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

SUMMARY REPORT

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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 4, 88th 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 "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 Arroyo Seco Roadless Area (05012), Angeles National Forest, Los Angeles County, California. The 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

Scope and procedure

This report summarizes the results of geologic and geochemical surveys carried out by the U.S. Geological Survey (R. E. Powell and others, 1981, unpublished map, U.S. Geological Survey, Menlo Park, Calif.; Obi and others, 1983b), and an investigation of mines, prospects, and mineralized areas conducted by the U.S. Bureau of Mines (Gabby, 1982). These surveys were designed to provide mineral-resource data for land-use decisions regarding the study area and, if compatible with such decisions, to provide a basis from which to plan followup mineral resources investigations. Our objectives in this summary document are (1) to assess known resources[1] in the study area and (2) to evaluate potential for additional resources.

To accomplish the first objective, we have examined known mineral occurrences and reviewed production history of mines and prospects in and around the roadless area, and we have estimated the quantity and quality of known resources where appropriate. To accomplish the second objective, we have sought evidence for mineral concentrations by direct observation (geologic mapping) and by a remote technique (stream-sediment geochemical survey). From this evidence and the results of the mining survey, we have identified geologic environments in the study area that are favorable for the concentration of mineral resources and have judged the likelihood (potential) for the presence of undiscovered mineral resources. On the basis of the strength of the available evidence for mineralization, the potential is expressed as low, moderate, or high. Where a specific model can be inferred for the mode of occurrence of known mineral concentrations in the vicinity of the study area, the approximate form and amount of resource (see footnote 1) most likely to be present in any undiscovered mineral deposit is evaluated by appropriate analogy with known deposits.

Geographic setting

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 crest of a ridge that includes the summits of Brown Mountain, Mount Lowe, and Mount Markham. Topographic elevations within the roadless area range from 1800 ft in Arroyo Seco near Oakwilde Picnic Area to nearly 6000 ft atop Mount Disappointment.

The area is readily accessible from the west and north along the Angeles Crest Highway. Access from the east can

[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.

be gained from the Mount Wilson-Red Box Road via a paved road that leads to the summit of Mount Disappointment and via a dirt road that leads west along the north flank of the Mount Markham-Mount Lowe ridge and then turns south into Millard Canyon. Entry to the latter two roads is controlled by the U.S. Forest Service. A hiking trail maintained by the U.S. Forest Service (USFS trail 12W07) traverses the area from Switzer Station (USFS) to Oakwilde Picnic Area. From the ridge between Brown Mountain and Mount Lowe, an undesignated trail runs down Bear Canyon to Arroyo Seco.

Geologic setting

The Arroyo Seco Roadless Area includes part of a terrane of crystalline rocks that is situated between the San Gabriel fault and the Sierra Madre fault, two major strands of the Cenozoic right-lateral San Andreas fault system (fig. 2). Crystalline-rock units within the area are distributed in lithologic belts that generally trend northwest. The geologic summary presented here is based on field work conducted in 1981 by Powell, Cox, and Matti, who mapped a study area that extends beyond the boundary of the roadless area. Previous geologic mapping within the study area includes that of Miller (1934), Saul (1976), and Smith (1977).

In this study, three lithologic varieties (gneissic subunits) are mapped together as a single Precambrian gneiss unit. The oldest of these subunits is Precambrian metasedimentary biotite-quartz-feldspar gneiss that commonly contains garnet, sillimanite, and possibly staurolite. This metasedimentary gneiss is interlayered with dark-colored Precambrian biotite-quartz-feldspar metaplutonic augen gneiss, the protolith of which intruded the metasedimentary gneiss as porphyritic granodiorite and monzogranite (igneous-rock nomenclature follows Streckeisen, 1973). The age of the augen gneiss, radiometrically dated at several localities outside the study area, ranges from 1650 to 1680 m.y. (Silver, 1971).

