DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

MISCELLANEOUS FIELD STUDIES
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PAMPHLET

MINERAL RESOURCE POTENTIAL OF THE MANZANO WILDERNESS, VALENCIA AND TORRANCE COUNTIES, NEW MEXICO

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STUDIES RELATED TO WILDERNESS

Under the provisions of the Wilderness Act (Public Law 88-577, September 3, 1964) and related acts, 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 "canoe" when the act was passed were incorporated into the National Wilderness Preservation System, and some of them are presently 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 Manzano Wilderness, Cibola National Forest, Valencia and Torrance Counties, N. Mex. The area was established as a wilderness by Public Law 95-237, February 24, 1978.

MINERAL RESOURCE POTENTIAL SUMMARY STATEMENT

There is a moderate potential for a small deposit averaging as much as 0.1 oz gold and 1 oz silver per ton in the Bartolo Canyon area as indicated by the presence of identified gold and silver mineral occurrences in the canyon. A low potential is indicated for additional small gold and silver deposits in an area of similar geology along the southwest boundary of the wilderness.

No indication of significant mineral occurrences was found elsewhere in the wilderness. The few anomalous values found in stream-sediment and outcrop analyses were for samples from widely separated localities and in amounts too low to indicate a resource potential.

INTRODUCTION

Location, geographic setting, and access

The Manzano Wilderness consists of about 57.8 sq mi (37,000 acres) in the Mountainair Ranger District of the Cibola National Forest. It is in the Manzano Mountains about 30 mi south-southeast of Albuquerque, along the boundary of Torrance and Valencia Counties (fig. 1). Elevations range from about 6,000 ft above sea level along the western base of the mountains to a maximum of 10,098 ft on Manzano Peak; the crest of the mountains is generally about 9,000 ft. Topographic relief ranges from about 1,600 ft to 2,400 ft per mile over most of the range. Access to the periphery of the wilderness is provided by unimproved dirt roads and jeep trails along most of the western and southeastern parts of the area, and by four improved dirt and gravel roads, one to the John F. Kennedy Campground in Canon del Trigo on the west-central boundary, one to Red Canyon picnic area on the southeast side, one to the top of Capilla Peak, and the Torreon-Tajique loop road near the northeast boundary.

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Present and previous studies

This report relies on a review of previous geologic studies of the area by other workers and on supplemental fieldwork conducted by the authors during 1979-1981. The geologic report and map are adapted from the work of Reiche (1949), Stark (1956), Myers and McKay (1971, 1972, 1974), and Condie and Budding (1979). Geologic fieldwork by the U.S. Geological Survey consisted of some geologic mapping and of geochemical sampling of selected stream deposits, mineralized areas, bedrock, and panned concentrates on some major drainages (Maxwell and Wobus, 1982a,b).

A detailed review of the published and unpublished literature on the geology and mineral activity of the area was completed, and mining-claim location notices were examined at the Torrance County Courthouse in Estancia, N. Mex., and at the Valencia County Courthouse in Los Lunas, N. Mex. Records of the U.S. Bureau of Land Management State

