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MINERAL RESOURCE POTENTIAL OF THE GOLDEN TROUT WILDERNESS, SOUTHERN SIERRA NEVADA, 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 Golden Trout Wilderness (NF903), Sequoia and Inyo National Forests, Tulare and Inyo Counties, California. The area was established as a wilderness by Public Law 95-237, 1978.

SUMMARY

Studies by the U.S. Geological Survey (USGS) and the U.S. Bureau of Mines (USBM) did not reveal any large mineral deposits. Tungsten, lead, silver, zinc, and molybdenum are the principal elements in ore-forming minerals detected in the study area. A total of 120,000 tons of indicated reserves and 120,000 tons of inferred reserves averaging 0.77 percent tungsten trioxide (WO_3) is in tactite at the Pine Tree mine (loc. 14). In one area of the wilderness (area A) a high potential exists for silver, lead, zinc, or copper and in three other areas a moderate potential exists for tungsten, copper, lead, zinc, silver, or gold (table 1).

The association of metallic ore deposits with contacts between intrusive and metasedimentary rocks in the Sierra Nevada and the abundance of these contacts in the wilderness suggest that some potential exists for small metallic mineral deposits. Potential for metallic mineral deposits in the Mineral King roof-pendant area is high. Potential for additional small deposits is moderate in the Maggie Mountain and eastern range-front areas, low in the Cold Creek area, and very low in the Little Kern Lake Creek, Right Stringer, Templeton Mountain, and Kern Peak-Indian Head areas. The White Mountain area is hydrothermally altered and geochemically and magnetically anomalous; potential for significant deposits there is probably moderate. The youth of the volcanic rocks in the wilderness and the presence of several hot springs suggest a possible geothermal resource, but its magnitude, if any, is unknown. The area has no known potential for coal, oil, or gas.

INTRODUCTION

The Golden Trout Wilderness includes 478 mi^2 of the rugged forested part of the southern Sierra Nevada (fig. 1). It is bounded on the east by Owens Valley, on the north by Sequoia National Park, and on the west and south by U.S. Forest Service multiple-use lands. The east side of the area is accessible from U.S. Highway 395, and the remainder is reached by county, state, and U.S. Forest Service roads from the San Joaquin Valley.

The geologic map by du Bray and Dellinger (1981) outlines the geologic setting of mines, prospects, and claims in the wilderness and delineates roof pendants of metamorphic rocks that contain most of the known and potential mineral resources. Additional reports (Webb, 1946, 1950; Christensen, 1963; Dalrymple, 1963; Moore and du Bray, 1977; Bacon and Duffield, 1979) address specific geologic aspects of the area.

To outline areas of mineral resource potential, the USBM evaluated known mines, prospects, and mineralized areas, and the USGS conducted geologic, geochemical, and geophysical investigations. Details of these evaluations were presented by du Bray and Dellinger (1981) (geology), Leach and others (1981a, b, c, d, e, f, g; 1983a, b) (geochemistry), N. T. Zilka (unpub. data, 1982) (mines and prospects), and Jachens and Elder (1983) (geophysics).

GEOLOGY, GEOCHEMISTRY, AND GEOPHYSICS PERTAINING TO MINERAL RESOURCE ASSESSMENT

GEOLOGY

The rocks exposed in the Golden Trout Wilderness are principally Jurassic or Cretaceous plutons of the Sierra Nevada batholith (Evernden and Kistler, 1970; J. H. Chen, oral commun., 1979). About 10 percent of the area is underlain by remnants of sedimentary and volcanic roof rocks, metamorphosed under albite-epidote- to hornblende-hornfels-facies conditions during emplacement of the batholith. The two largest bodies of metamorphic rock in the wilderness are a large unnamed roof pendant on the east slope of the range, northwest of Cartago, and the Mineral King roof pendant; smaller masses of metamorphic rock occur throughout the wilderness.

Metamorphic rocks

General features.—All the sedimentary and volcanic roof rocks that the batholith intruded were thermally metamorphosed, and some show the effects of burial and directed pressure. In most places, the metamorphic rocks are well stratified, foliated, and dip nearly vertical. These rocks are of particular interest as possible hosts to metallic mineral occurrences.

Metasedimentary rocks.—Metamorphosed limestone, phyllite, calc-silicate rock, biotite schist, and micaceous quartzite are the common metasedimentary-rock types exposed in the wilderness. The Mineral King roof pendant is principally composed of metamorphosed calcareous sedimentary rocks and phyllite; the other metasedimentary-rock types occur in smaller bodies elsewhere in the wilderness. The principal minerals in the metasedimentary rocks include hornblende, epidote, chlorite, diopside, and iron oxides; these rocks are uniformly fine grained and either hornfelsic or schistose.

Metavolcanic rocks.—Metavolcanic rocks are volumetrically dominant in the roof pendant on the east slope of the range and crop out locally elsewhere in the wilderness. These rocks are characterized by abrupt lithologic and textural changes along strike. Metavolcanic-rock composition ranges from rhyolitic to andesitic; these rocks occur as fine-grained flows, ash deposits, tuff, and volcanic breccia. The metavolcanic rocks are fine grained, dense, and consist of combinations of quartz, biotite, hornblende, feldspar, epidote, chlorite, sphene, iron oxides, and secondary minerals. The basalt flows are generally massive, whereas the more silicic volcanic rocks are more thinly bedded.