The metasedimentary gneiss and the metaplutonic gneiss subunits are interlayered with, and apparently intruded by, granitic to tonalitic gneiss that is probably equivalent to the Mendenhall Gneiss of Oakeshott (1958). The Mendenhall Gneiss consists chiefly of gneiss that was formed under conditions of granulite-grade metamorphism but that has been retrograded under conditions of the amphibolite facies. North of the study area, the age of the Mendenhall Gneiss is about 1425 m.y. (Silver, 1971). In the study area, however, deformed Mesozoic plutonic rocks may have been included in the Precambrian subunit that we have tentatively correlated with the Mendenhall Gneiss. Regionally, both within the San Gabriel Mountains and elsewhere within the Transverse Ranges, these three gneiss subunits comprise the country rock for Precambrian anorthosite and syenite (Oakeshott, 1958; Carter, 1982; Powell, 1982).

The Precambrian gneiss unit is intruded by the Mount Lowe Granodiorite of Miller (1926, 1934; see also, Ehlig, 1975, 1981), a pluton of porphyritic monzodiorite and quartz monzodiorite, that within the study area, consists of two principal phases distinguished by the relative abundances of feldspar phenocrysts and mafic minerals set in a fine-grained matrix of plagioclase, alkali feldspar, and minor quartz. At the margin of the pluton, a relatively dark phase contains scattered ovoid alkali-feldspar phenocrysts and coarse-grained hornblende, typically partly rimmed by epidote. In the interior of the pluton, a leucocratic phase contains abundant ovoid gray alkali-feldspar phenocrysts, coarse-grained hornblende or clots of biotite, and garnet. Quartz generally constitutes less than 10 percent of either unit. The two units, both of which are foliated, are transitional over a distance of a few feet. The Mount Lowe Granodiorite has been dated at about 220 m.y. in the San Gabriel Mountains northeast of the study area (Silver, 1971).

Between the San Gabriel and Sierra Madre faults, Precambrian gneiss and the Permian and (or) Triassic Mount Lowe Granodiorite are intruded successively by Mesozoic hornblendite; hornblende gabbro and diorite; biotite-hornblende quartz diorite, tonalite, and granodiorite; porphyritic hornblende-biotite monzogranite; and coarse-grained, nonporphyritic biotite monzogranite. All of these lithologic units are foliated to varying degrees; where deformation has been sufficiently intense, gneissic layering has developed within the plutonic units.

Medium- to coarse-grained, leucocratic biotite-plagioclase-quartz-alkali feldspar syenogranite (Echo Granite of Miller, 1930, 1934) crops out in the southeastern part of the study area. This unit, typically foliated, grades into mylonite along its northeast contact with the Mount Lowe Granodiorite and its north contact with Precambrian rocks. Because the syenogranite and mylonite are both crosscut by dikes of fine-grained monzogranite, the former are thought to be older than at least the youngest of the Mesozoic monzogranitic units in the study area. 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. Although Miller (1930) assigned a Precambrian age to the Echo Granite, the radiometric age of the syenogranite from a locality east of the study area is Mesozoic (uranium-lead; L. T. Silver, oral commun., 1977).

Thin, fine-grained, generally foliated and propyliticaliy 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 units 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 units. These relations suggest that a 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.

Within the study area west of the Sierra Madre fault, foliated leucocratic biotite monzogranite crops out. Along the Angeles Crest Highway north of the San Gabriel fault, coarse-grained, foliated hornblende and biotite-hornblende monzodiorite has been intruded by various units of fine- to medium-grained, locally porphyritic, foliated biotite and hornblende-biotite monzogranite and granodiorite.

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.

The segment of the San Gabriel fault adjacent to the study area has a demonstrated net right-lateral displacement of 14 mi (Ehlig, 1966). Apparently unbroken Quaternary(?) terrace deposits lap over the fault, although dense chapparal may obscure small displacements. A right-lateral displacement of about 24 mi has been proposed by Crowell (1975) for the Sierra Madre fault zone along the southwest margin of the study area. Contrast in rock units across the fault within the mapped area allows, but does not require, the proposed displacement.