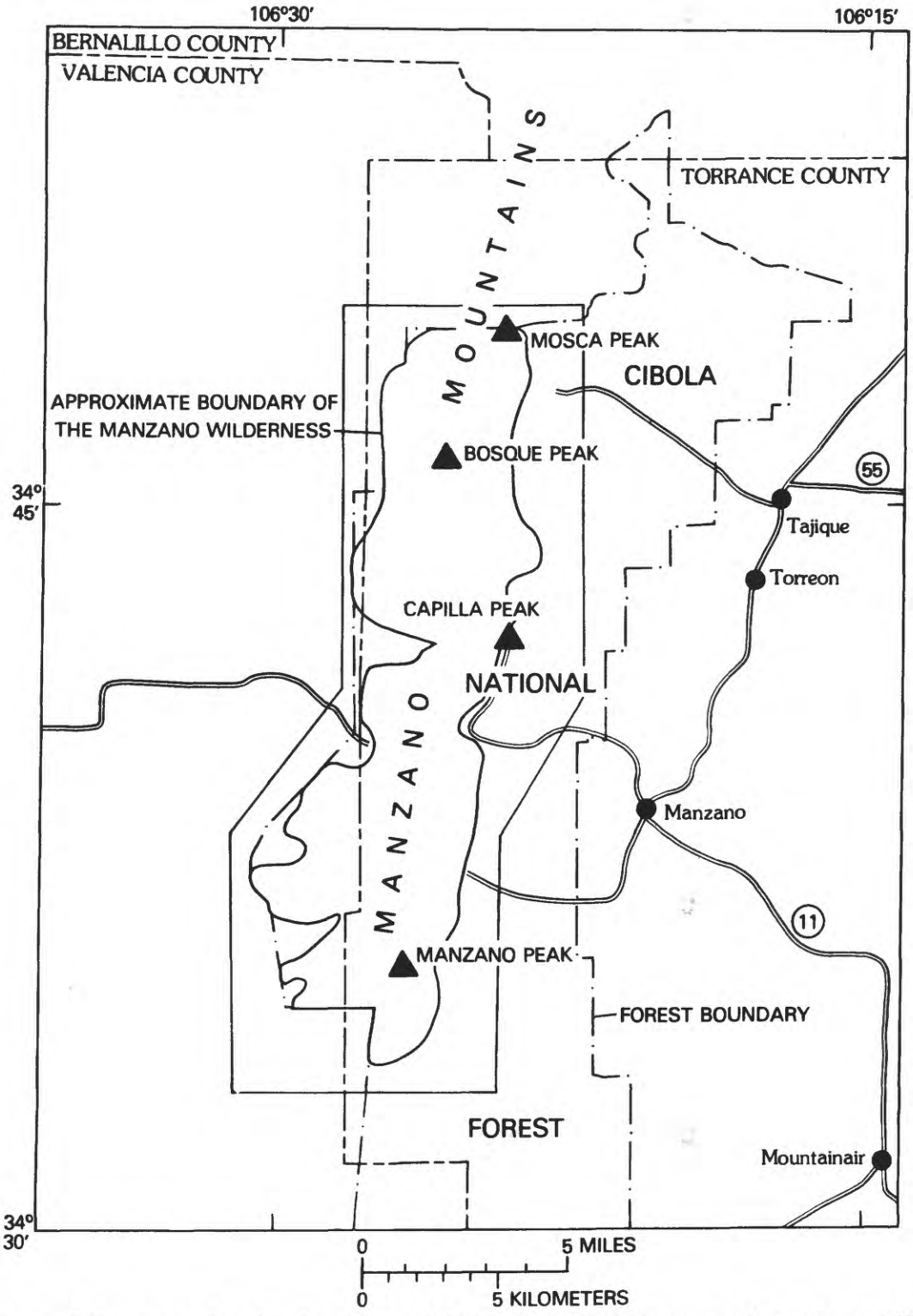

Figure 1.—Index map showing location of the Manzano Wilderness, Valencia and Torrance Counties, N. Mex.

Office in Santa Fe were checked for patented claims and oil and gas leases. Mining-claim files were checked at the Cibola National Forest Supervisor's Office in Albuquerque, N. Mex., and at the Mountainair Ranger District Office, in Mountainair, N. Mex.

Field investigations by the U.S. Bureau of Mines in 1980-81 focused on mines, prospect workings, and mineralized areas. Surface and underground workings within 1 mi of the wilderness were sampled and mapped. Mining claims found in the field were examined and sampled where workings or mineralized rock was encountered (Light, 1982).

Mining activity

No mining activity was encountered during studies of the wilderness. However, about 25 mines and prospects were located within or adjacent to the wilderness; of these, 15 are reported to have had exploration or development work since 1977 (Light, 1982).

