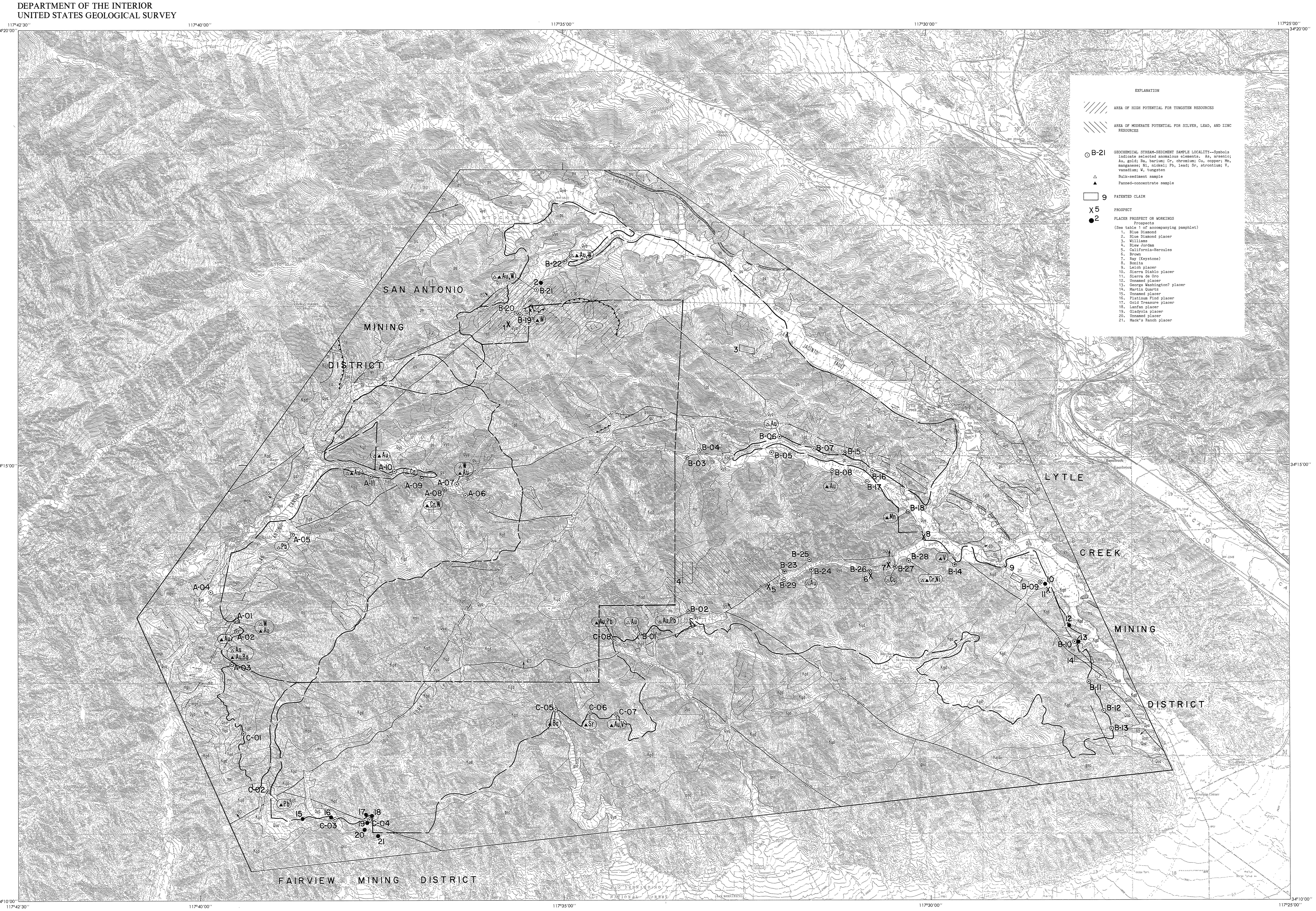
DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