GEOLOGY AND GEOCHEMISTRY PERTAINING TO MINERAL RESOURCE ASSESSMENT

Geology

The study area includes rocks that were formed and deformed in geologic environments having potential for concentration and deposition of ore minerals by magmatic and hydrothermal processes. However, 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 conspicuous veining or extensive alteration. A gold-silver-copper bearing quartz vein occurs south of the roadless area at the Dawn mine (fig. 2), where the host rock is the Echo Granite. Although the Echo Granite extends to the south boundary of the roadless area at Brown Mountain, very little of the granite is exposed within the roadless area, and we observed no mineral occurrences in the part of the Echo Granite that crops out within the roadless area. Because the Echo Granite is not exposed in 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 that intrude the Mount Lowe Granodiorite and the Precambrian gneiss unit elsewhere in the San Gabriel Mountains and in the Transverse Ranges east of the San Andreas fault (R. E. Powell and others, 1983, unpublished maps, U.S. Geological Survey, Menlo Park, Calif.), 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 metallic mineral 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 study 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 study area, at those localities in the Transverse Ranges east of the San Andreas fault where metallic 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 (R. E. Powell, 1983, unpublished maps, U.S. Geological Survey, Menlo Park, Calif.). 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 Arroyo Seco Roadless Area and vicinity was conducted to determine spatial variations in stream-sediment chemistry that might reflect local concentrations of ore minerals: each of 13 stream-sediment samples (fig. 2) was analyzed for 32 elements (Obi and others, 1983b). A bulk-sediment and two heavy-mineral fractions of each sample were analyzed using a semiquantitative emission spectrographic method (Grimes and Marranzino, 1968). The rationale behind a stream-sediment survey is that elements indicative of ore minerals will show up in anomalously high concentrations in drainages that contain deposits of those minerals, in contrast to normal background concentrations in drainages that do not contain deposits. However, because local geochemical anomalies do not necessarily reflect the presence of economic mineral concentrations, the results of a stream-sediment survey should be evaluated within the context of geologic data, and conclusions tested with further geochemical studies.

Eight elements (As, Au, Bi, Cd, Mo, Sb, W, Zn) were not detected in either the bulk-sediment or heavy-mineral fractions of 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.

In the bulk-sediment fraction, most elements (Fe, Mg, Ca, Ti, Mn, B, Ba, Be, Co, Cr, Cu, La, Nb, Ni, Pb, Sc, Sr, U, V, Y, Zr) were detected in concentrations within a factor of three of their respective ranges of estimated average elemental abundances for the types of rock exposed in the study area (compare, for example, Turekian, 1977; Levinson, 1980, p. 43-44). On the basis of this chemical correspondence between stream sediment and source rock-types, we conclude that none of these elements are anomalous in the bulk-sediment fraction and that each detected element probably occurs in common non-ore minerals or sparsely disseminated ore minerals, rather than in material derived from mineral deposits.

The distribution of suites of elements in the two heavy-mineral fractions is generally compatible with typical inferred chemical compositions of non-ore heavy minerals that we have observed in the rocks of the study area. For instance, higher concentrations of iron (Fe), magnesium (Mg), manganese (Mn), chromium (Cr), scandium (Sc), and vanadium (V) in the total heavy-mineral fraction as compared to the nonmagnetic fraction are consistent with incorporation of these elements in paramagnetic non-ore silicate and oxide minerals, such as hornblende, garnet, and possibly ilmenite, that occur in the rocks of every drainage basin in the study area. Cobalt (Co), copper (Cu), and nickel (Ni) also tend to reside with iron in paramagnetic minerals rather than to reside in nonmagnetic minerals. This tendency is consistent with a non-ore association for these elements in observed ferromagnesian silicates and oxides rather than in potential sulfide ore minerals, most of which contain little or no iron.

