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MINERAL RESOURCES AND RESOURCE POTENTIAL OF THE EAST YUBA AND WEST YUBA ROADLESS AREAS, PLUMAS AND SIERRA COUNTIES, 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 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 to be submitted to the President and the Congress. This report discusses the results of a mineral survey of the East Yuba Roadless Area (5264), Tahoe National Forest, Sierra County, and the West Yuba Roadless Area (5172), Plumas and Tahoe National Forests, Plumas and Sierra Counties, California. These 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

The East Yuba and West Yuba Roadless Areas are nearly contiguous and comprise 38,500 acres in the Mother Lode gold country in the northern Sierra Nevada, Calif. Both roadless areas have identified gold resources and a low to high potential for additional placer gold and lode gold and silver resources. There is a low to moderate potential for chromite resources in both roadless areas.

East Yuba Roadless Area

Both lode and placer gold mines and prospects are present in and adjacent to the East Yuba Roadless Area. Placer gold deposits include Quaternary bench gravels and longitudinal bars in active stream channels. Identified subeconomic gold resources in bench gravel at a gold price of $400 per troy oz are present at the Whipoorwill, Rebate, and Upper Lavezzola Creek prospects and the Dragonfly and Jay Bird mines. Active stream-channel placers include the Pot Luck I and II and the Little Bear mines, both of which have produced placer gold and were being mined at the time of this study. The Upper Pauley Creek prospect includes both bench and active stream deposits; no resources were identified, and development of the bench deposits is unlikely. Approximately 500,000 yd^3 of active stream deposits that locally contain some gold occur along Lavezzola and Pauley Creeks. The major drainages have sporadic occurrences of placer gold that are prospected on a seasonal basis.

Lode mines and prospects consist of quartz stockworks, quartz fissure veins, and an iron (magnetite) skarn. Quartz stockworks containing gold include the Sisson and Big Boulder mines. Quartz fissure vein deposits in the roadless area include the Empire and Willoughby mines and the Gold King prospect, and adjacent to the study area they include the Four Hills, Lone Star, and Garibaldi mines. All identified gold resources are subeconomic at a gold price of $400 per troy oz. However, the Empire and Sisson mines contain values that indicate further exploration is warranted.

The Sierra Iron mine consists of scattered skarn-type occurrences of podiform magnetite that are unlikely to be mineable in the foreseeable future.

There is a low potential for placer gold in Tertiary channel gravel at the north end of the roadless area.

Geochemical sampling revealed a low to moderate potential for small vein-type deposits of base and precious metals in three drainage basins in the northern, central, and southern parts of the roadless area.

There is a low to moderate potential for chromite and gold resources in ultramafic rocks in the southern and western parts of the roadless area.

There is no indication of a potential for coal, oil and gas, or geothermal resources.

West Yuba Roadless Area

Placers in and adjacent to the West Yuba Roadless Area consist of segments of gold-bearing Tertiary channel deposits and Quaternary bench gravels. In the study area, identified, subeconomic gold resources exist at the Sol Wood and One Day At A Time/Easy Does It mines, and gold resources are inferred at the New California, Tennessee, Gibraltar, Deadwood Diggings, Golden Scepter, Bunker Hill, Herkimer, and Telegraph mines and the Golden King prospect. On the basis of results of sample analyses and history of past production, further examination of sites without identified resources is warranted. The Excelsior-Monte Cristo, Craycroft-Wideawake, and Craycroft Diggings mines, adjacent to the study area, also contain identified subeconomic Tertiary placer gold resources. Identified gold resources in Quarternary bench deposits are present at the Clark Canyon and Deep Moon mines; the latter was being mined in 1982. Gold resources at the two properties are subeconomic and marginally economic, respectively, at a gold price of $400 per troy oz. Subeconomic resources are present in Quaternary bench gravel at the D-B-K prospect and the

Buckshot, Progressive, and Crescent mines.

Sample analyses and (or) histories of past production indicate that further work on gold-bearing veins at the Poker Flat and Telegraph mines and the Mammoth No. 1 and Sebastapol prospects is warranted. Disseminated, podiform chromite has also been reported at the Sebastapol prospect.

There is a low potential for placer gold in Tertiary gravel beneath the extensive, locally thick sequences of volcanic rocks that cover a large part of the West Yuba Roadless Area. The major drainages contain sporadic occurrences of placer gold that are prospected on a seasonal basis.

Geochemical sampling of the West Yuba Roadless Area indicates three drainage basins having a low to moderate potential for small deposits of vein-hosted gold, silver, and associated base metals.

A low to moderate potential exists for gold resources in fissure-filling quartz veins and for chromite in serpentinite in the Melones fault zone. Approximately 1,000 tons of chromite was produced during World Wars I and II from three mines within 2 mi of the roadless area.

There is no indication of a potential for coal, oil and gas, or geothermal resources in the roadless area.

INTRODUCTION

Location, size, and geographic setting

The East Yuba Roadless Area encompasses 17,600 acres in the Tahoe National Forest, Sierra County, Calif. (fig. 1). The West Yuba Roadless Area encompasses 14,900 acres in the Tahoe National Forest, Sierra County, and 6,000 acres in the Plumas National Forest, Plumas and Sierra Counties (fig. 1). The roadless areas are on the west side of the crest of the Sierra Nevada, a few miles north of the North Fork of the Yuba River. California Highway 49 parallels the river between Downieville, located about 2 mi south of the southern boundaries of the roadless areas, and Sierra City, located about 5 mi southeast of the East Yuba Roadless Area. Access to the roadless areas is provided from all sides by graded roads and jeep trails. An unpaved road north from Downieville also provides access to the corridor between the two areas. The site of Poker Flat, the gold rush town made famous by Bret Harte's book The Outcasts of Poker Flat, is on Canyon Creek at the northwest edge of the West Yuba Roadless Area.

Elevations in the roadless areas range from about 3,200 ft at Pauley Creek to 7,343 ft at Gibraltar Mountain. The topography of the areas is generally rugged. Lower areas are typically cut by steep ravines and canyons; cascades and small waterfalls are common. Several small lakes are in the higher parts of the eastern half of the East Yuba Roadless Area. Higher elevations are usually covered by open forests of fir and pine, and lower elevations have hardwood trees, manzanita, oak, and other plants of the chapparal.

Previous studies

Numerous publications describe the geology, mining history, and mineral deposits in and near the roadless areas. The general geology of the region is described by Turner (1897), Burnett and Jennings (1962), and Standlee (1978). Hietanen (1981) mapped and described areas west of the Melones fault. Reports on some mining properties in the area include Preston (1893), Crawford (1894), MacBoyle (1920a, b), and Logan (1929). Tertiary gravels in the region were described by Whitney (1880), Lindgren (1911), Haley (1923), Merwin (1968), and Yeend (1974). Durrell and Proctor (1948) studied the magnetite occurrences between Spencer Lakes and Hawley Lake.

Present studies

To evaluate the mineral resource potential of the East Yuba (5264) and West Yuba (5172) Roadless Areas, the U.S. Geological Survey conducted geologic mapping (J. R. Bergquist, unpub. data, 1981), geochemical surveys (Page and Bergquist, 1982), and geophysical studies (Andrew Griscom, unpub. data, 1981). The U.S. Bureau of Mines surveyed, sampled, and evaluated known mines, prospects, and mineralized zones in 1981 and 1982 (White and others, 1983). U.S. Forest Service records and mining claim records for Plumas and Sierra Counties were searched by U.S. Bureau of Mines personnel for information on mining claims within the roadless areas. Mining companies and claim owners provided production figures, assay data, and unpublished mine maps of some of the properties.

This report presents the appraisal of the identified mineral resources and the assessment of the mineral resource potential as determined from field studies and laboratory analyses of samples. Areas that were determined to have mineral resource potential are shown on figure 2 and the accompanying map.

GEOLOGY

The East Yuba and West Yuba Roadless Areas are in the northern part of the metamorphic belt of the western Sierra Nevada. Bedrock in the roadless areas is mostly Paleozoic metasedimentary and metavolcanic rocks that are locally overlain by Tertiary fluvial gravel and volcanic rocks. The north-trending Melones thrust-fault zone is in the western part of the West Yuba Roadless Area and separates the Pennsylvanian Calaveras Formation on the west from the Ordovician(?) to Devonian(?) Shoo Fly Complex on the east. The Melones fault zone is interpreted by Hietanen (1981) as a late Paleozoic and early Mesozoic subduction zone that now separates oceanic rocks on the west from continental rocks on the east.

The fault zone is bounded on the west by the Goodyears Creek fault and on the east by the Melones fault. The fault zone varies in width from about 2,500 ft near Poker Flat to about 6,500 ft in the southern part of the West Yuba Roadless Area. Ultramafic rocks within the fault zone locally host layered, podiform, and disseminated chromite deposits. Lode gold occurs in fissure-filling quartz veins associated with serpentinite wallrocks in the fault zone. Examples of these gold occurrences in and near the West Yuba Roadless Area include the Sebastapol prospect and the Poker Flat and Telegraph mines (table 1, fig. 2, nos. 2, 8, 14).

In and near the West Yuba Roadless Area, the Calaveras Formation includes interbedded metachert and muscovite-chlorite phyllite with discontinuous layers and lenses of metavolcanic rocks (Hietanen, 1981). Other rock units mapped by Hietanen (1981) west of the Melones fault include amphibolite, amphibole, and hornblende gneiss, metagabbro, serpentinite, schist, and quartzite.

The Shoo Fly Formation was renamed the Shoo Fly Complex by Harwood (1983). The Shoo Fly Complex consists of three major lithotectonic units (d'Allura and others, 1977; Schweickert, 1974). Schweickert (1981) informally divided the Shoo Fly into the "lower", "middle", and "upper" lithotectonic units. Only the lower two units of the Shoo Fly occur in this region. The lower unit of the Shoo Fly, which is immediately east of the Melones fault, consists of interbedded quartzite, lithic sandstone, and muscovite phyllite, with local chert and black pelitic limestone. These rocks have well-developed foliation and slaty cleavage. The contact between the lower and middle units of the Shoo Fly is a steeply dipping, north-northwest-trending fault east of Lavezzola Creek in the East Yuba Roadless Area.

