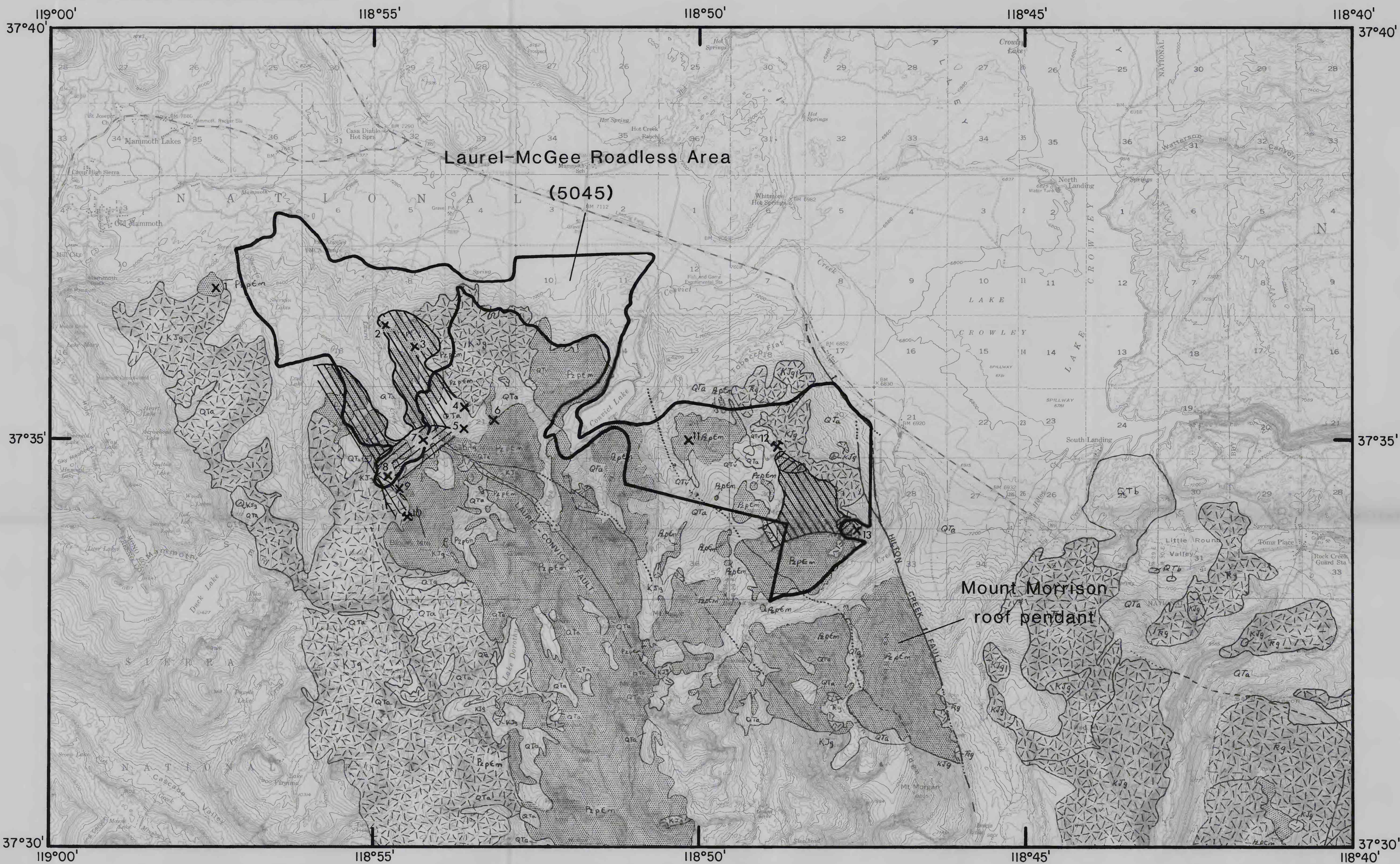

Base from U.S. Geological Survey, 1:62,500, Mt. Morrison, Casa Diablo, 1953.

TRUE NORTH
MAGNETIC NORTH
APPROXIMATE MEAN DECLINATION, 1983

SCALE 1:62500

CONTOUR INTERVAL 80 FEET

NATIONAL GEODETIC VERTICAL DATUM OF 1929

Geology from Langenheim and others (1982), Rinehart and Ross (1964).

