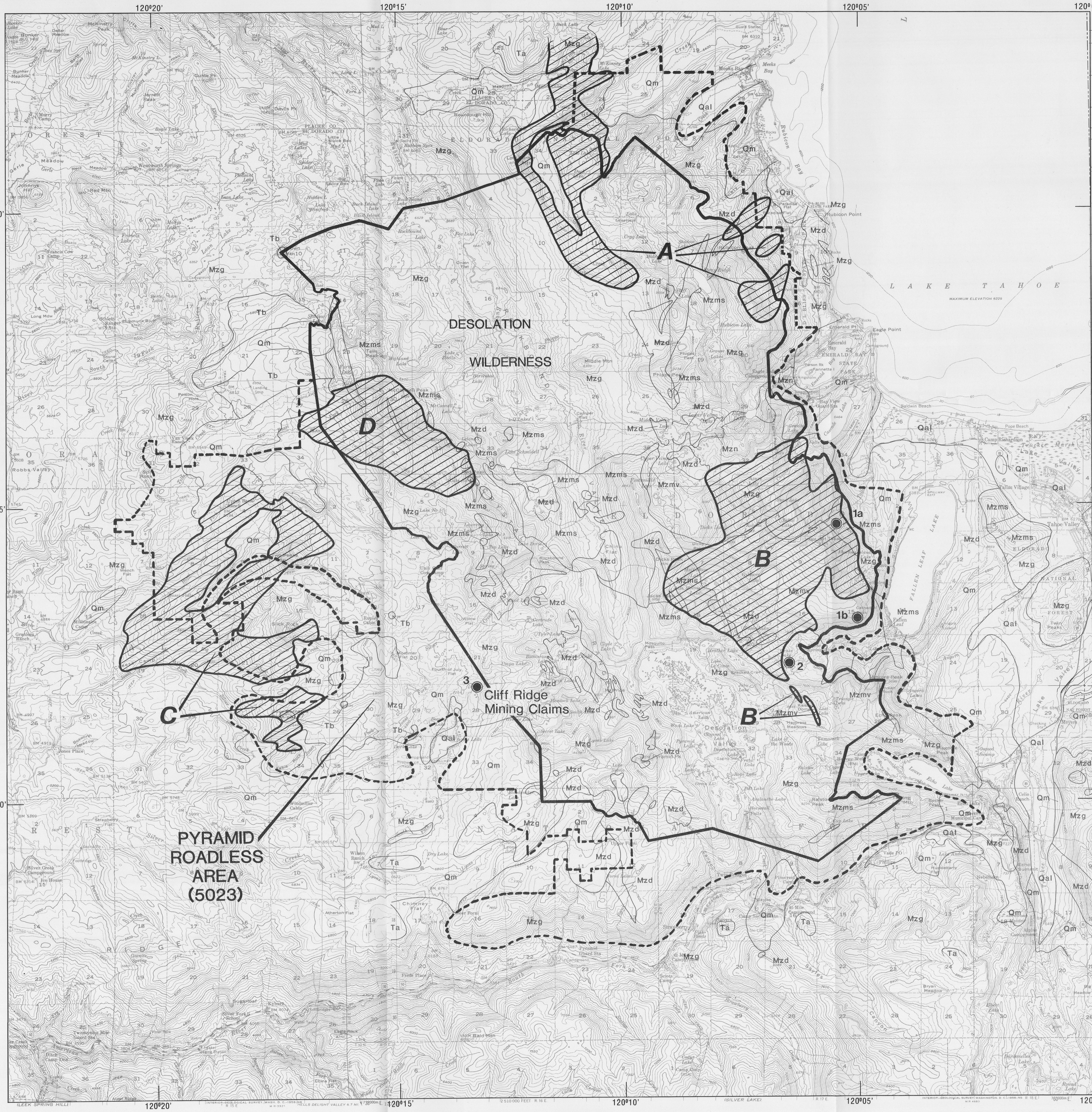
DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

MISCELLANEOUS FIELD STUDIES
MAP MF–1616–A



Base from U.S. Geological Survey
Robbs Peak, 1952; Granite Chief, 1953;
Fallen Leaf Lake, and Tahoe, 1955.