Granitoid rocks

Granitic rocks underlie most of the Golden Trout Wilderness. In all, 24 discrete, separately emplaced plutons crop out within the study area, ranging in composition from alaskitic granite to hornblende gabbro[1]. General information concerning the plutons of the Sierra Nevada was presented by Bateman and others (1963), Moore (1963), Rinehart and Ross (1964), and Bateman (1965).

The granitoid rocks are typically medium grained and homogeneous within a given pluton. They contain varying amounts of quartz, plagioclase, potassium feldspar, biotite, and hornblende as major constituents; minor constituents include iron oxides, zircon, apatite, and sphene. The plutonic rocks may be discussed in terms of four broad lithologic classes; five miscellaneous intrusive rock types are also identified.

Cathedral Peak-type granodiorite.—The most distinguishable granitoid-rock type in the wilderness is the Cathedral Peak-type granodiorite. Two very large plutons are characterized by zoned potassium feldspar megacrysts as much as 2 in. long, set in a coarse-grained matrix of plagioclase, quartz, potassium feldspar, and biotite. These plutons straddle the granite-granodiorite compositional boundary, have color indices between 6 and 12, and contain biotite as the principal mafic mineral.

Alaskite.—Seven plutons of alaskitic granite crop out in the wilderness. These plutons are medium grained; contain approximately equal amounts of quartz, potassium feldspar, and plagioclase; and contain less than 5 percent mafic minerals, principally biotite.

Granites.—Nonalaskitic granite crops out in five plutons. In these plutons, potassium feldspar accounts for more than a third of the feldspar, quartz content is greater than 20 percent, the color index ranges from 5 to 15, and megacrysts characteristic of the Cathedral Peak-type granodiorite are absent. Hornblende and biotite are the principal mafic minerals.

Other granodiorite.—The other commonly encountered granitoid-rock type is granodiorite. Ten granodioritic plutons are medium- to fine-grained bodies in which potassium feldspar makes up less than one-third but more than 10 percent of the total feldspar. The rocks contain hornblende as the principal mafic mineral, have color indices between 10 and 25, contain numerous mafic inclusions, and commonly contain accessory sphene. They are distinguished from the Cathedral Peak-type granodiorite by the absence of potassium feldspar megacrysts.

Other intrusive rocks.—In addition to the plutons discussed above, the Golden Trout Wilderness contains mafic dikes, a body of intrusion breccia, and bodies of aplite and mafic plutonic rocks. Small bodies of granodiorite that are more mafic than those mentioned above occur in the eastern part of the wilderness.

Volcanic rocks

Volcanic rocks occur in four areas of the wilderness: (1) Basalt flows in the Little Kern River drainage and on the Flatiron; (2) basalt flows and associated cinder accumulations along Golden Trout Creek; (3) dense rhyolite, some flow banded, at Templeton Mountain and on the adjacent low hill to the northeast; and (4) pumiceous rhyolite in Long Canyon.

The first two areas are characterized by dense gray to black olivine basalt. The basalt in the Little Kern River and Flatiron areas consists of flow remnants; one sample of basalt from the Flatiron area yielded a 3.5±0.1-m.y. K-Ar age (sample KA-1014, Dalrymple, 1963). The oxidized flows and cones of Golden Trout Creek are undated but are probably nearly coeval with the basalt in the Little Kern River and Flatiron areas.

The rhyolite of Templeton Mountain is composed of potassium feldspar, quartz, actinolite, plagioclase, biotite, and varying amounts of glass. This gray to tan rhyolite is distinctly crystalline in most places. Bacon and Duffield (1979) reported a 2.4±0.3-m.y. K-Ar age on the rhyolite of Templeton Mountain.

The rhyolite of Long Canyon is light colored, pumiceous, and contains phenocrysts of potassium feldspar, quartz, plagioclase, and biotite. This rhyolite is significantly more glassy than the rhyolite of Templeton Mountain. Bacon and Duffield (1979) reported a 0.185±0.15-m.y. K-Ar age on the rhyolite of Long Canyon.

The young ages of the volcanic rocks and the presence of hot springs suggest that geothermal resources may exist in the study area. Jordan Hot Springs, which has been developed for recreation, is less than 4 mi from the youngest known volcanic deposit (the rhyolite of Long Canyon) in the study area. The extent of geothermal resources, if any, is unknown.

GEOCHEMISTRY

The geochemical investigation of the study area consisted principally of collection and analyses of 495 stream-sediment samples, 348 samples of nonmagnetic heavy-mineral concentrate, and 111 rock samples, and evaluation of the resulting data. Water samples were collected from an area within the Little Kern watershed where iron oxide precipitation was observed. Sampling-site density is approximately 1 per square mile. All rock, stream-sediment, and nonmagnetic heavy-mineral concentrate samples were analyzed semiquantitatively for 31 elements, using an optical-emission-spectrographic technique (Grimes and Marranzino, 1968). In addition, selected samples of stream sediment and rocks from most major units were analyzed for uranium by neutron activation/delayed neutron counting. A complete tabulation of the data, a detailed discussion of the sampling and analytical methods, and statistical summaries of the data were presented by Leach and others (1981a); maps showing the geographic distribution of the data for selected elements were presented by Leach and others (1981b, c, d, e, f, g, 1983a, b).

