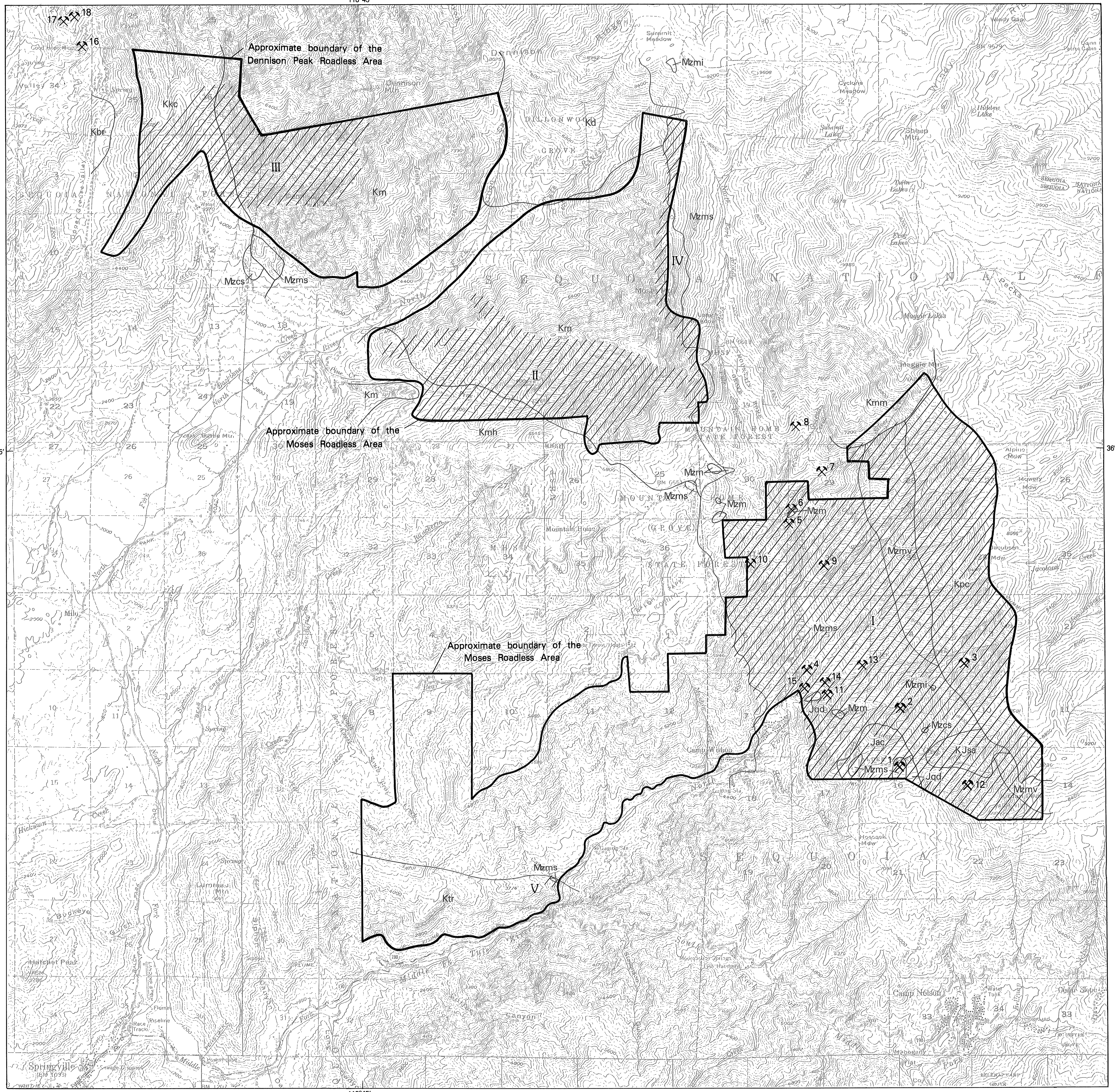

Base from U.S. Geological Survey, Camp Nelson, 1956, Mineral King, 1956, and Kaweah, 1957, 1:62,500; and Springville, 1957, 1:24,000

SCALE 1:48 000

CONTOUR INTERVAL 40 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

MAP LOCATION

Geology generalized from Sawlan and Ort (in press)

