

### CORRELATION OF MAP UNITS

Qs	} Holocene and Pleistocene	} QUATERNARY	} CENOZOIC	
Tia	} Pliocene and (or) Miocene	} TERTIARY		
Tav	} Miocene and Oligocene			
Kbm	} Upper Cretaceous	} CRETACEOUS	} MESOZOIC	
Kbl				Kgr
Kdg				
Mzm		} PRE-UPPER CRETACEOUS		

DESCRIPTION OF MAP UNITS	
Qs	SURFICIAL DEPOSITS, UNDIVIDED (QUATERNARY)
Tia	INTRUSIVE ANDESITE (PLIOCENE AND (OR) MIOCENE)
Tav	ANDESITIC VOLCANIC ROCKS (MIOCENE AND OLIGOCENE)
Kbm	BRYAN MEADOW GRANODIORITE (UPPER CRETACEOUS)
Kbl	BURNSIDE LAKE ADAMELLITE OF PARKER (1961) (UPPER CRETACEOUS)
Kgr	GRANITIC ROCKS, UNDIVIDED (UPPER CRETACEOUS)
Kdg	DIORITE AND GABBRO (UPPER CRETACEOUS)
Mem	METASEDIMENTARY AND METAVOLCANIC ROCKS (PRE-UPPER CRETACEOUS)
CONTACT--Dashed where approximately located	
FAULT--Dashed where approximately located; bar and ball on downthrown side	

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 Freel and Dardanelles Roadless Areas in the El Dorado and Alpine National Forests, Alpine and El Dorado Counties, California. Freel (5-271) and Dardanelles (4-982, 5-982) Roadless Areas were classified as further planning areas during the Second Roadless Area Review and Evaluation (SARE II) by the U.S. Forest Service, January 1979.

SUMMARY

The Dardanelles Roadless Area has potential for tungsten, zinc, silver, and copper resources. Copper disseminated in skarn and zinc-silver-copper sulfide mineralization in shear zones occur near Crater Lake along the southeast corner of the Dardanelles Roadless Area (area A). Available data suggest that small undiscovered deposits of these commodities may exist in this area. Tungsten occurs as scheelite disseminated in skarn at the Alpine mine (No. 4) and surrounding area. Approximately 800,000 tons of resources averaging 0.19 percent tungsten trioxide (W<sub>3</sub>O<sub>8</sub>) in the Alpine mine are estimated to be in the Dardanelles Roadless Area. The Mountain Top mine (No. 10) in the Freel Roadless Area contains an estimated 2,000 tons of resources averaging 0.61 oz silver per ton and 1.59 percent copper in a quartz vein.

INTRODUCTION

Location and access

The Freel and Dardanelles Roadless Areas comprise 60 mi<sup>2</sup> (155 km<sup>2</sup>) in the central Sierra Nevada just south of Lake Tahoe. The city of South Lake Tahoe is about 3 mi (5 km) north of the Freel and Dardanelles Roadless Areas are separated by Luther Pass (California Highway 89). Parts of the northern and southern boundaries of the Dardanelles Roadless Area are close to U.S. Highway 50 and California Highway 89, respectively.

Present studies

The U.S. Geological Survey conducted geologic mapping, geochemical sampling, and geophysical surveys, including compilation of existing gravity data and an aeromagnetic survey, during 1978-80. The U.S. Bureau of Mines gathered data on mines, prospects, and mineralized areas. The work included searches of literature and courthouse records and field examination of mines and prospects.

Geologic setting

Most of the rocks exposed in the Freel and Dardanelles Roadless Areas are Cretaceous granitic rocks of the Sierra Nevada batholith. Several small pendants of metasedimentary and metavolcanic rocks of Mesozoic (pre-Late Cretaceous) age are exposed along the eastern side of the Dardanelles Roadless Area. The ridges and peaks at the southern end of the Dardanelles area are capped by volcanic rocks of late Tertiary age (26 to 3 m.y.). Pleistocene glaciation extensively modified the topography and left widespread moraine and outwash deposits. Glacial deposits and features are especially well developed in the valleys of Trout Creek and Cold Creek in the Freel area, and in Hope Valley, just east of the Dardanelles area.