SCALE 1:62500

CONTOUR INTERVAL 80 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

Geology after Loomis (1964),
Dodge and Fillo (1967), Burnett 1971;
and field work by Armstrong, 1982.

AREA WITH LOW POTENTIAL FOR GOLD, SILVER, TUNGSTEN, ZINC, MOLYBDENUM, AND (OR) URANIUM--See text for further discussion

U.S. BUREAU OF MINES SAMPLE LOCALITY--Number referred to in text

APPROXIMATE BOUNDARY OF DESOLATION WILDERNESS

APPROXIMATE BOUNDARY OF PYRAMID ROADLESS AREA (5023)

CORRELATION OF MAP UNITS

Unit	Epoch	Period	Era
Qal, Qm		QUATERNARY	CENOZOIC
Tb, Ta	Miocene	TERTIARY	CENOZOIC
Mzg, Mzn		CRETACEOUS	MESOZOIC
Mzd, Mzmv, Mzms		CRETACEOUS AND (OR) JURASSIC	MESOZOIC

DESCRIPTION OF MAP UNITS

Qal ALLUVIUM (QUATERNARY)--Fine- to medium-grained silt and sand and pebble conglomerates, deposited in lacustrine and fluvial environments

Qm GLACIAL MORAINE AND OUTWASH GRAVEL DEPOSITS (QUATERNARY)--Boulder conglomerates to unconsolidated silts and clays

Tb PORPHYRITIC OLIVINE BASALT (MIOCENE)--Basalt with hypersthene, olivine, and augite microphenocrysts; groundmass of augite and labradorite

Ta ANDESITE BRECCIAS AND INTERBEDDED EPICLASTIC STREAM CONGLOMERATES AND SANDSTONE (MIOCENE)--Andesitic lava flows, mudflows; sedimentary rocks ranging from siltstone to cobble conglomerates

Mzg GRANODIORITE TO ALASKITE (CRETACEOUS)--Granodioritic intrusive masses ranging in composition from alaskite through quartz monzonite to quartz diorite; granodiorite is the most common rock type in the roadless area

Mzn NORITIC ROCKS (CRETACEOUS)--Leucocratic norites containing plagioclase, hypersthene, hornblende, and magnetite; rocks show compositional banding

Mzd DIORITIC ROCKS (CRETACEOUS AND (OR) JURASSIC)--Compositionally variable from quartz diorite to hornblende gabbro; hornblende-rich quartz diorite is most abundant

Mzmv METAVOLCANIC ROCKS (CRETACEOUS AND (OR) JURASSIC)--Principally dark quartzo-feldspathic hornfels; relict textural features of volcanic rocks, parent rocks probably andesites or dacites (Dodge and Fillo, 1967)

Mzms METASEDIMENTARY ROCKS (CRETACEOUS AND (OR) JURASSIC)--Fine-grained, calc- and quartzo-feldspathic hornfels derived from argillaceous limestone and mainly shales are the most abundant rock type present. Hornfels grade into quartzites as the amount of feldspar and mafic minerals decreases

CONTACT--Approximately located

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 Pyramid Roadless Area in the Eldorado National Forests and the Lake Tahoe Basin Management Unit, El Dorado County, California. The Pyramid Roadless Area (5023) 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

Studies show there is low potential for small deposits of gold, silver, and base metals in the Pyramid Roadless Area. There are two uranium claims (Cliff Ridge mining claims) located within the roadless area, but samples from this site showed no uranium. There are no indications of geothermal resources, coal, oil, or gas.