The middle unit of the Shoo Fly is a tectonic melange that includes blocks of limestone, greenstone, sheared chaotic conglomeratic sandstone, gabbro, chert, and elongate lenses of serpentinite that typically parallel the contact with the lower unit of the Shoo Fly. Mafic intrusive rocks occur within the middle unit of the Shoo Fly near Spencer Lakes, and a small trondhjemite stock is near the Four Hills mine. The middle unit of the Shoo Fly in the eastern part of the East Yuba Roadless Area includes elongate pods of serpentinite and associated ultramafic rocks.

Unconformably overlying the middle unit of the Shoo Fly is the Devonian Sierra Buttes Formation, a metamorphosed sequence of silicic pyroclastic rocks that includes lenses of fine-grained clastic rocks and black and white banded chert.

Two sets of gold-bearing en echelon fissure-filling

quartz veins intrude the middle unit of the Shoo Fly and the Sierra Buttes Formation along a north-northwest-trending belt. This belt includes the central and eastern parts of the East Yuba Roadless Area and extends from the Sierra City mining district to the Johnsville mining district, which is located a few miles north of the Four Hills mine. Seven gold-producing lode mines within the belt of gold-quartz veins are inside or adjacent to the East Yuba Roadless Area.

Locally overlying the Paleozoic units are remnants of Eocene (Tertiary) gold-bearing fluvial channel and flood-plain deposits that are mostly covered by volcanic rocks. Channel segments are as much as 4,500 ft long, 1,500 ft wide, and 160 ft thick. Twelve gold-producing placer mines in and adjacent to the West Yuba Roadless Area were developed in segments of Tertiary channel gravel.

Gold, in part reworked from Tertiary gravel, occurs sporadically in creeks and rivers in and near the roadless areas.

Thick sequences of Tertiary pyroclastic rocks that are mostly andesitic lahars overlie the Eocene gravel and large areas of the Paleozoic units. The youngest volcanic rocks are isolated basalt plugs and platy-weathering andesite flows.

The youngest unconsolidated units in the area are unmapped, scattered patches of Pleistocene glacial drift, small areas of lacustrine deposits, and alluvium in stream drainages.

GEOCHEMICAL STUDIES

A geochemical survey of the East Yuba and West Yuba Roadless Areas was done in 1980 and 1981. Eighty-one stream-sediment samples, 90 panned-concentrate samples, and 144 rock samples were collected for semiquantitative emission spectrographic analysis. In addition, samples of serpentinite and associated chromiferous rock were analyzed for gold and platinum-group metals using atomic-absorption and fire-assay methods. The analytical data are reported in Page and Bergquist (1982), and a map showing sample locations and magnitudes of geochemical anomalies was prepared by Page-Nedell and Bergquist (1985).

The sampling distribution was designed to include all major lithologies and most secondary stream drainages in the study area. Analysis of unaltered rock samples established background levels of elements that were analyzed in samples of stream-sediment and panned concentrate. Stream-sediment samples were taken from the margins of active stream beds where quiet-water deposition occurred when water levels were high. Stream panned-concentrate samples were taken as close to bedrock as possible. Organic material and light minerals were panned away, leaving for analysis heavy minerals comprising 5 percent or less of the original sample volume. Analysis of nonmagnetic heavy minerals in the panned concentrate typically yields geochemical information not yielded by analyses of stream sediment.

The elements silver, arsenic, gold, barium, bismuth, copper, iron, manganese, molybdenum, lead, antimony, tungsten, and zinc were chosen for statistical analysis because they are often associated with mineralization. Mineralized quartz veins occur in several places in the East Yuba Roadless Area, and some of these have been mined for gold and silver. Samples of vein rock in the East Yuba Roadless Area contained galena, chalcopyrite, pyrite, and free gold. Pyritization is pervasive throughout the study area and is probably related to extensive Mesozoic hydrothermal activity.

Areas with anomalous amounts of one or more metallic elements include:

Lavezzola Creek anomaly (fig. 2, area A). At the north end of the East Yuba Roadless Area, a small drainage underlain by the lower unit of the Shoo Fly contains anomalous silver, copper, and manganese in the stream-sediment sample. This suite of elements is related to hydrothermal precious-metal vein-type mineralization.

Hog Canyon anomaly (fig. 2, area B). The stream-sediment and panned-concentrate samples are from a site in Hog Canyon in the southeast corner of the East Yuba Roadless Area. Anomalous concentrations of silver, gold, lead, and antimony were found in the panned concentrate and silver, copper, lead, and manganese in the stream sediment. Although the sampling site is within the roadless area, most of the drainage basin is outside the study area. These suites of elements are related to hydrothermal precious-metal vein-type mineralization.

Pauley Creek anomaly (fig. 2, area C). In the East Yuba Roadless Area, panned concentrate from a stream that flows westward past the Willoughby mine into Pauley Creek contains anomalous silver, copper, and lead. This suite is related to hydrothermal precious-metal vein deposits. Mineralization at the Willoughby mine may have contributed to the anomaly. The bedrock in this area is the middle unit of the Shoo Fly that locally is cut by gold-quartz veins.

Hog Gulch anomaly (fig. 2, area D). Panned concentrate from a drainage basin east of Mount Fillmore in the West Yuba Roadless Area has anomalous silver, arsenic, gold, and lead. The area is underlain by both the lower unit of the Shoo Fly and patches of Pliocene andesitic lahars. The suite of anomalous elements indicates hydrothermal precious-metal vein-type mineralization.

Poker Flat anomaly (fig. 2, area E). The area sampled is in the northern part of the West Yuba Roadless Area and includes eight small drainage basins. This area yielded the highest anomalous values for silver, arsenic, gold, barium, copper, iron, and lead in panned concentrate. The suite of anomalous elements is associated with hydrothermal precious-metal vein-type mineralization. The Poker Flat lode gold mine and small areas of gold-bearing bench gravel are within the area sampled.

Saddleback Mountain anomaly (fig. 2, area F). Anomalous silver, copper, and tungsten occur in panned concentrate from a drainage at the headwaters of the Downie River in the West Yuba Roadless Area, east of Saddleback Mountain. The suite of anomalous elements is indicative of hydrothermal precious-metal vein-type mineralization.

GEOPHYSICAL STUDIES

Aeromagnetic and gravity maps were prepared as a geophysical contribution to the assessment of the mineral resource potential of the East Yuba and West Yuba Roadless Areas. The data were analyzed and interpreted by Andrew Griscom (unpub. data, 1981).

Magnetic anomalies and patterns shown on the aeromagnetic map are caused by variations in the amount of magnetic minerals, commonly magnetite, in the rock units and are therefore closely related to geologic features. Most of the magnetic anomalies and irregularities in magnetic patterns in the roadless areas occur over ultramafic and Tertiary volcanic rocks (Andrew Griscom, unpub. data, 1981). The magnetic expression of the metasedimentary and metavolcanic rocks is generally one of very low amplitude anomalies and relatively smooth magnetic field. Magnetic anomalies associated with the ultramafic rocks indicate that a continuous belt of these rocks extends beneath the younger volcanic rocks in the West Yuba Roadless Area. The magnetic data correlate with the geologic map and indicate the presence of ultramafic rocks concealed beneath the volcanic rocks in the Melones fault zone in the West Yuba Roadless Area. The ultramafic rocks are permissible hosts for deposits of chromite and lode gold.

About eighteen small magnetite occurrences are included in the Sierra Iron "mine" (table 1, no. 34) near the north end of the East Yuba Roadless Area between Spencer and Hawley Lakes. These occurrences are associated with an anomaly of 200 gammas on the aeromagnetic map (Andrew Griscom, unpub. data, 1981). The low amplitude of this anomaly indicates that magnetite occurrences in this area are relatively small and provide no evidence of a potential for undiscovered iron resources.

The anomalies and patterns on the gravity map are caused by variations in density between rock units and are also closely related to geologic features. The regional gravity map (Oliver and others, 1982) indicates a substantial gravity high of about 35 mGal that is associated with the more dense amphibolite and hornblende gneiss in the northern part of the West Yuba Roadless Area. A gravity gradient generally associated with the Melones fault indicates that

higher density layered rocks are found west of the fault zone, which contains ultramafic rocks. This observation supports the interpretation by Hietanen (1981) that the Melones fault separates oceanic rocks on the west from continental rocks on the east. The gravity map is otherwise relatively featureless and provides no evidence for additional mineral resources.

MINING HISTORY AND MINING DISTRICTS

The East and West Yuba Roadless Areas are in the northern part of the Mother Lode gold region of California. Placer gold mining began in the streams and rivers in the area of Downieville and Sierra City soon after the discovery of gold at Sutter's Mill in 1848. Numerous placer gold and lode gold mines and prospects are located within and near the roadless areas. Evidence of early large-scale placer mining can still be seen in the form of bedrock sluices and large piles of boulder tailings along stream banks in the West Yuba Roadless Area. Placer gold also was mined from Tertiary river gravels that are now perched above the present stream drainages. Mining of Tertiary channel gravel produced more placer gold than mining along the active drainages. The Tertiary gravel was first mined by drift methods, but subsequently was worked by less expensive hydraulic methods between 1853 and 1884. Hydraulic mining was curtailed by the Sawyer decision of 1884 that restricted dumping of mine tailings into active waterways. Lode mining of gold began about 1850 and accounts for most of the gold production in the region.

The Sierra City mining district extends from Sierra City north-northwest to Plumas County and includes lode gold mines and a few placer properties in Sierra County. The Sisson, Four Hills, Willoughby, and Empire mines (fig. 2, nos. 31, 33, 36, 38) in the East Yuba Roadless Area are in this district. The district was most productive from 1870 to 1914 with additional mining in the 1920's and 1930's; total estimated gold production was at least $30 million, using values at times of production[1] (Clark, 1970, p. 117). An estimated $2 million in gold was produced from the Four Hills mine on the northeast edge of the East Yuba Roadless Area (Clark, 1970, p. 117). About $150 million in gold was produced in Sierra County between 1848 and 1965 (Clark, 1970, p. 9).