Explanatory pamphlet accompanies map

Table 1.--Mines and prospects in or near the Laurel-McGee Roadless Area

Map No.	Name	Summary	Workings	Sample data
1	Pappas prospect	Scheelite-bearing tactite occurs as pods in large angular boulders of marble uncovered in some trenches, and as fragments in slope wash (Rinehart and Ross, 1964).	Several bulldozer trenches.	No sample data.
2	Laurel Creek prospect	Small zones of limonite-stained, poorly developed tactite along a N. 15° E.-trending contact of quartz monzonite with gray limestone.	Three small pits	Three grab samples assayed as high as 0.02 oz/ton gold and 4.2 oz/ton silver. One grab sample assayed no appreciable metals.
3	Section 17 prospect	Small lenses of diopside-hedenbergite-quartz tactite occur along the contact of quartz monzonite with limestone. Traces of chalcopyrite, malachite, and chrysocolla were found in the more siliceous tactite zones.	Three small pits	Three samples assayed as much as 0.1 percent copper.
4	Laurel Mountain prospect	The prospect is underlain by talus consisting of limonite-stained siliceous hornfels. No sulfides noted.	Two dumps from possible prospect pits.	Two grab samples from the dumps assayed no significant mineral values.
5	Surprise No. 7 prospect	White limestone containing small amounts of garnet, epidote, and magnetite underlies the prospect.	One adit caved 22 ft from portal.	One grab sample from the dump assayed 0.02 percent tungsten trioxide (WO_3).
6	Laurel Creek Tungsten No. 1 prospect	Lead and zinc minerals, with minor tungsten, occur in a 1.5- to 6-ft-wide zone striking N. 40° W. and dipping 70° NE. to vertical. The zone is between marble and buff-colored hornfels. Quartz comprises less than 10 percent of the zone. No recorded production.	One small cut and a 6-ft-long adit with stope opening to the surface.	A 5.0-ft chip sample from the adit face assayed 0.07 percent WO_3. A 3.0-ft chip sample taken across the stope entrance assayed 0.4 oz/ton silver, 1.4 percent lead, 1.1 percent zinc, and less than 0.03 percent WO_3. A 2.0-ft chip sample across the bottom of the stope assayed 7.9 percent lead, 0.31 percent zinc, 0.3 oz/ton silver, and 0.06 percent WO_3. A grab sample assayed no appreciable metals.
7	Lucky Strike prospect	Sphalerite, chalcopyrite, galena, and pyrite occur in siliceous zones in marble. The largest zone averages more than 7 ft wide and is 96 ft long.	One 68-ft-long adit, one 35-ft-long adit, one shaft, several pits and trenches.	Indicated resources are 6,200 tons averaging 5.45 percent zinc, 0.54 oz/ton silver, 0.40 percent copper, and 0.31 percent lead. Of 52 samples, 20 contained from 0.41-11.5 percent zinc and 0.09-1.9 percent copper; eight contained from 0.39-3.4 percent lead, and six assayed from 0.5-2.7 oz/ton of silver.
8	Morhardt mine	Scheelite and molybdenite in boulders originating from contact zone in cirque near the Hard Point mine. No rock in place.	Ten pits as much as 16 ft deep.	Eight grab and nine select samples were taken from boulders. Assay values ranged from 0.01-4.0 percent WO_3.
9	Tungsten prospect	Scheelite and molybdenite occur in large siliceous hornfels and quartz monzonite boulders in a glacial moraine. The boulders are from the contact zone at the Hard Point mine.	Four elongated pits	Five grab and three select samples were taken. Assay values in seven samples ranged from 0.54-6.55 percent WO_3. One sample was barren.
10	Hard Point mine	A sulfide-rich zone more than 350 ft long and 10-30 ft thick parallels a nearly horizontal contact of metasedimentary rocks and granodiorite.	Adit 154 ft long, with stope 130 ft long, 90 ft wide, and 30 ft deep.	Assays of 39 samples were as much as 6.60 percent WO_3, 0.38 percent molybdenum, and 0.53 percent copper. Indicated and inferred resources are 16,000 tons averaging 1.0 percent WO_3.
11	Lake View prospect	A large lense of limonite occurs in calcareous sandstone and siltstone.	One 22-ft diameter pit.	One grab sample assayed no significant mineral values.
12	Tiptop mine	Diopside-hedenbergite and grossularite-andradite tactite occurs along the contact of quartz monzonite with calcareous sedimentary rocks.	One 20-ft-deep shaft and five trenches.	Fourteen samples: eight assayed from 0.02-0.18 percent WO_3.
13	Payday prospect	Scheelite-bearing tactite zones 1-10 ft wide occur along the contact of intrusive rocks with calcareous sedimentary rocks.	One 40-ft-long adit and several pits.	Forty-eight samples: 22 assayed from 0.03-2.8 percent WO_3.