GEOLOGY

Mesozoic

Metamorphic rocks

All the sedimentary and volcanic rocks intruded by the Sierra Nevada batholith in the Pyramid Roadless Area are thermally metamorphosed and show the effects of directed pressure. These rocks are mostly biotite-hornblende gneiss and schist, porphyroblastic granitoid rocks, and calc-silicate hornfels. Mineral assemblages suggest metamorphism to amphibolite facies or hornblende-hornfels contact facies (Dodge and Fillo, 1967; Loomis, 1964). The prebatholithic metamorphic rocks occur in the east-trending Mount Tallac pendant in the east-central part of the roadless area. Two groups of metamorphic rocks have been recognized; metasedimentary sequence and metavolcanic sequence that comformably overlies it.

The metasedimentary rocks are fine-grained calc-silicate and quartzo-feldspathic hornfelses derived from argillaceous limestones and shales. Weathered outcrops of these hornfelses generally are brown, but fresh rock ranges from bluish white to black. The calc-silicate hornfelses are massive light-colored rocks consist chiefly of calcite, quartz, plagioclase, and diopside, but also containing subordinate epidote, grossularite, idocrase, actinolite, scapolite, sphene, wollastonite, and unidentified opaque minerals. In contrast, the quartzo-feldspathic hornfelses generally are finely laminar and dark, and consist principally of quartz, plagioclase, biotite, and actinolite in zones of lower grade metamorphism, and hornblende in zones of higher grade metamorphism.

The metavolcanic rocks in the roadless area south of Fallen Leaf Lake are dark quartzo-feldspathic hornfels. Relict textural features typical of volcanic rocks are present. The presence of quartz and biotite, as well as hornblende or tremolite and minor amounts of epidote and unidentified opaque minerals, and in pneymatolitic rocks, tourmaline, suggest that the parent rocks were probably andesites or dacites.

Most of the metavolcanic hornfels rocks are believed to have been derived from pyroclastic rocks. A broad area just east of the metavolcanic-metasedimentary contact is underlain by metavolcanic breccia (Dodge and Fillo, 1967; Loomis, 1964).

Plutonic rocks

Dioritic rocks.--Several masses of dioritic rock are exposed in the northeastern and southwestern parts of the Pyramid Roadless Area. In some places a complete transition from dark igneous to dark metamorphic rocks can be seen. Although the contacts between granitic and dioritic rocks are generally sharp, the age relations and mode of origin of the diorites are not consistent throughout the area. Some dioritic material was derived by metamorphism, some crystallized from magma that was injected into pre-existing rocks.

Dioritic rocks range from quartz diorite to hornblende gabbro, hornblende-rich quartz diorite being most abundant.

Granitic rocks.--The major rock type in the northeastern, southern, and western part of the Pyramid Roadless area is quartz-bearing plutonic rock . Within the Desolation Wilderness, Dodge and Fillo (1967) recognized eight discrete granitic units recognizable in the field, however, they made no distinctions between individual units on their geologic map. Loomis (1964, pl. 1) recognized seven distinct granitic plutons within the the Pyramid Roadless Area. Granodiorite is the most prevalent rock type. The intrusive masses range from alaskite through quartz monzonite to quartz diorite.

Noritic rocks.--Loomis (1963, 1964) and Dodge and Fillo (1967) described and mapped a small mass of noritic rocks near the east side of the roadless area, south- west of Emerald Bay. These rocks are fine- to medium-grained leucocratic norite containing plagioclase, hypersthene, hornblende, magnetite, and minor amounts of quartz, calcite, augite, biotite, and apatite. Compositional banding is a conspicuous feature of these rocks.

Cenozoic

Volcanic rocks

Andesite breccias and interbedded epiclastic stream conglomerates and sandstones are absent within the Pyramid Roadless Area; however, these rocks occur adjacent to the south and southeast parts of the area.

Porphyritic olivine basalt occurs on the northwest side of the roadless area. Four Cornered Peak and two unnamed peaks in the west-central part of the area are composed of olivine basalt.