The Downieville mining district, centered around the town of Downieville, includes the mines in the southern part of the West Yuba Roadless Area and a few placer gold mines in the East Yuba Roadless Area. The placer mines in the district are in present stream drainages and in gold-bearing Tertiary gravel. A few lode mines in gold-quartz veins are also located in the Downieville mining district.

The Poker Flat mining district includes the northern part of the West Yuba Roadless Area and is centered around the gold rush town of Poker Flat on Canyon Creek. Most of the mines in this district are for placer gold, although there are a few lode gold mines. The area was first mined for placer gold in the gold rush of 1849. Hydraulic gold mining dominated from the late 1850's until 1884 and lode mining continued into the early 1900s (Clark, 1970, p. 109).

At the time of field investigations, there was prospecting for placer gold in most of the active streams in the roadless areas. Tertiary gravel was mined for gold in 1982 in the Howland Flat and Potosi mining districts a few miles north of the West Yuba Roadless Area. Active placer mines include the Telegraph (fig. 2, no. 14) and the White Bear and Cowell just outside the West Yuba Roadless Area. In 1982 exploration was done at the Four Hills and Primrose lode-gold mines near the East Yuba Roadless Area. In 1981 there was active mining at the Empire lode gold mine in the East Yuba Roadless Area.

The White Bear, Golconda, and Oxford mines, within 2 mi of the southern part of the West Yuba Roadless Area, produced about 1,000 tons of chromite ore from ultramafic rocks during World Wars I and II (Rynearson, 1953, p. 250). The Oxford mine and mill (fig. 2) accounted for most of the production.

MINES, PROSPECTS, AND MINERAL RESOURCES

Forty mines and prospects were examined during the study, 23 of them in the West Yuba Roadless Area and 17 in the East Yuba Roadless Area (fig. 2). Of the 23 properties in the West Yuba Roadless Area, 18 are placers, four are lodes, and one property is both lode and placer; eight placer and nine lode locations are in the East Yuba Roadless Area. Summary descriptions, including analytical and production data, are shown on table 1; the property numbers correspond with those shown on figure 2.

A total of 622 bulk and pan placer samples were collected from the two roadless areas. These samples were sluiced or panned in the field and further concentrated on a laboratory-size Wilfley table. Gold content was determined by weighing both hand-picked particles of gold and amalgamated gold from the sample. A total of 339 lode samples were taken from mines, prospects, and mineralized areas. The samples were analyzed by atomic-absorption, chemical, and fire-assay methods. At least one sample from every lode prospect and mine was analyzed for 42 elements by semiquantitative spectrographic methods to determine the presence and concentrations of: aluminum, antimony, arsenic, barium, beryllium, bismuth, boron, cadmium, calcium, chromium, cobalt, columbium, copper, gallium, gold, hafnium, indium, iron, lanthanum, lead, lithium, magnesium, manganese, molybdenum, nickel, phosphorus, platinum, rhenium, scandium, silicon, silver, sodium, strontium, tantalum, tellurium, thallium, tin, titantium, vanadium, yttrium, zinc, and zirconium.

Capital and operating costs for mining of small-scale, surficial placer deposits are estimated at about $4.00 per yd^3 (1982 costs); underground mining of placer deposits would be significantly higher as would the cost to strip a large amount of overburden from those deposits in which the gold is concentrated near the bottom of the channel. The minimum capital and operating costs for vein-type lode deposits, including mining and milling, are estimated at $50 per ton. Average values per yd^3 (placer) or ton (lode) were compared with these costs to estimate mining feasibility. Resources are considered economic (reserves) only when the value per unit weight or volume is greater than the estimated per unit capital and operating cost. Because both the price of commodities and capital and operating costs are not static, periodic feasibility studies are required to update the economic status of a given deposit as needed. Because no two mines are exactly alike, feasibility studies are needed for each property that approaches economic status.

East Yuba Roadless Area

Approximately 800 claims were located in the East Yuba Roadless Area, between 1858 and 1980; about 200 active placer and lode claims were recorded with the U.S. Bureau of Land Management in 1982. Lode properties active in 1982 were the Sisson, Big Boulder, Four Hills, and Empire (fig. 2, nos. 31, 32, 33, and 38). The patented Lone Star and Empire properties (fig. 2., nos. 37 and 38) encompass approximately 74 acres in and adjacent to the East Yuba Roadless Area.

Total production from the Sisson, Willoughby, Lone Star, Empire, and Four Hills lode mines (fig. 2, nos. 31, 33, 36, 37, and 38) is approximately 22,500 oz of gold and 13,500 oz of silver.

These and other vein-type deposits are typically massive white quartz ranging from a few feet to about 2,400 ft along strike and from 0.5 to 20 ft thick. Gold in the veins

[1] Gold valued at $20.67 per ounce until 1933 and $35 per ounce from 1933 to 1965.

occurs as disseminated free gold and is associated with disseminated pyrite. Distribution of gold in the quartz veins is typically sparse and erratic and is reported to be in shoots (MacBoyle, 1920a, p. 137; 1920b, p. 87).

The Sisson and Big Boulder mines (fig. 2, nos. 31 and 32) are on irregular stockworks of quartz veinlets along a contact between an aplite dike and phyllite. The stockworks range from a few feet to 400 ft long and are as much as 20 ft thick. Gold is typically associated with pyrite and arsenopyrite at the Big Boulder mine, and with pyrite, chalcopyrite, and sphalerite at the Sisson mine.

The Sierra Iron "mine" (fig. 2, no. 34) consists of at least 18 contact metasomatic magnetite pods near intrusive contacts in the area between Spencer and Hawley Lakes in the northern part of the East Yuba Roadless Area. Pods range from about 1 x 4 ft to 180 x 200 ft and average 21 percent total iron content (Durrell and Proctor, 1948, p. 190-192).

About 80 acres of locally gold-bearing bench and skim bar gravel occur intermittently along Lavezzola, Sunnyside, Spencer, and Pauley Creeks. Properties including parts of these gravels are the Whipoorwill, Rebate, Upper Lavezzola Creek, Dragonfly, Jay Bird, and Upper Pauley Creek (fig. 2, nos. 24, 25, 26, 29, 30, and 40). The gravels are composed of about 30 percent volcanic rocks, 30 percent intrusive rocks, 30 percent metasedimentary rocks, and 10 percent quartz. Since 1905, an estimated 185 oz of placer gold was mined along Lavezzola Creek at the Pot Luck I and II, Little Bear, and Dragonfly properties (fig. 2, nos. 27, 28, and 29).

West Yuba Roadless Area

About 650 mining claims were located in the West Yuba Roadless Area between 1858 and 1980; more than 300 active placer and lode claims were recorded with the U.S. Bureau of Land Management in 1982. One claim of about 30 acres on the Herkimer property (fig. 2, no. 10) has been patented. Properties in the roadless area being prospected or mined in 1982 were the Clark Canyon, D-B-K, Buckshot, Sol Wood, Deep Moon, Progressive, Crescent, and One Day At A Time/Easy Does It (fig. 2, nos. 11, 12, 13, 15, 17, 18, 19, and 22).

U.S. Bureau of Mines records indicate that the Tennessee, Gibraltar, Deadwood Diggings, Golden Scepter, Bunker Hill, and Herkimer placers (fig. 2, nos. 3, 5, 6, 7, 9, and 10), yielded approximately 1,500 oz of gold from 1892 to 1946. The Telegraph, Excelsior-Monte Cristo, Craycroft-Wideawake, and Craycroft Diggings properties (fig. 2, nos. 14, 16, 21, and 23), adjacent to the roadless area, produced 15,200 oz of gold.

Placer gold occurs in segments of Tertiary channel gravel, in bench gravel, and in active drainage channels. Tertiary channel gravel is exposed at the New California, Deadwood Diggings, Sol Wood, Excelsior-Monte Cristo, Golden King, Craycroft-Wideawake, One Day At A Time/Easy Does It, and the Craycroft Diggings properties (fig. 2, nos. 1, 6, 15, 16, 20, 21, 22, and 23), and is present at the Tennessee, Gibraltar, Golden Scepter, Bunker Hill, Herkimer, and Telegraph properties (fig. 2, nos. 3, 5, 7, 9, 10, and 14). The last 6 properties could not be sampled because of caved and otherwise inaccessible workings; most of these properties consist of Tertiary gravel capped by andesite flows. Segments of channel gravel are as much as 160 ft thick, 1,460 ft wide, and 5,000 ft long and are composed of about 60 percent white quartz, 38 percent metasedimentary rocks, and 2 percent limonite and pyrite, with clasts ranging in size from sand to boulders. Surface exposures are commonly cream to red because of oxidation of iron sulfides; underground, the unoxidized gravel is white to blue. Limonite-cemented gravel layers range in thickness from less than an inch to about 3 ft and occur sporadically throughout the channels. Gold is concentrated primarily in the bottom part of the channels, along the line of maximum depth. The gold is typically subangular to rounded weighing from 0.1 mg to 100 mg, although much larger nuggets have been mined from the Tertiary channels in the vicinity.

Deposits of bench gravel are remnants of Holocene flood plains and occur above the level of active stream channels. The Clark Canyon, D-B-K, Buckshot, Deep Moon, Progressive, and Crescent properties (fig. 2, nos. 11, 12, 13, 17, 18, and 19) are on bench gravel. Gold occurs as rounded pieces typically weighing from 0.1 mg to 100 mg and is concentrated in the lowest parts of the deposits.

The Melones fault zone trends northerly through the western part of the West Yuba Roadless Area and separates ultramafic rocks (peridotite and serpentinite) on the west from metasedimentary rocks on the east. Ultramafic rocks within and west of the Melones fault zone host chromite deposits at the White Bear, Golconda, and Oxford mines (fig. 2). These mines produced about 1,000 tons of chromite ore during World Wars I and II (Rynearson, 1953, p. 250). The Oxford mine was the largest producer.