MISCELLANEOUS FIELD STUDIES
MAP MF-1646-A



Base from U.S. Geological Survey, 1:24,000
Mount San Antonio, 1955 (photorevised 1968);
Telegraph Peak, 1956 (photorevised 1968);
Cajon, 1956 (photorevised 1973); Cucamonga
Peak and Devore, 1966; Mount Baldy, 1967

SCALE 1:31 680

1 ½ 0 1 MILE

1 .5 0 1 KILOMETER

CONTOUR INTERVAL 40 FEET

NATIONAL GEODETIC VERTICAL DATUM OF 1929

Geology mapped by D. M. Morton, 1968 and 1972-77

MINERAL RESOURCE POTENTIAL MAP OF THE CUCAMONGA ROADLESS AREAS, SAN BERNARDINO COUNTY, CALIFORNIA

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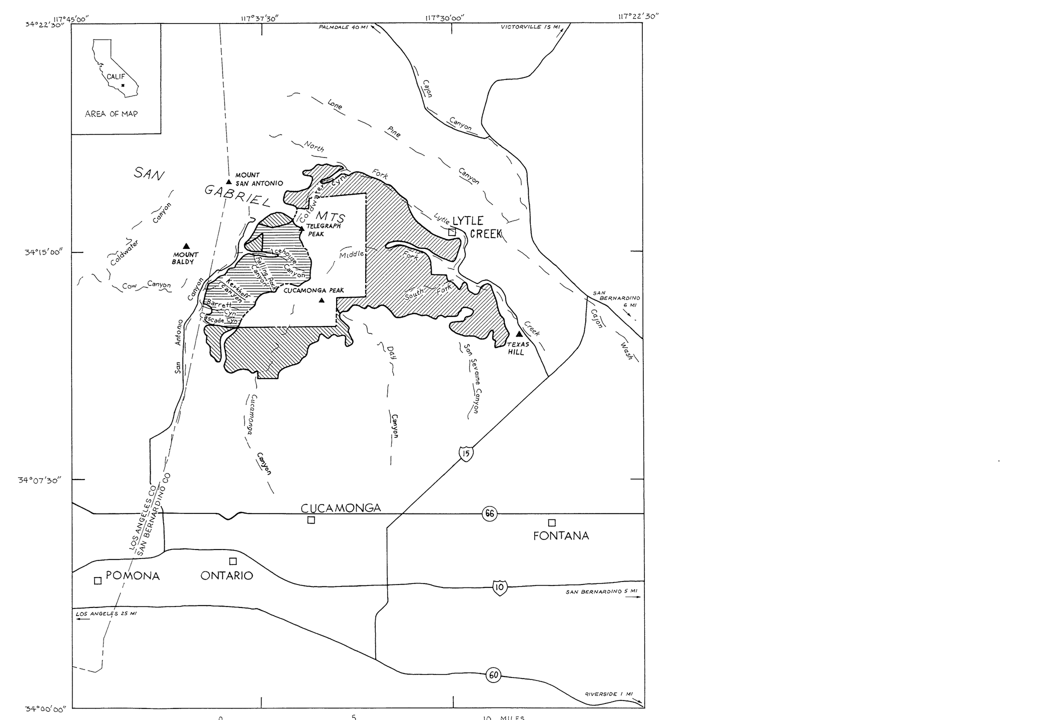
U.S. Bureau of Mines
1983



INDEX MAP SHOWING LOCATION OF THE CUCAMONGA ROADLESS AREAS (A5-174, B5-174, C5-174), SAN BERNARDINO COUNTY, CALIF.

CORRELATION OF MAP UNITS

Unit	Age		
Qya	Holocene	QUATERNARY	CENOZOIC
Qoa	Holocene and (or) Pleistocene	QUATERNARY	CENOZOIC
Tgd	Miocene	TERTIARY	CENOZOIC
ps	Paleocene and (or) older	TERTIARY AND (OR) OLDER	CENOZOIC AND (OR) OLDER
Kgd, Kqd (Kqdc)		CRETACEOUS	MESOZOIC
gs, ca			MESOZOIC
ms			PALEOZOIC(?) OR OLDER
mgn			PALEOZOIC(?) OR OLDER
gnc			PRECAMBRIAN(?)

