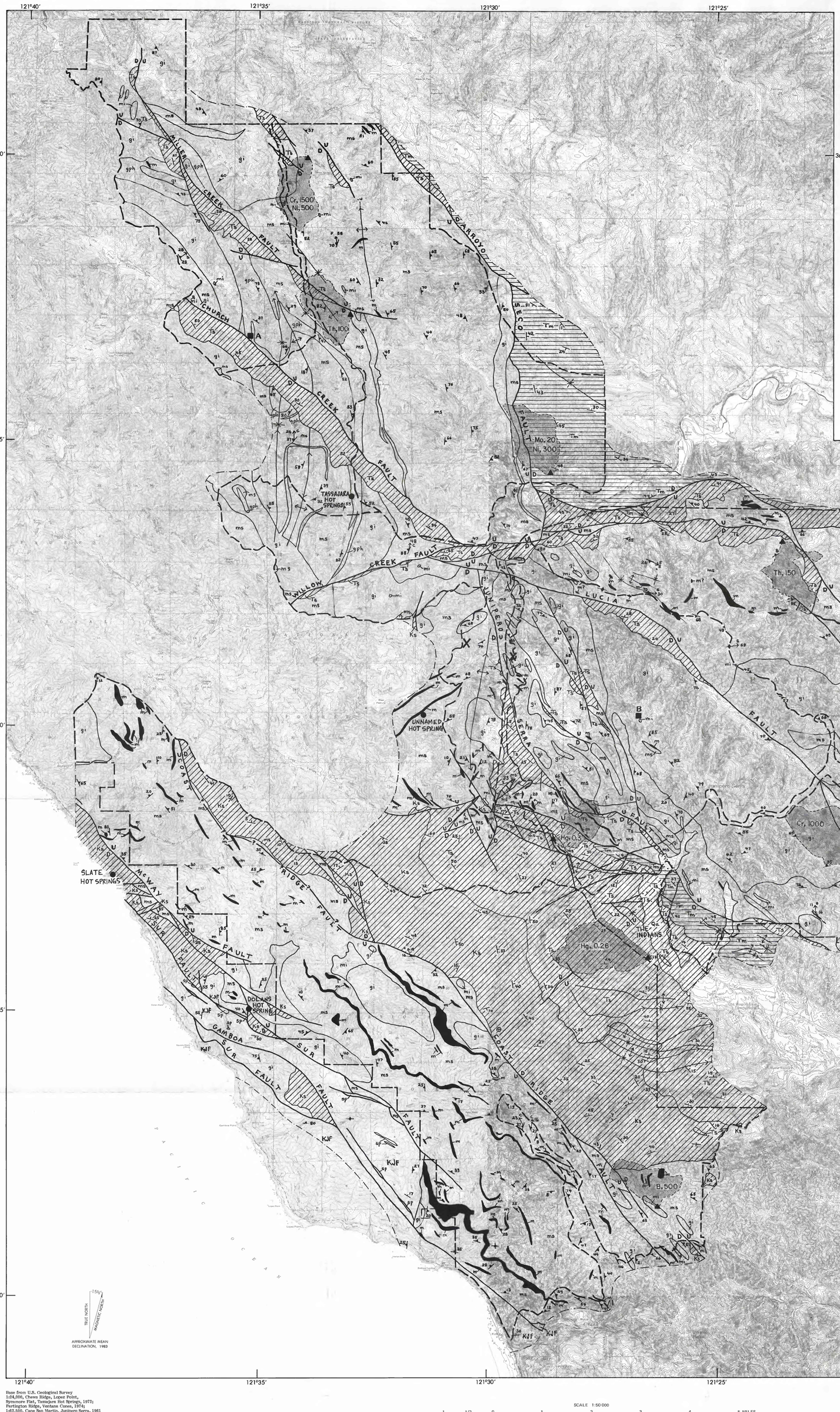
DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