MINERAL RESOURCE POTENTIAL MAP OF THE MOSES AND DENNISON PEAK ROADLESS AREAS, TULARE COUNTY, CALIFORNIA

By
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and
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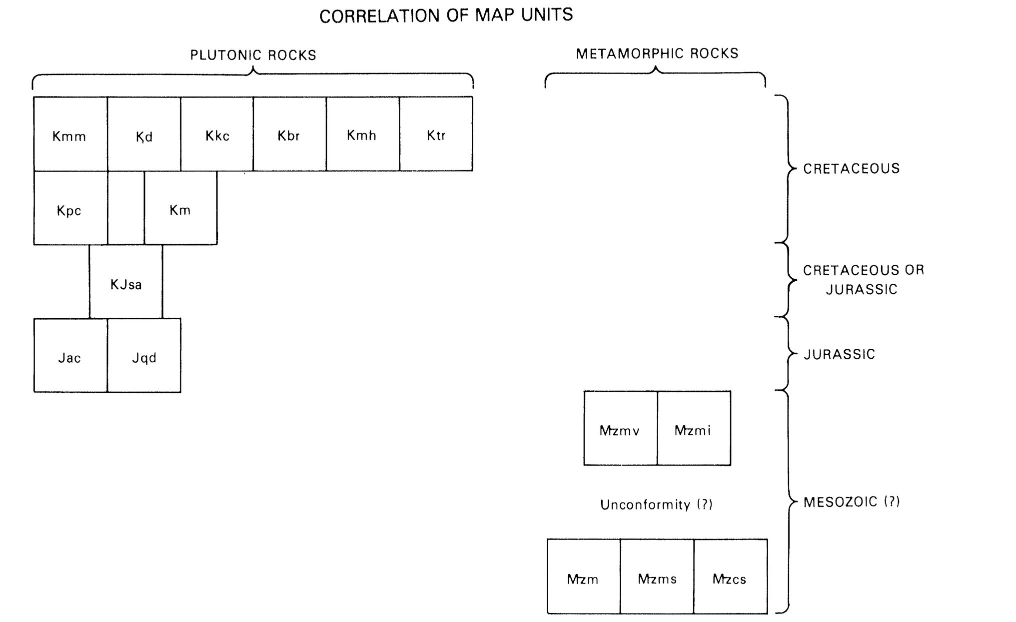
1985

CORRELATION OF MAP UNITS



DESCRIPTION OF MAP UNITS

Kmm ALASKITE OF MAGGIE MOUNTAIN (CRETACEOUS)--Coarse-grained, hypidiomorphic granular, unfoliated, biotite-bearing alaskitic granite

Kd GRANODIORITE OF DILLONWOOD (CRETACEOUS)--Medium-grained, hypidiomorphic granular, biotite and hornblende granitoid intrusive. Composition varies from quartz diorite in narrow (191-244 m) border facies that typically contains abundant mafic inclusions to granodiorite in center of pluton

Kkc GRANODIORITE OF KRAMER CREEK (CRETACEOUS)--Hornblende-biotite granodiorite characterized by local extreme textural variation due to cataclasis and possibly protoclasis. Hypidiomorphic granular zones alternate with protomylonitic zones in interior of pluton; strong deformation produced mylonite along eastern margin of pluton

Kbr ALASKITE OF BLUE RIDGE (CRETACEOUS)--Medium- to coarse-grained, hypidiomorphic granular, muscovite-biotite alaskitic granite. Includes pegmatites, some of which contain large muscovite plates

Kmh GRANODIORITE OF MOUNTAIN HOME (CRETACEOUS)--Medium-grained, hypidiomorphic granular, biotite-hornblende granodiorite

Ktr GRANITE OF TULE RIVER (CRETACEOUS)--Coarse-grained, hypidiomorphic granular, hornblende-biotite granite; locally alaskitic. Conspicuous large (commonly >1 cm) polycrystalline quartz blebs give rock characteristic "leopard skin" appearance

Kpc GRANODIORITE OF PECKS CANYON (CRETACEOUS)--Medium-grained, hypidiomorphic granular, biotite-hornblende granitoid rock. Composition intermediate between granodiorite and quartz-monzonite

Km ALASKITE OF MOSES MOUNTAIN (CRETACEOUS)--Medium-grained, allotriomorphic to subhypidiomorphic granular, biotite-hornblende alaskite granite; typically has bleached yellowish-white appearance