The geochemical evaluation is based on the distribution and variations of selected elements in stream-sediment samples and in the nonmagnetic fraction of heavy-mineral-concentrate samples. Because these samples are derived from various rock types, concentrations of elements approximating the upper 5 percent of the data were generally considered to be anomalous. For many elements, the

[1]Igneous-rock nomenclature used in this report is that of Streckeisen (1973).

geochemical threshold value was adjusted upward or downward from the 95th-percentile value to accommodate distinct breaks in the frequency distribution of the data. More than 95 percent of the samples had concentrations below the analytical limit of detection for certain elements (gold and zinc); detected concentrations of those elements were considered anomalous. Maps were prepared showing the distribution of samples with anomalous concentrations of selected elements, and areas were characterized by suites of anomalous elements (Leach and others, 1981b, c, d, e, f, g, 1983a, b). The Mineral King roof-pendant area has a high potential for mineral occurrences; five of the eight other areas were identified as having a very low to moderate potential for mineral occurrences.

Mineral King roof pendant

Anomalous concentrations of many ore-related elements occur in stream-sediment and heavy-mineral-concentrate samples from throughout the Mineral King roof-pendant area (A, fig. 2). Most of the anomalous samples in this area were collected at sites underlain by the roof pendant or within a few miles of its contact with granitoid rocks of the Sierra Nevada batholith. In the northern part of the area, the stream sediment is characterized by anomalous concentrations of lead, zinc, and silver; anomalous concentrations of molybdenum, copper, tin, and boron are also common. Heavy-mineral concentrates from the area commonly contain anomalous concentrations of lead, arsenic, and tin; two samples contain anomalous concentrations of gold. The central part of the Mineral King roof-pendant area, extending from Soda Spring Creek to Alpine Creek, contains the same suite of anomalous elements in stream sediment, excluding copper and tin; however, heavy-mineral concentrates commonly contain anomalous concentrations of silver, tungsten, and bismuth.

Within a few miles of the Pine Tree mine, significant amounts of iron oxide precipitation occur in Mineral King roof-pendant sediment and in numerous spring-discharge areas. These springs are cold (10°C), acidic (pH=6.0), characterized by high concentrations of iron, calcium, magnesium, and arsenic, and supersaturated with respect to CO_2. Acid-producing reactions in the ground-water-recharge area and subsequent dissolution of calcareous roof-pendant rocks could account for the composition of the ground waters in this area. A possible acid-producing reaction is the oxidation of pyrite—possibly associated with metallic-sulfide mineral deposits in the ground-water-recharge area.

One heavy-mineral sample, collected from a small tributary to Alpine Creek, contains exceptionally high concentrations of silver (15 ppm), arsenic (3,000 ppm), boron (500 ppm), copper (1,500 ppm), lead (700 ppm), tin (100 ppm), and tungsten (200 ppm). Stream-sediment samples from the southern part of the Mineral King roof-pendant area contain anomalous concentrations of lead and zinc; heavy-mineral concentrates from this area contain anomalous concentrations of silver, tungsten, and bismuth.

Several mineral prospects and mining claims are located in the Mineral King roof-pendant area, including the Pine Tree mine, which is currently producing small amounts of tungsten. Occurrences of copper, lead, and zinc are reported in the Mineral King district, several miles north of Farewell Gap, and in the Camp Wishon district southwest of the wilderness. The geochemical anomalies identified in the Mineral King roof-pendant area may reflect extensions of the mineralized rock found in the Mineral King and Camp Wishon districts.

The geochemical anomalies and known mineral occurrences in the Mineral King roof-pendant area are probably the result of contact metasomatism, that is, the reaction between roof-pendant rocks and high-temperature fluids associated with the intrusion of granitoid magmas. Deposits formed in this manner are common in the Sierra Nevada and the Great Basin, where many of them are mined for tungsten, copper, molybdenum, lead, or zinc.

The geochemical data and the presence of known small occurrences suggest a high potential for other small mineral deposits containing lead, zinc, silver, bismuth, or tungsten in the Mineral King roof-pendant area.

Maggie Mountain

Stream-sediment samples from the area near Maggie Mountain (area B), west of the Mineral King roof pendant, contain anomalous concentrations of lead, silver, tin, and molybdenum. In the vicinity of Maggie Mountain, small metavolcanic and metasedimentary bodies occur within the granodiorite of Pecks Canyon and the alaskite of Maggie Mountain. This area is approximately equidistant from the Mineral King and Tule River roof pendants. Five abandoned claims and prospects are located in the area; the Galena Cave deposits (loc. 3) contains sphalerite (ZnS) and the Jack Danials deposit (loc. 4) includes minor scheelite ($CaWO_4$). The Maggie Mountain area has a moderate potential for small mineral deposits containing tungsten, lead, silver, or zinc.

Eastern range front

Reconnaissance sampling of the Sierra Nevada range front was severely hindered by the steep terrain. Samples were obtainable from only a few locations in the major drainages, resulting in incomplete coverage of many of the interfluvial areas. Even in the major drainages, heavy-mineral concentrates were rarely collected because of the absence of substantial amounts of active-stream sediment.

Stream sediment containing anomalous concentrations of lead, copper, molybdenum, silver, and barium was sampled in and near the catchment areas of Braley Creek and South Fork Ash Creek (area C). The anomalous concentrations of copper, silver, and barium are generally restricted to areas underlain by metavolcanic rocks; anomalous concentrations of bismuth and tungsten were also found in heavy-mineral concentrates from this area. Anomalous concentrations of molybdenum and lead, however, are not restricted to areas underlain by metavolcanic rocks but also occur in areas with exposures of mafic plutonic rocks, granite, and granodiorite.