MISCELLANEOUS FIELD STUDIES
MAP MF-1559-A



Base from U.S. Geological Survey
1:24,000, Chews Ridge, Lopez Point, Sycamore Flat, Tassajara Hot Springs, 1972; Partington Ridge, Ventana Cones, 1974; 1:62,500, Cape San Martin, Junipero Serra, 1961

Geology from Seiders and others (1983)

SCALE 1:50 000

1 1/2 0 1 2 3 4 5 MILES

1 .5 0 1 2 3 4 5 6 7 KILOMETERS

CONTOUR INTERVAL 20 AND 40 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

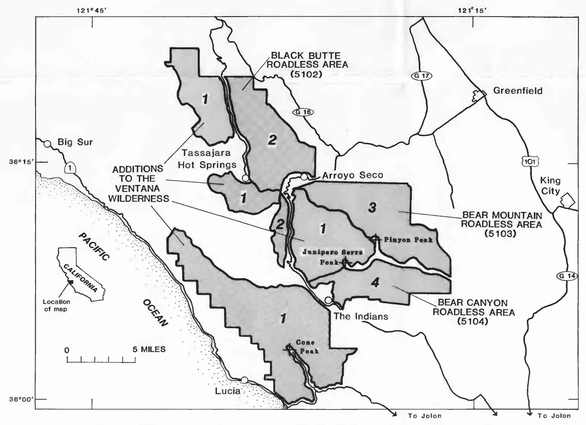
EXPLANATION

MINERAL RESOURCE POTENTIAL

- Low, for oil, gas, and phosphate rock in the Monterey Formation
- Very low, for oil and gas in sedimentary rocks older than the Monterey Formation
- Low, for metallic-mineral deposits in igneous and metamorphic rocks
- Low, for crystalline limestone resources; m denotes marble
- Hg, 0.3 — STREAM-SEDIMENT SAMPLE—Showing drainage area and anomalous element values (in parts per million)
- HOT SPRING
- A — MINERALIZED-ROCK SAMPLE—A, with anomalous silver (3 ppm), copper (500), molybdenum (50 ppm), and vanadium (1,500 ppm); B, with anomalous silver (50 ppm), arsenic (500 ppm), bismuth (30 ppm), copper (100 ppm), and lead (1,500 ppm)
- X — PROSPECT
- APPROXIMATE BOUNDARY OF STUDY AREA
- APPROXIMATE EXTENT OF MAPPING—Where different from boundary

CORRELATION OF MAP UNITS

SEDIMENTARY DEPOSITS	METAMORPHIC ROCKS	IGNEOUS ROCKS	
Qa			QUATERNARY
Unconformity			
Ta, Tm, Ts			Miocene; Miocene to Paleocene; Upper Cretaceous — TERTIARY; CRETACEOUS
	KJf, sp		CRETACEOUS AND JURASSIC
		gi, mi	CRETACEOUS AND OLDER(?)
	ms, gph, m		AGE UNKNOWN



INDEX MAP SHOWING LOCATION OF STUDY AREA. 1, ADDITION TO THE VENTANA WILDERNESS; 2, BLACK BUTTE ROADLESS AREA; 3, BEAR MOUNTAIN ROADLESS AREA; 4, BEAR CANYON ROADLESS AREA.

DESCRIPTION OF MAP UNITS

SEDIMENTARY DEPOSITS

- Qa — ALLUVIUM (QUATERNARY)—Only most extensive deposits shown. Locally, line pattern denotes mineral resource potential of underlying bedrock
- Tm — MONTEREY FORMATION (MIOCENE)—Mudstone
- Ts — SEDIMENTARY ROCKS (MIOCENE TO PALEOCENE)—Sandstone, mudstone, and conglomerate
- Ks — SEDIMENTARY ROCKS (UPPER CRETACEOUS)—Sandstone, mudstone, and conglomerate