KJsa GRANODIORITE OF SOUTH ALDER CREEK (JURASSIC OR CRETACEOUS)--Texturally fine to medium grained biotite hornblende granodiorite. Textures vary from fine grained allotriomorphic granular and incipiently mylonitized to medium grained and foliated, but generally hypidiomorphic granular. Uncertain whether one or two plutons included in unit

Jac GABBRO OF ALDER CREEK (JURASSIC)--Medium- to very coarse grained, poikilitic, biotite-bearing two-pyroxene hornblende gabbro characterized by distinctive texture dominated by large equant oikocrysts of hornblende

Jqd QUARTZ DIORITE (JURASSIC)--Medium-grained, hypidiomorphic granular, two-pyroxene biotite-hornblende rocks; 5-15 percent quartz and 0-3 percent alkali feldspar

Mzmv METAVOLCANIC ROCKS (MESOZOIC?)--Dark-green to white, fine-grained, massive or brecciated, mostly blastoporphyritic lavas

Mzmi META-INTRUSIVE ROCKS (MESOZOIC?)--Milky white, very fine grained, hornfelsic rocks that are probably metahypabyssal silicic intrusives

Mzm MARBLE (MESOZOIC?)--Blue-gray to white, medium to coarsely crystalline marble that typically crops out as isolated elongate pods parallel to structural trend of roof pendant

Mzms METASEDIMENTARY ROCKS (MESOZOIC?)--Predominately pale-cream to gray or pinkish-brown quartzose hornfels, thin bedded with black to gray phyllitic to finely schistose metapelite. Thick-bedded and massive quartzose hornfels also common. Minor bedded and podiform marble, lenticular calc-silicate rocks, and small mafic and silicic dikes and sills

Mzcs CALC-SILICATE ROCKS (MESOZOIC?)--White, green, greenish-gray, and red-brown, fine- to coarse-grained, typically massive but compositionally and mineralogically heterogeneous skarn composed chiefly of calcite, garnet, diopside, tremolite, wollastonite(?), actinolite amphibole, idocrase, clinohumite, spinel, and phlogopite

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 survey of the Moses (05203) and Dennison Peak (05202) Roadless Areas in the Sequoia National Forest, Tulare County, California. Moses and Dennison Peak Roadless Areas were classified as further planning areas during the Second Roadless Area Review and Evaluation (RARE II) by the U.S. Forest Service, January 1979.

MINERAL RESOURCE POTENTIAL SUMMARY STATEMENT

Five localities within the Moses and Dennison Peak Roadless Areas were defined as having from moderate to high mineral resource potential for small occurrences of lead-silver-zinc-, copper-, or tungsten-bearing skarns. Anomalous stream-sediment and heavy-mineral concentrate data, favorable host lithology, and the presence of known mines and prospects were used to define the five areas of favorability.

INTRODUCTION

Location of study area

The Moses and Dennison Peak Roadless Areas include 36 mi^2 and 9 mi^2, respectively, in the southern Sierra Nevada of California, southeast of Sequoia National Park. Both areas are within lands administered by Sequoia National Forest. Springville lies 4 mi to the southwest and Visalia is 30 mi to the northwest. California Highway 190 and Balch Park Road are the principal access routes.

A geochemical survey of Moses and Dennison Peak Roadless Areas was conducted by Goldfarb and others (1984). Stream-sediment and heavy-mineral concentrate samples were collected from first- and second-order drainages. Watersheds containing anomalous amounts of ore pathfinder elements were delineated. Sawlan and Ort (in press) mapped the geology of the two roadless areas. No geophysical work was undertaken.

Examination of mineralized rocks, prospects, and mining claims was undertaken by the U.S. Bureau of Mines, but results of these studies were not available to incorporate in this report. However, a list and description of the known mineral occurrences were derived from the literature (table 1), and the occurrences are plotted on the mineral resource map.

GEOLOGY

The geology of the roadless areas consists essentially of a moderate-size (approx. 16-mi^2) roof pendant of metasedimentary and metavolcanic rocks surrounded by plutons of granitic to gabbroic composition.

