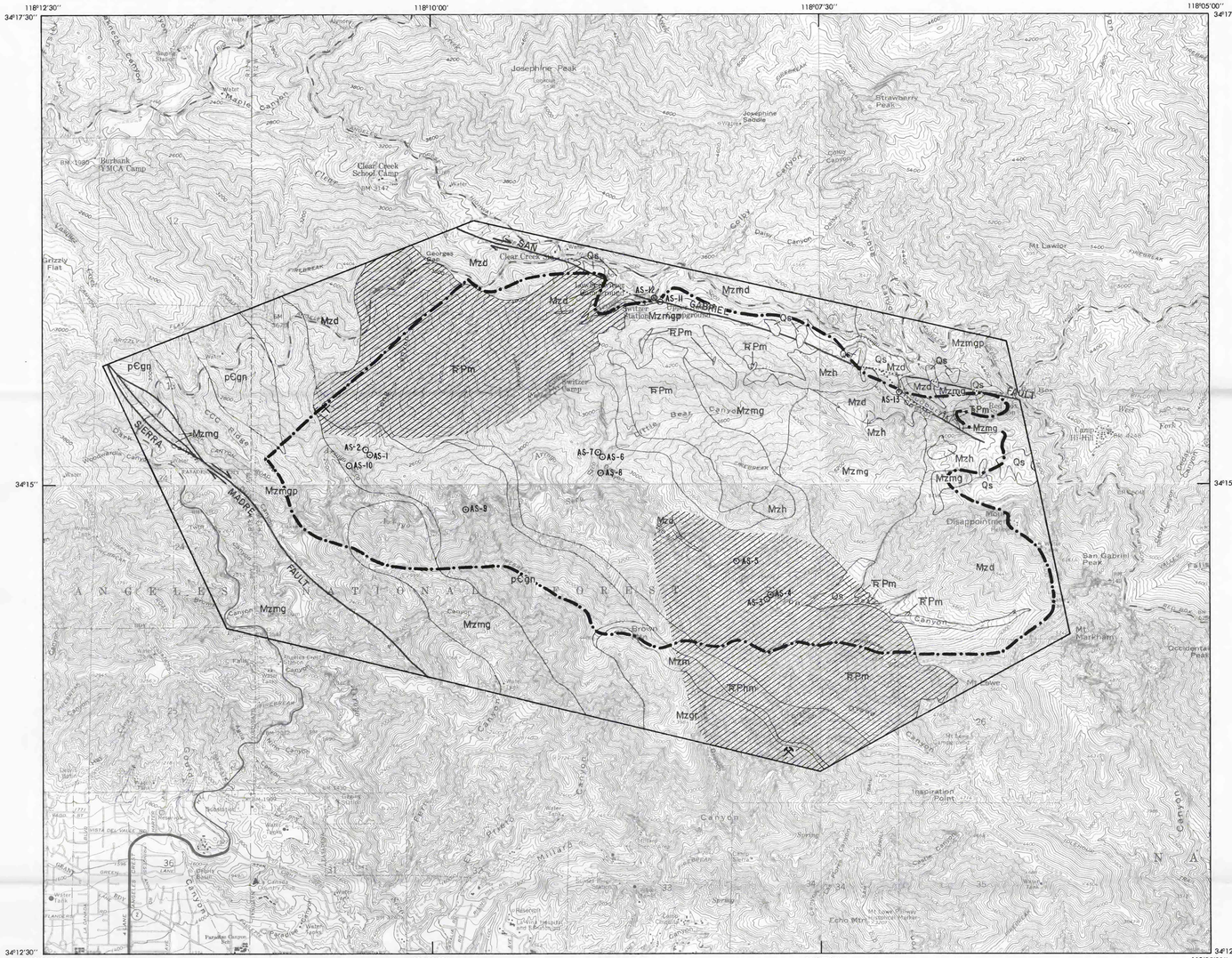
DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

MISCELLANEOUS FIELD STUDIES
MAP MF–1607–A



Base from U.S. Geological Survey, 1:24,000, Chilao Flat, Condor Peak, 1959; Pasadena, Mt. Wilson, 1966