METAMORPHIC ROCKS

- KJf — FRANCISCAN ASSEMBLAGE (CRETACEOUS AND JURASSIC)—Metasandstone, metasiltstone, chert, greenstone, and smaller serpentinite masses. Locally, also includes larger masses mapped separately as:
- sp — Serpentinite (Jurassic)
- ms — METASEDIMENTARY ROCKS (AGE UNKNOWN)—Quartzofeldspathic gneiss, quartzite, amphibolite, calc-silicate rock, and schist.
- gph — GRAPHITIC, PYRITIC GNEISS (AGE UNKNOWN)
- m — MARBLE (AGE UNKNOWN)—Crystalline limestone

IGNEOUS ROCKS

INTRUSIVE ROCKS (CRETACEOUS AND OLDER?)—Divided into:

- gi — Granitic intrusive rocks—Granodiorite, quartz monzonite, and quartz diorite
- mi — Mafic and ultramafic intrusive rocks—Diorite, gabbro, and various ultramafic rocks, in part serpentinized

- CONTACT
- FAULT—Queried where inferred; dotted where concealed. U, upthrown side; D, downthrown side
- ANTICLINE—Showing direction of plunge; queried where uncertain
- SYNCLINE—Showing direction of plunge

STRIKE AND DIP OF BEDS

- Inclined
- Horizontal
- Vertical

STRIKE AND DIP OF FOLIATION

- Inclined
- Horizontal
- Vertical

BEARING AND PLUNGE OF LINEATION

- Inclined, C, crenulations; S, sillimanite needles

- SMALL FOLD AXIS—Showing direction and amount of plunge

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 part of the Ventana Wilderness and the Black Butte (5102), Bear Mountain (5103), and Bear Canyon (5104) Roadless Areas in the Los Padres National Forest, Monterey County, California. The Ventana Wilderness was established by Public Law 91-58; this report discusses additions to the Ventana Wilderness that were established by Public Law 95-237 in 1978. The Black Butte, Bear Mountain, and Bear Canyon 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.

INTRODUCTION

The Ventana Wilderness encompasses approximately 159,000 acres, of which about 98,000 acres was initially designated as a primitive area and 61,000 acres was later added. This report deals with the areas added to the wilderness together with the Black Butte, Bear Mountain, and Bear Canyon Roadless Areas. In all, they comprise about 116,000 acres in the Los Padres National Forest, Monterey County, Calif. For the purpose of this report the areas will be referred to collectively as the study area.

The study area is located in the Santa Lucia Range between U.S. Highway 101, which passes through Greenfield, and California Highway 1 on the Pacific coast. Paved roads from U.S. Highway 101 provide access from the east. A paved road crosses the range just south of the area. The area has rugged topography and a dense cover of brush with local groves of oak, madrone, pine, and redwood. Elevations range from near sea level to 5,155 ft at Cone Peak, just 3.2 mi inland, and to 5,862 ft at Junipero Serra Peak, the highest point in the range.

GEOLOGY

The study area is underlain by various igneous, metamorphic, and sedimentary rocks (Seiders and others, 1983). Most of the metamorphic rocks are high grade, but at the southwest edge of the study area, a complex fault system juxtaposes low-grade metamorphic rocks of the Franciscan assemblage (Gilbert, 1973). The Franciscan assemblage occupies only a small part of the study area. The high-grade metamorphic rocks are chiefly quartzofeldspathic biotite gneiss, some with layers containing sillimanite and (or) garnet. Subordinate rock types are biotite-feldspar quartzite, amphibolite, calc-silicate rock, and sillimanite-biotite schist. Lenses and layers of marble make up a small part of the metamorphic sequence and are most abundant in the southwestern part of the area. Gneiss containing graphite and pyrite occurs near Tassajara Hot Springs and northwestward, where Wiebe (1970) mapped it as a marker unit with a map pattern that indicates refolding. Other graphitic gneiss, generally less rich in pyrite, is moderately abundant in the southwestern part of the area but is rare elsewhere; this graphitic gneiss is not shown on the simplified geologic map. The age of the metamorphic rocks is not known with certainty. The protoliths may be Paleozoic in age and were probably metamorphosed during the Cretaceous.