MINERAL RESOURCE POTENTIAL MAP OF THE LAUREL–McGEE ROADLESS AREA, MONO COUNTY, CALIFORNIA

By
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U.S. Bureau of Mines

1983

EXPLANATION

MINERAL RESOURCE POTENTIAL

Area of moderate resource potential for tungsten and (or) base and precious metals

Area of low resource potential for tungsten and (or) base and precious metals

CORRELATION OF MAP UNITS

QTa QTv — QUATERNARY AND (OR) TERTIARY

KJg — CRETACEOUS AND (OR) JURASSIC

₮g — TRIASSIC

Pz p€m — PALEOZOIC OR PRECAMBRIAN

DESCRIPTION OF MAP UNITS

QTa — ALLUVIAL DEPOSITS (QUATERNARY AND (OR) TERTIARY)--Unconsolidated sand, silt, and gravel. Includes alluvial fans, talus and glacial moraines

QTv — VOLCANIC ROCKS (QUATERNARY AND (OR) TERTIARY)--Basalt and andesitic lava flows, and andesitic to rhyolitic tuffaceous rocks. In this area, includes the Bishop Tuff (Pleistocene)

KJg — GRANITIC ROCKS (CRETACEOUS AND (OR) JURASSIC)--Fine- to coarse-grained porphyritic diorite to alaskite. Mostly granodiorite and quartz monzonite. In this area, includes the Round Valley Peak Granodiorite (Cretaceous), Lamark Granodiorite (Cretaceous), and other unnamed plutons

₮g — TUNGSTEN HILLS QUARTZ MONZONITE (TRIASSIC)--Medium-light-gray, medium-grained porphyritic quartz monzonite

Pz p€m — METAMORPHIC ROCKS (PALEOZOIC (OR) PRECAMBRIAN)--Includes mica schist, phyllite, hornfels, calc-hornfels, tactite, marble, slate, metachert, quartzite, and other types of metamorphic rocks. The stratigraphic sequence can be determined in places; elsewhere structural complexity and recrystallization obscures stratigraphic relationships

CONTACT

FAULT WITH SCARP--Dashed where approximately located; dotted where concealed. Bar and ball on downthrown side

MINE

PROSPECT

APPROXIMATE BOUNDARY OF ROADLESS AREA

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 Laurel-McGee Roadless Area in the Inyo National Forest, Mono County, California. Laurel-McGee Roadless Area (5045) 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, conducted to evaluate the mineral resource potential of the Laurel-McGee Roadless Area, Mono County, Calif. (fig. 1), reveal that several drainages within the roadless area contain anomalous concentrations of one or more metallic elements. These elements include arsenic, barium, bismuth, copper, gold, lead, silver, and tungsten that indicate a potential for the occurrence of precious metal mineral deposits. The elements occur in relatively low concentrations; therefore, the potential for exposed tungsten and base-and precious-metal resources is low. Areas of highest potential occur on the eroding flanks of Mount McGee and west of Laurel Mountain along the contact zones between metasedimentary and plutonic rocks. Prospecting on Mount McGee during 1940-52 yielded a small tonnage of high-grade ore; however, no sizable ore body has been detected to date.

Identified mineral resources in or near the Laurel-McGee Roadless Area occur at the Lucky Strike prospect where there are small low-grade resources (table 1) of zinc, silver, copper, and lead. The Hard Point mine about 0.5 mi outside the roadless area contains some tungsten resources and tungsten production has been recorded from it and the nearby Morhardt mine. On the basis of these occurrences an area around and including these mines and prospects has moderate resource potential for tungsten, with low resource potential for silver, copper, zinc, and lead.

The north edge of the roadless area lies within the Long Valley caldera. Parts of this volcanic structure have possible geothermal resource potential. Present and past exploration for geothermal resources indicate that areas with enough heat to be a possible geothermal resource are far removed from the roadless area.

INTRODUCTION

The Laurel-McGee Roadless Area encompasses about 14.8 mi^2 of Inyo National Forest about 30 mi northwest of Bishop and 3 mi southeast of Mammoth Lakes, Calif. (fig. 1). The area is accessible from the east by gravel and paved roads that branch off U.S. Highway 395. The roadless area, which lies between 11,067 and 7,200 ft elevation, is semiarid and sparsely covered with sagebrush, juniper, pinon pine, and limber pine.