GEOLOGY

The Manzano Mountains, part of the uplifted eastern margin of the Rio Grande trench, are an eastward-dipping, fault-block mountain range with a core of complexly deformed Precambrian rocks overlain by Pennsylvanian sedimentary rocks. The Manzano Wilderness is land that is largely underlain by Precambrian rocks. It includes the mountain crest and steep, west-facing slopes and some of the east-facing slopes in the southern part of the area.

The major faults in the region occur along the eastern and western borders of the range. Those along the west base of the mountains, near the western boundary of the wilderness, have projected displacements of at least 10,000 ft down to the west, and there is as much additional displacement on other faults a short distance west of the map area. Short fault segments are shown on the map only where scarps or displacements are evident in the alluvium or pediment deposits; most are covered by younger alluvium. The faults are not well alined and are probably part of a wide zone of faults marking the east edge of the Rio Grande trench.

The faults along the east base of the mountains are mostly west-dipping reverse faults; older rocks on the west are upthrust against and over younger rocks on the east. Some segments of the faults are vertical or eastward dipping. Several prominent faults in the Precambrian rocks are parallel to the reverse faults and are probably related to the same period of deformation. Numerous occurrences of cataclasite and bull-quartz veins in the Precambrian probably represent such faults and shear zones. The base of the prominent quartzite bed northwest of Comanche Canyon may be a fault zone; Reiche (1949, p. 1188) describes a zone of strong silicification 3-4 ft thick at the unconformity where there has been essentially complete replacement of quartzite by massive milky quartz. The rocks above and below the unconformity and the quartzite are similar, except that foliation and schistosity west of the quartzite trend generally east-west to northeast, and bedding and foliation in the quartzite immediately above the milky quartz and in the overlying argillaceous rocks trend north-northeast.

Folds in the Manzano Mountains are a minor part of the structures; the sedimentary rocks have only a few small and open folds plunging gently eastward. Bedding is locally steeply dipping or overturned adjacent to the reverse faults. Numerous small folds are present throughout the Precambrian rocks; a few in the southeastern part of the wilderness are plotted on the map that accompanies this pamphlet. The argillaceous metasedimentary rocks (p€ar on the accompanying map) along the west side of the wilderness, south of Canon de Jaramillo, and especially prominent in Canon Monte Largo, are characterized by (1) tightly crenulated, nearly isoclinal folds that show amplitude-to-length ratios varying from 1:1 to as much as 4:1; (2) chevron crenulations having amplitudes of a few centimeters on the limbs of chevron folds having one to several meters amplitude, which are in turn part of an apparent fold having hundreds of meters amplitude.

A major syncline mapped (Stark, 1956; Condie and Budding, 1979) in the Precambrian rocks, its axis along the center of the outcrop area of metavolcanic rocks (p€mv) may not be present. The rocks on either side of the metavolcanic unit have considerable differences both in lithology and fabric. Those on the east side are composed mostly of quartzite and phyllite characterized by prominent bedding or compositional layering; foliation, where evident, is parallel to the layering. Contacts with the metavolcanics and between units are generally gradational or interfingering. In contrast, those on the west side are largely argillaceous metasedimentary rocks (p€ar), containing numerous lenses and layers of quartzite, that appear to have had a more complex deformational history than the overlying rocks to the east. Bedding or compositional layering is poorly preserved except in the quartzite, where bedding and cross bedding are locally preserved in the thickest units. Many of the quartzite layers appear to be lenticular, but they could be tectonically disjointed remnants of beds; some lenses of more competent quartz cataclasite and quartz-sericite schist may also be disjointed remnants of beds. Some quartzite layers exhibit isoclinal folds not seen in the overlying rocks. The foliation in the argillaceous metasedimentary rocks near the contact with the overlying rocks is generally parallel to the contact but may be highly discordant a short distance from the contact.

