH ARE INDICATED
 - SAMPLE LOCALITIES—Right half of symbol filled indicates Ag 21 or more (0.4 g/metric ton); left half of symbol filled indicates Au 0.1 oz/ton (3.4 g/metric ton)
 - Grab or dump sample
 - Chip or channel sample

Figure 2—Map showing areas having potential for stockwork molybdenum deposits.



- EXPLANATION**
- BOUNDARY OF WILDERNESS STUDY AREA
 - BOUNDARY OF MINING DISTRICT
 - BOUNDARY OF MINERALIZED LOCALITY
 - BOUNDARY OF AREA HAVING MODERATE POTENTIAL FOR PRECIOUS-METAL VEIN DEPOSITS
 - PRECAMBRIAN AMPHIBOLITE AND METAVOLCANIC ROCKS
 - DRAINAGE BASIN ANTEPALEOZOIC IN WHICH THE HEAVY MAGNETIC FRACTION OF STREAM-SEDIMENT SAMPLES

Figure 3—Map showing areas having potential for precious-metal deposits.



- EXPLANATION**
- BOUNDARY OF WILDERNESS STUDY AREA
 - BOUNDARY OF AREA HAVING MODERATE POTENTIAL FOR MASSIVE-SULFIDE DEPOSITS
 - PRECAMBRIAN AMPHIBOLITE AND METAVOLCANIC ROCKS
 - DRAINAGE BASIN ANTEPALEOZOIC IN WHICH THE HEAVY MAGNETIC FRACTION OF STREAM-SEDIMENT SAMPLES

Figure 4—Map showing areas having potential for massive-sulfide deposits.

MINERAL RESOURCE POTENTIAL MAP OF THE COLUMBINE-HONDO WILDERNESS STUDY AREA, TAOS COUNTY, NEW MEXICO

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