Analysis of geologic and geochemical data and information gathered at mines and prospects were used to evaluate the mineral resource potential of the Laurel-McGee Roadless Area. During the summer of 1975 and fall of 1982, the U.S. Bureau of Mines conducted a detailed investigation of mines and prospects in or near the roadless area and examined records and published literature for information related to mineral deposits; the U.S. Geological Survey conducted field and laboratory investigations of the roadless area in 1980 and 1981.

Enlargement of the Laurel-McGee Roadless Area to include what was originally designated the Sherwin Non-Wilderness subsequent to the U.S. Geological Survey sampling program has precluded the western area from a detailed study. The part of the mineral resource evaluation based on geologic and geochemical analyses is therefore confined to the eastern part of the roadless area. The U.S. Bureau of Mines has sampled mines and prospects in both parts of the roadless area, and the results from both areas are included in this report.

GEOLOGY

The Laurel-McGee Roadless Area contains a variety of plutonic, metamorphic, and sedimentary rocks that range in age from early Paleozoic to Holocene. The Paleozoic rocks consist of a thick sequence composed mainly of limestone, dolomite, shale, and sandstone, all of which have been metamorphosed. The metasedimentary rocks are in sharp contact with granitic intrusive rocks of Mesozoic age that comprise part of the Sierra Nevada batholith. Lying unconformably on the Paleozoic metasedimentary and Mesozoic plutonic rocks are small erosional remnants of Pliocene(?) andesitic rocks, and Pleistocene Bishop Tuff deposits.

Pleistocene glacial deposits occur as well-defined moraines at the mouths of major canyons and as small patches of till and erratics on some upland surfaces. Alluvial and colluvial deposits of Holocene age are present in the valley floors.

Major pre-Cenozoic folding and faulting is related to pre-batholithic regional deformation of the sedimentary sequence and to batholithic emplacement. The largest single structural feature in the area is a westward dipping homoclinal sequence that makes up the Mount Morrison roof pendant.

Major faults of Cenozoic age are high-angle normal faults related to uplift of the Sierra Nevada. The oldest faults cutting Cenozoic rocks are probably Pleistocene in age as suggested by displacement of upper Cenozoic deposits on McGee Mountain. Post-Pleistocene movement along many faults is documented by scarps formed during recent earthquakes.

Comprehensive geologic studies of the map area were published by Rinehart and Ross (1956, 1957, 1964) and Bateman (1965). The most current and comprehensive discussion of the mines and ore deposits in the Laurel McGee Roadless Area is in Rinehart and Ross (1964). Earlier reports on mineral deposits and mines in the study area include those by Hess and Larsen (1921), Lemmon (1941), and Tucker and Sampson (1941). The geology for this report was modified after Langenheim and others (1982), and Rinehart and Ross (1964).

GEOCHEMICAL STUDIES

Samples of rock, stream sediment, and heavy-mineral concentrates were collected and analyzed for 31 elements (silver, arsenic, gold, boron, barium, beryllium, bismuth, calcium, cadmium, cobalt, chromium, copper, iron, lanthanum, magnesium, manganese, molybdenum, niobium, nickel, lead, antimony, scandium, tin, strontium, thorium, titanium, uranium, vanadium, tungsten, yttrium, zinc, and zircon) using a six-step semiquantitative emission spectrographic method (Grimes and Marranzino, 1968). All of the rock and stream-sediment samples were also analyzed for zinc and some of these samples were analyzed for gold by atomic-absorption spectrometry (Ward and others, 1969), and some were analyzed for gold by the same technique (Meier, 1980). Stream-sediment samples were analyzed for uranium using a modification of the fluorometric method of Centanni and others (1956). A listing of the analyses is given in Cosca and others, (1983).

Analyses of rock samples provides information on the background chemical abundances in rocks in the study area. Analyses of stream-sediment samples provide information regarding chemical concentrations of eroded rock material in the drainages upstream from each sample site and heavy-mineral-concentrate samples provide information on a limited number of minerals that are commonly related to mineralization.