Geology, geophysics, and geochemistry

Geology

Metamorphic rocks

Four small roof pendants of metasedimentary and metavolcanic rocks of Mesozoic age are exposed along the eastern edge of the Dardanelles Roadless Area. The largest of these pendants surrounds Crater Lake and covers about 1.5 mi<sup>2</sup> (4.0 km<sup>2</sup>). The other three pendants have an aggregate area of less than 0.2 mi<sup>2</sup> (0.5 km<sup>2</sup>).

Granitic rocks

Granitic rocks exposed in the Freel and Dardanelles Roadless Areas form 12 plutons (John and others, 1981). Most of the granitic rock is granodiorite in composition, although the rock ranges from alkalis to diorite. Potassium-argon radiometric dating suggests that all these plutons were emplaced during a relatively short span of time in the late Cretaceous, approximately 90-95 m.y. before present (Evernden and Kistler, 1970; McKee and Howe, 1981; and John and others, 1981). A unit consisting of quartz diorite and diorite appears to form large inclusions within younger plutons.

Volcanic rocks

Late Tertiary volcanic and volcanoclastic sedimentary rocks cover many of the ridges and peaks in the Dardanelles area. These rocks consist mainly of andesitic lavas, although andesite and basalt flows, volcanoclastic sandstone and conglomerate, andesite intrusives, and rhyolite tuff are also present. The volcanic section is as thick as 1,600 ft (490 m) on Stevens Peak. The ages of the volcanic rocks range from late Oligocene to late Miocene or earliest Pliocene.

Surficial deposits

Surficial deposits of Quaternary age are widespread in the area. The most extensive deposits are moraine and outwash deposits of Pleistocene age. Alluvial deposits of Holocene age occur on the valley floors.

Geophysics

Isostatic and Bouguer gravity maps and an aeromagnetic map (Plouff, 1983) were made for this study. The gravity maps are dominated by closely spaced north-trending contours that reflect major crustal features of the Sierra Nevada batholith. The only significant anomaly not masked by the regional background is a 3- by 6-mi gravity low trending east-west in the northern half of the Dardanelles Roadless Area. The gravity low may reflect a pluton of relatively low density.

The aeromagnetic map was made from data collected about 1,000 ft above the ground along flight lines spaced at intervals of 0.5 mi (U.S. Geological Survey, 1981). This map has complex patterns that reflect variations of topography in the rugged area. Two large magnetic anomalies are noteworthy. A magnetic high nearly 5 mi in diameter is located in the southern half of the Freel Roadless Area, and the northern tip of the Dardanelles area. The high may be underlain by a complex mafic pluton. A prominent 3- by 5-mi magnetic low located at the southeast corner of the Dardanelles area may reflect a large body of metamorphic rocks that extends thousands of feet beneath the surface.

Geochemical studies

A total of 21 rock samples, 35 stream-sediment samples, and 35 nonmagnetic heavy-mineral concentrates of the stream-sediment samples were analyzed for 31 elements by a six-step semiquantitative emission spectrographic method. Rock and stream-sediment samples were also analyzed for arsenic, barium, cadmium, cobalt, iron, manganese, molybdenum, lead, antimony, tungsten, and zinc were found in the drainage basins along the east side of the Carson Range between Luther Pass and Carson Pass in the Dardanelles area. The highest concentrations are centered in the vicinity of the Alpine mine (No. 4) and the Alhambra prospect (No. 5). The strong anomalies indicate a favorable environment for contact metamorphic tungsten deposits. No significant geochemical anomalies were found in the Freel Roadless Area.

MINING DISTRICTS AND MINERALIZATION

Mining activity began in the region in the late 1850's, shortly after the discovery of the Constock lode in Nevada. Principal mining districts near the study areas include Magui-Monitor, Silver Mountain, Raymond, Summit City, and Hope Valley, which are south and east of the study area. These districts were established in the 1860's. Mines in and adjacent to the Dardanelles Roadless Area are in the Hope Valley district.