Dalrymple (1964) using K-Ar dating methods, determined middle to late Miocene age for volcanic activity in many localities in the central Sierra Nevada, and the volcanic rocks adjacent to the Pyramid Roadless Area may be of similar age.

Quaternary deposits

A record of the glacial advances and retreats is preserved in moraines. Four main advances are known, and a fifth minor advance is represented by several rock glaciers that still may be active. The Quaternary glacial deposits within the Pyramid Roadless Area are glacial moraines and outwash gravels. Thick lateral and terminal moraines are found around Fallen Leaf Lake, Cascade Lake, Emerald Bay, and General and Meeks Creeks in the northeast. Moraines and outwash gravel are extensive south and east of Wrights Lake.

GEOCHEMICAL STUDIES

The geochemical investigation of the Pyramid Roadless Area was based on analyses of 35 rock, 90 minus-60-mesh stream-sediment, and 88 nonmagnetic heavy-mineral-concentrate samples collected in the summer of 1982.

All samples were analyzed for 31 elements using a six-step semiquantitative emission spectrographic method. The rock and stream-sediment samples were also analyzed for arsenic, gold, and zinc by atomic-absorption spectrometry and for uranium by a fluorometric method.

Discussion of geochemical anomalies

Rock Samples

Only five of the 35 rock samples collected for this study contain anomalous concentrations of elements suggestive of mineralization. Three granodiorite samples from the west side of the roadless area contained weakly anomalous concentrations of uranium. Samples of metasedimentary and metavolcanic rocks contained low concentrations of copper and copper and molybdenum, respectively.

MINERALIZED AREAS

Stream-sediment and heavy-mineral-concentrate samples

Geochemical anomalies for stream-sediment or heavy-mineral-concentrate samples are present in several parts of the Pyramid Roadless Area. For purposes of discussion the drainage basins have been divided into four areas.

Area A.--Area A, in the northern part of the Pyramid Roadless Area, extends from McKinney Creek on the north to Emerald Bay on the south. Geologically, this area is composed of granodiorite containing up to about 5 percent dioritic inclusions.

Area B.--Area B, in the southeastern part of the Pyramid Roadless Area, extends from Cascade Lake on the north to Echo Lake on the south. This area is characterized by metamorphosed blocks of pre-Cretaceous sedimentary and volcanic sequences that have been intruded mainly by granodioritic plutons of the Sierra Nevada batholith.

Area C.--Area C, in the western part of the study area, extends from Tells Creek on the north to the Jones Fork of Silver Creek on the south. Granodioritic plutonic rocks of the Sierra Nevada batholith predominate here. Outcrops of metamorphosed pre-batholithic sedimentary and volcanic rocks and Tertiary andesitic or basaltic flow rocks are present locally.

Area D.--Area D, is in the extreme northern end of the western part of the Pyramid Roadless Area. Granodioritic plutonic rocks of the Sierra Nevada batholith predominate with some glacial outwash. One concentrate sample collected from the upper tributaries of Bassi Fork yielded strongly anomalous concentrations of silver and gold. The source of this precious-metal anomaly is not known.

The U.S. Bureau of Mines gathered data concerning mines, prospects, and mineralized areas. Twelve rock samples taken from mineralized areas in and adjacent to the Pyramid Roadless Area were analyzed by atomic-absorption, chemical, and fire-assay methods. All samples were checked for radioactivity with a gamma-ray scintillometer and for fluorescence with an ultraviolet light. Most of the samples were analyzed by semi-quantitative spectrographic methods.

No mineral resources were indicated by the Bureau of Mines investigation. The Cliff Ridge mining claims, north of Wrights Lake, were located for uranium in 1959 and 1979. Both claims are on a 4-ft thick aplite dike that strikes N. 80° W., and dips 66° SW. in quartz monzonite. The dike is characterized by a slightly-higher-than-background count using a gamma ray scintillometer, but samples from this site (no. 3) showed no uranium.