The outcrop area of the intrusive igneous rocks is about half that of metamorphic rocks. These igneous rocks are mainly granodiorite, quartz monzonite, and quartz diorite, but diorite and gabbro bodies also occur. The largest intrusive bodies are near Junipero Serra and Pinyon Peaks. A few small ultramafic intrusions, some with unusual zoned structure, occur widely spaced within the granitic and high-grade metamorphic rocks. Charnockitic tonalite is found in the southwestern part of the area (Compton, 1960). Both the igneous and the metamorphic rocks contain abundant dikes and pods of pegmatite. Radiometric dating suggests an emplacement age of 100-110 m.y. (middle Cretaceous) for the granitic rocks of the northern Santa Lucia Range (Mattinson, 1978; Ross, 1978).

The igneous and metamorphic rocks are overlain unconformably by sedimentary rocks, mainly sandstone, mudstone, and conglomerate. These rocks show complex stratigraphic relations and have been assigned various stratigraphic names (Durham, 1974; Graham, 1978). In addition to the Ventana Wilderness in the southwestern part of the study area, the sedimentary rocks are Late Cretaceous and Paleocene; elsewhere they are Paleocene to Miocene. The Monterey Formation (Miocene) is a distinctive mudstone unit, rich in foraminifers and containing porcelaneous beds. Many rock samples of the Monterey emit a fetid petroliferous odor when freshly broken. In the study area the Monterey is the youngest sedimentary rock exposed.

Sand and gravel occur in alluvium and alluvial terraces along most streams where the bodies are generally small, but near The Indians two broad tongues of bouldery alluvium extend 1 and 3 mi into the mountains along minor streams.

ASSESSMENT OF MINERAL RESOURCE POTENTIAL

General

A low potential for metallic-mineral deposits is assigned to parts of the study area underlain by high-grade metamorphic and intrusive igneous rocks. The low potential is assigned, in part, because there have been no previous discoveries of mineral resource deposits in the study area, nor have similar rocks anywhere in the region shown potential deposits.

Geochemical anomalies of certain elements were found in nine stream-sediment samples. These anomalies seem to correlate with minerals in the rocks exposed within the drainage areas of the samples that are not abundant enough to indicate resource potential. Anomalous values of thorium in two stream-sediment samples probably come from concentrations of monazite, an accessory mineral in the igneous and metamorphic rocks. Likewise, anomalous boron in one sample may come from the rock-forming minerals tourmaline and (or) dumortierite. Anomalous chromium and nickel in one sample may come from small bodies of ultramafic rocks exposed in the drainage area; chromium in another sample may have a similar source, although no ultramafic bodies have been mapped there. Anomalous values of molybdenum and nickel are found in one sample derived largely from the Monterey Formation. Slow molybdenum and nickel are commonly concentrated in organic-rich sediments (Goldschmidt, 1954; Schultz and others, 1960), the organic-rich mudstone of the Monterey is a likely source of the anomaly. The source of another molybdenum anomaly, at the east end of the Bear Canyon Roadless Area, is not known. Mercury is anomalous in two stream-sediment samples, but the values are not very high when compared with samples from the original Ventana Wilderness (Pearson and others, 1967) or with a sample from an area with known mercury mineralization south of the study area.

Field examination and chemical analyses of rocks showed little evidence of mineralization in the study area. One rock sample contained anomalous values of silver, arsenic, bismuth, copper, and lead, but the area of mineralization seems to be limited and there is no anomaly in stream-sediment samples of the area. A unit of sulfidic, graphitic gneiss in the northwestern part of the study area shows anomalous values of vanadium, molybdenum, copper, and silver, but not enough for resource potential. Float gold was detected in some placer samples but not in significant amounts.

The very small part of the area underlain by low-grade metamorphic rocks of the Franciscan assemblage shows a low potential for metallic-mineral deposits. There is no potential for oil and gas in any of the metamorphic or igneous rocks of the area. Likewise, the sedimentary rocks have no potential for metallic-mineral deposits, except, perhaps, for a very low potential for mercury.

