MINERAL RESOURCE POTENTIAL OF THE KAISER WILDERNESS (NF041), SIERRA NATIONAL FOREST, FRESNO COUNTY, CALIFORNIA

SUMMARY REPORT

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STUDIES RELATED TO WILDERNESS

Under the provisions of the Wilderness Act (Public Law 88-577, September 3, 1964) and the Joint Conference Report on Senate Bill 4, 88th Congress, 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 Kaiser Wilderness (NF041), Sierra National Forest, Fresno County, California. The area was established as a wilderness by Public Law 94-557, 1976.

SUMMARY

The Kaiser Wilderness occupies 22,500 acres (9,100 ha) in Sierra National Forest, Fresno County, Calif. (fig. 1). Occurrences of tungsten and metamorphosed limestone and dolomite are found in the Kaiser Wilderness. Tungsten occurs in pods of tactite located in calcareous metasedimentary rocks at their contacts with granitic rocks of the Sierra Nevada batholith. Very pure calcitic and dolomitic marbles occur in a massive lens-shaped outcrop about 3,000 ft (910 m) long and 500 ft (150 m) wide. Stream-sediment samples containing minor but anomalous amounts of gold were collected in the southern part of the wilderness. However, the potential for significant undiscovered mineral deposits is considered to be low. The area has no known potential for geothermal energy, coal, oil, or gas.

INTRODUCTION

The Kaiser Wilderness is located on the gently sloping west flank of California's Sierra Nevada about 50 mi (80 km) northeast of Fresno (fig. 1). Kaiser Ridge, which culminates at Kaiser Peak, 10,320 ft (3,145 m), is the principal physiographic feature in the wilderness. Most of the wilderness lies on the south flank of Kaiser Ridge, north of Huntington Lake. The area is mostly forested but includes alpine terrain consisting of lakes, meadows, low shrubs, and stunted trees, typical of the Sierra Nevada crest. Access to the area is by State Highway 168 and several county and logging roads to the south.

Geologic, aeromagnetic, and geochemical data were compiled by du Bray and Dellinger (1980) as part of the mineral survey conducted by the U.S. Geological Survey and the U.S. Bureau of Mines. The geologic map is a compilation of four published geologic quadrangle maps: Shuteye Peak (Huber, 1968), Shaver Lake (Lockwood and Bateman, 1976), Huntington Lake (Bateman and Wones, 1972), and Kaiser Peak (Bateman and others, 1971). The tungsten potential in the area was first discussed by Krauskopf (1953). The wilderness was previously examined for mineral resource potential during the U.S. Forest Service Sierra Demonstration Project study conducted by Lockwood and others (1972). Data for stream-sediment samples collected in the area and descriptive geology are abstracted from their report.

The wilderness is principally underlain by two plutons of the Sierra Nevada batholith, although metamorphosed Paleozoic sedimentary rocks crop out in several small areas. The sedimentary rocks were locally converted to scheelite-bearing tactite at their contacts with granitic rocks. Mining activity has been restricted to the tactite bodies, both in bedrock and in nearby glacial deposits. Recorded production is restricted to the Lucky Blue group of claims (location 1, fig. 2), from which 200 tons (180 t) of tungsten ore was extracted during the early 1950's.

Metamorphosed calcareous sedimentary rocks, in which scheelite-bearing tactite and high-purity calcitic and dolomitic marbles occur, have the principal mineral resource potential in the wilderness. Stream-sediment samples containing minor but anomalous amounts of gold were taken from Deer Creek and the unnamed creek east of Line Creek (area C, fig. 2); these drainages have very low potential for gold resources.