For rock samples, six elements (arsenic, gold, copper, molybdenum, tungsten, and zinc) were selected as possibly being related to mineralization. Ten elements (arsenic, gold, beryllium, bismuth, copper, molybdenum, lead, tin, tungten, and zinc) commonly indicative of mineralization (when found in anomalous concentrations) were selected for investigation in the stream-sediment samples, and 11 elements (silver, arsenic, boron, beryllium, bismuth, copper, molybdenum, lead, tin, tungsten, and zinc) were selected from the concentrate samples. Two elements (cobalt and iron) were selected in addition as possibly being related to hydrothermal alteration (pyritization), but not necessarily mineralization.

MINES AND PROSPECTS

About 100 mining claims have been located in the Laurel-McGee Roadless Area. Some of the first claims were located south of Convict Lake in 1896 and in the Laurel Creek drainage in 1901. In 1928, W. E. Selbie located the Jessie claim group (Hard Point mine) and the Alice claim group (Lucky Strike prospect). Interest in the tungsten potential of metasedimentary rocks increased sharply when the price of tungsten was stimulated by demand during World War II. The Tiptop mine, and probably most of the other known tungsten deposits on the Mount Morrison roof pendant were discovered in the early 1940's.

Tungsten production has been recorded from the Hard Point, Morhardt, and Tiptop mines. More than 20,000 short ton units[1] of tungsten trioxide (WO_3) were produced from the Hard Point from 1970 through 1972 by Union Carbide Corporation (Floyd Miller, oral commun., 1976); 28 tons of ore averaging 5 percent WO_3 were produced during the mid-1940's at the Tiptop mine (Tom Phelps, oral commun., 1979); and about 100 tons of ore averaging 1.0 percent WO_3 were produced from the Morhardt mine during the 1940's (Rinehart and Ross, 1964).

Identified metallic mineral resources in the roadless area occur in two geologic environments. Tungsten, predominately in scheelite ($CaWO_4$), formed within garnet-hedenbergite-quartz tactite along or near contact zones between the metasedimentary and intrusive rocks. The main deposits of this type are the Tiptop mine, Hard Point mine, and Payday prospect. At the Lucky Strike prospect, sulfide minerals have replaced marble zones in metasedimentary rocks.

Six groups of workings are inside and seven are outside, but near, the Laurel-McGee Roadless Area. Information on these of the mines and prospects, including assay data and estimated resources, are summarized in table 1. Resources are calculated for the Lucky Strike prospect and Hard Point mine, although they are too small to be mined profitably at current metal prices. Resources were not calculated at the Tiptop mine because of the spotty nature of the tungsten mineralization.

ASSESSMENT OF MINERAL RESOURCE POTENTIAL

Mineralization that might be expected in the Laurel-McGee Roadless Area is related to tactite deposits in metasedimentary rocks adjacent to granitic plutons. The important metals in the tactite deposits are tungsten and gold, with secondary silver, copper, and molybdenum. Mineral resource assessment of the Laurel-McGee Roadless Area was based primarily on evaluation of existing mines and prospects in or near the roadless area, the assumption being that additional mineralization may occur at these sites and in surrounding rocks if they are of a similar type. In the eastern part of the roadless area, evaluation of specific mines and prospects was augmented by geochemical sampling of stream sediments as a means to evaluate resource potential. Drainage basins with anomalous concentrations of elements indicative of tactite mineralization may contain large enough mineral deposits to have resource potential.

Two parts of the Laurel-McGee Roadless Area have moderate resource potential for tungsten, and possibly copper, gold, lead, silver, and zinc, in or near existing mines and prospects (see map). One of these areas includes the Lucky Strike prospect and Morhardt mines, the other includes the Payday prospect and Tiptop mine. An area of up to about 0.5 mi^2 around these mines, containing mostly metasedimentary rocks and possibly additional tactites, has moderate mineral resource potential. Farther from these mines and in the vicinity of other less promising properties (Laurel Creek prospect, Section 17 prospect), the mineral resource potential is low. In the eastern part of the roadless area, areas that include the Tiptop mine and Payday prospect have moderate resource potential for tactite mineralization. The area south of the Tiptop has low potential for tactite mineralization and possibly base-and-precious metal vein deposits on the basis of anomalous amounts of arsenic, barium, bismuth, copper, gold, lead, silver, and tungsten in stream-sediment samples.

The north edge of the roadless area lies within the Long Valley caldera. Parts of this volcanic structure have geothermal potential. Present and past exploration, including surface heat measurements, drilling, evaluation of hot springs, geologic mapping, and radiometric dating of volcanic rocks indicate that probable geothermal resources related to this volcanic system are in areas far removed from the Laurel-McGee Roadless Area.