Geology by R. E. Powell, B. F. Cox, J. C. Matti, 1981

APPROXIMATE MEAN DECLINATION, 1983

SCALE 1:24 000

CONTOUR INTERVAL 40 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

MINERAL RESOURCE POTENTIAL MAP OF THE ARROYO SECO ROADLESS AREA, LOS ANGELES COUNTY, CALIFORNIA

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1983

EXPLANATION

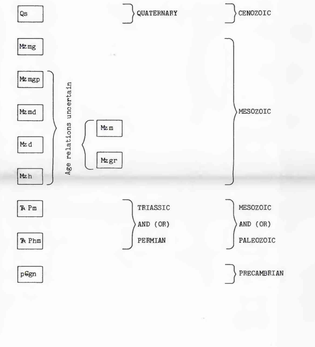
AREA OF LOW POTENTIAL FOR LOW-GRADE GOLD RESOURCES IN MINOR DEPOSITS

DAWN MINE—Description of workings in text

PROSPECT—Occurrence of molybdenite and copper-bearing minerals reported by Gay and Hoffman (1954); not found during this study

AS-1 STREAM-SEDIMENT SAMPLE LOCALITY

CORRELATION OF MAP UNITS



DESCRIPTION OF MAP UNITS

Qs SURFICIAL DEPOSITS (QUATERNARY)—Unconsolidated alluvium in active stream beds; alluvium and colluvium in older, dissected deposits. Consist of sand, pebbly sand, and gravel

Mzmg BIOTITE MONZOGRANITE (MESOZOIC)—Light-colored, fine- to coarse-grained, generally nonporphyritic; as mapped, locally includes granodiorite. Foliated to varying degrees

Mzmgp PORPHYRITIC BIOTITE MONZOGRANITE (MESOZOIC)—Coarse-grained; contains phenocrysts of alkali feldspar, locally contains hornblende; as mapped, locally includes granodiorite, quartz monzodiorite, and monzodiorite. Foliated to varying degrees, locally gneissic

Mzmd HORNBLENDE MONZODIORITE (MESOZOIC)—Coarse-grained; locally contains biotite. Foliated

Mzd BIOTITE-HORNBLENDE QUARTZ DIORITE, DIORITE, AND GABBRO (MESOZOIC)—Dark-colored, fine- to coarse-grained, sphene-bearing; as mapped, locally includes tonalite and granodiorite. Foliated to varying degrees

Mzh HORNBLENDITE (MESOZOIC)—Melanocratic, coarse-grained. Foliated

Mzm MYLONITE (MESOZOIC)—Occurs along contact between the syenogranite unit and both the hornblende monzodiorite and quartz monzodiorite (ℳPm) and the metasedimentary and metaplutonic gneiss (pCgn) units

Mzgr SYENOGRANITE (MESOZOIC)—Leucocratic, medium- to coarse-grained alkali feldspar-quartz-plagioclase granite with sparse biotite. Foliated to varying degrees. Equivalent to the Echo Granite of Miller (1930)

ℳPm MONZODIORITE AND QUARTZ MONZODIORITE (PERMIAN AND (OR) TRIASSIC)—Leucocratic, porphyritic, contains abundant gray or pink ovoid phenocrysts of alkali feldspar, coarse-grained hornblende or clots of biotite, and garnet in fine-grained matrix of plagioclase, alkali feldspar, and minor quartz. Foliated. Equivalent to the Mount Lowe Granodiorite of Miller (1926)

ℳPhm HORNBLENDE MONZODIORITE AND QUARTZ MONZODIORITE (PERMIAN AND (OR) TRIASSIC)—Porphyritic, contains abundant hornblende phenocrysts, partly rimmed by epidote, and scattered ovoid phenocrysts of alkali feldspar in fine-grained matrix of plagioclase, alkali feldspar, and minor quartz. Foliated to mylonitic. Equivalent to the Mount Lowe Granodiorite of Miller (1926)

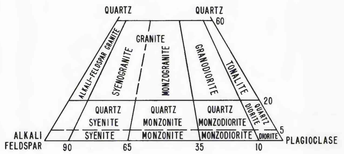
pCgn METASEDIMENTARY AND METAPLUTONIC GNEISS (PRECAMBRIAN)—Unit consists of three interlayered subunits, not mapped separately herein: dark-colored pelitic gneiss (oldest); dark-colored biotite-quartz-feldspar granodioritic augen gneiss; light-colored granitic gneiss and dark-colored mafic gneiss (youngest) probably equivalent to the Mendenhall Gneiss of Oakeshott (1958)

CONTACT

FAULT—Dotted where concealed. Arrows show direction of relative movement

APPROXIMATE BOUNDARY OF ROADLESS AREA

BOUNDARY OF MAPPED AREA



Classification of plutonic rock types (modified from Streckeisen, 1973)

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 Arroyo Seco Roadless Area (05012) in the Angeles National Forest, Los Angeles County, California. The Arroyo Seco Roadless Area was classified as a further planning area during the Second Roadless Area Review and Evaluation (RARE II) by the U. S. Forest Service, January 1979.