GEOLOGY, GEOCHEMISTRY, AND GEOPHYSICS

Geology

Metamorphic rocks account for about one percent of the rocks exposed in the wilderness. Of these, quartzite is the most abundant and occurs principally as isolated blocks and masses within the granodiorite of Dinkey Creek. Other metamorphic rock types (marble, calc-hornfels, hornfels, and pelitic schist) are found chiefly in septa[1] between the granodiorite of Dinkey Creek and the Mount Givens Granodiorite (Hamilton, 1956). The metamorphic rocks are

[1] "Septa" (sing. "septum"), as used here, refers to thin, markedly elongate, commonly discontinuous, downward projecting bodies of metamorphic rock that separate two plutonic bodies. They are presumed to be remnants of the roof of country rock intruded by the plutons.

similar to rocks found elsewhere in the Sierra Nevada that have metallic ore deposits associated with them. The quartzite is recrystallized, characteristically medium grained and light colored, and contains very few mafic grains, minor amounts of potassium-feldspar, and a trace of plagioclase. Hamilton (1956) suggests that the quartzite was sandstone prior to metamorphism. Coarse gray calcitic marble and lesser amounts of medium-grained white dolomitic marble are associated with calc-hornfels. Common minerals in the calcareous metasedimentary rocks include wollastonite, diopside, grossularite, plagioclase, and spinel. Scheelite is a minor constituent in some of the calc-silicate tactite rocks. Pelitic schist and hornfels including hornblende and biotite schist occur along Kaiser Ridge. These rocks are medium grained, gray to black, and contain plagioclase, potassium-feldspar, quartz, biotite, and hornblende. Hamilton (1956) suggests that they originated as argillaceous and arenaceous sedimentary deposits.

The two principal plutons in the Kaiser Wilderness are the Mount Givens Granodiorite, which is one of the largest plutons in the Sierra Nevada (Lockwood and others, 1972), and the granodiorite of Dinkey Creek. Isotopic uranium-lead age determinations indicate that they crystallized 88-93 and 105 m.y. B. P., respectively (Stern and others, 1981). Both plutons are light to medium gray and contain mafic inclusions, but inclusions are abundant only in the granodiorite of Dinkey Creek. The plutons can also be distinguished by the textural variability of the Mount Givens Granodiorite. The areas with the greatest mineral resource potential in the wilderness are the septa of calcareous metasedimentary rocks that almost everywhere separate these large plutons.

Trachyandesite is the only volcanic rock in the wilderness and crops out near the southern boundary on Black Point. This unit is probably about 10 m. y. old.

Quaternary deposits include moraines and alluvium. The moraines consist of poorly sorted bouldery material, deposited as Pleistocene glaciers retreated. Much of the ore mined from the Lucky Blue group of claims came from glacial erratics near outcrops of tungsten-bearing tactite, but glacial deposits farther from mineralized bedrock are not considered likely to contain significant resources.

Geochemistry

The geochemical anomalies detected in the Kaiser Wilderness were described by du Bray and Dellinger (1980). The three stream-sediment samples collected in Deer Creek and one sample from the unnamed creek east of Line Creek (area C, fig. 2) are anomalous in gold; three samples from the west fork of Line Creek contain anomalous amounts of copper. Two samples anomalous with respect to molybdenum are associated with the marble unit near Lower Twin Lake (area B). No anomalous concentrations of tin, arsenic, silver, lead, zinc, nickel, chromium, niobium, vanadium, cobalt, or lanthanum were detected, indicating that deposits of these metals probably do not exist within the wilderness. Lockwood and others (1972) suggest that the Line Creek copper anomaly is attributable to copper contained in concentrations of detrital magnetite. There is very low potential for small gold resources in area C.

Geophysics

The aeromagnetic map of the Kaiser Wilderness (du Bray and Dellinger, 1980) does not indicate the existence of concealed ore bodies within the wilderness. The single identified aeromagnetic anomaly is attributed to a body of mafic plutonic rock located about 0.5 mi north of Long Lake.

MINING DISTRICTS AND MINERALIZATION

Many of the 49 recorded mining claims staked in the Kaiser Wilderness were not found, mainly due to vague location descriptions, rugged terrain, and dense vegetation. Known mineral resources in the study area are limited to the occurrence of tungsten in the area between Avalanche Lake and upper West Kaiser Creek (area A, fig. 2) and to cacitic and dolomitic marbles in the Potter Pass-Twin Lakes area (area b).