DESCRIPTION OF MAP UNITS

Qya YOUNGER ALLUVIUM (HOLOCENE)--Unconsolidated grayish alluvium on canyon floors consisting of a mixture of sand- through boulder-size material. Includes some low-lying unconsolidated terrace deposits and areas underlain by colluvium and talus

Qoa OLDER ALLUVIUM (HOLOCENE AND (OR) PLEISTOCENE)--Boulder-rich, unconsolidated to slightly consolidated, crudely bedded alluvium and colluvium containing subrounded clasts in a coarse sand matrix

Tgd GRANODIORITE (MIOCENE)--Uniform, texturally massive, medium- to coarse-grained biotite granodiorite. Along its outer margins, the granodiorite locally is porphyritic and contains quartz with crystal form suggestive of beta quartz. Intrudes the Pelona Schist and cataclastic rocks associated with the Vincent thrust

ps PELONA SCHIST (PALEOCENE AND (OR) OLDER)--Consists predominantly of well-layered, fine-grained, fissile, spotted, gray muscovite-albite-quartz schist with local quartz-rich layers; subordinate lithologies include greenstone, biotite schist, garnet-biotite schist, metachert, carbonate-quartz rock, and rare masses of carbonate-tremolite rock, talc-rich rock, and pods of actinolite or actinolite and talc. Metachert, some with small amounts of barite and spessartine, occurs within or adjacent to greenstone. Sections immediately below the Vincent thrust consist mainly of dark-green foliated and crudely layered chlorite-epidote-albite greenstone. Locally the schist contains small blocks of bright-green fuchsite. The age of the Pelona Schist protolith is regarded to be Mesozoic(?); the metamorphic age is considered to be Paleocene and (or) older (Evans, 1982b)

Kgd GRANODIORITE AND QUARTZ MONZONITE (CRETACEOUS)--Irregular- to tabular-shaped biotite-granodiorite and quartz monzonite dikes that cut quartz diorite and associated metamorphic rocks

Kqd QUARTZ DIORITIC ROCKS (CRETACEOUS)--Foliated gray rocks consisting mainly of hornblende-biotite quartz diorite in southern extent of unit and mixed quartz diorite and granodiorite elsewhere. Much of the rock unit has undergone cataclastic deformation, especially in its southern extent. Also along south margin of quartz diorite there are elongate rock masses of diorite (Deer Diorite of Alf, 1948). The diorite generally is not as deformed as the adjacent quartz diorite, and consists principally of a mixture of plagioclase and hornblende. At southern extent the quartz dioritic rocks unit locally is divided into:

Kqdc Cataclasite--Homogeneous, thoroughly cataclastically deformed fine- to coarse-grained rock with porphyroclasts of plagioclase, quartz, and hornblende

gs GNEISS AND SCHIST (MESOZOIC)--Wide variety of high-grade metamorphic rocks. Includes biotite-bearing quartz-feldspar schist and gneiss, leucogneiss, pods and discontinuous masses of quartzite and marble. Cataclastic textures are common. In the vicinity of the Vincent thrust, the gneiss has been thoroughly reconstituted to a cataclasite (unit ca). Age of unit is Cretaceous and older

ca CATACLASITE (MESOZOIC)--Thoroughly cataclastically deformed and recrystallized gneiss and schist of high metamorphic grade. This cataclasite is present in vicinity of Vincent thrust and is considered to be result of movement within Vincent thrust zone. Age of unit is Cretaceous and older

ms METASEDIMENTARY ROCKS, UNDIFFERENTIATED (PALEOZOIC? OR OLDER)--Amphibolite-grade biotite-bearing schist, quartzite, and impure marble. In its western extent, unit consists of thick sections of marble and quartzite with local occurrences of graphite, and common to abundant biotite-garnet-feldspar-quartz schist. Eastward from San Antonio Canyon, the rocks are progressively intermixed with quartz diorite; in the vicinity of Lytle Creek, the unit consists of pods or septa of schist and marble within quartz diorite