The argillaceous metasedimentary rocks (p€ar) along the west side of the wilderness and a small wedge of greenstone (p€gn) on the north side of the wilderness are interpreted to be the oldest of the Precambrian rocks. The metasedimentary rocks were intruded by the granodiorite of the Ojito stock, which has an isochron age of 1.57 b.y. (billion years) (Condie and Budding, 1979). The metavolcanic rocks of bimodal composition (p€mv) (Servillita metarhyolite of Stark and Dapples, 1946) are considered the youngest of the metamorphic rocks and have an isochron age of 1.7 b.y. (Bolton, 1976; Condie and Budding, 1979).

Sedimentary rocks within the wilderness are mostly limestone and minor siltstone, sandstone, and conglomerate. Principal sedimentary map units are the Pennsylvanian Sandia Formation, locally underlain by erosional remnants of Mississippian Arroyo Penasco Group, and the Pennsylvanian Los Moyos Limestone.

GEOCHEMISTRY

The main objective of the geochemical survey was to identify areas that may contain unknown or concealed mineral deposits. Major ephemeral streams and some tributaries were sampled, and panned concentrates were taken along the largest streams. Representative bedrock samples were also collected, and all areas of detected altered or mineralized rock were sampled. Selected high-grade samples of the most highly mineralized rock found on mine and prospect dumps and chip samples across veins and mineralized areas in mines were analyzed.

A total of 237 samples was collected in or near the Manzano Wilderness, of which 109 were dry stream-sediment samples, 19 were panned concentrates, 23 were outcrop samples, and 86 were chip-channel and grab samples from mines and prospects. Chip-channel samples ranged from 1.5 to 6 ft long and were taken across veins and mineralized zones in mine workings. Analytical results were published in Maxwell and Wobus (1982b) and in Light (1982).

Gold was detected in several stream-sediment samples from the Comanche Canyon area, in amounts ranging generally from 0.05 to 0.3 ppm; two samples contained 1.1 ppm and 1.7 ppm gold (less than 0.05 oz per ton). Panned concentrates from the wilderness contained a maximum of 0.5 ppm gold. Silver and gold content was below the detection limit in most samples.

Tungsten was present in most samples in amounts ranging from 2 to 10 ppm and as much as 1,200 ppm in panned concentrates. Molybdenum was detected in a few stream-sediment and outcrop samples, in concentrations ranging from 5 to 15 ppm. Bismuth was present in outcrop samples (10 ppm) and in panned concentrates (50-500 ppm). Tin was detected in one stream-sediment sample (15 ppm) and in one panned concentrate (50 ppm); both could be the result of contamination. Zirconium concentrations were anomalous in about half of the stream-sediment samples and zirconium was present in highly anomalous concentrations in most of the panned concentrates. Because of the nature of distribution and the low absolute amounts, none of the anomalies were considered to be an indication of potential resources.

GEOPHYSICS

An aeromagnetic survey of an area east of Albuquerque, N. Mex., was flown in 1974 and an aeromagnetic map compiled for open-file release by the U.S. Geological Survey (1975) at a scale of 1:125,000. The Manzano Wilderness section of the map was enlarged and superimposed on the geologic map of the wilderness area, and a small inset map of the complete Bouguer gravity anomaly of the wilderness map area was prepared by Lindrith Cordell (Maxwell and Wobus, 1982b).

The aeromagnetic map showing the total-intensity magnetic field of the wilderness indicates a high magnetic ridge corresponding to the outcrop area of metavolcanic rocks (p€mv) and its subsurface projection and a magnetic trough following the outcrop area of the argillaceous metasedimentary rocks (p€ar). A prominent anomalous high is centered over a quartzite layer or over an unconformity or fault zone northwest of Comanche Canyon. This anomaly appears to be relatively shallow, apparently is not related to the intrusives of granodiorite and gabbro of the Ojito stock, and might represent only a local increase in the abundance of magnetic minerals in the metasedimentary rocks. A gravity map (Maxwell and Wobus, 1982b) indicates no anomaly or change in the gravity profile in the vicinity of the magnetic anomaly.