Tungsten occurs in scattered scheelite-bearing tactite pods and glacial erratics composed of tactite. These bodies comprise the Lucky Blue group of claims (location 1, fig. 2), which was located in 1951. According to the claimant, Mr. F. T. Wilmoth, as much as 200 tons (180 t) of ore, worth about $50,000, was produced between 1951 and 1956 (Lockwood and others, 1972). Most of the ore came from glacial erratics, but some was extracted from tactite pods in bedrock. Ore was processed near the claims; it was crushed in a two-stamp mill and concentrated using a shaking table and flotation cells. Presently Mr. Wilmoth is driving an adit to intersect and explore at depth the tactite pods exposed at the surface. The small, widely spaced scheelite-bearing tactite pods occur over a lateral distance of about 7,000 ft (2,140 m) and over a vertical distance of about 600 ft (180 m). According to U.S. Bureau of Mines assay reports, the tungsten content is as high as 0.48 percent tungsten trioxide (WO_3), but most samples contain smaller concentrations. One sample collected by the U.S. Geological Survey in 1969 contains 1 percent tungsten, but most samples contain much less (Lockwood and others, 1972). Tactite pods probably exist at depth, but their economic potential is likely to be limited by their small size and low scheelite content. Extensive detailed subsurface exploration would be necessary for a complete resource evaluation.

Calcitic and dolomitic marbles occur in the Potter Pass-Twin Lakes area (B, fig. 2) in a massive lens-shaped outcrop about 3,000 ft (910 m) long and 500 ft (150 m) wide. The lens is an isolated body in a metasedimentary complex that strikes northwestly and is nearly vertical. Several claims have been filed for this area since 1930, most recently in 1959. The Larry No. 1 prospect (location 2, fig. 2) is in this area, but no production has been recorded and only discovery and exploration pits were found. Assay results indicate that the body is composed of high-purity calcitic dolomitic marbles. The dolomitic material may be suitable for use as refractory dolomite, and the calcitic marble (strongly recrystallized limestone) for cement, sugar refining, steel flux, and chemical products. The lenticular body may contain as much as 60 million tons (54 million t) of high-purity calcitic and dolomitic marbles. Tonnage calculations were based on a lenticular body 3,000 ft long, 500 ft wide, and an estimated 1,500 ft deep (900 m x 150 m x 450 m). The proportion of calcitic to dolomitic marbles, and their distribution within the body, is unknown.

ASSESSMENT OF MINERAL RESOURCE POTENTIAL

The locations of mines and prospects in the Kaiser Wilderness and areas with known or potential mineral resources are shown in figure 2. Information about mines and prospects is given in table 1. Within the Sierra Demonstration Project area, which includes the wilderness, all previously known metallic deposits are accompanied by strong anomalies in downstream sediment samples (Lockwood and others, 1972). Any other significant metallic ore deposits exposed at the surface of the Kaiser Wilderness would probably have been detected by the geochemical sampling program.

The mineral resource potential of the Avalanche Lake-West Kaiser Creek and Potter Pass-Twin Lakes areas (A and B, fig. 2) cannot be estimated further without subsurface data. The persistence of scheelite-bearing tactite pods indicates potential for the existence of other pods at depth. However, the variable scheelite content, small size, and random occurrence of tactite pods exposed on the surface preclude estimation of subsurface resources, and suggest that tungsten could not be extracted economically. Some additional testing of the calcitic and dolomitic marbles might be warranted, but the inaccessibility of the body, its distance from potential markets, and the ready availability of these materials in areas closer to markets probably preclude economic exploitation of this deposit. Stream-sediment samples containing minor but anomalous amounts of gold indicate the presence of gold in the drainages of Deer Creek and the unnamed creek east of Line Creek (area C), but it is very unlikely that gold is present in sufficient concentrations to be economically developed. The area has no known potential for geothermal energy, coal, oil, or gas.