Gold and silver minerals occur in fissure-filled quartz veins commonly associated with serpentinite wallrocks along the Melones fault at the Poker Flat and Telegraph mines and at the Sebastapol prospect (fig. 2, nos. 2, 8, and 14). These mines have produced about 1,700 oz of gold. Quartz veins also occur locally in the Shoo Fly Complex east of the Melones fault. At the Mammoth No. 1 prospect (fig. 2, no. 4) a massive north-trending iron oxide-stained quartz vein locally contains gold.

ASSESSMENT OF MINERAL RESOURCES AND RESOURCE POTENTIAL

East Yuba Roadless Area

The East Yuba Roadless Area has identified lode gold and silver resources and includes areas having a low to high potential for undiscovered resources of gold and silver. There are scattered iron (low-tonnage magnetite) occurrences in the northern part of the roadless area, but there is no evidence of a potential for undiscovered iron resources. There is a low to moderate potential for small deposits of chromite in areas of ultramafic rocks.

Within the East Yuba Roadless Area, the Sisson, Willoughby, and Empire mines (fig. 2, nos. 31, 36, 38) contain 190,000 tons of indicated and inferred subeconomic lode gold and silver resources (table 2). Additional gold and silver resources are likely at these mines. The Four Hills mine (fig. 2, no. 33), adjacent to the roadless area, contains about 600,000 tons of gold- and silver-bearing quartz in veins and stockworks. Further exploration may reveal additional lode gold and silver resources. Gold and silver resources may exist at the Big Boulder, Lone Star, Garibaldi, and Gold King properties (fig. 2, nos. 32, 35, 37, 39) on the basis of mine examinations and sampling, proximity to mines with gold and silver resources in similar geologic settings, and location of the mines within a mineralized belt.

Two large areas having a low to moderate potential for lode gold and silver resources were delineated in the central and eastern parts of the East Yuba Roadless Area on the basis of geology and known mineral deposits (fig. 2).

The Whipoorwill prospect (fig. 2, no. 24), on upper Lavezzola Creek, contains about 65,000 yd^3 of indicated and inferred subeconomic placer gold resources averaging $0.85 (0.0021 oz) gold per yd^3 of gravel within the first 5 ft above bedrock. Although no other placer gold resources were identified in the East Yuba Roadless Area, more than 500,000 yd^3 of bench gravel containing placer gold occurrences were identified at the Rebate, Upper Lavezzola Creek, Potluck I and II, and Little Bear properties (fig. 2, nos. 25, 26, 27, 28). Development of these bench gravels is unlikely without either a significant increase in the price of gold above $400 per oz or identification of higher grade zones. Active channels of Lavezzola and Pauley Creeks contain occurrences of placer gold and are being prospected with suction dredges on a seasonal basis; however, gravel volumes are small. Significant gold occurrences are unlikely along most active stream drainages in the area.

There has been no mining of Tertiary channel gravel in the East Yuba Roadless Area, and geologic mapping revealed no indications of Tertiary gravel. However, the Tertiary channels are typically overlain by volcanic flows, and there is a low potential for placer gold in Tertiary channel gravel beneath volcanic rocks at the north end of the roadless area.

Geochemical studies indicate that three small drainage basins in the East Yuba Roadless Area have a low to moderate potential for resources of base and precious metals. The Lavezzola Creek anomaly (fig. 2, area A) suggests a low to moderate potential for gold, silver, and associated base metals in veins. The Hog Canyon anomaly (fig. 2, area B) indicates a low to moderate potential for base and precious metals in veins. Mines in the drainage basin may have contributed to this anomaly. The Pauley Creek anomaly (fig. 2, area C) indicates a low to moderate potential for base and precious metals in veins. The Willoughby lode gold mine may have contributed to this anomaly.

The Sierra Iron "mine" (table 1, fig. 2, no. 34) consists of about 18 podiform magnetite occurrences between Spencer Lakes and Hawley Lake at the north end of the East Yuba Roadless Area. The small tonnage of magnetite, the low grade, and the sporadic distribution of these occurrences will preclude development. Geophysical data provide no evidence of a potential for undiscovered iron resources.

There is a low to moderate potential for small deposits of podiform chromite and gold in veins in ultramafic rocks that occur in the western part of the East Yuba Roadless Area.

Sand and gravel occur along present stream drainages; however, other sources contain greater volumes of material and are more accessible and closer to existing markets.

There is no indication of potential for coal, oil and gas, or geothermal resources.

West Yuba Roadless Area

The West Yuba Roadless Area contains identified placer gold resources, and there is a low to high potential for additional placer gold resources. Geochemical data indicate three areas having a low to moderate potential for resources of base and precious metals. There is a low to moderate potential for gold and chromite resources in ultramafic rocks.

Tertiary channel deposits at the Sol Wood and One Day At A Time/Easy Does It mines (fig. 2, nos. 15, 22) total 76,000 yd^3 of indicated and inferred placer gold resources. These channels may extend outside the roadless area to the Craycroft-Wideawake mine and Craycroft Diggings (fig. 2, nos. 21, 23). The Craycroft Diggings contain about 200,000 yd^3 of inferred placer gold resources. Additional placer gold resources are likely in Tertiary gravel at the Sol Wood and Craycroft-Wideawake mines. The New California, Tennessee, Gilbraltar, Deadwood Diggings, Golden Scepter, Bunker Hill, Herkimer, and Telegraph mines and the Golden King prospect (fig. 2, nos. 1, 3, 5, 6, 7, 9, 10, 14, and 20) are also in segments of Tertiary channel gravel. Samples from hydraulic pits at some of these properties contained randomly distributed gold values. Placer gold resources of undetermined quantity and grade are inferred on the basis of both past production and other similar occurrences containing identified resources.

Approximately 3 million yd^3 of gravel is estimated to occur beneath volcanic cap rocks between the Excelsior and Monte Cristo properties. The gold-bearing Tertiary channels are mostly covered by younger volcanic flows. Areas beneath these flows have a low potential for placer gold in buried Tertiary channels. Exploration for buried channel deposits would be severely hampered by the thickness of volcanic overburden.

The Deep Moon mine (fig. 2, no. 17), which was being explored in 1982, contains 36,000 yd^3 of indicated marginal reserves in bench gravel deposits. The Clark Canyon, D-B-K, Buckshot, Progressive, and Crescent properties (fig. 2, nos. 11, 12, 13, 18, and 19) are deposits of bench gravel that have been extensively mined. Sampling indicates that remaining bench gravel contains only erratically distributed and generally subeconomic gold values.

Lode gold occurs in fissure-filling quartz veins associated with serpentinite wallrocks in the Melones fault zone. A low to moderate potential exists for gold resources in ultramafic rocks in the Melones fault zone.

The Poker Flat mine (fig. 2, no. 2) contains an estimated 500,000 tons of low-grade gold-bearing quartz in veins. Additional resources are inferred based on past production records and analyses of selected samples. Quartz veins at the Mammoth No. 1 and Sebastapol prospects (fig. 2, nos. 4, 8) are not as extensive as at the Poker Flat mine although gold resources may exist in unexplored parts of the fault zones.

Chromite was produced from ultramafic rocks in the Melones fault zone at the White Bear, Golconda, and Oxford mines, located south of the West Yuba Roadless Area. Aeromagnetic data indicate that the ultramafic rocks, which locally host small deposits of chromite outside the roadless area, extend beneath younger volcanic rocks in the western part of the West Yuba Roadless Area. A low to moderate potential for chromite resources in the West Yuba Roadless Area is indicated by the extension of the ultramafic rocks and the proximity of chromite in mineable quantities south of the roadless area. Exploration and mining would be severely hampered by the thickness of volcanic overburden.

Geochemical anomalies at Hog Gulch, Poker Flat, and Saddleback Mountain (fig. 2, areas D, E, F) indicate a low to moderate potential for base and precious metals in veins.

Sand and gravel occur in large volumes in Tertiary channel segments and in present drainages in the roadless area; however, other sources of these materials are more accessible and closer to existing markets.

There is no indication of a potential for coal, oil and gas, or geothermal resources.

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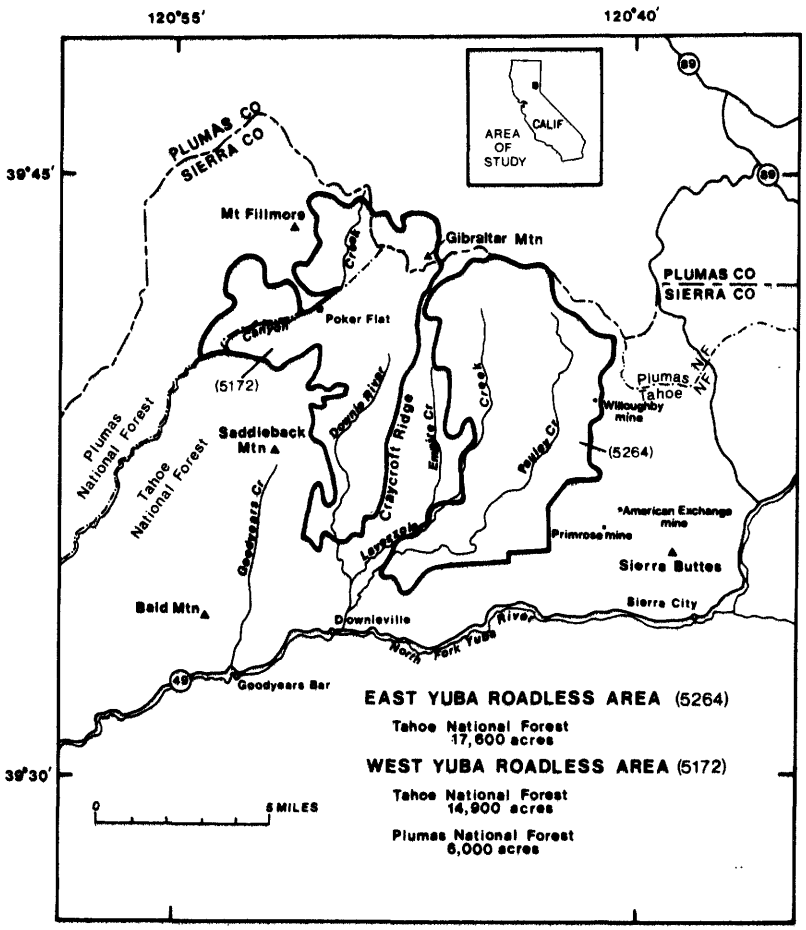

Figure 1. Index map showing location of East Yuba and West Yuba Roadless Areas, Plumas and Sierra Counties, Calif.