Six sulfide-mineral prospects and claims are located in the eastern range-front area. The potential for additional occurrences of small sulfide deposits, particularly in areas of altered metavolcanic rocks, is moderate.

White Mountain

The White Mountain area (D) is underlain entirely by the porphyritic granite of White Mountain. Heavy-mineral concentrates from this area contain anomalous concentrations of silver, lead, bismuth, boron, tungsten, tin, thorium, and molybdenum, and stream sediment contains anomalous concentrations of beryllium and manganese. Heavy-mineral concentrates from the area contain a suite of anomalous elements similar to that of the Mineral King roof-pendant area, but the White Mountain area is not underlain by metamorphic rocks. There are no known mineral occurrences in the area. The nearest exposure of metamorphic roof rocks is 3 mi to the west. Much of the White Mountain area has undergone some hydrothermal alteration, as shown by silica enrichment and the presence of numerous quartz veins, commonly containing fluorite, epidote, clay minerals, and iron oxides. A sharp magnetic anomaly is also centered over White Mountain. The potential for small mineral occurrences in the White Mountain area is moderate.

Cold Creek

One sample of heavy-mineral concentrate, collected from a small tributary to Cold Creek (area E), contained 500 ppm gold and 70 ppm silver. This sample may indicate a disseminated-gold source, considering the absence of any other anomalous metallic-element concentrations. Numerous quartz veins were observed upstream from the sample site in a complex geologic environment that includes the contact between the alaskite of Hells Hole and the granite of Window Cliffs and small bodies of metamorphic rocks. Other samples collected in the area did not contain anomalous metallic-element concentrations; therefore, the potential for significant gold-silver deposits in the Cold Creek area is low.

Little Kern Lake Creek

A few stream-sediment samples collected from the west side of the Kern River canyon near Little Kern Lake Creek (area G) contain anomalous concentrations of tin; one sample contains an anomalous concentration of silver. Heavy-mineral concentrates from this area contain anomalous concentrations of copper, lead, and (or) tin. The area is underlain by the granite of Little Kern Lake Creek and the alaskite of Coyote Pass. There are no known mineral occurrences in the area. The significance of the geochemical anomaly is uncertain, and the potential for mineral deposits in the Little Kern Lake Creek area is very low.

Right Stringer

Anomalous concentrations of zinc occur in heavy-mineral-concentrate samples from below the drainage divide southwest of the headwaters of Right Stringer (area H). The absence of anomalous concentrations of other elements in these samples suggests lithologic control of the anomalous zinc. Samples of stream sediments from this area contain anomalous concentrations of iron, vanadium, zirconium, and, to a lesser extent, copper and cobalt. This suite of anomalous elements in stream sediment probably reflects the sorption of metals into iron oxyhydroxides and thus does not necessarily indicate the presence of mineral deposits. The area is underlain by the granite of Window Cliffs. There are no known mineral deposits in the area. The potential for mineral deposits in the Right Stringer area is low.

GEOPHYSICS

An aeromagnetic survey of the Golden Trout Wilderness (U.S. Geological Survey, 1979) was flown and compiled by LKB Resources, Inc., under contract to the USGS during 1978 and 1979. Total-intensity magnetic data were collected along east-west flightlines spaced approximately 0.5 mi apart and connected by three north-south flightlines. The survey was flown at a height of approximately 1,000 ft above the average terrain. Because the area surveyed has considerable topographic relief, actual ground clearance fluctuated between 300 ft and 4,500 ft along some flightlines.

A residual magnetic map was generated by subtracting from the data the International Geomagnetic Reference Field (1975) (updated to the dates flown) and adding a constant 52,000 gammas to all the data. The data were then contoured by computer, using a grid of 575 ft east-west and 1,300 ft north-south.

Much of the complexity of this aeromagnetic map due to effects arising from the topography in the survey area. The survey aircraft was not able to maintain a constant height above the ground surface and tended to pass much higher above valley floors than above adjacent ridgecrests. Because most of the rocks exposed at the surface in this area are magnetic to some degree and appear to be magnetized in a direction nearly parallel to the earth's present field, the varying height of the aircraft above the ground surface resulted in magnetic highs over ridges and magnetic lows over valleys.

Superposed on the topography-related magnetic anomalies are magnetic anomalies that reflect the distribution of ferrimagnetic minerals, most commonly magnetite, within the underlying rock masses. At the magnetic latitude of the Golden Trout Wilderness, boundaries between regions with different concentrations of magnetic minerals have associated magnetic gradients, and these boundaries are generally at the locus of points of steepest gradient. A general interpretation of the aeromagnetic data from the Golden Trout Wilderness has been presented by Jachens and Elder (1983). Presented in this report is a summary of those parts of the interpretation that relate to potential mineral resources of the study area.

Mineral King roof pendant

That part of the Mineral King roof pendant (area A, fig. 2) within the Golden Trout Wilderness is characterized by a pronounced magnetic low with steep magnetic gradients above its east and west boundaries. This magnetic low reflects the nonmagnetic character of this body relative to the granitoid rocks with which it is in contact.