Mining claims

Since 1883 approximately 100 lode mining claims have been located in the Dardanelles Roadless Area. The active Anderson claims (No. 8), southwest of the Alhambra prospect (No. 5), were staked after our fieldwork was completed (1981). The Alpine mine (No. 4) and Alhambra prospect (No. 5) are outside the roadless area on private land.

Twenty-seven lode claims are known to have been located in the Freel Roadless Area. Most were at or near the Mountain Top mine (No. 10). Two groups of claims were located for uranium; one is about 1 mi (1.6 km) north of the Mountain Top mine, and the other is near High Meadows.

No oil, gas, or geothermal leases exist in the study areas.

Mines, prospects and mineralized areas

Zinc, silver, copper, molybdenum, and tungsten deposits occur at three properties along the eastern boundary of the Dardanelles Roadless Area and in the Freel Roadless Area. These and other properties are shown on the map and information about them is summarized in the accompanying pamphlet.

Mineral deposits in the Dardanelles Roadless Area occur in shear and skarn zones. The Alhambra prospect (No. 5) follows a north- to northwesterly-trending shear zone 2-20 ft (0.6-6.1 m) thick in metasedimentary rocks that contains quartz with sphalerite, chalcopyrite, pyrite, and minor silver sulfides. The Alpine mine (No. 4) is developed in a skarn zone containing disseminated scheelite. The Drumlummon prospect (No. 3) contains a sulfide layer 2 in. (5 cm) thick in skarn containing about 90 percent chalcopyrite and 10 percent pyrrhotite.

The Mountain Top mine (No. 10) in the Freel Roadless Area is developed on a north-northwest-trending quartz vein in granodiorite that contains blebs of borite, chalcopyrite, and molybdenite.

ASSESSMENT OF MINERAL RESOURCE POTENTIAL

The southeastern part of the Dardanelles Roadless Area has a high resource potential for tungsten, silver, copper, and molybdenum at the Mountain Top mine (No. 10) in the Freel Roadless Area. Mineral resource potential at three properties is estimated in table 1.

The most significant resources in the Dardanelles Roadless Area are in area A in the vicinity of the Alpine mine (No. 4) and the Alhambra (No. 5) and Drumlummon (No. 3) prospects, where there is an estimated 800,000 tons of inferred resources averaging 0.19 percent tungsten trioxide (W<sub>3</sub>O<sub>8</sub>). There is a possibility that the tungsten, zinc, copper, and silver resources known in area A may extend west, to near Weiss Lake, beneath the Tertiary cover.

The Mountain Top mine (No. 10) in the Freel Roadless Area is estimated to have 2,000 tons of indicated resources that average 1.59 percent copper, 0.61 oz silver per ton, and 0.042 percent molybdenum.

Limestone southwest of Crater Lake in the Dardanelles Roadless Area does not appear to have potential as a mineral resource because of impurities.

REFERENCES

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U.S. Bureau of Mines and U.S. Geological Survey, 1980, Principles of a resource/reserve classification for minerals: U.S. Geological Survey Circular 531, 3 p.

U.S. Geological Survey, 1981, Aeromagnetic map of the Dardanelles area, California: Open-File Report 81-431, scale 1:62,500, 2 sheets.

Table 1.—Estimated mineral resources in and near the Freel and Dardanelles Roadless Areas, California					
Property	Type	Tonnage <sup>1</sup>	Resource classification <sup>2</sup>	Product	Grade
Alpine mine (No. 4)	Skarn zone	31,240,000	Inferred subeconomic	Tungsten	0.19 percent
		460,000	Indicated subeconomic	Silver	.19 percent
Alhambra prospect (No. 5)	Shear zone	2,000,000	Inferred subeconomic	Zinc	1.85 percent
				Copper	.25 oz per ton
		200,000	Indicated subeconomic	Zinc	1.85 percent
				Silver	.25 oz per ton
				Copper	.17 percent
Mountain Top mine (No. 10)	Quartz vein	2,000	Indicated subeconomic	Silver	.61 oz per ton
				Copper	1.59 percent
				Molybdenum	.042 percent

