

**MINERAL RESOURCE POTENTIAL OF THE ISHI, MILL CREEK, POLK SPRINGS,
AND BUTT MOUNTAIN ROADLESS AREAS, TEHAMA AND
PLUMAS COUNTIES, CALIFORNIA**

SUMMARY REPORT

By

Jocelyn A. Peterson, Robin B. Fiebelkorn, and Karen A. Johnson
U.S. Geological Survey

and

Eric E. Cather, Harry W. Campbell, David K. Denton, Jr., and Peter N. Gabby
U.S. Bureau of Mines

STUDIES RELATED TO WILDERNESS

Under the provisions of the Wilderness Act (Public Law 88-577, September 3, 1964) and related acts, the U.S. Geological Survey and the U.S. Bureau of Mines have been conducting mineral surveys of wilderness and primitive areas. Areas officially designated as "wilderness," "wild," or "canoe" when the act was passed were incorporated into the National Wilderness Preservation System, and some of them are presently being studied. The act provided that areas under consideration for wilderness designation should be studied for suitability for incorporation into the Wilderness System. The mineral surveys constitute one aspect of the suitability studies. The act directs that the results of such surveys are to be made available to the public and be submitted to the President and the Congress. This report discusses the results of a mineral survey of the Ishi (B5098), Mill Creek (O5284), Polk Springs (O5097), and Butt Mountain (O5100) Roadless Areas in the Lassen National Forest, Tehama and Plumas Counties, California. The 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.

SUMMARY

Approximately 270,000 yd³ of inferred auriferous gravel resources were estimated in three Tertiary deposits in the Polk Springs Roadless Area (table 1). These resources are exposed between Paleozoic and (or) Mesozoic metamorphic rocks and tuff-breccia and lava flows of the Pliocene Tuscan Formation which suggests that although no deposits were identified in the other roadless areas, they may be concealed beneath the Tuscan Formation.

Recent stream gravels of Deer Creek in the Polk Springs Roadless Area contain enough gold to attract gold hobbyists; however, the stream gravels do not have sufficient volume to be considered a significant resource. Potential exists for additional auriferous gravels near the Occidental mine in the Polk Springs Roadless Area.

Bleached zones within the Tuscan Formation do not appear to have associated mineralization. Although geothermal activity near Lassen Peak does not extend as far south as the study area, Sulphur Lick, in the southern Ishi area, contains cold mineralized water.

INTRODUCTION

The Ishi (16,000 acres), Mill Creek (7,700 acres), Polk Springs (9,400 acres), and Butt Mountain (8,600 acres) Roadless Areas are located approximately 25 mi north of Chico and 25 mi south of Lassen Peak, Calif. (fig. 1) in a region characterized by rugged topography and dense brush or forest. Access to the area is by trails and secondary roads off State Highways 32, 36, and 89. Geologically the area is characterized by thick volcanic sequences of Tertiary and Quaternary age with local outcrops of Paleozoic and (or) Mesozoic and Cretaceous strata.

The U.S. Geological Survey and the U.S. Bureau of Mines conducted a mineral resource assessment of the Ishi, Mill Creek, Polk Springs, and Butt Mountain Roadless Areas to determine their mineral resource potential. The U.S. Geological Survey conducted geologic mapping and geochemical studies of the areas and the U.S. Bureau of Mines was responsible for detailed examination of mines, prospects, and mineralized zones. Research included a survey of U.S. Bureau of Mines files, claim records from Tehama and Plumas Counties, U.S. Bureau of Land Management claim-recordation indices and master title plats, and literature pertinent to mining activity and mineral occurrences in the roadless areas.

**GEOLOGY AND GEOCHEMISTRY PERTAINING TO
MINERAL RESOURCE ASSESSMENT**

Geology

The roadless areas lie in a volcanic terrane of the Cascade Range, characterized by upper Tertiary and lower Quaternary pyroclastic units and lava flows (Peterson and others, 1982b). Paleozoic and (or) Mesozoic metamorphic rocks, exposed locally in major stream drainages in the study areas, include both greenstone and metasedimentary schist. These rocks are probably related to similar metamorphic rocks in the northern Sierra Nevada. They contain quartz veins ranging from microscopic to several inches in width. The density of these veins varies from almost none to several per square foot. The Chico Formation of Cretaceous age unconformably overlies the metamorphic rocks and is characterized in the study area by pelecypod-bearing sandstone. Locally overlying the metamorphic rocks, and exposed near Polk Springs are remnants of Tertiary channel deposits. The deposits consist of sand to cobbles derived from metamorphic rocks. Clay is an abundant constituent of

the gravels locally. The Tertiary and Quaternary volcanic units unconformably overlie the Cretaceous Chico Formation.