Because of the mineral resource potential associated with this roof pendant, computer modeling of the magnetic data along a series of east-west profiles was conducted to define the subsurface geometry of this body. The model indicates that, in general, the margins of the Mineral King roof pendant dip steeply and that the pendant extends to depths which are approximately equal to the width of surface exposures. Along a profile that crosses the roof pendant at the junction of Shotgun Creek and the Little Kern River, the roof pendant has near-vertical margins and extends about 13,000 ft beneath the surface. Farther south, along a profile that crosses the junction of Willow Creek and the Little Kern River, the model indicates that the boundaries of the roof pendant dip inward and that the roof pendant is approximately 3,000 ft thick. Furthermore, the magnetic data suggest that along this profile the roof pendant is thickest at a point approximately 0.6 mi east of its west contact.

In the southwestern part of the wilderness, the Mineral King roof pendant is split into two limbs, and modeling of the magnetic data along a profile that crosses both limbs at the junction of Table Meadow Creek and the Little Kern River indicates that the western limb of the roof pendant is only approximately 1,600 ft thick. Qualitative interpretation of the magnetic data over other parts of the western limb suggest that it is thin throughout most of its length. In contrast, beneath the profile the eastern limb extends to a depth of approximately 6,500 ft. The two limbs do not appear to connect at depth.

White Mountain

Geochemical surveys define a zone of geochemical anomalies in an area underlain by the granite of White Mountain (area D). Although the magnetic field over most of the White Mountain pluton is characterized by low-amplitude long-wavelength anomalies, a sharp magnetic anomaly, approximately circular and with a diameter of about 0.6 mi, is centered over White Mountain. Although this anomaly partly reflects topography, modeling of the magnetic data indicates that it also reflects a region which is more magnetic than its surroundings and, in turn, suggests the presence of an anomalous concentration of ferrimagnetic minerals near the top of White Mountain—a concentration that could be related to the source of the geochemical anomalies. The magnetic data also suggest the presence of an anomalous, though lower, concentration of ferrimagnetic minerals on the north-south trending ridge located approximately 1.5 mi south of the peak of White Mountain.

A circular magnetic anomaly similar to the one over White Mountain is shown on the aeromagnetic map as occurring over the White Mountain pluton near its west edge, approximately 2.5 mi north of the south boundary of the Golden Trout Wilderness. However, this anomaly was mislocated during compilation of the map and actually occurs approximately 1.3 mi west of its map location, over the highly magnetic granodiorite of Loggy Meadow.

Little Kern Lake Creek

Another zone of geochemical anomalies lies in the area of Little Kern Lake Creek (area G), an area underlain by the granites of Little Kern Lake Creek and Grasshopper Flat. Although no obvious magnetic anomaly occurs directly above the geochemically defined anomalous zone, approximately 0.6 mi north of this zone a large circular magnetic high, 1.3 mi in diameter, straddles the contact between the Little Kern Lake Creek and Grasshopper Flat plutons. Although the source of this magnetic anomaly is unknown, an estimate of the depth to the top of the source indicates that the magnetic material either is exposed at the surface or lies at a depth of, at most, a few hundred yards.

MINES, PROSPECTS, AND MINERALIZED AREAS

Prospecting and claim location within the Golden Trout Wilderness resulted from peripheral mining activity. Courthouse records indicate that 143 claims were located in the wilderness. The currently active Pine Tree mine (loc. 14) is the only property in the area that has a record of production. At least 36 other prospects have been abandoned, and Jordan Hot Springs has been developed for recreation.

The Mineral King mining district, now part of Sequoia National Park, adjoins the wilderness on the northwest; the Camp Wishon mining district adjoins it on the west. Both districts are on roof pendants of metamorphic rocks that extend into the wilderness, but neither district has had significant recorded production. Whereas early miners sought precious metals associated with disseminated sulfide zones in limestone adjacent to granitic rocks, more recent interest in the region has centered on scheelite-bearing garnet-epidote tactite along roof-pendant/intrusive-rock contacts. A total of 14 tungsten properties are located within 10 mi of the wilderness boundary, and one, the Pine Tree mine, is within the wilderness.

The Pine Tree-Coyote claim group is located along a ridgecrest on the west side of the Little Kern River, in secs. 5 and 8, T. 9 S., R. 32 E. Tungsten ore is being mined from two pits. Scheelite is irregularly disseminated in fracture zones within tactite composed of garnet, calcite, quartz, epidote, and diopside. Ore is processed through a 2-ton-per-day gravity mill that has a recovery rate of about 60 percent and produces a concentrate averaging between 15 and 25 percent tungsten trioxide. About 2,000 lbs of concentrate has been produced annually for 15 years (D. Walker, oral commun., 1979). As many as 14 tactite units are exposed, the largest of which is as much as 800 ft long and 50 ft wide, but they are only partially mineralized. The mineralized parts contain as much as 4.4 percent tungsten trioxide (WO_3) but average 0.2 percent. Within the mineralized parts of the deposit is a total of 120,000 tons of indicated reserves and 120,000 tons of inferred reserves containing an estimated 0.77 percent tungsten trioxide. Mill capacity could be increased somewhat, and recovery could be improved by adding at least one concentrating table exclusively to treat the slimes.

The locations of other mineral properties in the wilderness are shown on figure 2; brief descriptions are included in table 2 on the accompanying mineral resource potential map. Detailed information is contained in a U.S. Bureau of Mines Mineral Lands Assessment report prepared by N. T. Zilka (unpub. data, 1982).