Deposits of crystalline limestone occur in the metamorphic-rock sequence but have a low potential because of their minimal thickness and inaccessibility. Sand and gravel occur in alluvium and alluvial terraces, but the deposits are rather small and remote. Larger deposits occur just outside the study area.

The sedimentary rocks of the study area are possible sources of petroleum and natural gas. In the Salinas Valley area nearby, all oil and gas is produced from sandstone in the Monterey Formation. The Monterey in the study area is beyond the known limits of productive sandstone beds and has a low potential for oil and gas. Cretaceous through Miocene sedimentary rocks that underlie the Monterey have not been productive anywhere in the region, nor do they show any favorable indications of oil or gas in the study area. The Cretaceous sedimentary rocks have been found to be low in total organic content and to have poor reservoir potential (Howell and Claypool, 1977). All sedimentary rocks older than the Monterey are considered to have a very low potential for oil and gas.

Phosphate rock occurs in the region within the Monterey Formation, but its abundance is not known. As noted by Hart (1966), the large agricultural use of phosphate for fertilizer in California could indicate resource potential for relatively low grade deposits. Although data on abundance are lacking, the Monterey in the study area may have a low potential for phosphate rock.

Springs with moderate flows of hot water occur just outside the study area at Tassajara and Slates Hot Springs. They know are utilized as hot baths, and expansion for space heating or other geothermal use might be possible. However, no similar springs are known to exist within the study area, and so there is a low potential for geothermal-energy resources within the study area.

Additions to Ventana Wilderness

Eighty-six mining claims, none of which are currently active, were reportedly located within the additions to the wilderness. Occurrences of gold, graphite, limestone, molybdenum, phosphate, and monazite are cited in the literature (Hart, 1966). Field examinations by the U.S. Bureau of Mines indicate that gold, graphite, and limestone do occur but are of insufficient quantity or grade to constitute potential resources (Esparza and Sabine, 1981, 1982). There is a low potential for mineral deposits and geothermal energy. Sedimentary rocks have a very low potential for oil and gas, except for a small area containing the Monterey Formation, where the potential may be only slightly greater.

Black Butte Roadless Area

According to Monterey County records, eight lode claims have been located in this area since 1901. No evidence of prospects or active claims was found, and samples of outcrops and stream channels contained no mineral resource potential (Stebbins, 1981a, b). One small excavation visited by Pearson and others (1967) showed no evidence of mineralization. The potential for metallic-mineral deposits is low. Although part of the area is underlain by the Monterey Formation, which has produced oil and gas nearby, it is beyond the known limits of oil-bearing sandstone and therefore has a low potential for oil and gas. Phosphate has been reported in the area (Durham, 1970), but there is little data on abundance and the potential is low.

Bear Mountain Roadless Area

Only two mining claims were recorded, and no production was reported. Sample analyses do not indicate anomalous concentrations of any mineral commodity (Spear, 1981, 1982). The area has a low potential for mineral deposits and geothermal energy. Parts of the area underlain by the Monterey Formation have a low potential for oil and gas. The Monterey Formation may have a limited potential as a phosphate source, but quantitative data are lacking.

Bear Canyon Roadless Area

Six 160-acre petroleum claims were located in this area in 1901. From 1916 to 1939, five lode claims were filed. There are no mineral, geothermal, or oil and gas leases. Field and aerial reconnaissance revealed no workings on any of the claims (Benham, 1982a, b). The area has a low potential for metallic-mineral deposits. Parts of the area underlain by the Monterey Formation have a low potential for oil and gas, since the area is located beyond the known limits of oil-bearing sandstone beds. Phosphate rock has been found in the Monterey Formation but the abundance is not known and there is only a low resources potential.

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MINERAL RESOURCE POTENTIAL MAP OF PART OF THE VENTANA WILDERNESS AND THE BLACK BUTTE, BEAR MOUNTAIN, AND BEAR CANYON ROADLESS AREAS, MONTEREY COUNTY, CALIFORNIA

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1983

Explanatory pamphlet accompanies map

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