The most extensive volcanic unit is the Tuscan Formation of Pliocene age. It is composed primarily of thick andesitic tuff-breccia (laharic) flows but contains intercalated thin flows and tuffs of mafic composition. It is the oldest unmetamorphosed volcanic unit in the area. Butt Mountain is one of several source areas for the Tuscan Formation, which thins westward toward the Chico monocline (Harwood and others, 1981). The basal part of the Tuscan Formation, particularly in the thinner western part, often consists of conglomerate containing pebbles from the underlying metamorphic rocks. Potassium-argon dating (Evernden and others, 1964; Harwood and others, 1981) confirms a Pliocene age for the Tuscan Formation.

Late in the Pliocene the character of the volcanic activity changed from pyroclastic emanations to lava flows, resulting in a sequence of mafic volcanic rocks characterized by andesite flows with some basalt flows. The source of many of the flows in the study area is near Mineral, Calif. (Wilson, 1961), about 5 mi north of the Mill Creek Roadless Area. Active vents today are in the vicinity of Lassen Peak and have not contributed to the volcanic sequence in the roadless areas.

Alteration

The Tuscan Formation contains several areas, usually less than an acre in size, in which the rocks have been bleached from their usual tan color to a light gray or white, apparently due to the development of clay minerals. It is thought that these bleached areas may be the result of hydrothermal activity, but none of the areas visited contain visible sulfides. Sulphur Lick, in the southern Ishi area (fig. 2), however, did include a mineralized cold-water spring. The areas of alteration appear to be randomly distributed throughout parts of the Tuscan Formation.

Geochemistry

Geochemical data (Peterson and others, 1982a) indicate normal statistical variations from background levels for each of the rock types analyzed. High values of chromium, copper, and nickel do not correlate with any geologic evidence of mineralization and are scattered randomly and widely throughout the study area. Although gold did not show up in the chemical data, it was noted visually in panned samples collected in Deer Creek.

MINING DISTRICTS AND MINERALIZATION

Regional mining

About 10 to 12 mi south of the Butt Mountain Roadless Area, several properties including the Bonanza King, Butte Queen, Butte King, Carr, Chips Creek, Golden Summit, Lott, Philbrook, and Sky High collectively yielded at least 10,000 oz of gold and 1,300 oz of silver between 1899 and 1940 according to U.S. Bureau of Mines files; production records are incomplete before 1900. Minor amounts of copper, lead, zinc, and antimony were also reported from the Bonanza King (O'Brien, 1949). Over 80 percent of the gold was from placer operations. In 1982, none of the mines were active.

Mining in the roadless areas

The only significant mining activity in the study areas has been in the Polk Springs Roadless Area on claims along Deer Creek near Polk Springs. These claims are accessible by trails and from gravel roads originating at Soda Springs or the Transfer Fire Station on State Highway 32.

Gold discovered in Deer Creek about 1850 resulted in the location of claims on the present sites of the Blue Channel, Jackson, and Occidental placer mines in the Polk Springs mining district. The deposits were worked by small-scale methods until about 1880 when hydraulic mining was introduced. Gravels perched 100 to 200 vertical ft on the sides of Deer Creek canyon were hydraulically mined until

the Sawyer court decision terminated hydraulic mining in the Sacramento River drainage in 1884. No subsequent production has come from the Polk Springs district; however, an attempt was made in 1930 to mine the Blue Channel placer. Production records are not available.

The Blue Channel, Jackson, and Occidental placers are on perched terraces of auriferous gravels exposed between Paleozoic and (or) Mesozoic metamorphic rocks and tuff-breccia and lava flows of the Pliocene Tuscan Formation. These deposits are further described in table 1.

ASSESSMENT OF MINERAL RESOURCE POTENTIAL

A low potential for Tertiary auriferous gravel resources exists in the Ishi, Mill Creek, Polk Springs, and Butt Mountain Roadless Areas. Geologic and geochemical data indicate little potential for mineral resources in Cretaceous sedimentary and Cenozoic volcanic rocks of these areas. Within the volcanic terrane several bleached areas (fig. 2) may be indicative of hydrothermal activity. However, none of these areas contain visible sulfide minerals, and geochemical analyses of rocks from these areas showed that abundances for analyzed elements are no greater than background levels.