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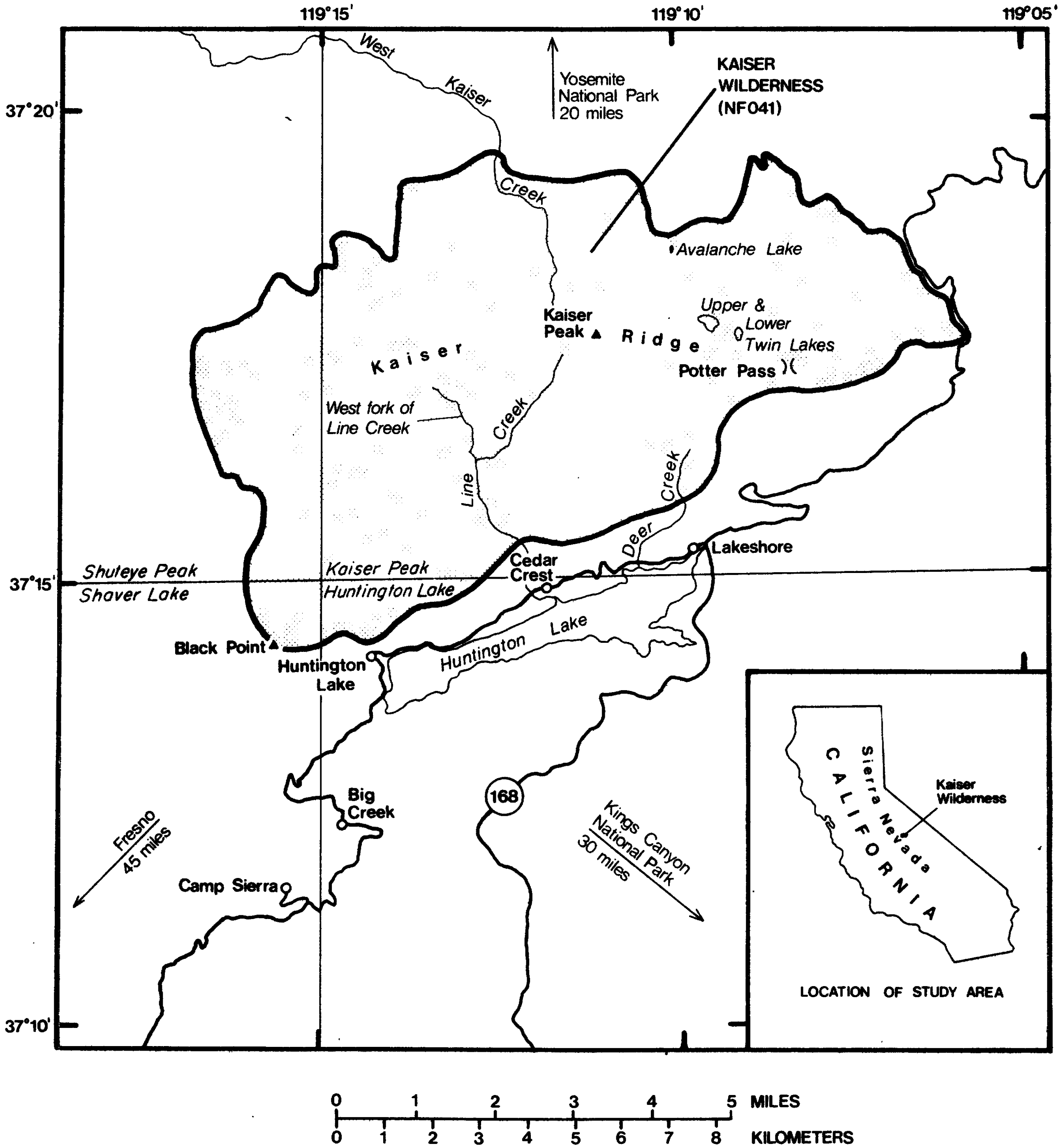

Figure 1.--Index map showing the location of Kaiser Wilderness, the surrounding area, and the topographic 15-minute quadrangles covering the area.