Metamorphic rocks underlie about 15 percent of the combined roadless areas and occur mostly as the Wishon-Tule roof pendant along the North Fork of the Middle Fork of the Tule River and as small septa or foundered blocks along the margins of plutons. Protoliths include mostly fine grained, thin bedded quartzose sandstone and pelite, podiform limestone, minor basaltic dikes, and in the eastern portion of the roof pendant, abundant porphyritic volcanic rocks. Present lithologies are quartzose hornfels, phyllites, fine-grained schists, marble, and blastoporphyritic actinolite-bearing metavolcanic rocks.

Rocks of the pendant were regionally metamorphosed to middle and upper greenschist facies. Subsequent thermal metamorphism produced hornblende hornfels-grade assemblages adjacent to granitic and granodioritic plutons and slightly higher grade assemblages next to dioritic and gabbroic plutons. An early Mesozoic age is tentatively assigned to protoliths of the metamorphic rocks (Christensen, 1963), based on lithologic and stratigraphic similarities with the neighboring Mineral King pendant, separated by only 6 mi from the southwest part of the Tule River pendant. Metamorphic rocks of the Mineral King pendant have been assigned to the Upper Triassic to Middle Jurassic Kings sequence (Saleeby and others, 1978); their arguments, summarized by Sawlan and Ort (in press) are the basis for a Mesozoic(?) age assignment for the Tule River pendant.

Most of the exposed rocks within the Moses and Dennison Peak Roadless Areas are plutonic rocks of the Jurassic to Cretaceous Sierra Nevada batholith. Granodiorite and alaskitic granite are the most abundant intrusive rock types, but quartz diorite, diorite, and gabbro are also present. Intrusive contacts are generally sharp but between some bodies agmatitic zones are present.

GEOCHEMISTRY

A drainage basin reconnaissance survey of the Moses and Dennison Peak Roadless Areas identified three areas containing geochemical anomalies possibly related to mineral resources.

1. The Camp Wishon district in Moses Roadless Area--Anomalous boron and zinc in stream sediments, and boron, silver, and bismuth in heavy-mineral concentrates within drainages underlain by metamorphic roof pendant, centered around the North Fork of the Middle Fork of the Tule River.
2. Region between Backbone and Pine Creeks in Moses Roadless Area--Anomalous tungsten and bismuth in heavy-mineral concentrates in an area mainly underlain by the alaskites of Moses Mountain.
3. Kramer Creek and vicinity in Dennison Peak Roadless Area--Anomalous lead and silver in stream sediments, and boron, tin, lead, silver, arsenic, and gold in heavy-mineral concentrates in an area underlain by granodiorite of Kramer Creek.

Thresholds used to select anomalous concentrations of resource-related elements within stream-sediment and heavy-mineral concentrate samples are listed in tables 2 and 3.

MINERAL OCCURRENCES

Table 1 lists, and the mineral resource potential map shows, the known mineral occurrences within and adjacent to the roadless areas. Minor skarn mineralization is known to be associated with the contacts between the plutons and metamorphic pendant rocks. Veins containing pyrrhotite, chalcopyrite, argentiferous galena, and sphalerite occur in the Camp Wishon district, located within the Moses Roadless Area to the east of the North Fork of the Middle Fork of the Tule River. These occurrences are reported to contain scheelite and minor gold (California Division of Mines, 1930). Additional known mineralization is reported from the Royal Tungsten, Martin, and Good Hope mines (nos. 17, 18, and 16, respectively, on map), 2 mi northwest of Dennison Peak Roadless Area. Scheelite in this area is associated with garnet and epidote along contacts between the granitic rocks and lime-rich metamorphic rocks (Krauskopf, 1953).

Very little production has been recorded from these known occurrences. Less than 10,000 lbs of copper were taken from the Camp Wishon district. A small shipment of ore from the Cedar Hill claim (no. 6) had a smelter recovery of 81 oz silver/ton (Goodwin, 1958). The combined production and reserves of the Royal Tungsten, Martin, and Good Hope mines is estimated to be less than 100 short tons of tungsten (Krauskopf, 1953).

ASSESSMENT OF MINERAL RESOURCE POTENTIAL

Areas have been identified as having high, moderate, or low resource potential for indicated commodities based on the following criteria:

High resource potential: Anomalous concentrations of ore-related elements in samples of stream-sediment and nonmagnetic heavy-mineral concentrate in areas containing favorable host rocks and known mineral resources or occurrences.

Moderate resource potential: Anomalous concentrations of ore-related elements in samples of stream sediment and (or) nonmagnetic heavy-mineral concentrate; or the presence of favorable host rocks, without anomalous concentrations of ore-related elements.