In the northern Sierra Nevada, some metamorphic rocks similar to those exposed in the stream beds of Deer and Ditch Creek (Polk Springs area) and Mill Creek (Mill Creek area) contain massive sulfide deposits and gold-bearing quartz veins. There was no evidence of sulfide mineralization in the small exposures of metamorphic rocks within the roadless areas, but the quartz veins probably contain small amounts of gold.

Tertiary channel deposits in Deer and Ditch Creeks above exposures of metamorphic rocks contained sufficient gold for placer operations to have occurred in the past. Approximately 200,000 yd³ of inferred subeconomic placer gold resources which may contain gold values of \$5.00 per yd³ occur at the Blue Channel placer mine in the Polk Springs Roadless Area. Gold value is based on \$500 per troy oz. U.S. Bureau of Mines sampling at the Blue Channel mine was restricted to a portion of alluvial strata above bedrock and contained no gold. However, previous samples (Haley, 1931) contained gold values averaging \$5.00 per yd³. About 50,000 yd³ of inferred subeconomic placer gold resources valued at \$2.27 per yd³ occur at the Occidental mine and approximately 19,000 yd³ of inferred subeconomic placer gold resources valued at \$0.28 per yd³ occur at the Jackson mine also in the Polk Springs Roadless Area. Hydraulic mining restrictions have prevented gold recovery from these placers; however, new techniques such as leaching could make future gold recovery possible.

Potential exists for additional auriferous gravels in Tertiary river channels under the Tuscan Formation at the Occidental placer mine. Recent stream gravels of Deer Creek in the Polk Springs Roadless Area contain gold; however, a significant gold resource does not exist because of insufficient volumes of gravel. These stream gravels contain enough gold to attract gold hobbyists.

Gold-bearing gravel exposures at these mines suggest that additional placer gold deposits are concealed in Tertiary river channels beneath the Tuscan Formation in the four roadless areas. Most auriferous gravels in the Sierra Nevada were deposited before the major period of volcanic activity; many of the gravels crop out discontinuously along the basal contact of Tertiary volcanics rocks (Bateman and Wahrhaftig, 1966).

Several oil and gas leases bordering the Ishi area and one in the Mill Creek Roadless Area were held in the 1950's and early 1960's. All the leases are now terminated with no production recorded. Interest in these areas may have been based on the occurrence of gas seeps in Upper Cretaceous rocks at Tuscan Springs 9 mi to the west. Cretaceous sedimentary rocks which have yielded gas in the central Sacramento Valley may correlate with the Chico Formation (Rogers, 1962), a unit underlying the Tuscan in parts of the roadless areas.

Applications for geothermal leases are pending for several tracts covering about 2.5 mi² on the north side of the

Butt Mountain Roadless Area. No evidence of potential geothermal resources was found during this study.

Sand and gravel occur in narrow terraces and slender strips along most major drainages in the area. The occurrences have a low potential because they are small and distant from major markets.

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Table 1.--Mines¹ in the Polk Springs Roadless Area

Mine	Summary of geology	Workings and production	Sample data and resources ²
Blue Channel placer	A Tertiary channel containing sand, pebbles, and cobbles derived from metamorphic rocks is exposed between Paleozoic and (or) Mesozoic schist and Pliocene andesitic tuff-breccia flows. Exposed portions of the Blue Channel placer are 500 ft long, 350 ft wide, and 35 ft thick.	One hydraulic pit had an estimated 30,000 yd ³ of gravel removed.	One channel sample totaling 2.4 ft ³ from a trench in alluvium and one pan-concentrated sample of stream gravel containing no gold. Previous sampling results (Haley, 1931) contained gold values averaging \$5.00 per yd ³ . An inferred subeconomic gold resource of 200,000 yd ³ valued at \$5.00 per yd ³ exists.
Jackson placer	An unmined remnant of a Tertiary channel containing sand, pebbles, and cobbles derived from metamorphic rocks is exposed between Paleozoic and (or) Mesozoic quartz-mica schist and Pliocene andesitic tuff-breccia flows. The unmined channel averages 200 ft long, 100 ft wide, and 25 ft thick.	Two hydraulic pits; one had an estimated 6,000 yd ³ and the other about 50,000 yd ³ of gravel removed.	One channel sample totaling 1.0 ft ³ from alluvium contained \$0.28 gold per yd ³ of gravel. An inferred subeconomic resource of about 19,000 yd ³ of auriferous gravels valued at \$0.28 per yd ³ remains.
Occidental placer	A terrace channel containing auriferous gravels which mantles Paleozoic and (or) Mesozoic greenstone is overlain by Pliocene andesitic tuff-breccia flows. Clays make up as much as 40 percent of this placer estimated to be 300 ft long, 150 ft wide, and 30 ft thick.	In 1879 the mine site had \$8,000 worth of development including dams, ditches, tunnels, pipe, and cabins.	One channel sample totaling 1.0 ft ³ contained \$2.27 gold per yd ³ and one pan-concentrated sample of stream gravels contained no gold. An inferred subeconomic resource of 50,000 yd ³ of auriferous gravels valued at \$2.27 per yd ³ remains.