ASSESSMENT OF MINERAL RESOURCE POTENTIAL

During the investigation of the Golden Trout Wilderness, the USGS and the USBM delineated one site with identified resources and several areas with potential mineral resources. Areas designated as having mineral potential were determined on the basis of: (1) Known mineral occurrences, (2) favorable host rocks, (3) groups of geochemically anomalous samples, (4) aeromagnetic anomalies, and (5) surface alteration. Areas with all five of these characteristics are assigned a high potential; geochemically anomalous areas with two of the other characteristics are assigned a moderate potential; and areas with only one of these characteristics are assigned a low or a very low potential, depending on the significance of the characteristic. Locations of mines and prospects and areas with potential resources are shown on figure 2.

The Mineral King roof-pendant area (A) is assigned a high potential for deposits containing lead, zinc, silver, bismuth, or tungsten; it has known mineral deposits, favorable host rocks, and zones of surface alteration, is strongly geochemically anomalous, and is characterized by a pronounced low in the aeromagnetic data. The Maggie Mountain (B) and eastern range-front (C) areas also contain known deposits and favorable host rocks, but are not so geochemically anomalous; they are assigned a moderate potential for additional deposits containing tungsten, lead, silver, or zinc. The White Mountain area (D) is altered and both geochemically and aeromagnetically anomalous, but lacks known mineral deposits; its potential for mineral deposits containing silver, lead, or tungsten is moderate. The Cold Creek area (E) has a low potential for small gold/silver deposits, on the basis of high concentrations of gold and silver in a single sample of heavy-mineral concentrate from the area. Eight abandoned prospects are located southeast of Templeton Mountain (area F); this area has a very low potential for mineral deposits. The Little Kern Lake Creek (G) and Right Stringer (H) areas are geochemically anomalous, but other indicators of mineralization were not noted; these areas have a very low potential for mineral deposits. Metasedimentary and metavolcanic rocks crop out in the Kern Peak-Indian Head area (I); solely of the basis of the presence of these favorable host rocks, this area has a very low potential for mineral deposits.

One mineral property in the Golden Trout Wilderness has a high potential for tungsten deposits. The currently producing Pine Tree mine on the Little Kern River has an estimated 120,000 tons each of indicated and inferred reserves, averaging 0.77 percent WO_3, sufficient to maintain the 2-ton-per-day operation for more than 200 years. At least 36 other properties have no apparent mineral potential.

The youth of the volcanic rocks and the presence of several hot springs in the wilderness suggest that geothermal resources may exist. The extent of these resources, if any, is unknown. There is no known potential for coal, oil, or gas.

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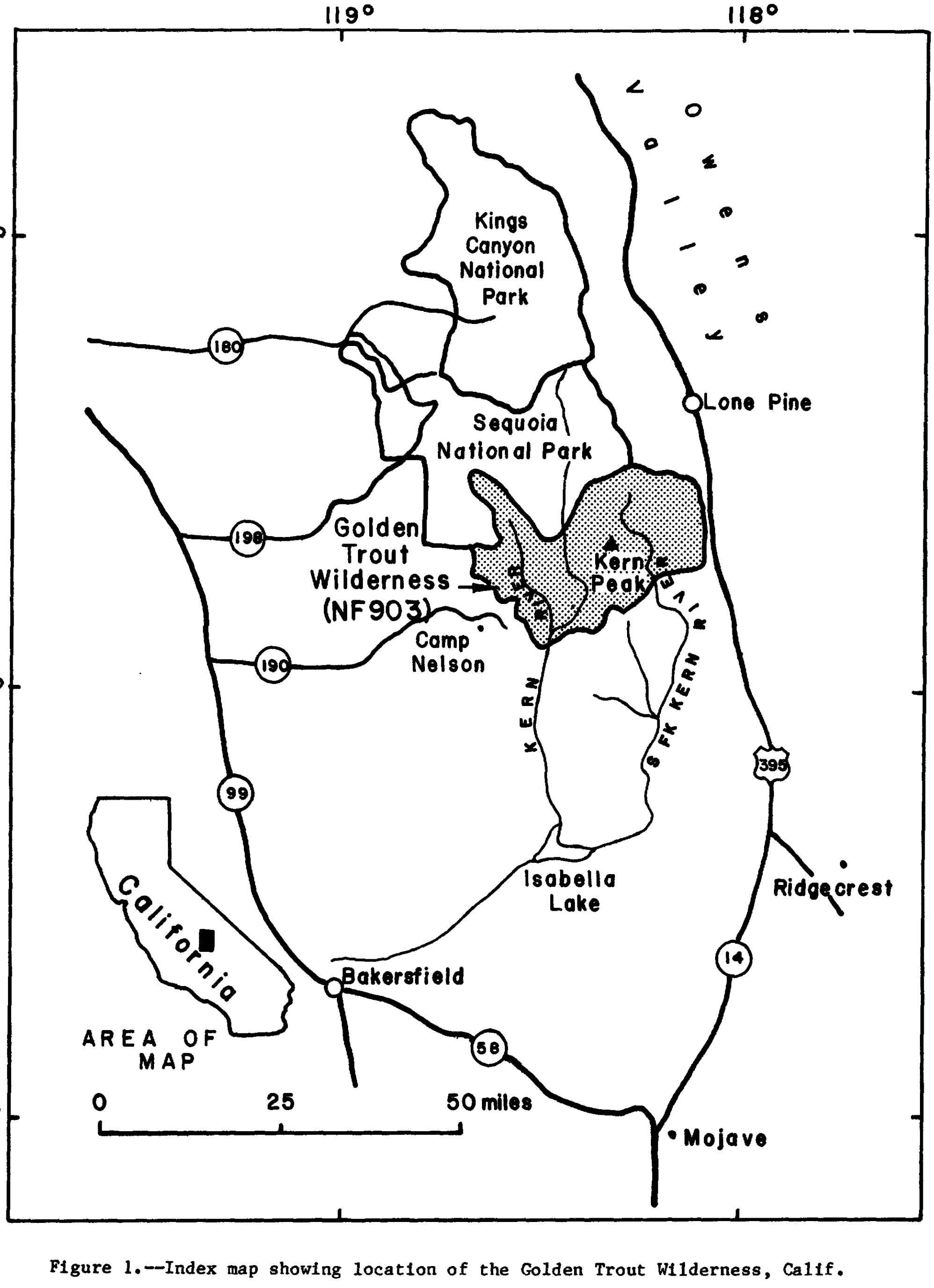