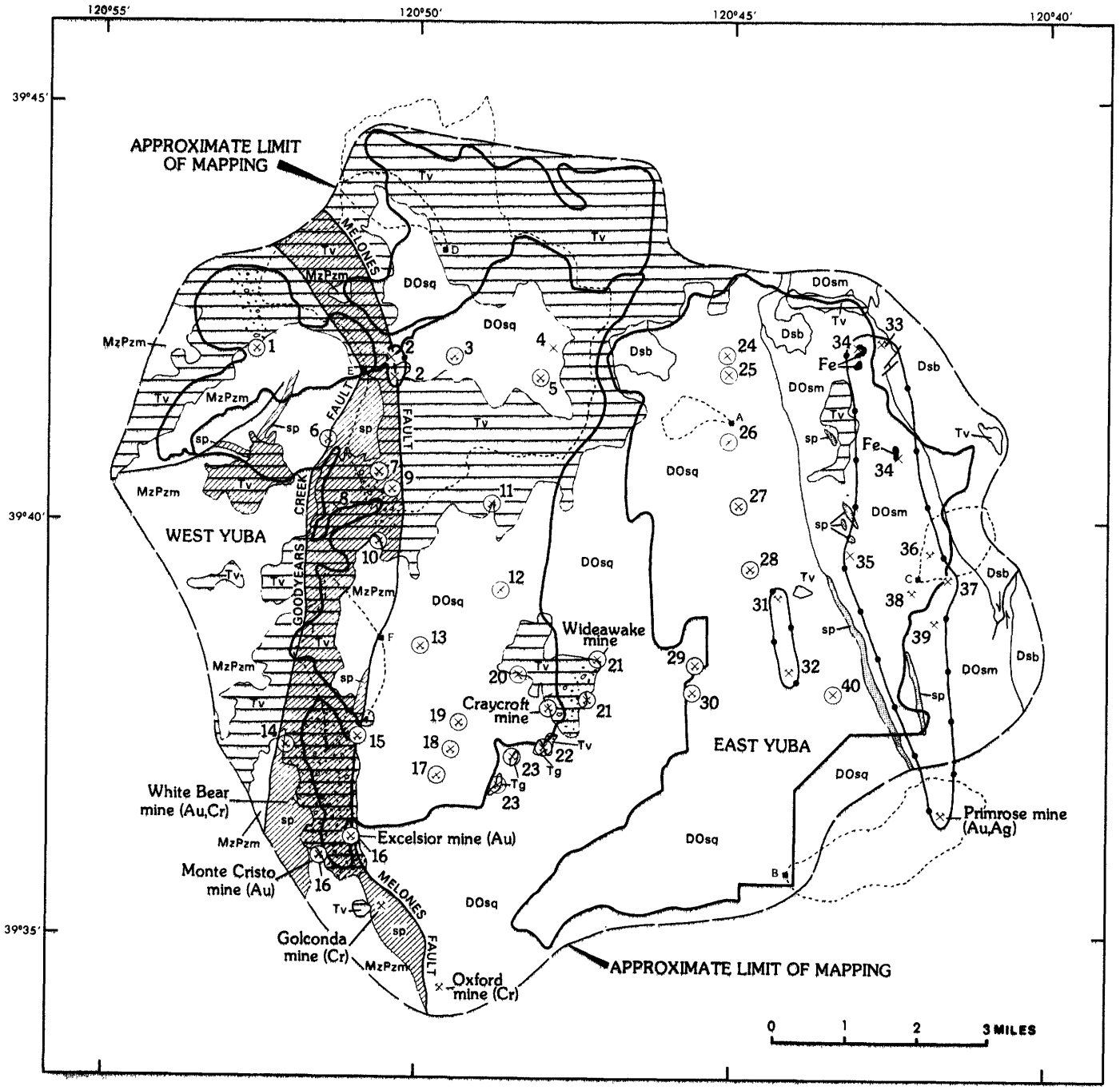

Figure 2. Mines, prospects, and areas having mineral resource potential in the East Yuba and West Yuba Roadless Areas.

EXPLANATION FOR FIGURE 2

BOUNDARY OF AREA HAVING A LOW TO MODERATE POTENTIAL FOR LODE GOLD AND SILVER--High potential for lode gold and silver exists locally at five mines

AREA HAVING A LOW TO MODERATE POTENTIAL FOR CHROMITE AND GOLD IN ULTRAMAFIC ROCKS--Dot pattern used for small areas

BOUNDARY OF AREA HAVING A LOW TO MODERATE POTENTIAL FOR GOLD, SILVER, AND ASSOCIATED BASE METALS IN VEINS--Boundary follows perimeter of drainage basin. Letter indicates sampling site and is keyed to discussion in text

AREA HAVING A LOW POTENTIAL FOR PLACER GOLD IN TERTIARY GRAVEL BENEATH VOLCANIC ROCKS

AREA HAVING A MODERATE TO HIGH POTENTIAL FOR PLACER GOLD IN TERTIARY GRAVEL

MAGNETITE OCCURRENCE

MINES AND PROSPECTS--Numbers are keyed to text and tables 1 and 2

Lode mine--Recorded or apparent production

Lode prospect

Placer mine--Recorded or apparent production

Placer prospect

(Ag) Silver

(Au) Gold

(Cr) Chromium

(Fe) Iron

MAP UNITS

Tv VOLCANIC ROCKS (TERTIARY)

Tg GRAVEL (TERTIARY)

sp SERPENTINITE (MESOZOIC AND (OR) PALEOZOIC)

MzPz m METAMORPHIC ROCKS (MESOZOIC AND (OR) PALEOZOIC)

Dsb SIERRA BUTTES FORMATION (DEVONIAN)

SHOO FLY COMPLEX (DEVONIAN? TO ORDOVICIAN?)--Divided into:

DOsm Tectonic melange--Equivalent to middle unit of Schweickert's (1981) Shoo Fly Formation

DOsq Quartzite, sandstone, phyllite, chert, and limestone--Equivalent to lower unit of Schweickert's (1981) Shoo Fly Formation

CONTACT

FAULT--Arrows indicate relative offset

APPROXIMATE BOUNDARY OF ROADLESS AREA

Table 1.--Mines and prospects in the East Yuba and West Yuba Roadless Areas and vicinity
[Underlined properties have identified resources or warrant further exploration; those not underlined have no identified resources or are poorly exposed; resource values are based on a gold price of $400.00 per troy oz]

Map no.	Name (commodity)	Summary	Workings and production	Sample and resource data
		West Yuba Roadless Area		
1	New California mine (gold)	A segment of a gold-bearing Tertiary gravel channel has a northwest course and is approximately 380 ft wide and at least 80 ft thick. The channel is inferred to extend 2,800 ft; the constituents are approximately 75 percent white quartz, ranging in size from sand to cobbles, 15 percent slate, and 10 percent clay.	One caved adit estimated to be about 660 ft in length and a sloughed hydraulic pit approximately 380 ft wide with a highwall about 80 ft high. There is no record of production.	Thirty-nine samples were collected from 79 vertical ft of the highwall at one site. Gold content in three samples averaged $0.27 (0.0068 oz) gold per yd^3; 36 samples contained no gold. Gravel adjacent to bedrock was not sampled due to lack of exposure. Placer gold resources are likely in north extensions of the Tertiary channel gravel.
2	Poker Flat mine (gold)	The north-trending Melones fault zone can be traced for 2,200 ft across the prospect. The fault zone is 180 ft wide and contains fissure-filling quartz, mariposite, and altered metasedimentary and metavolcanic rocks. The mineralized portion of the zone averaged 2.5 ft thick (MacBoyle, 1920b, p. 75). Minor amounts of pyrite, galena, and free gold occur in the mariposite and quartz.	One adit is 350 ft in length (caved 105 ft from the portal in 1982), one shaft formerly 150 ft deep with 335 ft of crosscuts is caved, one adit 130 ft in length, 12 pits, and 7 caved adits. Reported production was $10,000 in gold, or about 480 oz of gold, based on $20.67 gold per troy oz (MacBoyle, 1920b, p. 75).	Thirty-nine samples were taken; three dump samples averaged 0.15 oz gold per ton; five chip samples across surface outcrops in the fault zone ranged from trace to 0.022 oz gold per ton; gold was not detected in 31 other samples from the open adit and dumps. Gold resources may exist in unexplored parts of the fault zone.
3	Tennessee mine (gold)	A segment of a Tertiary gravel channel has a course N. 52° W., is about 12 ft thick, and contains quartz, slate, and quartzite clasts (MacBoyle, 1920b, p. 57-58).	One caved adit. Production from 1934 to 1948 was 330.57 oz of placer gold.	The channel was not exposed. On the basis of previous reports and production records, gold resources are likely in unexplored portions of the gravel channel.
4	Mammoth No. 1 prospect (gold)	A massive quartz vein strikes N. 4° E. to N. 26° W. and dips 80° SE. to 44° NE. in Paleozoic marine sedimentary rocks. The vein is exposed along strike for 316 ft, ranges from 4 to 25 ft thick, and contains about 3 percent pyrite, 2 percent arsenopyrite (in veinlets 1 in. thick), and less than 1 percent galena. The vein pinches and swells and is coated with limonite stalactites in subsurface workings.	One adit has 103 ft of workings.	An estimated 800 tons of gold-bearing vein quartz averaging 0.023 oz gold per ton occurs on the property. Four of eighteen chip samples across the vein contained 0.014 to 0.056 oz gold per ton; no gold was detected in the remaining 14 samples. Additional gold resources may occur along strike and at depth in unexplored parts of the vein.