Low resource potential: Geologic and geochemical data indicate the existence of resources is unlikely and no known mines or prospects present.

Because our sample sites are widely spaced with respect to the size of potential resource occurrences, the definitions for resource potential are broad and the mapped boundaries of favorable terrain are highly generalized.

Mineralization of possible significance within the two roadless areas consists of small occurrences of tungsten, copper, or zinc-bearing skarns. Five areas (table 4) were identified as having moderate to high mineral resource potential.

CONTACT

MINE OR PROSPECT--Numbers refer to table 1

AREA WITH MINERAL RESOURCE POTENTIAL--Numbers refer to table 4

REFERENCES

Aubury, L. E., 1902, The copper resources of California: California Mining Bureau Bulletin 23, 282 p.
______1908, The copper resources of California: California Mining Bureau Bulletin 50, 366 p.
California Division of Mines, 1930, Chapter of report XXVI of state mineralogist: California Journal of Mines and Geology, v. 26, no. 1, p. 467.
Christensen, M. N., 1963, Structure of metamorphic rocks at Mineral King, California: California University Publications in Geological Sciences, v. 42, no. 4, p. 159-198.
Eric, J. H., 1948, Copper in California: California Division of Mines Bulletin 144, p. 352-353.
Franke, H. A., 1930, Tulare County: California Division of Mines Report 26, p. 423-471.
Goldfarb, R. J., Leach, D. L., Domenico, J. A., and Smaglik, S. M., 1984, Geochemical map of the Moses and Dennison Peak Roadless Areas, California: U.S. Geological Survey Miscellaneous Field Studies Map, MF-1651-B, scale 1:48,000.
Goodwin, J. G., 1958, Mines and mineral resources of Tulare County, California: California Journal of Mines and Geology, v. 54, no. 3, p. 317-492.
Jenkins, O. P., 1942, Tabulation of tungsten deposits of California to accompany economic mineral map no. 4: California Journal of Mines and Geology, v. 38, nos. 3 and 4, p. 356-357.
Jenkins, W. O., 1943, Tungsten deposits northeast of Visalia, California: California Journal of Mines and Geology, v. 39, no. 2, p. 169-182.
Krauskopf, K. B., 1953, Tungsten deposits of Madera, Fresno, and Tulare Counties, California: California Division of Mines Special Report 35, 83 p.
Saleeby, J. B., Goodwin, S. E., Sharp, W. D., and Busby, C. J., 1978, Early Mesozoic paleotectonic-paleogeographic reconstruction of the southern Sierra Nevada region, in Mesozoic paleogeography of the western United States: Society of Economic Paleontology and Mineralogy, Pacific Section, p. 311-336.
Sawlan, M. G., and Ort, K. M., in press, Geologic map of the Moses and Dennison Peak Roadless Areas, Tulare County, California: U.S. Geological Survey Miscellaneous Field Studies Map MF-1651-C, scale 1:48,000.
Tucker, W. B., 1919, Mines and mineral resources of Tulare County: California Mining Bureau Report 15, p. 900-954.

Table 1.--Mines and prospects within and adjacent to the Moses and Dennison Peak Roadless Areas