Concentrations of lead (Pb) in the nonmagnetic heavy-mineral fraction of several samples (200 ppm, AS-2; 150 ppm, AS-7, -12; 100 ppm, AS-1; 70 ppm, AS-9, -10, -11) are slightly elevated with respect to concentrations in the remainder of the samples (30 ppm, AS-4; 20 ppm, AS-3, -5, -6, -13; less than 20 ppm, AS-8). The slightly elevated values could indicate either the presence of an ore mineral such as galena or—because all the slightly elevated concentrations of lead are only found in samples derived from drainage basins through which the Angeles Crest Highway passes and because target shooting and littering have contaminated the roadside—the presence of minor contamination.

Silver (Ag) is detected only in one heavy-mineral fraction of one sample (3ppm, AS-7) from the Arroyo Seco. Because silver is not detected in the nonmagnetic heavy-mineral fraction and because traces of silver in an iron-bearing non-ore or ore mineral are unlikely to result in such a high concentration, the detected silver probably resides either in a trace amount of silver ore, which could have a source either inside or outside the study area, or in a contaminant. The latter interpretation is possible because of the proximity of the sampling site to a major highway and heavily used campgrounds and picnic areas.

In the nonmagnetic heavy-mineral fractions of nine samples (AS-1, -2, -6, -7, -9, -10, -11, -12, -13), tin (Sn) is detected in concentrations of 100 ppm or less. Tin occurs in every 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 was collected from the vicinity of a heavily used picnic area. Although the tin could be present as a trace constituent in a non-ore mineral, such as zircon, or in trace amounts of an ore mineral, such as cassiterite, it also could be a contaminant derived from litter, such as tin-plated cans.

Thorium (Th) is detected in the nonmagnetic heavy-mineral fraction of one sample (1,000 ppm, AS-6) and in a lower concentration in two other samples (200 ppm, AS-4, -11). Although the three drainage basins from which these samples were collected do not share a common rock unit that was not also sampled in other drainages, the anomalous samples are all from streams that drain Mesozoic monzogranite. Thorium may be present either as a trace constituent in non-ore minerals, such as allanite or zircon, or in the ore mineral monazite, any of which could be derived from the monzogranite. Monazite, which is the principal ore mineral of thorium, is commonly recovered from placer deposits. Even if the detected thorium is present in monazite, the small volume of alluvial deposits within the study area provides no place for the accumulation of large placer deposits, and the low concentrations of thorium in the stream sediments do not suggest high-grade placer deposits.

In areas of the Transverse Ranges known to have mineral deposits, relatively high concentrations have been detected in the nonmagnetic heavy-mineral fraction of stream-sediment samples for associated suites of elements that include gold (up to 200 ppm), silver (up to 30 ppm), molybdenum (Mo, up to 1,500 ppm), tungsten (W, up to 20,000+ ppm), lead (up to 50,000 ppm), bismuth (Bi, up to 2,000 ppm), tin (up to 2,000 ppm), and thorium (up to 5,000+ ppm) (for references, see Obi and others, 1983b). In the context of these elevated values for elements typically associated with mineral deposits in the region, the relatively low concentrations of these elements in samples from the study area provide evidence for a lack of significant mineral concentrations in the Arroyo Seco Roadless Area.

MINES, PROSPECTS, AND MINING AREAS

Methods and previous studies

The U. S. Bureau of Mines (USBM) personnel conducted a literature search and examined mines and prospects in the Arroyo Seco Roadless Area (fig. 2) (Gabby, 1982). Twenty-one lode samples from the Dawn mine were analyzed by fire assay, atomic absorption, and semiquantitative spectrographic methods. Four placer samples taken from streams draining the study area were gravity concentrated to determine gold and heavy mineral content. Mineral deposits and occurrences in the region were previously summarized by Gay and Hoffman (1954).