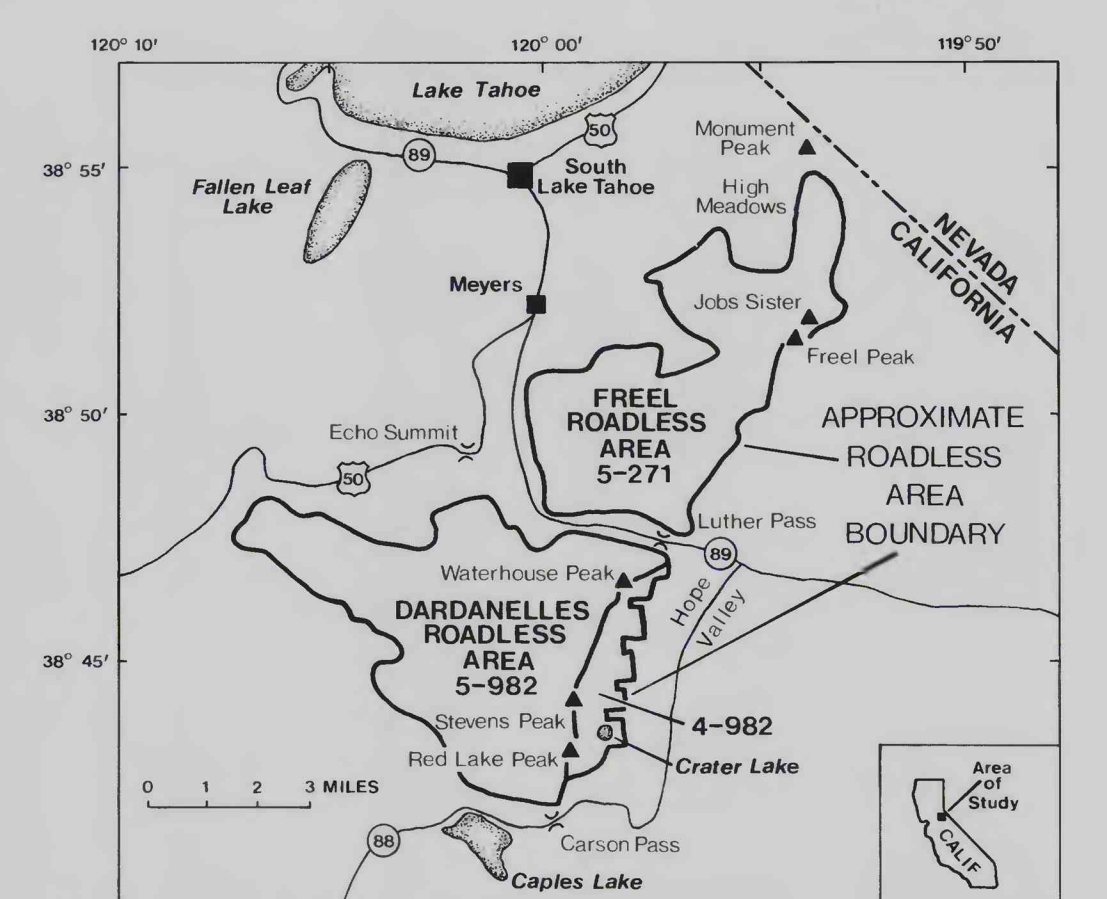
<sup>1</sup>Metric conversions: tons x 0.9072 = tonnes (t); oz per ton x 34.285 = grams per tonne (g/t).

<sup>2</sup>Resource classification from U.S. Bureau of Mines and U.S. Geological Survey (1980).

<sup>3</sup>800,000 tons are in the study area.

MINES AND PROSPECTS SHOWN ON MAP

1. Unnamed	6. Unnamed
2. Unnamed	7. Unnamed
3. Drumlummon prospect	8. Anderson claims
4. Alpine mine	9. Unnamed
5. Alhambra prospect	10. Mountain Top mine



INDEX MAP SHOWING GEOGRAPHIC LOCATION OF THE FREEL (5-271) AND DARDANELLES (4-982, 5-982) ROADLESS AREAS, CALIF.

## MINERAL RESOURCE POTENTIAL MAP OF THE FREEL AND DARDANELLES ROADLESS AREAS, ALPINE AND EL DORADO COUNTIES, CALIFORNIA

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Explanatory pamphlet accompanies map

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