mgn MIGMATITIC GNEISS (PALEOZOIC? OR OLDER)--Migmatitic gneiss of varied composition within and east of San Antonio Canyon. Hornblende-bearing mineral assemblages are common. Generally lacks the cataclastic textures that are widespread in the gneiss and schist unit (gs)

gnc GRANULITE GNEISS AND CATACLASITE (PRECAMBRIAN?)--Very heterogeneous assemblage of structurally complicated granulite-grade gneiss and cataclasite. Mineral assemblages commonly contain garnet and orthopyroxene and rarely olivine. Contains discontinuous masses of marble, which generally contain diopside-and phlogopite. Pods and masses of light-gray charnockitic rocks, as much as 1.2 mi in length, occur locally within the gneiss

CONTACT

30 FAULT, SHOWING DIP--Dotted where concealed. Arrows indicate direction of relative movement

55 THRUST FAULT, SHOWING DIP--Dotted where concealed. Sawteeth on upper plate

SHEARED ROCKS--Sheared crystalline rocks in fault zone

LANDSLIDE DEPOSIT--Arrows show inferred direction of movement

BOUNDARY OF MAPPED AREA

APPROXIMATE BOUNDARY OF CUCAMONGA ROADLESS AREAS

APPROXIMATE BOUNDARY OF EXISTING CUCAMONGA WILDERNESS

STUDIES RELATED TO WILDERNESS

The Wilderness Act (Public Law 88-577, September 3, 1964) and related acts require the U.S. Geological Survey and the U.S. Bureau of Mines to survey certain areas on Federal lands to determine their mineral resource potential. Results must be made available to the public and be submitted to the President and the Congress. This report presents the results of a mineral resource potential survey of the Cucamonga Roadless Areas in Angeles and San Bernardino National Forests, San Bernardino County, California. Area A (A5-174) was classified as a recommended wilderness, and areas B and C (B5-174 and C5-174) as further planning areas during the Second Roadless Area Review and Evaluation (RARE II) by the U.S. Forest Service, January 1979.

SUMMARY

Geologic, geochemical, and geophysical evidence, together with a review of historical mining and prospecting activities, suggests that most of the Cucamonga Roadless Areas has a low potential for all types of mineral and energy resources--including precious and base metals, building stone and aggregate, fossil fuels, radioactive-mineral resources, and geothermal resources. A subeconomic tungsten occurrence located in the northern part of area B is currently being explored. It contains 16,000 tons of identified resources averaging 0.16 percent tungsten trioxide (WO_3); there is a high potential for the occurrence of additional tungsten resources. An area of moderate potential for the occurrence of silver, lead, and zinc resources is located near the head of the South Fork of Lytle Creek in the southwestern part of area B.

INTRODUCTION

The Cucamonga Roadless Areas are located about 10 mi northwest of San Bernardino and about 10 mi northeast of Pomona, Calif. The study area comprises approximately 37.5 mi² (24,000 acres) that surround the existing Cucamonga Wilderness in the Angeles and San Bernardino National Forests in the southeastern San Gabriel Mountains.

GEOLOGY

The Cucamonga Roadless Areas are underlain by a wide variety of metamorphic and plutonic rocks. The older metamorphic rocks are considered to be of Precambrian age, with younger ones of both probable Paleozoic and Mesozoic age. Plutonic rocks are of both Mesozoic (Cretaceous) and Tertiary (Miocene) age. Numerous faults cross the areas and occur in close proximity to the areas. The oldest fault, the Vincent thrust, is a major structural discontinuity of probable late Mesozoic or early Cenozoic age that lies interior to the mountain ranges; it has been segmented by younger faults. Reverse faults of the Cucamonga fault zone along the south margins of the roadless areas have uplifted the San Gabriel Mountains. Several major strike-slip faults occur within and adjacent to the areas. A wide variety of landslides are abundant throughout the eastern San Gabriel Mountains, and surficial alluvial deposits occur along all major drainages.

Geologic evidence suggests that the Cucamonga Roadless Areas generally have a low potential for the occurrence of mineral resources. During our geologic field studies, we observed localized zones of mineralized rocks, but we did not observe extensive mineralized zones or geologic environments favorable for such occurrences.