SUMMARY

Geologic and geochemical investigations and a survey of mines and prospects indicate that two parts of the Arroyo Seco Roadless Area intruded by mafic dikes have a low potential for the presence of low-grade gold resources. The roadless area has no demonstrated or inferred mineral resources and there is no evidence of a potential for resources other than gold. Sand, gravel, and stone suitable for construction materials are found in the roadless area, but similar or better quality materials are more abundant and more accessible outside the area. No previously unknown mineral occurrence was located during this study.

INTRODUCTION

Situated in the southwestern San Gabriel Mountains in Los Angeles County, Calif., the Arroyo Seco Roadless Area encompasses about 8 mi^2 (5000 acres) within the Angeles National Forest (fig. 1). The roadless area includes Bear and Little Bear Canyons and most of upper Arroyo Seco between Red Box Gap and Oakwilde Picnic Area. The area is approximately bounded to the north by the Angeles Crest Highway (State Highway 2) and to the south by CCC Ridge and the ridge crest that includes the summits of Brown Mountain, Mount Lowe, and Mount Markham. Topographic elevations within the roadless area range from 1500 ft in Arroyo Seco near Oakwilde Picnic Area to nearly 6000 ft atop Mount Disappointment.

GEOLOGY

The Arroyo Seco Roadless Area includes part of a terrane of crystalline rock that is situated between the San Gabriel and Sierra Madre faults, two major strands of the Cenozoic right-lateral San Andreas fault system. Previous geologic mapping within the area includes that of Miller (1934), Saul (1976), and Smith (1977).

The oldest rocks in the area comprise a composite unit of Precambrian metasedimentary and metaplutonic gneiss. Older metasedimentary gneiss is interlayered with dark-colored augen gneiss, which is derived from a protolith of porphyritic granodiorite and monzogranite that intruded the metasedimentary gneiss (igneous-rock nomenclature follows Streckeisen, 1973). These two units are interlayered with, and apparently intruded by, Precambrian granitic to tonalitic gneiss (Mendenhall Gneiss of Oakeshott, 1958).

The Precambrian gneiss unit is intruded by Permian and (or) Triassic rocks mapped previously as porphyritic monzodiorite and quartz monzodiorite (Mount Lowe Granodiorite of Miller, 1926, 1934).

Between the San Gabriel and Sierra Madre faults, the gneiss and monzodiorite both are intruded successively by Mesozoic hornblendite; quartz diorite, diorite, and gabbro (Mzd); and monzogranite (Mzmgp, Mzmg). All of these units are foliated to varying degrees. Leucocratic syenogranite (Echo Granite of Miller, 1930, 1934) crops out in the southeastern part of the mapped area. This unit, typically foliated, grades into mylonite along its northeast contact with the Mount Lowe Granodiorite and along its north contact with Precambrian gneiss. Both the syenogranite and the mylonite are crosscut by dikes of Mesozoic fine-grained monzogranite (Mzmg). We have not established sequencing relations between the syenogranite and Mesozoic plutonic units other than the fine-grained monzogranite, although mafic dikes that may be related to the mafic Mesozoic plutonic rocks crosscut the Echo Granite.

Thin, fine-grained, generally foliated and propylitically altered mafic dikes crosscut the Echo Granite, the Mount Lowe Granodiorite, and probably the Precambrian gneiss unit. The dikes are most abundant in the Mount Lowe Granodiorite near the Angeles Crest Highway between Georges Gap and the junction between the Angeles Crest and Angeles Forest Highways and in the Mount Lowe Granodiorite from Bear Canyon southward across Mount Lowe into Millard Canyon. Some or all of the mafic dikes appear to be related to the Mesozoic mafic plutonic rocks in that they intrude the Mount Lowe Granodiorite near its contacts with the mafic plutonic rocks and in that no mafic dikes were observed to crosscut the mafic plutonic rocks or younger felsic plutonic rock units. These relations suggest that at least some of the mafic plutonic units are younger than the Echo Granite, but it is also possible that more than one generation of mafic dike is present in the area.

Mesozoic monzogranite crops out along the Angeles Crest Highway west of the Sierra Madre fault. Along the Angeles Crest Highway north of the San Gabriel fault, Mesozoic monzodiorite (Mzmd) has been intruded by monzogranite and granodiorite (Mzmgp). All these units are foliated.