Table 1.--Mines and prospects in the East Yuba and West Yuba Roadless Areas and vicinity--Continued

Map no.	Name (commodity)	Summary	Workings and production	Sample and resource data
5	Gibraltar mine (gold)	An andesite-capped segment of a Tertiary gravel channel has a west-trending course, contains blue quartz, and is 2.5 to 5.0 ft thick (MacBoyle, 1920b, p. 39).	One adit is approximately 1,780 ft long, with a shaft 310 ft in depth (MacBoyle, 1920b, p. 39); 19.37 oz gold produced between 1911 and 1925.	The channel was not exposed; however, on the basis of previous reports and production records, gold resources may exist in unexplored parts of the gravel channel.
6	Deadwood Diggings mine (gold)	A segment of a gold-bearing Tertiary gravel channel has a generally east-trending course. Channel dimensions could not be measured due to a lack of exposures and removal of most of the deposit. Gravel composition is approximately 80 percent white quartz, 10 percent slate and graphitic shale, 5 percent pyrite, and 5 percent clay.	Portions of a sloughed hydraulic pit and evidence of ground sluicing remain. 499.47 oz of gold were produced from 1892 to 1946.	Twenty-five samples were collected at four sample sites. Gold value in eight samples was from $0.41 to $2.19 (0.001 to 0.005 oz) per yd^3; no gold was detected in 17 samples. Gold resources may occur in unexplored tributary channels adjacent to the main channel.
7	Golden Scepter mine (gold)	An andesite mudflow-capped segment of a Tertiary gravel channel is obscured by colluvium.	One caved adit is estimated to be 100 ft in length. In 1905, gold production from the gravel was 19.01 oz.	The channel was not exposed; however, on the basis of previous reports and production records, gold resources may occur in unexplored parts of the channel gravel capped by andesite mudflow.
8	Sebastapol prospect (Reese mine) (gold, silver)	A massive, 2.3-ft-thick quartz vein strikes N. 61° W. and dips 33° to 43° SW. along a serpentinite-peridotite contact.	One adit totaled 470 ft in length with 260 ft of drifts and 210 ft of crosscuts. There is no record of production.	Nineteen chip samples were taken from the adit; gold content in three chip samples across the vein ranged from 0.012 to 0.044 oz per ton; three other chip samples across the vein contained 0.2 to 2.0 oz silver per ton. Six of the nineteen samples were analyzed for chromium; values in three samples ranged from 0.05 to 0.26 percent chromium. Gold and silver resources may occur in unexplored parts of the quartz vein. Significant chromite resources are unlikely in ultramafic wallrocks.
9	Bunker Hill mine (gold)	An andesite-capped segment of a Tertiary gravel channel has a south-trending course and is about 50 ft wide and 4 to 6 ft thick (MacBoyle, 1920b, p. 42-43).	One caved adit. From 1890 to 1911, 559.06 oz of gold were removed from the gravel.	The channel was not exposed; however, on the basis of previous reports and production records, gold resources may be present in unexplored parts of the channel.
10	Herkimer mine (gold)	An andesite-capped segment of a Tertiary gravel channel has a south-trending course and is about 50 ft wide and 4 to 6 ft thick (MacBoyle, 1920b, p. 42-43).	One caved adit was originally about 1,600 ft long (MacBoyle, 1920b, p. 43). In 1929, production from the mine was 71.90 oz of gold.	The channel was not exposed; however, on the basis of previous reports and production records, gold resources may be present in unexplored parts of the channel.

Table 1.--Mines and prospects in the East Yuba and West Yuba Roadless Areas and vicinity--Continued

Map no.	Name (commodity)	Summary	Workings and production	Sample and resource data
11	Clark Canyon mine (gold)	Three Quaternary bench gravel deposits are on slate bedrock; bench gravels cover 0.3 acres and average 5 ft thick. Gravel is subrounded to rounded and contains about 50 percent metasedimentary rocks, 40 percent andesite, and 10 percent quartz. The gravel is moderately sorted and compact; gravel imbrication and bedrock slope indicate the abandoned channel has a south-trending course.	Workings consist of two adits, with a combined length of about 538 ft, and four caved adits. There is no record of production.	Nine samples were collected from the gravel-bedrock contact to an average of 3.5 ft above bedrock; gold content in four samples was from \$0.95 to \$46.22 (0.0023 to 0.12 oz) per yd^3. Approximately 2,400 yd^3 of gold-bearing gravel averages about \$5.10 (0.013 oz) gold per yd^3. The lower 3.5 ft of 1,700 yd^3 averages \$7.30 (0.018 oz) gold. It is unlikely that additional resources exist.
12	D-B-K prospect (gold)	A volcanic mudflow-capped bench gravel, underlain by slate bedrock, is about 90 ft wide and 28 ft thick. A 200-ft-long segment of the channel has a southwest course, based on bedrock slope and gravel imbrication. The gravel is rounded and contains about 45 percent slate, 30 percent andesite, and 25 percent quartz.	A 170-ft-long tunnel and two adits with about 130 ft of workings explore the prospect. There is no record of production.	Seven samples were collected. Gold content in one sample was \$1.60 (0.004 oz) per yd^3. No gold was detected in six samples.
13	Buckshot mine (gold)	A gravel bench overlying slate bedrock, is about 450 ft long, 100 ft wide, and from 6 to 19 ft thick. The gravel is rounded and contains about 70 percent andesite, 28 percent slate, and 2 percent quartz.	One 60-ft-long adit is partially back filled with worked gravel.	No gold was detected in seven samples from the gravel-slate contact.
14	Telegraph mine (gold, placer and lode)	A consulting mining engineer's report (B. C. Austin, unpub. data, 1937) indicates two segments of Tertiary gravel channels have a south-trending course, volcanic flows have scoured the bedrock and gravel is only in bedrock depressions; quartz veins in the bedrock strike northerly, dip easterly, and contain sulfide minerals with varying amounts of gold.	One inaccessible adit with at least 6,500 ft of underground development was reported by B. C. Austin (unpub. data, 1937). Gold production from the Tertiary channel gravel was 1,410 oz; another 1,210 oz of gold was produced from the fissure-filling quartz veins in the bedrock.	Gold resources are likely in northerly extensions of the Tertiary gravel channel and in quartz veins in the bedrock.
15	Sol Wood mine (gold)	Colluvium caps a north-trending segment of a gold-bearing Tertiary gravel channel. Bedrock is composed of gritty slate. The channel is inferred to be about 120 ft wide, 2,390 ft long, and 3.4 ft thick. Gravel composition is about 80 percent quartz, 10 percent slate, and 10 percent clay. Clasts range in size from boulders (on bedrock) to sand.	One adit with 579 ft of workings is caved 135 ft from the portal (D. Costa, unpub. data, 1981). Unrecorded production is reported from the property (Vernon Huffman, oral commun., 1981).	Approximately 16,000 yd^3 of indicated and inferred subeconomic resources that average \$32.37 (0.081 oz) gold per yd^3 within 3 ft of bedrock. Eight samples were collected from three sample sites; gold values ranged from \$0.41 to \$84.55 (0.001 to 0.21 oz) per yd^3. Additional gold resources are likely in probable north extensions of the channel.

Table 1.--Mines and prospects in the East Yuba and West Yuba Roadless Areas and vicinity--Continued

Map no.	Name (commodity)	Summary	Workings and production	Sample and resource data
16	Excelsior - Monte Cristo mines[2] (gold)	Volcanic rock caps a segment of a Tertiary gravel channel with a southwest course from the Excelsior to the Monte Cristo mine. Channel dimensions are: 2,400 ft long, 800 ft wide, and 77 ft thick. The gravel contains about 80 percent white quartz, 10 percent slate and metasedimentary rocks, and 10 percent clay. Clasts range in size from boulders (on bedrock) to sand.	Several caved adits, two hydraulic pit remnants, and evidence of major ground sluicing. Combined gold production from the properties from 1889 to 1936 was 5,729.23 oz of gold.	One hundred forty samples were collected from five sites. Forty-five samples contained gold values from $0.02 to $100.78 (0.00005 to 0.252 oz) gold per yd^3. Weighted average gold content in all 140 samples was $0.67 (0.002 oz) gold per yd^3. Approximately 3 million yd^3 of gold-bearing gravel are estimated to occur beneath volcanic cap rocks. Additional placer gold resources may be present in unexplored areas between the Excelsior and Monte Cristo mines.
17	Deep Moon mine (gold)	A gravel bench 1,200 ft long covers about 3 acres. Thickness varies from a few feet to at least 27 ft, averaging 7.5 ft. The gravel is composed of about 40 percent slate, 40 percent quartz, and 20 percent intrusive rocks; it lies on slate bedrock, and clasts range in size from boulders (on bedrock) to pebbles.	Approximately 0.4 acres of gravel has been prospected. One caved inclined shaft, one adit about 380 ft in length, and two trenches, approximately 160 ft long, by 30 ft wide, by 30 ft deep, and 25 ft long by 6 ft wide, by 6 ft deep are at the mine. A washing plant with a capacity of about 300 yd^3 per day was in operation in 1982.	An estimated 36,000 yd^3 of indicated marginal gold reserves averages $3.10 (0.0078 oz) gold per yd^3. Twenty-four samples were collected from seven sites. Gold values from 17 samples ranged from $0.26 to $76.09 (0.07 to 0.19 oz) per yd^3.
18	Progressive mine (gold)	A gravel bench with a surface area of 0.5 acres is about 230 ft long, 100 ft wide, averages 19 ft thick, and is underlain by slate and covered by colluvium. The gravel is rounded and contains about 40 percent slate, 40 percent quartz, and 20 percent intrusive rock. Size distribution of the gravel is from boulders to pebbles.	An estimated 1 million yd^3 of gravel has been worked. Two pits: one is 160 ft long, 40 ft wide, and 10 ft deep; the other is 120 ft long, 50 ft wide, and 20 ft deep. Production from the property is unknown.	Thirty-three samples were collected from three locations; gold content in one sample was $2.78 (0.007 oz) per yd^3; no gold was detected in 32 samples.
19	Crescent mine (gold)	Bench gravel outcropping in three locations is overlain by colluvium and is on slate bedrock. The area of gravel is estimated to be 470 ft long, 24 ft thick, contains interstitial clay, and has moderately sorted, rounded clasts of andesite, sandstone, and slate. Clasts range in size from boulders to pebbles.	Approximately 1,800 yd^3 of gravel have been removed by drift mining. Four adits, totaling about 88 ft of workings, and one pit are on the property. Mine production is unknown.	Twenty-six samples were collected from 17 locations; gold content in one sample was $0.31 (0.0008 oz) per yd^3. No gold was detected in 25 samples.