MINING DISTRICTS AND MINERALIZED AREAS

The Manzano Wilderness does not lie within a recognized mining district, but has been referred to as part of the Scholle or Manzano district. Numerous mining claims have been located for base and precious metals in the region. At least 25 mines and prospects occur in and adjacent to the wilderness; most of them are in the vicinities of Bartolo Canyon (fig. 2, loc. 1), Canon Monte de Abajo (fig. 2, loc. 4), Priest Canyon, and Canon de Salas (fig.2, loc. 2).

Workings in the Bartolo Canyon area consist of three adits, driven 15, 18, and 175 ft, and several prospect pits. Numerous samples taken across faults within these abandoned workings contained anomalously high concentrations of gold, silver, or copper. One sample from the largest adit, a 2-foot-wide chip, contained 0.372 oz of gold per ton, 4.0 oz of silver per ton, 0.65 percent copper, and 1.45 percent lead. Three other samples from this northwest-trending fault zone contained 0.012 oz or more gold per ton. A small precious-metal deposit may exist in the Bartolo Canyon area, containing several thousand to several hundred thousand tons of mineralized rock bearing 0.01 to 0.40 oz gold per ton.

In Canon de Salas, about 1 mi north of the adits in Bartolo Canyon, there is a 20-foot-long open cut and a 10-foot-long adit. The adit was driven to intersect a northeast-trending fault containing minor pyrite, galena, and some copper staining. Two of the three samples from this fault contained 0.4 oz silver per ton, but no other metal in anomalous concentrations.

The Cordova prospect (fig. 2, loc. 3) and an unnamed adit 0.7 mi east of it (fig. 2, loc. 4) are about 1 mi north of Canon Monte de Abajo, between Canon Monte Largo and Canon Monte de Abajo. The Cordova prospect consists of several open cuts and a flooded shaft. Two samples from these workings contained 0.4 oz silver per ton, but no other metals in anomalous concentrations. The adit at locality 4 has 200 ft of underground workings; several samples from the workings contained anomalously high copper values; the maximum was 0.84 percent. Prospects near the southeastern boundary of the wilderness (around loc. 5, fig. 2) contained anomalous concentrations of silver (0.4 oz per ton) and copper (0.78 percent).

ASSESSMENT OF MINERAL RESOURCE POTENTIAL

There is a moderate potential for a small precious-metal deposit containing several thousand tons of mineralized rock averaging as much as 0.1 oz gold and 1 oz silver per ton as indicated by mineral occurrences in the canyon. A low potential is indicated for additional small gold and silver resources in an area of similar geology along the southwest boundary of the wilderness (fig. 2). No other