Mining and prospecting history

The entire study 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 study area. A prospect that was reported to be located approximately on the northwestern 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 roadless area produced gold between 1895 and 1950 (Gay and Hoffman, 1954). About 6 mi north of the study area the Monte Cristo, Tejunga, Last Hope, Loomis, Alice Keng, and Black Cargo mines produced gold intermittently between 1895 and 1955, according to USBM records.

Gold

The Dawn mine is located in the SW1/4, sec. 27, T. 2 N., R. 12 W. on Millard Creek, about 0.6 mi south of the roadless area. At the Dawn mine, a gold-bearing vein as much as 5 ft thick contains white quartz, altered (silicified) granite, fractured granite, granitic gouge, limonite, pyrite stringers, and copper minerals. The host rock is medium- to coarse-grained leucocratic syenogranite (Echo Granite). Workings consisted of about 900 ft of drifts and about 100 ft of raises and winzes (Gay and Hoffman, 1954, p. 619). However, only three adits, 50, 175, and 360 ft long, were accessible for mapping and sampling in 1981.

Seventeen chip samples of the vein and altered (silicified) granite were taken. Six had 0.032 to 0.704 oz gold per ton; four contained 0.3 to 1.9 oz silver per ton; and five had 0.02 to 0.06 weight percent copper.

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 there are about 1,000 tons of subeconomic gold-bearing rock that averages 0.046 oz gold per ton at the Dawn mine south of the roadless area. The host rock for the gold-bearing quartz vein at the Dawn mine is a distinctive granite (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 Echo Granite 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, no evidence of a potential for gold resources was found in most of the roadless area. Where the Echo Granite is exposed along the south margin of the roadless area in the vicinity of Brown Mountain, there is a low potential for small, 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 in areas where the 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.

In related rocks elsewhere in the region, a strong correspondence exists between the presence of gold and tungsten mineralization and a weaker correspondence exists between the presence of gold and silver, copper, molybdenum, bismuth, and lead (Evans, 1982; Obi and others, 1983a; R. E. Powell and others, 1983, unpublished maps, U.S. Geological Survey, Menlo Park, Calif.). Compared to stream-sediment concentrations of these associated elements from nearby areas known to be mineralized, the nondetection of tungsten, copper, molybdenum, and bismuth together with the low concentrations detected for silver (one sample only) and lead provide supporting evidence for a low potential for the presence of gold resources associated with mafic dikes in the Arroyo Seco Roadless Area.

Where gold deposits occur in similar geologic settings elsewhere in the region (Evans, 1982; Matti and others, 1982; R. E. Powell and others, 1983, unpublished maps, U.S. Geological Survey, Menlo Park, Calif.), geologic and geochemical evidence for gold mineralization is much stronger and mining is 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 material of similar or better quality is available and more readily accessible outside the area. Sand and gravel, confined to small deposits in narrow, inaccessible stream beds in the study area, are not significant resources. We have not identified energy mineral resources in the roadless area, and no evidence of a potential was found for such 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 found in the stream-sediment samples indicate the presence of a mineral deposit. The maximum concentrations that were measured for all elements are low in comparison to values that generally have been reported in stream-sediment surveys for districts where metallic mineral deposits are present.

Most ore-indicating elements either were not detected or were detected in concentrations and in sediment fractions that are consistent with their occurrence in hydraulic accumulations of non-ore minerals that we have observed in rocks in the study area. 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 the scarcity of prospects in the roadless area are consistent with a lack of significant mineral occurrences.