Within the existing Cucamonga Wilderness, a small area is underlain by quartz diorite containing copper and silver (Zilka and Schmauch, 1982, p. 89). No similar mineralized rocks were observed in the quartz diorite elsewhere in the study area.

Cataclastic rocks above the Vincent thrust appear to have potential for the occurrence of both low-grade tungsten and lode gold. The Blue Diamond prospect in the northern part of area B is within highly deformed rocks above the Vincent thrust.

Garnet-epidote tactite (skarn) occurs locally where carbonate metamorphic rocks are engulfed, or partly so, by quartz diorite. Silver-lead-zinc mineralization occurs in calc-silicate rock and tactite at the Blew Jordam and the California-Hercules prospects, which are located near the head of the South Fork of Lytle Creek. Other calc-silicate rocks and tactite contain pods of sulfide minerals. No significant tungsten mineralization was noted within the calc-silicate tactite rocks.

Barite and manganese-bearing garnet (spessartite) occur locally as accessory minerals within metachert in the Pelona Schist. The chromium-bearing mica, fuchsite, occurs as occasional isolated pods in some parts of the Pelona Schist. Minor amounts of talc occur intermixed with actinolitic amphibole locally in the most mafic parts of the Pelona Schist.

Graphite occurs locally as minor pods and disseminated crystals within marble on the east side of San Antonio Canyon and as minor thin layers within some of the associated schist. In Cascade Canyon, a metasomatized part of the marble locally contains a small amount of lazurite (lapis lazuli). Also in Cascade Canyon, leucocratic granitic rocks intrusive into carbonate rocks have locally been enriched in aluminum, giving rise to minor occurrences of nongem-quality pink corundum.

Lower parts of some perched and elevated alluvial deposits in San Antonio Canyon, Cucamonga Canyon, and Lytle Creek drainages have been prospected and a few mined on a small scale for placer gold.

GEOCHEMISTRY

A reconnaissance stream-sediment geochemical survey was conducted in the Cucamonga Roadless Areas for 31 major, minor, and trace elements in order to determine spatial variations in stream-sediment chemistry that might reflect concentrations of potentially economic minerals. The locations of 48 geochemical sample localities and the analytical results for stream sediments and panned concentrates are shown in tables 1 and 2 on the geochemical map sheet (MF-1646-B). Location of anomalous values, relative to other samples, are shown on the map sheet. Additional geochemical values within the study area and the existing Cucamonga Wilderness are shown by Evans (1982c, p. 33-51).

Within and near the Cucamonga Roadless Areas, the chemical composition determined from the stream-sediment samples indicates apparently no significant systematic anomalous element concentrations. Most of the analyses fall within ranges that are reasonable for nonmineralized crystalline rocks and their derivative stream sediments; few values exceed this geochemical background. Moreover, except for a few isolated samples, for all elements the maximum concentrations that were measured are low in comparison to values that have been reported in stream-sediment geochemical studies for districts where signficant mineral deposits are present.

Anomalous gold values in the Barrett and Cascade Canyon areas are spatially associated with metamorphosed carbonate rocks and quartzite, as is also the case for upper Day Canyon, the South Fork of Lytle Creek, and Falling Rock Canyon. Gold values on the north side of Icehouse Canyon are spatially associated with cataclastic gneiss.

In Coldwater Canyon, anomalous gold and tungsten values are probably related to cataclastic rocks in the vicinity of the Vincent thrust, which appears to be the site of gold and tungsten mineralization farther west in the San Gabriel Mountains (see Evans, 1982a).

Isolated chromium and nickel values near the mouth of the South Fork of Lytle Creek and chromium values in Icehouse Canyon may both be related to pyroxene or other mafic minerals occurring in the metamorphic rocks.

Geochemical samples taken from the Cascade, Barrett, Kerkhoff, and Icehouse Canyon areas may be contaminated; these areas have long been the sites of human activity. Lead contamination is possible in all major drainages of the eastern San Gabriel Mountains.