¹Although production records are not available, placer gold was probably produced.

²Gold value based on \$500 per troy oz.

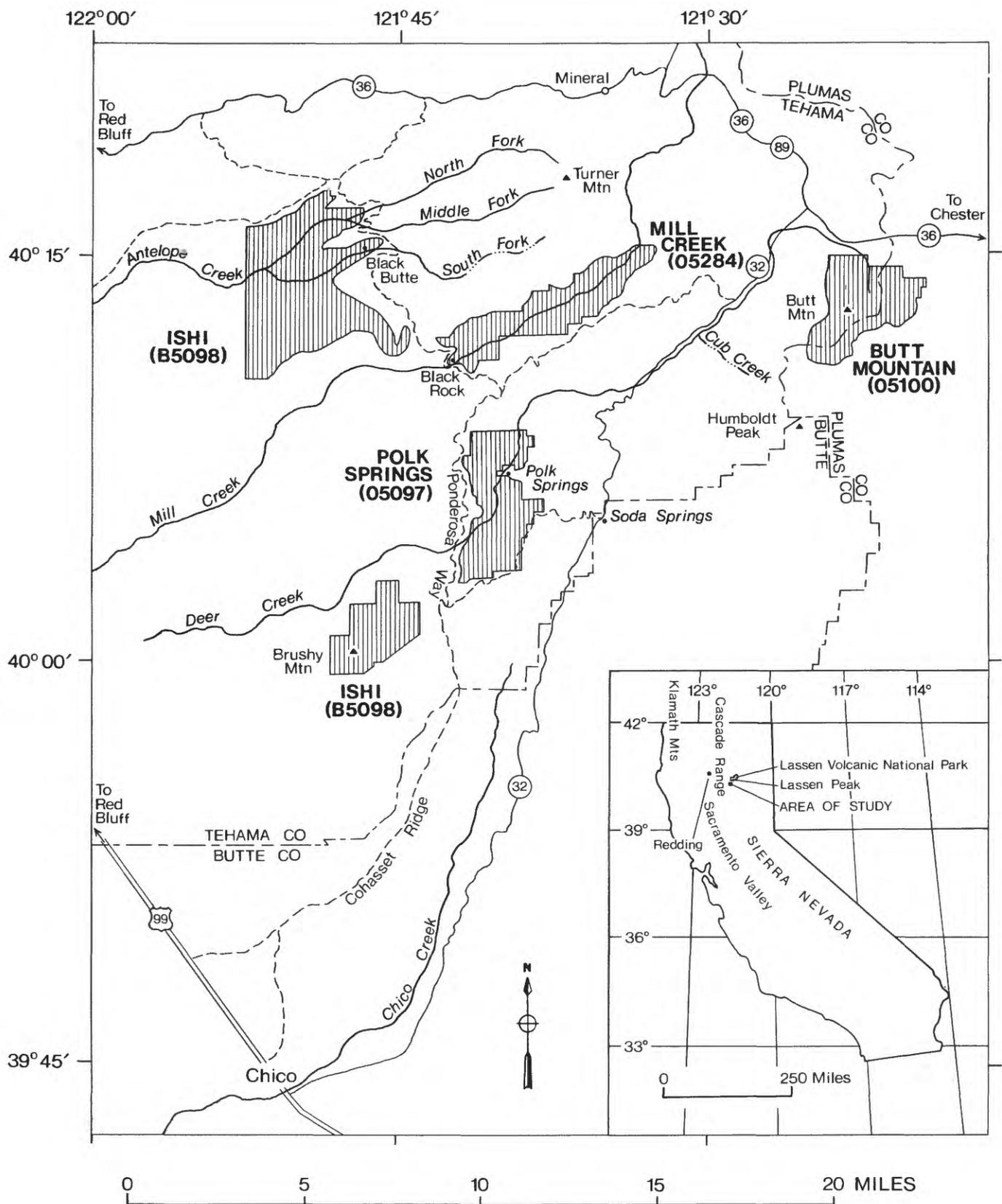


Figure 1.--Index map showing location of roadless areas (lined areas) described in this report.