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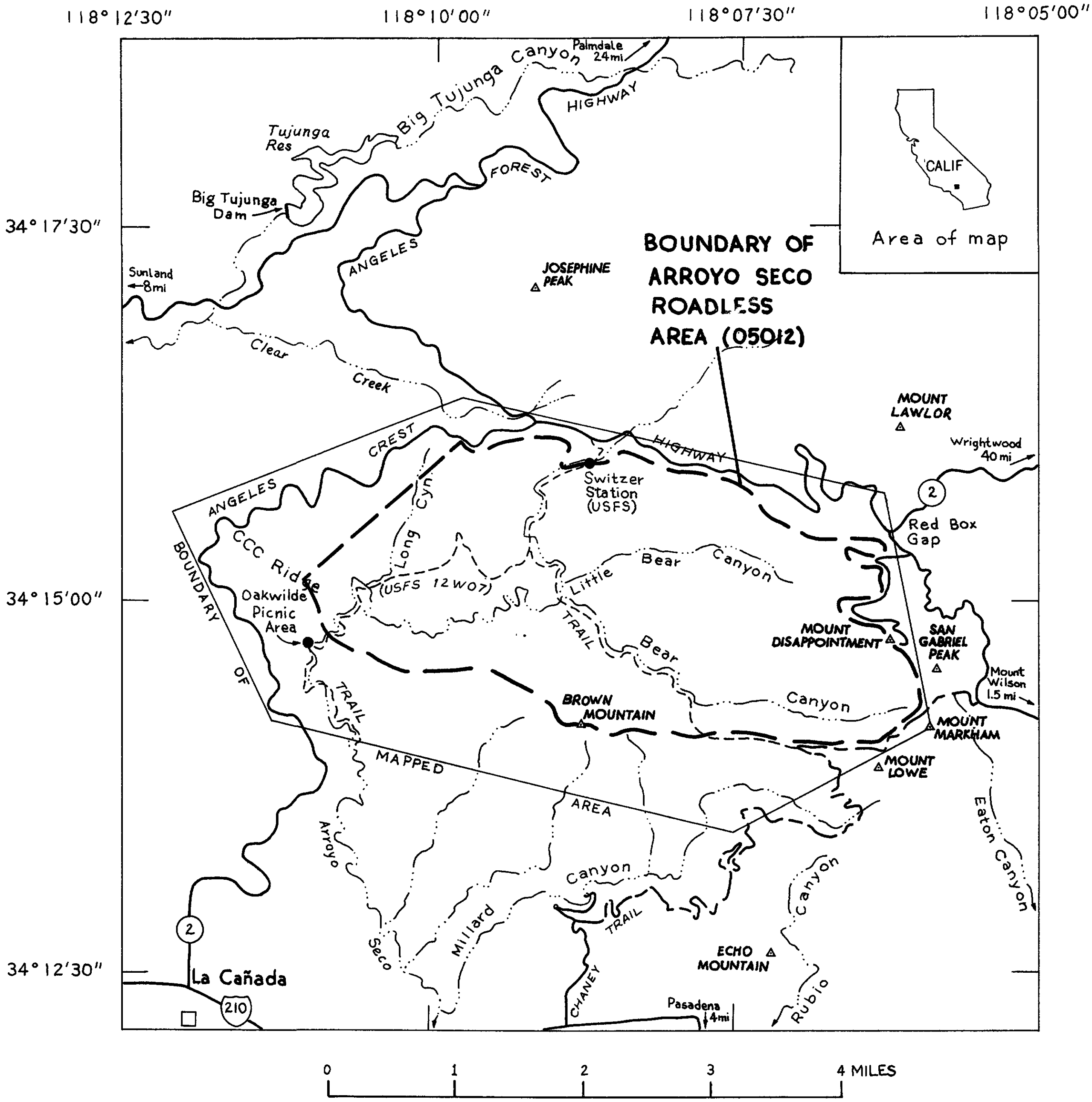

Figure 1.--Index map showing location of the Arroyo Seco Roadless Area (05012), San Gabriel Mountains, Los Angeles County, Calif.