Silicified and limonite-stained metasedimentary rocks occur near a granitic contact west of Fallen Leaf Lake (no. 1b). The metamorphic rocks are part of the Mt. Tallac pendant and locally contain as much as 2 percent disseminated sulfides. Seven samples of altered metasedimentary rocks contained no base or precious metals.

Three quartz stringers containing molybdenite rosettes and massive arsenopyrite occur in slightly limonite-stained quartz monzonite near Grass Lake (no. 2). These stringers, 0.25 to 2 in. thick, trend northeast-southwest, but were not exposed in the roadless area. Four samples of mineralized parts of the stringers contained from 0.28 to 1.06 percent MoS_2 (molybdenum disulfide).

ASSESSMENT OF MINERAL RESOURCES

The areas of mineral resource potential within the Pyramid Roadless Area are defined by areas of anomalously high values of base and precious metals in geochemical analyses, by known deposits, and by assessment of geologically favorable host rocks.

Two uranium claims are present within the Pyramid Roadless Area. Studies show that the amount of uranium mineralization at the two claims is so small as to preclude mining given the present market value for uranium. There is low potential for deposits of base or precious metals in the roadless area. There are no indications of coal, oil, gas, or geothermal resources in the roadless area.

The anomalous element suites found in Area A indicate that precious-metal and (or) tungsten deposits might be present in the northeastern part of the Pyramid Roadless Area.

Rock samples collected from area B in the east-central part of the Pyramid Roadless Area suggest that precious-metal deposits and contact-metasomatic tungsten deposits might be present.

Area C in the western part of the study area, extends from Tells Creek on the north to Big Silver Creek on the south. On the basis of the concentration levels of the various elements, the resource potential for precious-metals and tungsten and (or) uranium deposits in the roadless area is low.

Area D, in the extreme northern end of the western part of the roadless area, yielded strongly anomalous concentrations of silver and gold in one concentrate sample collected from the upper tributaries of Bassi Fork. The source of this precious-metal anomaly is not known. On the basis of this one concentrate sample, this area has a low potential for precious-metal deposits.

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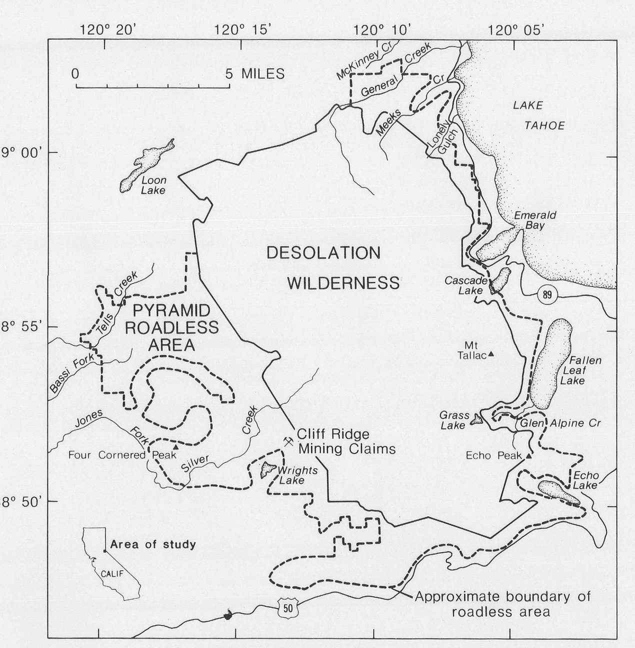

INDEX MAP

MINERAL RESOURCE POTENTIAL MAP OF THE PYRAMID ROADLESS AREA, EL DORADO COUNTY, CALIFORNIA

By
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U. S. Geological Survey
and
Douglas F. Scott
U. S. Bureau of Mines
1983

Explanatory pamphlet accompanies map

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