Table 1.--Mines and prospects in the East Yuba and West Yuba Roadless Areas and vicinity--Continued

Map no.	Name (commodity)	Summary	Workings and production	Sample and resource data
20	Golden King prospect (gold)	A segment of a Tertiary gravel channel is on slate bedrock and capped by andesite mudflow. The channel is about 9 ft thick and is exposed for 70 ft. It contains about 80 percent white quartz and 20 percent metasedimentary rocks.	One adit is caved 148 ft from the portal.	No gold was detected in one sample of gravel. Because similar prospects have recorded production, gold-bearing resources may be present.
21	Craycroft-Wideawake mine[2] (gold)	Andesite mudflow caps a segment of Tertiary gravel channel that has a southwest course. The channel is inferred to be 42 ft thick, 1,460 ft wide, and 4,490 ft long. Gravel composition is about 80 percent white quartz, 10 percent slate, and 10 percent clay. Clasts range in size from boulders to sand.	Eight caved adits, two adits totaling about 260 ft of workings, and two open cuts develop the mine. From 1884 to 1894, 5,806 oz of gold were produced from the gravel (MacBoyle 1920a, p. 63).	Twenty samples were collected from three locations; gold content in three samples was from $0.24 to $0.88 (0.0006 to 0.0022 oz) per yd^3. in seventeen samples. No gold was detected in 17 samples. Based on past production, gold resources are likely in unexplored parts of the channel.
22	One Day At A Time/Easy Does It mine (gold)	A segment of a Tertiary gravel channel has a N. 45° E. course, is 110 ft thick, and inferred to be 2,600 ft long. The gravel contains about 80 percent white quartz, 10 percent clay, and 10 percent metasedimentary rocks. Clasts range in size from boulders to sand.	One adit has about 400 ft of underground development. Surface workings consist of a remnant hydraulic pit and evidence of a ground sluicing operation. No production records are available.	Approximately 60,000 yd^3 of indicated and inferred subeconomic resources are estimated to average $5.82 (0.015 oz) gold per yd^3, within 6.3 ft of bedrock. Thirty-six samples were collected; gold content in 18 samples was from $0.10 to $27.47 (0.0003 to 0.0686 oz) per yd^3. No gold was detected in 18 samples.
23	Craycroft Diggings mine[2] (gold)	An andesite-capped segment of a Tertiary gravel channel has a south course and is about 3,900 ft long, 250 ft wide, and 50 ft thick. The gravel contains about 80 percent white quartz, 10 percent slate, and 10 percent clay. Clasts range in size from cobbles to sand.	Evidence of a remnant hydraulic pit and ground-sluicing activity are at the property. Records indicate 3,441.90 oz of gold were produced from 1890 to 1953.	An estimated 200,000 yd^3 of inferred subeconomic gold resources average $1.50 (0.0038 oz) gold per yd^3 within 10 ft of bedrock. Twenty-three samples were collected from two sample sites; gold content in 13 samples ranged from $0.06 to $7.67 (0.0002 to 0.019 oz) per yd^3. No gold was detected in 10 samples.

Table 1.--Mines and prospects in the East Yuba and West Yuba Roadless Areas and vicinity--Continued

Map no.	Name (commodity)	Summary	Workings and production	Sample and resource data
		East Yuba Roadless Area		
24	Whipoorwill prospect (gold)	Two gravel benches occur at the confluence of Spencer, Sunnyside, and Lavezzola Creeks. One deposit averages 9 ft thick and occupies 9.2 acres; the second averages 6 ft thick and covers 6.9 acres. Gravel is composed of 30 percent volcanic rocks, 30 percent intrusive rocks, 30 percent metasedimentary rocks, and 10 percent quartz. The gravel overlies slate and phyllite bedrock at the east boundary of the deposits in Spencer Creek; constituents range in size from boulders to clay.	There are no workings or records of production.	An estimated 65,000 yd^3 of indicated and inferred subeconomic resources average $0.85 (0.0021 oz) gold per yd^3. Thirteen samples collected from five trenches ranged from $0.07 to $2.91 (0.0002 to 0.007 oz) gold per yd^3. It is unlikely that additional resources are present.
25	Rebate prospect (gold)	Consists of one large and three small gravel benches and one skim bar. The largest bench covers 8.7 acres and averages 8 ft thick. The three smaller benches have a total surface area of 2.5 acres and an average thickness of 5 ft. The skim bar occupies 0.5 acre and has an estimated thickness of 3 ft. Gravel is sporadically iron oxide stained and consists of 50 percent intrusive rocks, 30 percent volcanic rocks, and 20 percent metasedimentary rocks; constituents range in size from sand to boulders.	There are no workings or records of production.	An estimated 68,000 yd^3 of bench gravel contains an average of $0.16 (0.0004 oz) gold per yd^3. Six samples were collected from six trenches; one sample contained $0.98 (0.002 oz) gold per yd^3 and the remaining five samples contained no gold. Additional placer gold resources are unlikely. Suction dredging of the active channel may yield gold.
26	Upper Lavezzola Creek prospect (gold)	Two gravel benches: one has a surface area of 9 acres and an average thickness of 15 ft; the other has a surface area of 6 acres and a thickness of 7 ft. Three skim bars have a combined surface area of 4 acres and minimum thickness of 3 ft.	There are no workings or records of production.	Sixteen samples were collected from three trenches; three samples contained $0.51, $0.39, and $0.52 (0.001, 0.0009, and 0.001 oz) gold per yd^3; 13 samples contained no gold. An estimated 140,000 yd^3 of gravel contain an average of $0.09 (0.0002) oz gold per yd^3. Additional resources are unlikely.
27	Pot Luck I and II mine (gold)	Consists of approximately 3,000 ft of active channel ranging from 10 to 50 ft wide. Strike of the near-vertical metasedimentary bedrock parallels the stream course. Gravel volume is small; some gravel occurs in plunge pools, in bedrock crevices, and as a thin veneer on bedrock at the edge of the active channel.	A two-man operation using a 4-in. floating suction dredge reported 25 oz of gold recovered from an estimated 275-ft length of active channel. Ten oz of gold were recovered from 90 to 120 yd^3 of dredged gravel during 34 working days in 1981; 15 oz of gold were recovered from 110 to 130 yd^3 of dredged gravel during 56 working days in 1982 (Charles Erickson, written commun., 1981, 1982).	Exploration of the unworked active channel with a suction dredge may yield additional gold.

Table 1.--Mines and prospects in the East Yuba and West Yuba Roadless Areas and vicinity--Continued

Map no.	Name (commodity)	Summary	Workings and production	Sample and resource data
28	Little Bear mine (gold)	Consists of approximately 2,200 ft of active channel ranging from 10 to 50 ft wide and approximately 1.5 acres of ground-sluiced bench gravel.	At least 15 oz was reported recovered during suction dredging operations from 1970 to 1982 (J. Hatton, owner, written commun., 1983).	Four channel samples were taken from one trench site on a remnant of bench gravel. One sample contained \$0.11 (0.0003 oz) gold per yd^3; each of three samples contained less than \$0.01 (0.00003 oz) gold per yd^3. Four pan samples were taken of gravels trapped in crevices and potholes in bedrock; one sample contained no gold and three had from \$0.11 to \$4.46 (0.0003 to 0.01 oz) gold per yd^3. Exploration on the active channel with a suction dredge may yield additional gold.
29	Dragonfly mine (gold)	Consists of two gravel benches. The west and the east benches occupy 2.2 and 4.8 acres, respectively; both deposits average 17 ft thick. Constituents are approximately 50 percent silt and 50 percent gravel (boulders to cobbles).	Workings consisted of a 500-ft-long drain tunnel and 30 ft of drifts, all in gravel (MacBoyle, 1920b, p. 135). A caved decline is the only evidence of these workings. Reported production between 1905 and 1914 was 145 oz of gold.	Twelve channel samples were collected from two trenches: eight samples contained from \$0.01 to \$0.09 (0.00003 to 0.0002 oz) gold per yd^3. About 100,000 yd^3 of bench gravel containing gold averages \$0.05 (0.0001 oz) gold per yd^3.
30	Jay Bird mine (gold)	Two gravel benches; the west bench covers 2.6 acres and averages 8 ft thick; the east bench occupies 5.5 acres and averages 27 ft thick. Constituents are approximately 50 percent silt and 50 percent gravel (boulders to cobbles).	Approximately 140,000 yd^3 of gravel have been worked by ground sluicing and bulldozing. Production is unknown.	Thirty-five channel samples were collected from four trenches: three samples contained no gold; 32 samples ranged from trace to \$1.32 (up to 0.003 oz) gold per yd^3. An estimated 140,000 yd^3 of bench gravel that averages \$0.14 (0.0004 oz) gold per yd^3 remain.
31	Sisson mine (gold)	A zone of stockworks, formed by quartz veinlets concentrated at the contact between an aplite dike and phyllite country rock, averages 6 ft thick and is exposed for 440 ft. The stockworks, mainly concentrated in the aplite dike, strike N. 15° to 45° W., with near vertical dips, and contain sporadic pyrite, chalcopyrite, and sphalerite within the quartz veinlets (1 to 5 percent of total rock where observed).	The property has 360 ft of underground workings and three exploration pits. Four oz of gold were produced in 1937.	An estimated 120,000 tons of indicated and inferred subeconomic resources average 0.10 oz gold per ton. Thirteen samples were taken: ten chip samples taken across the mineralized zone averaged 0.10 oz gold per ton. A select sample from a stockpile contained 0.372 oz gold per ton. Additional resources may exist in unexplored parts of the stockworks.