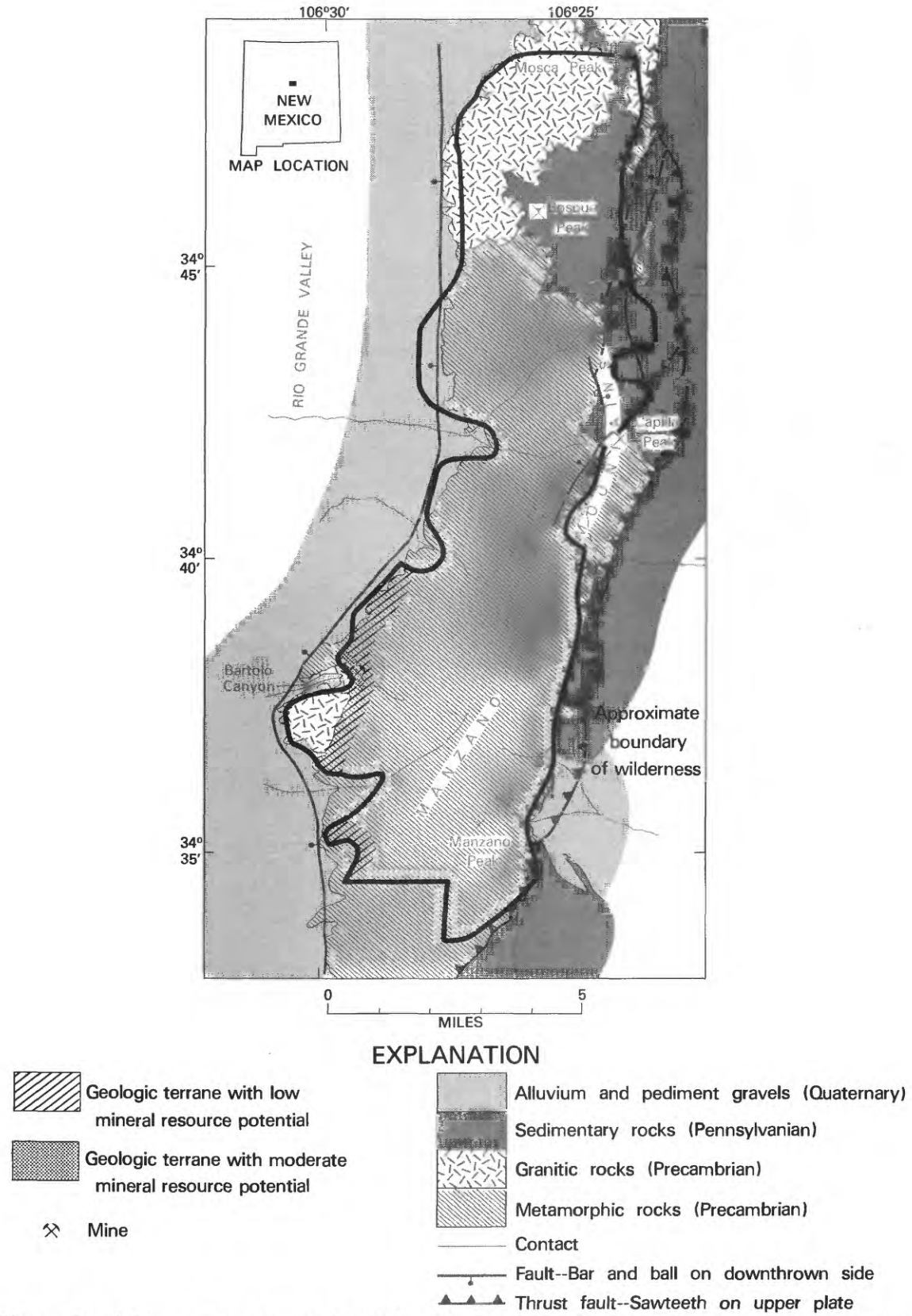

Figure 2.—Mineral resource potential and generalized geologic map of the Manzano Wilderness, Valencia and Torrance Counties, N. Mex.

significant mineral occurrences were found within the wilderness.

Bismuth was detected in two samples of remnants of Mississippian rocks from the area southeast of Mosca Peak. Zirconium was detected in anomalous concentrations in many stream-sediment samples from drainages in the argillaceous metasedimentary rock unit. The zirconium probably represents an alluvial concentration of detrital zircon during deposition of the Precambrian sediments, then further concentration in the Quaternary alluvium.

Gold was detected in very small amounts in several stream-sediment and rock samples, but only four samples contained more than 1 ppm, one sample each of stream sediments from Comanche and Diablo Canyons and of rock and vein material from a small canyon south of Canon del Trigo and from Ojito Canyon. Silver was detected in several samples, but in amounts less than 1 ppm; other elements were also found in anomalous concentrations, but none appear to indicate the presence of mineral deposits.

Although oil and gas leases are located adjacent to the wilderness, the bedrock of the wilderness is predominantly Precambrian metamorphic terrane, which seems to preclude oil and gas occurrences.

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