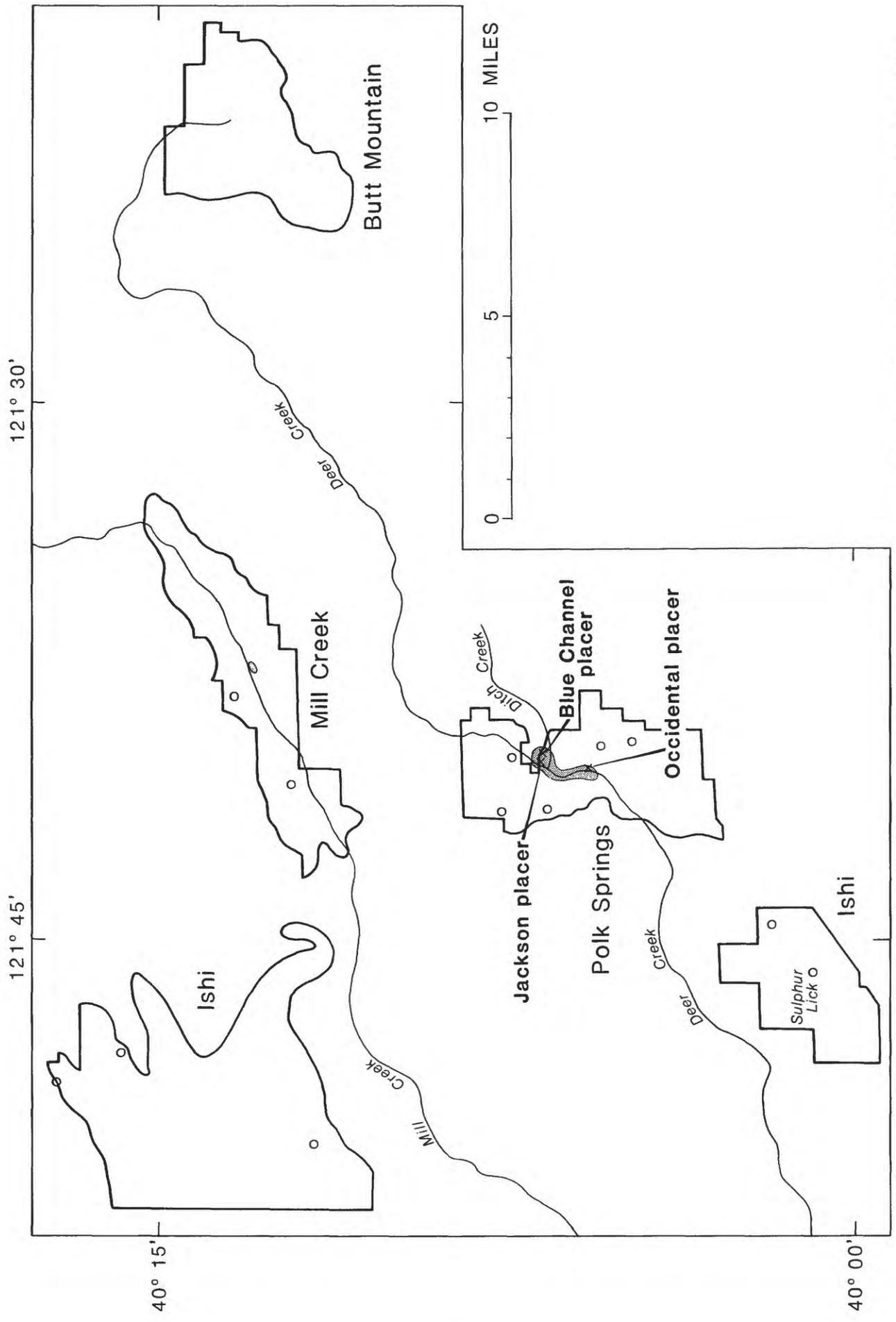


Figure 2.--Roadless areas (outlined), showing mines (x) in Polk Springs Roadless Area, areas of low potential for gold (shaded), and hydrothermally altered, bleached areas (o) with probably no potential for mineral resources.