Surficial Quaternary deposits of sand, pebbly sand, and gravel are largely confined to narrow, deeply incised active stream beds, although a few small terraces are covered with dissected alluvial deposits in the northern part of the study area.

Although concentration and deposition of ore minerals by magmatic and hydrothermal processes has occurred in geologic settings similar to that of the study area, we did not observe mineral concentrations along any of the faults or intrusive contacts or within any of the rock units in the roadless area. Nor did we observe prominent veining or extensive alteration. The Echo Granite contains a gold-silver-copper bearing quartz vein at the Dawn mine, south of the roadless area. The granite extends to the southern boundary of the roadless area at Brown Mountain, but very little of the unit is exposed within the study area. Because the Echo Granite has not been breached by the deeply incised Arroyo Seco north of Brown Mountain, it is unlikely that the granite is present beneath much of the roadless area.

Thin, fine-grained mafic dikes crosscut the Echo Granite at the Dawn mine. Although gold, silver, copper, tungsten, molybdenum, bismuth, and lead concentrations are spatially associated with similar-looking mafic dikes elsewhere in the region, no evidence was found for significant mineralization near dikes in the vicinity of the roadless area other than at the Dawn mine. At those localities in the region where gold deposits are found associated with mafic dikes, thick quartz veins—commonly exposed for lengths of several hundred feet—and evidence for hydrothermally altered rock are also present. Only scattered small quartz veins and veinlets were observed associated with mafic dikes in the vicinity of the Arroyo Seco Roadless Area. One such locality is at the Dawn mine and another is in roadcuts through the Mount Lowe Granodiorite along the Angeles Crest Highway between Georges Gap and the junction between the Angeles Crest and Angeles Forest Highways.

In contrast to our observations in the Arroyo Seco study area, in the Transverse Ranges east of the San Andreas fault, where mineral concentrations are also associated with quartz veins and mafic dikes in rocks related to those of the Arroyo Seco area, the mafic dikes are observed to crosscut all Mesozoic plutonic units. Despite ambiguity as to the number of generations of mafic dikes that have served as conduits for later mineralization, the regional spatial association between mafic dikes and mineral concentrations forms a basis for evaluating metallic mineral resource potential.

GEOCHEMISTRY

A reconnaissance geochemical survey in the study area (Obi and others, 1983) was conducted to determine spatial variations in stream-sediment chemistry that might reflect local concentrations of ore minerals. A total of 13 stream-sediment samples were analyzed for 32 elements.

Eight elements (As, Au, Bi, Cd, Mo, Sb, W, Zn) were not detected in any sample. Because the lower detection limit of gold (Au) using the emission spectrographic method is 2,000 times greater than its estimated average elemental abundance for rock-types exposed within the study area, significant gold concentrations in stream sediment derived from gold deposits could remain undetected. Most elements (Fe, Mg, Ca, Ti, Mn, B, Ba, Be, Co, Cr, Cu, La, Nb, Ni, Sc, Sr, U, V, Y, Zr) were detected in concentrations that are compatible both with the ranges of estimated average elemental abundances for the types of rocks exposed in the study area and with the inferred presence in the stream-sediment samples of non-ore minerals that we observed in the rocks.

Slightly elevated concentrations of lead (Pb, 70 to 200 ppm) were detected in all samples from drainage basins through which the Angeles Crest Highway passes. These lead concentrations could indicate the presence of either minor amounts of an ore mineral such as galena or minor roadside contamination from lead-shot and (or) litter.

Tin (Sn) occurs in slightly elevated concentrations (no greater than 100 ppm) in each sample collected from a drainage basin through which the Angeles Crest Highway passes and in only one sample (AS-6) from a drainage basin that does not contain part of the highway. The one exception is collected from a heavily used picnic area. The tin could be present as a trace constituent in a non-ore mineral, such as zircon, in trace amounts of an ore mineral, such as cassiterite, or as a minor contaminant derived from litter, such as tin-plated cans.

Silver (Ag) was detected in only one sample (AS-7: 3 ppm). The silver probably resides in a trace amount of silver ore (possibly derived from outside the study area) or in a contaminant.

Thorium (Th) was detected in low concentrations in only three samples (AS-4,-6,-11) from streams that drain Mesozoic monzogranite. The detected thorium may be present as a trace constituent of non-ore minerals, such as allanite or zircon, or in trace amounts of monazite, which is the principal ore mineral of thorium.