The results of the geochemical survey are compatible with the geologic evidence: the geochemistry suggests a generally low mineral resource potential for the Cucamonga Roadless Areas, with a local moderate to high resource potential for tungsten, silver, lead, zinc, and low-grade gold.

GEOPHYSICS

An aeromagnetic survey of the Cucamonga Roadless Areas was flown in 1980 (U.S. Geological Survey, 1981). Anomalies and patterns on magnetic maps are caused by variations in the amount of magnetic minerals (commonly magnetite) in rock units, and are often closely related to geologic contacts and structures. The magnetic-intensity contours potentially can indicate concentrations of iron-rich minerals as well as terranes where these minerals are deficient, as within zones of altered rocks.

The largest aeromagnetic anomalies within the study area can be attributed to relatively mafic igneous rocks exposed at the surface, and aeromagnetic gradients within the area mark igneous and fault contacts and do not indicate mineralization or a potential for mineral occurrences. Thus magnetic anomalies and patterns within the study area are not unexpected for the kinds of crystalline rocks and geologic structures exposed here, and there is no aeromagnetic evidence for mineralization within the Cucamonga Roadless Areas.

MINING DISTRICTS AND MINERALIZATION

Methods and previous studies

The resource evaluation of the roadless areas by the U.S. Bureau of Mines was carried out in 1980. Research into mining and geologic literature and a search of San Bernardino County mining records for claims located in the area were conducted. Owners of mineral properties were contacted if possible, and U.S. Bureau of Land Management and U.S. Bureau of Mines statistics on active properties and past mineral production were consulted.

A search for all mines, prospects, and claims was conducted. Prospects were examined, sampled, and mapped if warranted; a total of 77 lode samples and 16 placer samples were taken.

History of mining activity

Based on San Bernardino County mining records, approximately 130 mining claims have been located within roadless areas B and C since passage of the 1872 Mining Act, including 100 lode claims and 30 placer claims. In 1980, the Blue Diamond tungsten and Sierra de Oro gold prospects (nos. 1 and 11 on the map) were being actively explored. Four patented lode and one patented placer claim are located in area B. There are no mineral leases in the study area.

Three gold mining districts, primarily placer districts, are peripheral to the study area: the San Antonio district lies to the northwest, the Lytle Creek district borders on the east, and the Fairview district lies near the southwest corner.

Within the study area, the Blew Jordam (no. 4) and California-Hercules (no. 5) prospects were discovered in the early 1920's and explored prior to World War II. Both are tactite-type occurrences bearing silver, lead, and zinc. The Blue Diamond tungsten prospect (no. 1) was discovered in 1977.

Prospects and mineral occurrences

Mineral data from mines and prospects in the vicinity of the Cucamonga Roadless Areas (Peters, 1983, p. 13) are summarized in table 1 of the accompanying pamphlet.

Metallic mineralization

The Blue Diamond prospect (no. 1) is located in a tabular gneissic unit containing carbonate-bearing lenses of quartz with scheelite. The unit is in a zone of highly deformed rocks above the Vincent thrust. The mineralized zone appears to be coplanar with lithology and foliation and may extend along strike and downdip of the surface occurrence. Discontinuous surface exposures of the scheelite-bearing gneiss were traced over a strike length of 600 ft. The mineralized zone contains an estimated 16,000 tons of indicated and inferred subeconomic tungsten resources averaging 0.16 percent tungsten trioxide (WO_3).

Occurrences of silver, lead, and zinc, and lesser amounts of tungsten and cadmium are found in small tactite masses at the Blew Jordam (no. 4) and California-Hercules (no. 5) prospects. Poor exposure of the mineralized rocks prevented a complete delineation of the occurrences. At the Blew Jordam, we estimated at least 100 tons of tactite within several outcrops, which occur over a distance of 1,200 ft. Chip samples averaged 10 oz silver per ton, 3.75 percent zinc, and 2.3 percent lead. At the California-Hercules, we estimated resources of 1,000 tons of tactite averaging 1.3 oz silver per ton, 0.71 percent lead, and 0.75 percent zinc.