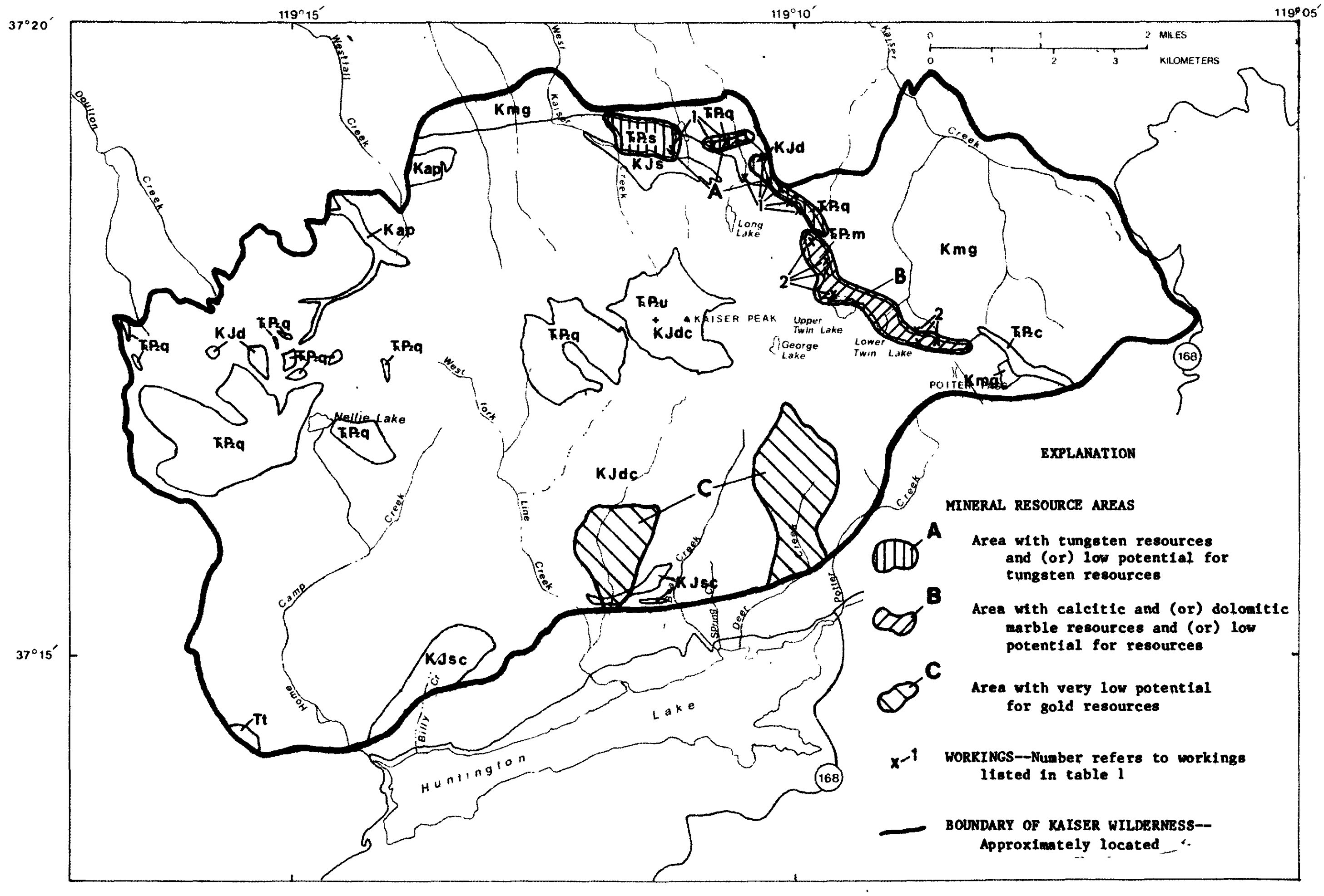

Figure 2.--Areas with mineral resource potential and location of mines and prospects in the Kaiser Wilderness.