Map No.	Name	Location Sec.	T. S.	R. E.	Resource	Description	Reference
1	Iron Capping----	16	20	31	Cu (Pb, Zn)	An iron gossan capping, 200-500 ft wide, prospected by 4- to 6-ft deep pits that disclosed a complex sulfide body containing pyrite, chalcopyrite, galena, and sphalerite.	Tucker, 1919, p. 951; Eric, 1948, p. 352.
2	Barber-Witt-----	.9(?)	20	31	Cu	Chalcopyrite and pyrite in east-striking vein along contact between granodiorite and porphyry.	Eric, 1948, p. 352; Tucker, 1919, p. 908.
3	Prince Albert---	3	20	31	Zn-Pb-Ag	Zinc-lead-silver prospect in the Camp Wishon district.	Franke, 1930, p. 467.
4	Thunder Shower and Buckhead.	5	20	31	Zn-Pb-Ag	Sphalerite along contact between irregular limestone lenses and mica schist.	Tucker, 1919, p. 953.
5	Powell----------	32	19	31	Cu (Pb, Zn, W)	Chalcopyrite, galena, sphalerite, and pyrrhotite in fracture zones in interbedded limestone, schists, slate, and quartzite. Gangue minerals include garnet, epidote, hornblende, actinolite, feldspar, calcite, and quartz. Scheelite present in some workings.	Aubury, 1902, p. 234, and 1908, p. 290; Eric, 1948, p. 353; Franke, 1930, p. 435-438; Tucker, 1919, p. 909-910.
6	Cedar Hill------	29	19	31	Zn-Pb-Ag	Complex ore containing Zn, Pb, and Cu.	Eric, 1948, p. 352; Franke, 1930, p. 437-467.
7	Galena Cave-----	29	19	31	Zn-Pb-Ag	Mainly lead prospect.	Franke, 1930, p. 467.
8	Skylark---------	20	19	31	Zn-Pb-Ag	Prospect.	Do.
9	Dewey-----------	32	19	31	Cu	----do----------------------------	Aubury, 1902, p. 236; 1908, p. 292.
10	Grider----------	31	19	31	Cu	----do----------------------------	Aubury, 1902, p. 234; 1908, p. 290.
11	Arsenic and Soda Springs.	8(?)	20	31	Zn-Pb	----do----------------------------	Franke, 1930, p. 471.
12	Elder-Berry-----	15	20	31	Pb-Zn	----do----------------------------	Franke, 1930, p. 476.
13	Meadows Group---	5	20	31	Zn-Pb	Vein width 3 ft. Sphalerite occurs in an epidote "dike" along contact between limestone and mica schist.	Tucker, 1919, p. 952.
14	Monarch Group---	5	20	31	Zn-Pb	Ore is zinc-sulfide occurring along epidote "dikes" that cut the limestone and schist.	Do.
15	Peach Dumpling Group.	8	20	31	Pb-Zn	The ore is a zinc-sulfide occurring in an epidote "dike."	Do.
16	Good Hope Mines (Pioneer).	34 & 27	18	29	W	Scheelite disseminated in garnet-epidote tactite along northern edge of an irregularly shaped limestone pendant.	Goodwin, 1958, p. 361.
17	Royal Tungsten--	27	18	29	W	Scheelite erratically distributed through tactite body 50 ft wide by 700 ft long, along contact between marble and granodiorite.	Jenkins, 1942, p. 356, and 1943, p. 178; Krauskopf, 1953, p. 82.
18	Martin----------	27	18	29	W	Small outcrops of tactite containing small amount of scheelite, distributed for a mile along a poorly exposed contact between granodiorite and calc-silicate rocks.	Krauskopf, 1953, p. 82.

Table 2.--Anomalous concentration thresholds for selected elements in minus-80-mesh stream-sediment samples

[L, indicates detectable but less than limit of determination]

Element	Threshold (ppm)
Ag	0.5 L
B	100
Bi	10 L
Cu	50
Pb	70
Mo	5
Sn	10 L
Zn	200 L

Table 3.--Anomalous concentration thresholds for selected elements in heavy-mineral concentrate samples

[L, indicates detectable but less than limit of determination]

Element	Threshold (ppm)
Ag	2
As	300
Au	10
B	500
Bi	200
Mo	20
Pb	200
Sb	100 L
Sn	100
W	50

Table 4.--Areas with mineral resource potential

[Leaders (---), no favorable criteria]

Map area	Resource potential	Commodity	Geochemical favorability: Anomalous values for specified ore-related elements in stream sediments	Geochemical favorability: Anomalous values for specified ore-related elements in heavy-mineral concentrates	Presence of metamorphic roof pendant	Known mineral occurrences
I	High----	Pb-Ag-Zn-bearing skarn.	B, Zn	B, Ag, Bi	Present----	Eight mines and (or) prospects.
I	Moderate	Cu-bearing skarn.	---	---	Present----	Five mines and (or) prospects.
II	Moderate	W-bearing skarn or weakly mineralized alaskite.	---	W, Bi	---	---
III	Moderate	Pb-Ag-Zn-bearing skarn.	Pb, Ag	B, Sn, Pb, Ag, As, Au	---	---
IV	Moderate	Pb, Ag, Zn, Cu, and (or) W-bearing skarn.	---	---	Present----	---
V	Moderate	Pb, Ag, Zn, Cu, and (or) W-bearing skarn.	---	---	Present----	---

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