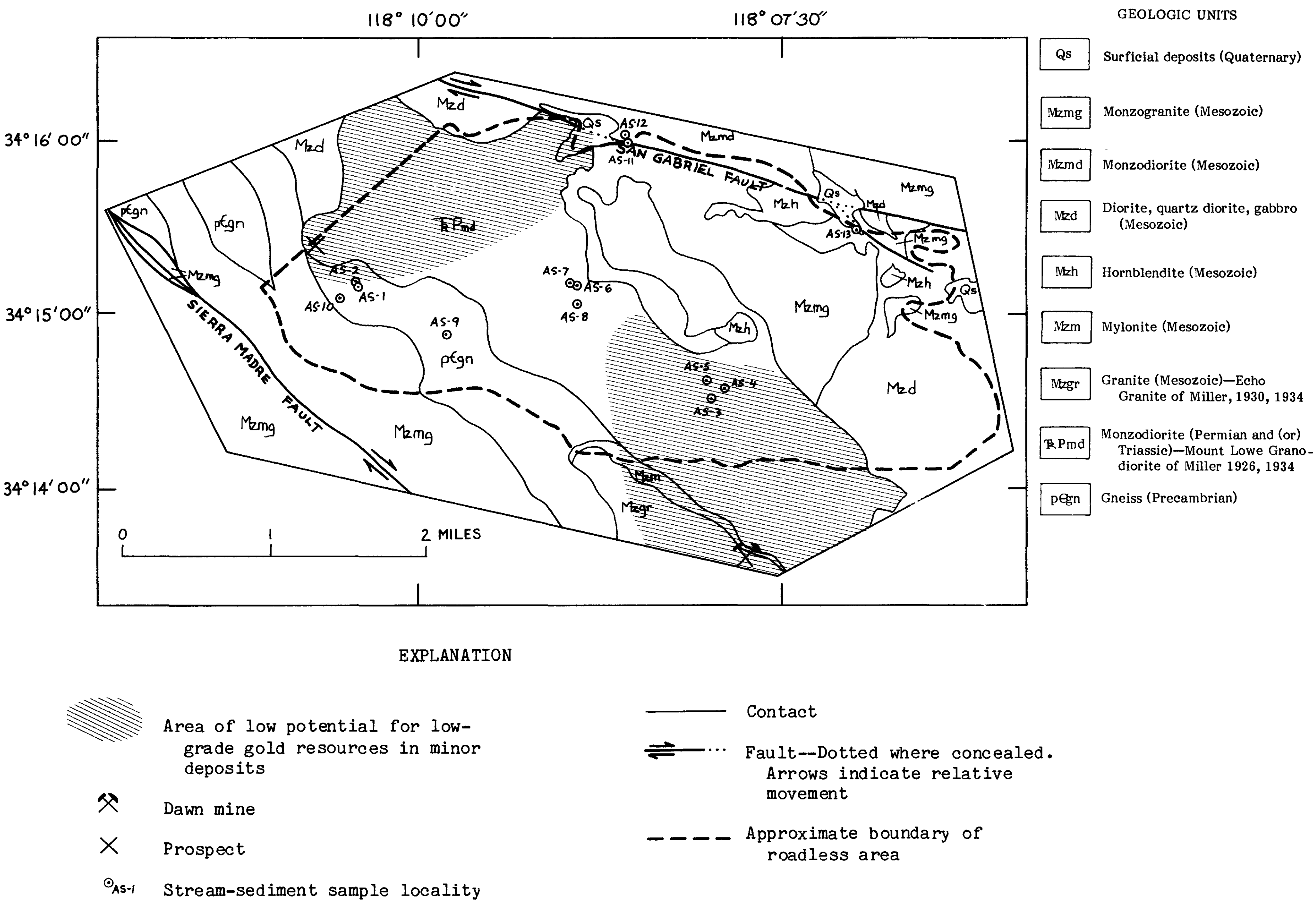

Figure 2.--Arroyo Seco Roadless Area showing zone with mineral resource potential, Dawn mine, and prospect reported by Gay and Hoffman (1954). Geology simplified from accompanying mineral resource potential map.