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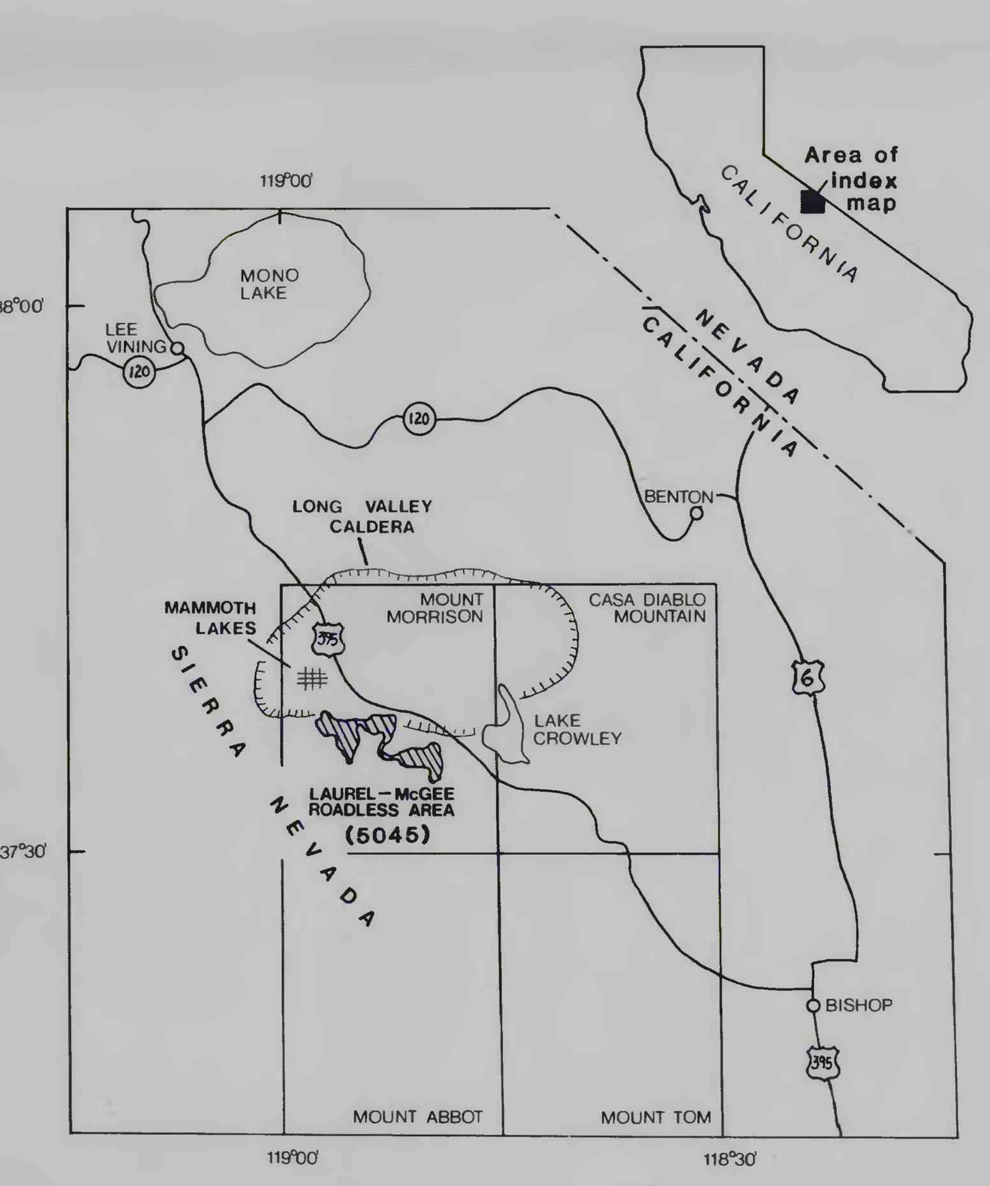
[1] A short ton unit equals 1 percent of a short ton or 20 lbs of tungsten trioxide or 15.862 lbs of tungsten and is used to report tungsten assay values and to state market value of ore or concentrates.



INDEX MAP SHOWING LOCATION OF ROADLESS AREA IN EAST-CENTRAL CALIFORNIA AND THE 15-MINUTE QUADRANGLES COVERING THE STUDY AREA

Interior—Geological Survey, Reston, Va.—1983

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