Figure 1.--Index map showing location of the Golden Trout Wilderness, Calif.

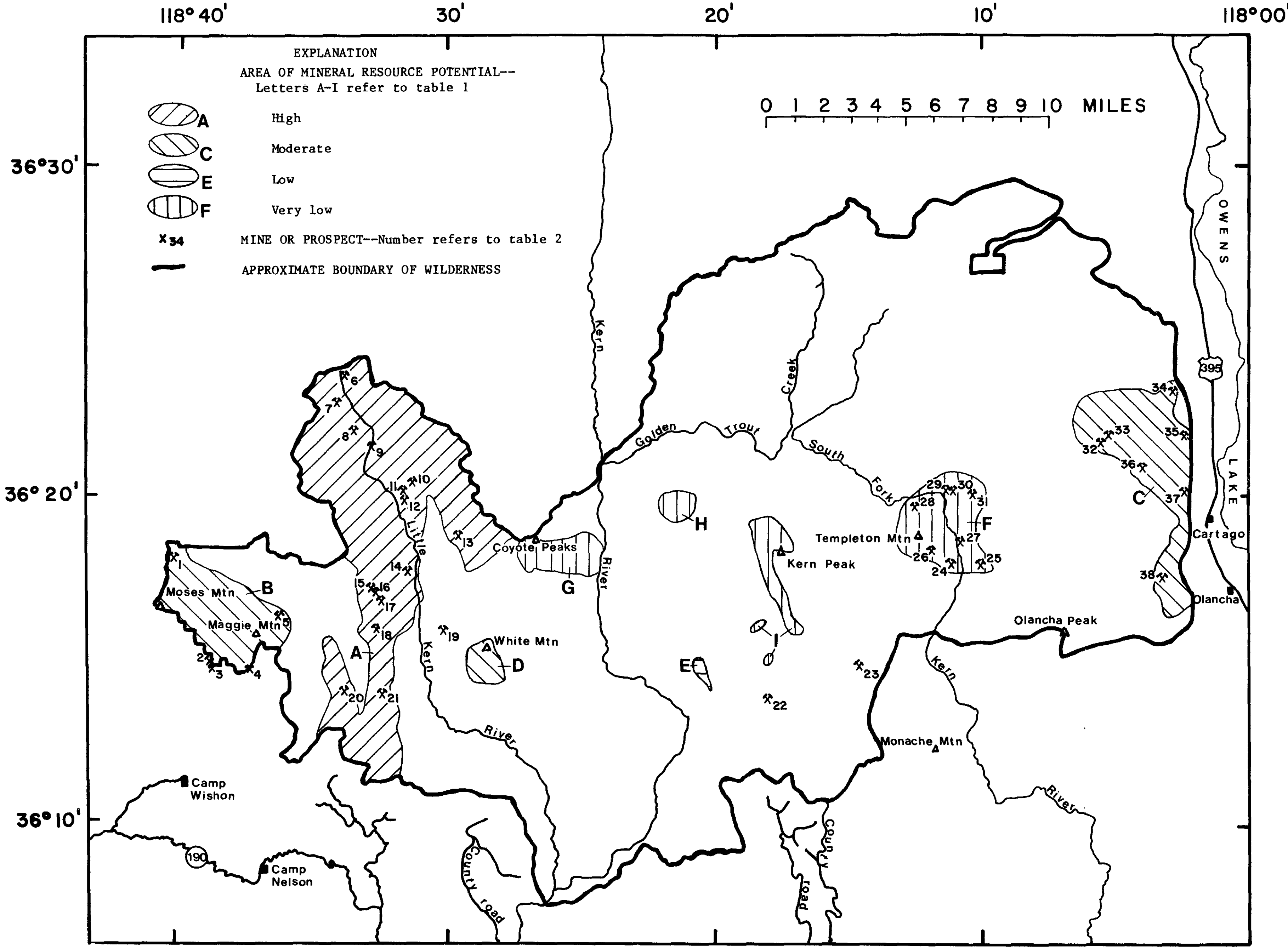

Figure 2.--Areas with potential mineral resources, and locations of mines and prospects in the Golden Trout Wilderness, Calif.