Table 1.--Mines and prospects in the East Yuba and West Yuba Roadless Areas and vicinity--Continued

Map no.	Name (commodity)	Summary	Workings and production	Sample and resource data
32	Big Boulder "mine"[1] (gold)	Four stockworks comprised of quartz veinlets, metarhyolite, and phyllite range from 25 to 45 ft long and average 3 ft thick. The stockworks are north trending, have near-vertical dips, and contain sporadic pyrite and arsenopyrite (less than 1 percent).	A 105-ft adit is driven perpendicular to the strike of the four stockworks. No production is recorded.	Sixteen samples were taken. Six chip samples taken across the stockwork contained no gold or silver. One limestone sample contained 0.01 oz gold per ton and one select stockpile sample contained 0.02 oz gold per ton. Although samples across the stockworks contained no gold or silver, resources may exist adjacent to and north of the property. The Big Boulder mine is situated in similar host rocks and on the same geologic structure as the Sisson mine, 1 mi north.
33	Four Hills mine[2] (gold, silver)	A fissure-filling quartz vein strikes N. 55° W., dips 40° to 60° SW., and averages 4.5 ft thick. The vein is exposed at the surface for 3,400 ft along strike and to a depth of 235 ft in workings; it occurs in a 21-acre exposure of a quartz monzonite apophysis. The quartz vein is massive with less than 1 percent sulfide-mineral pods. Stockworks of quartz veinlets extend out from the vein 10 to 40 ft.	Workings on the vein include a 300-ft shaft, 2,970 ft of drifts, and 1,275 ft of crosscuts (P. Bachels, unpub. data, 1981) four main stopes, and at least two raises to the surface. Production from 1896 to 1953 was 15,975 oz of gold and 4,064 oz of silver.	One hundred thirteen samples were taken: 74 chip samples taken across vein outcrops and underground exposures averaged 0.02 oz gold per ton. Estimated 600,000 tons of vein quartz averages 0.02 oz gold per ton, and 0.10 oz silver per ton. Production records indicate a grade of 0.26 oz gold per ton, and 0.05 oz silver per ton. Additional resources are likely in unmined parts of the vein.
34	Sierra Iron "mine"[1] (iron)	Podiform magnetite is in calcareous metasedimentary rocks near the contact of intrusive rocks (metarhyolite and metadiorite), principally in two areas; the Spencer Lakes area contains about 13 occurrences, and the Hawley Lake area has about five. The two largest occurrences are in the Hawley Lake area and measure 200 ft long by 180 ft wide, and 135 ft long by 40 ft wide. The next largest one is in the Spencer Lakes area and contains five outcrops that comprise an area 120 ft long by 50 ft wide. Recorded dimensions of the smallest magnetite outcrop in the Spencer Lakes area are 9 ft long and 2.5 ft wide. Magnetite pods are comprised of either magnetite-talc or magnetite-calcite (Durrell and Proctor, 1948, p. 177-186).	No workings were found.	Occurrences in the Spencer Lakes and Hawley Lake areas contain an estimated 45,900 tons of magnetite-bearing rock that averages 21 percent total iron content (Durrell and Proctor, 1948, p. 190-192).

Table 1.--Mines and prospects in the East Yuba and West Yuba Roadless Areas and vicinity--Continued

Map no.	Name (commodity)	Summary	Workings and production	Sample and resource data
35	Gold King prospect (gold, silver, copper)	Two en echelon fissure-filling veins in metasedimentary rocks intersect at the prospect. One vein strikes N. 65° W., dips 50° SW., is 432 ft long, and averages 1.0 ft thick. The other strikes N. 50° W., dips 50° SW., is 212 ft long, and averages 1.3 ft thick. The veins are massive quartz with sporadic pods (less than 1 percent) of copper, lead, and zinc sulfides. A stockwork system of quartz stringers extends between the two veins.	A 15-ft deep inclined shaft, four trenches, and two pits are on the property.	Fifteen chip samples averaged 0.007 of oz gold and 0.47 oz of silver per ton. Eight samples contained from 0.5 to 1.5 percent copper. Nine samples contained only minor amounts of lead and zinc. Gold and silver resources may be present in the unexplored veins.
36	Willoughby mine[2] (gold, silver)	A fissure-filling quartz vein, in slate country rock, strikes N. 25° E. to N. 75° E., dips 40° to 51° SE., and averages 0.7 ft thick. The exposed strike length underground is 260 ft and the downdip extension is 335 ft.	On the property are three adits (one is caved), three caved shafts, and two trenches. Production from 1909 to 1941 was 244 oz of gold and 53 oz of silver.	Twenty-four samples were taken: 20 chip samples across vein outcrops and underground exposure average 0.36 oz of gold and 0.07 oz of silver per ton. About 7,000 tons of indicated and inferred subeconomic resources are estimated and additional resources may exist along strike and at depth.
37	Lone Star mine (gold, silver)	A fissure-filling quartz vein is at the contact between slate and altered ultramafic rocks. The vein strikes N. 40° E., dips 80° NW. to vertically, is 230 ft long, and averages 2 ft thick.	Workings include one 70-ft adit, a 105-ft trench, and a 20-ft shaft. Production records were combined with the Empire mine.	Eleven samples were taken: nine chip samples from the vein averaged 0.034 oz gold per ton. One grab sample from the dump contained 0.078 oz gold per ton. Approximately 2,000 tons of vein quartz average 0.034 oz of gold and 0.25 oz of silver per ton. Additional resources are likely in unexplored parts of the vein.
38	Empire mine (gold, silver)	Fissure-filling quartz veins are in metasedimentary and metavolcanic country rocks. Siliceous to basic dikes cut these rocks and the veins. The main (Empire) vein strikes from N. 50° to 75° E., dips 50° to 60° SE., and ranges from 1 to 12 ft thick, averaging 3 ft. It is exposed on the surface and underground for about 1,400 ft, and contains disseminated free gold and auriferous pyrite. Other less continuous quartz veins trend east, dip southerly, and contain sporadic pyrite.	One adit 570 ft long is stoped to the surface; one inclined shaft is 470 ft deep with 1,300 ft of drifts on five levels. From 1895 to 1976 the Empire and Lone Star properties had a combined production of 6,324 oz of gold and 9,349 oz of silver.	An estimated 63,000 tons of indicated and inferred subeconomic resources average 0.22 oz gold and 0.18 oz silver per ton. Twenty-two samples were taken; five chip samples from the main vein averaged 0.22 oz gold per ton. One select sample and one dump grab sample contained 0.10 and 0.32 oz gold per ton respectively. Additional gold resources may occur west along strike and at depth in the quartz veins.

Table 1.--Mines and prospects in the East Yuba and West Yuba Roadless Areas and vicinity--Continued

Map no.	Name (commodity)	Summary	Workings and production	Sample and resource data
39	Garibaldi mine[2] (gold, silver)	A persistent fissure-filling quartz vein is along foliation planes of phyllitic shale host rock. The vein is massive, strikes N. 10° E., dips 75° SE. to vertically, averages 1 ft thick, and is 1,000 ft long.	One adit caved 260 ft from the portal. In 1891, 29 oz of gold were produced from the vein.	Twenty-four samples were taken: 21 chip samples from the vein averaged 0.059 oz gold and 0.018 oz silver per ton. One grab sample from an ore chute contained 0.124 oz gold per ton. An estimated 2,000 tons of vein quartz averages 0.078 oz gold and 0.024 oz silver per ton. Additional gold-silver resources may occur in unexplored parts of the vein.
40	Upper Pauley Creek prospect (gold)	Two gravel benches and two skim bars. Bench gravel covers 5.5 acres with an average thickness of about 2 ft; the skim bars cover 2 acres and average 3 ft thick.	There are no workings or recorded production.	Two of three channel samples from three trenches contained no gold; one sample contained $0.47 (0.001 oz) gold per yd^3. One chip sample of cemented glacial till (false bedrock) contained $0.16 (0.0004 oz) gold per yd^3. Two pan samples of gravel on bedrock contained $1.97 and $49.85 (0.005 and 0.125 oz) gold per yd^3. Some gold may occur in the active channel.

[1]"mine" indicates historical name, although no production is recorded.
[2]Outside the roadless areas.

Table 2.--Estimated identified resources in the East Yuba and West Yuba Roadless Areas
[Gold values based on $400 per troy oz]

Map no.	Property	Deposit type	Resource classification	Quantity	Grade
			East Yuba Roadless Area		
24	Whipoorwill prospect	Bench gravel	Indicated and inferred subeconomic	65,000 yd^3	$0.85 (0.0021 oz) per yd^3
31	Sisson mine	Fissure-filling quartz vein	Indicated and inferred subeconomic	120,000 tons	0.10 oz gold per ton
36	Willoughby mine	Fissure-filling quartz vein	Indicated and inferred subeconomic	7,000 tons	0.36 oz gold per ton 0.07 oz silver per ton
38	Empire mine	Fissure-filling quartz vein	Indicated and inferred subeconomic	63,000 tons	0.22 oz gold per ton 0.18 oz silver per ton
			Lode total	190,000 tons	
			Placer total	65,000 yd^3	
			West Yuba Roadless Area		
15	Sol Wood mine	Tertiary gravel channel	Indicated and inferred subeconomic	16,000 yd^3	$32.37 (0.081 oz) gold per yd^3
17	Deep Moon mine	Bench gravel	Indicated marginal reserves	36,000 yd^3	$3.10 (0.0078 oz) gold per yd^3
22	One Day at a Time/Easy Does It mine	Tertiary gravel channel	Indicated and inferred subeconomic	60,000 yd^3	$5.82 (0.015 oz) gold per yd^3
			Placer total	112,000 yd^3	