Placer occurrences

In roadless area B, two fluvial sand and gravel deposits (nos. 9 and 10) perched 20 ft above the Lytle Creek flood plain just inside the study area, locally contain as much as $1.17[1] gold per yd³. These deposits are small and discontinuous and contain an average gold value of less than 45 cents per yd³. Small placer prospects are also found along intermittent tributaries to Lytle Creek (map sheet and table 1 of accompanying pamphlet, nos. 12 and 13). Gravel is limited to the stream beds and small perched bars, and its volume is less than 2,000 yd³ per mi of stream channel.

The Cucamonga C Roadless area has minor placer deposits, but no known lode gold deposits. Seven placer gold prospects were examined along Cucamonga Creek and its tributaries (nos. 15-21). One reconnaissance pan sample had a gold value of $1.23 per yd³. Other samples had no more than 5 cents gold value per yd³. Gravel deposits are limited to present stream channels and also probably do not exceed 2,000 yd³ per mi of channel.

Construction materials

Sand, gravel, and stone suitable for construction materials occur in limited amounts in both roadless areas B and C. However, larger deposits of equal or better quality are available closer to major markets in southern California.

Hydrocarbon, radioactive, and geothermal occurrences

No hydrocarbon or radioactive-mineral occurrences are known in the study area. A sulfurous hot spring located just outside the roadless areas on the north bank of Lytle Creek was buried by the flood of 1938. Geothermal potential could not be fully determined, but the temperature was not high enough to produce steam (Gertrude Becker, U.S. Forest Service, Lytle Creek Ranger Station, oral commun., 1981).

ASSESSMENT OF MINERAL RESOURCE POTENTIAL

Geologic, geochemical, and geophysical evidence, together with a review of prospecting and mining activities, indicates that the Cucamonga Roadless Areas generally have low potential for the occurrence of large metallic mineral deposits, industrial resources, and energy resources. There is a high potential for the discovery of additional tungsten resources at the Blue Diamond prospect and a moderate potential for localized, small-scale minor occurrences of silver, lead, and zinc in the vicinity of known mineralized zones in area B. This mineral resource assessment is based on the following considerations:

(1) Geologic mapping indicates that geologic environments favorable for the occurrence of mineral deposits have not produced extensive mineralized zones within the study area.

(2) Generally low concentrations of specific elements as determined by chemical analyses of stream-sediment and panned-concentrate samples from 48 localities indicate that elemental abundances generally fall within expected background ranges.

(3) Aeromagnetic patterns seem to be caused by fault and igneous contacts with mafic igneous rocks, and do not suggest concentrations of iron-rich minerals or large areas of alteration.

(4) Historic prospecting activities within the areas have identified localized occurrences of base and precious metals in some rock units, but have not led to the discovery of large deposits.

Two areas of low mineral resource potential are associated with three prospects in area B. One area is at the Blue Diamond prospect (fig. 2, no. 1) which is located above the Vincent thrust in carbonate-bearing gneiss that contains lenses of quartz with scheelite. The prospect has demonstrated subeconomic resources of tungsten, and areas in the vicinity have a high potential for additional resources.

At the second area, the Blew Jordam and California-Hercules prospects contain occurrences of silver, lead, and zinc, and lesser amounts of tungsten and cadmium (nos. 4 and 5). The metals are associated with poorly exposed small pods of tactite. The prospects contain identified subeconomic tactite resources estimated at 100 and 1,000 tons, respectively. Areas in the vicinity of these two prospects have moderate potential for silver, lead, and zinc resources; however, any undiscovered resources probably will be small. This conclusion is supported by geologic mapping which did not reveal extensive or large tactite pods or belts in this vicinity and by the absence of significant geochemical anomalies in sediment from streams surrounding the two prospects.

[1] At $450.00 per troy oz gold price.

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Explanatory pamphlet accompanies map

Interior—Geological Survey, Reston, Va.—1983

For sale by Branch of Distribution, U.S. Geological Survey, Box 25286, Federal Center, Denver, CO 80225