Area	Potential resources	Deposit type	High metallic values in stream-sediment samples	High metallic values in nonmagnetic heavy-mineral-concentrate samples	Favorable host rocks (metasedimentary or metavolcanic rocks)	Known mines or prospects	Aeromagnetic anomaly	Surface alteration	Potential for small deposits
A	W, Pb, Ag Zn, Cu	Contact metasomatic, vein, disseminated	X	X	X	X	X	X	High
B	W, Pb, Ag, Zn	Contact metasomatic, vein, disseminated	X		X	X			Moderate
C	Au, Ag, Cu W	Contact metasomatic, vein	X	X	X	X			Moderate
D	Ag, Pb, W	vein	X	X			X	X	Moderate
E	Au, Ag[1]	vein, disseminated		X					Low
F	Mn	vein, breccia				X			Very low
G	2/		X	X					Very low
H	3/		X	X	4/				Very low
I	5/				X				Very low

[1]One sample of nonmagnetic heavy-mineral concentrate contained 500 ppm gold and 70 ppm silver.

[2]One sample of nonmagnetic heavy-mineral concentrate contained 1,000 ppm copper, 3,000 ppm lead, 150 ppm tin, 100 ppm tungsten, and detectable antimony and gold; four other samples contained 100 to 300 ppm tin, and seven samples had detectable gold, silver, or tungsten.

[3]Three samples of nonmagnetic heavy-mineral concentrate contained 200 to 300 ppm zinc; four stream-sediment samples from the same area contained 15 to 20 percent iron and 700 to 1,000 ppm vanadium.

[4]Small unmapped bodies of metamorphic rocks and mafic dikes that occur in this area may be responsible for the observed geochemical anomaly.

[5]Doubtful resource potential based solely on the presence of metamorphic rocks.

Table 1.—Favorable mineral resource areas: Resources, deposit types, and selection criteria

Table 2.--Mines and prospects in the Golden Trout Wilderness

Map No.	Name	Workings	Resource data
1	Aurom Ltd	Two shafts, 4 pits	Two shear zones in quartzite and argillite. No anomalous concentrations.
2	Prospect	One pit	Disseminated pyrite in argillite. No anomalous concentrations.
3	Galena Cave	One shaft, 2 pits	Pyrite and sphalerite in thin fractures in limestone.
4	Jack Danials	None	Tactite at marble-granite contact. Minor scheelite.
5	Four Friends	None	Metasedimentary rocks. No anomalous concentrations.
6	Meadow mine	One shaft	Disseminated sulfides in fractured argillite. Minor gold, silver, lead, and zinc.
7	Prospect	One adit, 1 pit	Shear zone in limestone. Minor lead and zinc.
8	Prospect	One adit	Highly fractured quartzite. No anomalous concentrations.
9	Prospect	One adit, 1 shaft	Quartz lens. 0.05 percent lead.
10	Sommers	Four pits	Disseminated pyrite and arsenopyrite in limestone. Trace of gold.
11	Prospect	One shaft	Shear zone in limestone. Trace of silver.
12	Robuck	One shaft, 1 trench, 1 pit	Shear zones in argillite. No anomalous concentrations.
13	Tamarack		Tactite locally in marble. Trace of gold.
14	Pine Tree mine	Several pits	Scheelite in tactite. Reserves totaling 240,000 tons containing 0.77 percent tungsten trioxide (WO_3).
15	Prospect	Two pits	Breccia zone in quartzite. No anomalous concentrations.
16	Prospect	One pit	Small quartz vein. No anomalous concentrations.
17	Prospect	One adit	Shear zone in quartzite. Trace of gold.
18	Prospect	Four pits	Disseminated pyrite and arsenopyrite in metasedimentary rocks. Trace of gold.
19	Lyon Meadows	Two pits	Travertine aroung spring. 0.006 percent U_3O_8.

Table 2.--Mines and prospects in the Golden Trout Wilderness--continued

Map No.	Name	Workings	Resource data
20	73-74	Two trenches, 3 pits	Argillite. No anomalous concentrations.
21	Lucky Seven	Three adits, 3 trenches	Tactite lenses. Trace of tungsten.
22	Jordan Hot Springs	Bathhouses	Indicated reservoir temperature, 160°C.
23	2 MH No. A-E	None	Diorite dike. No anomalous concentrations.
24	Rose Quartz	One pit	Quartz vein. No anomalous concentrations.
25	Crystal 1, 2	Two pits	Manganese oxide in breccia. As much as 3.0 percent manganese
26	Mickey 1, 2	Three pits	Quartz veinlets. No anomalous concentrations.
27	Crystal Rock	One pit	Manganese oxide in breccia. As much as 11.6 percent manganese.
28	Snowball 1-6	None	Altered granite. No anomalous concentrations.
29	Howard	One pit	Iron oxides along fracture in granite. No anomalous concentrations.
30	Dynamite 1, 2	One pit	Manganese oxide in breccia.
31	Consolidated 1, 2	Three pits	Manganese oxide in breccia. As much as 1.1 percent manganese.
32	Verde Grande	Seven pits	Malachite along joints in granite. As much as 0.16 percent copper.
33	Hill Top	None	Quartz veinlets. As much as 3.6 troy oz silver/ton.
34	Prospect	Five pits	Limonite and malachite locally on granite. No anomalous concentrations.
35	Prospect	One adit	Quartz lens in one of several shears. Trace of gold and as much as 0.6 troy oz silver/ton.
36	Prospect	One adit	Two shear-zone sets cut hornfels. Traces of gold and silver.
37	Trapper group	Two adits, 5 pits	Quartz veins in metasedimentary rocks. No anomalous concentrations.
38	Prospect	Two adits, 2 pits	Quartz veinlets in metavolcanic rocks. As much as 0.3 troy oz gold/ton.