MINES, PROSPECTS, AND MINING AREAS

An investigation of mines, prospects, and mineralized areas was conducted by the U.S. Bureau of Mines (Gabby, 1982). The entire roadless area was withdrawn from mineral entry by the Act of May 29, 1928 (Public Law 70-578). There are no producing or developing mines, active or patented mining claims, or mineral leases in the roadless area. A prospect that was reported to be located approximately on the northwest boundary of the roadless area and to contain molybdenite and copper-bearing minerals (Gay and Hoffman, 1954) was not found during this study. The Dawn mine just south of the area produced gold between 1895 and 1950 (Gay and Hoffman, 1954).

ASSESSMENT OF MINERAL RESOURCE POTENTIAL

Gold

No previously unknown gold occurrence was found during this study and no gold resources are identified in the Arroyo Seco Roadless Area, although at the Dawn mine south of the roadless area, subeconomic gold-bearing rock averaging 0.046 oz gold per ton occurs in a quartz vein in a leucocratic syenogranite body (Echo Granite of Miller, 1930) that extends only to the south boundary of the roadless area at Brown Mountain. We did not find gold associated with any other lithologic unit in the study area. Because very little of the syenogranite is exposed within the roadless area, because it is unlikely that much of the unit is present in the subsurface, and because gold was not found to be associated with any other unit, we conclude that, if the Echo Granite is the principal gold-bearing rock unit in the area, there is no evidence of a potential for the occurrence of gold resources in most of the area. Where syenogranite is exposed along the southern margin of the roadless area in the vicinity of Brown Mountain, there is a low potential for low-grade gold deposits.

On the other hand, if the mafic dikes are the source of or conduit for gold mineralization at the Dawn mine, as they appear to be elsewhere in the region, then the parts of the roadless area where the dikes crop out have a potential for the occurrence of gold deposits. Because quartz veins and evidence for hydrothermal alteration or mineralization are sparse, we assign a low potential for gold resources in lode deposits where mafic dikes crop out and in placer deposits downstream from these areas, principally in Arroyo Seco and Bear Canyon. Because the mafic dikes are thin, nonresistant, and therefore poorly exposed, we assign a low potential to larger areas than those in which the dikes were actually observed.

Where gold deposits occur in similar geologic settings elsewhere in the region, geologic and geochemical evidence for gold mineralization is such stronger and mining more extensive than they are in the vicinity of the study area. The deposits in these outlying districts are typically small and low-grade. By analogy with these deposits and that at the Dawn mine, any undiscovered deposit in the roadless area is most likely to be very small and to contain low-grade resources that are at best similar to those at the Dawn mine.

Other commodities

Stone suitable for construction materials is found in the study area, but abundant similar or better quality material is available and more readily accessible outside the study area. Sand and gravel, confined to narrow stream beds in the study area, are not significant resources.

Geologic mapping has revealed no extensive veining, epithermal alteration, or other evidence for the occurrence of significant metallic mineral concentrations within the roadless area. In the geochemical survey, none of the elemental concentrations in the stream-sediment samples indicate the presence of a mineral deposit. Those elements (silver, lead, thorium, tin) for which slightly elevated concentrations have been detected in some samples are probably derived either from small, scattered mineral occurrences related to a weak mineralizing system or from roadside or picnic-site contamination along the Angeles Crest Highway. The absence of mines and scarcity of prospects in the roadless area are consistent with a lack of significant mineral occurrences.

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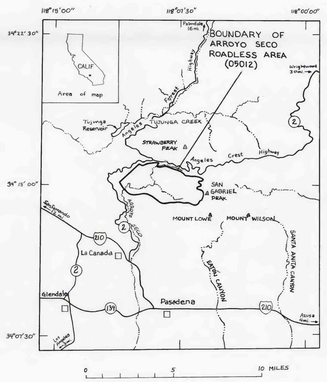

INDEX MAP SHOWING LOCATION OF THE ARROYO SECO ROADLESS AREA, SAN GABRIEL MOUNTAINS, LOS ANGELES COUNTY, CALIF.

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

[1]Resource—a concentration of naturally occurring solid, liquid, or gaseous material in or on the Earth's crust in such form and amount that economic extraction of a commodity from the concentration is currently or potentially feasible (U.S. Bureau of Mines and U.S. Geological Survey, 1980). Defined in this broad fashion, a resource may include material (reserves) that can be developed profitably under current market conditions or it may contain only material (marginal reserves, subeconomic resources) that requires more favorable market conditions or more advanced technological capability to be developed profitably.