MINERAL RESOURCE POTENTIAL OF THE CHIPS CREEK AND BUCKS LAKE ROADLESS AREAS, BUTTE AND PLUMAS 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 be submitted to the President and the Congress. This report discusses the results of a mineral survey of the Bucks Lake and Chips Creek Roadless Areas, Lassen and Plumas National Forests, Butte and Plumas Counties, California. The Bucks Lake (5168) and Chips Creek (5099) Roadless Areas were classified as further planning areas during the Second Roadless Area Review and Evaluation (RARE II) by the U.S. Forest Service, January 1979.

SUMMARY

A survey of the Bucks Lake and Chips Creek Roadless Areas, Butte and Plumas Counties, Calif., indicates several areas with mineral resource potential.

In the Bucks Lake Roadless Area, at the Shenandoah mine, 7,500 tons of subeconomic resources are indicated or inferred (table 1) and a high potential for additional lode gold resources exists at or near the mine. The Bud Lee, Fales Hill, and Monte Cristo-Channel Peak mines have a total of 280,000 yd^3 of subeconomic placer gold resources and 25,000 yd^3 of reserves; the potential for additional placer gold resources is high at these properties. Low to moderate placer gold potential exists in areas covered by Quaternary glacial deposits.

In the Chips Creek Roadless Area, the Belden mine contains 15,000 tons of indicated and inferred subeconomic resources and has a moderate potential for additional copper-gold-lead-silver lode resources. The potential for placer gold resources within the Chips Creek Roadless Area is high at and near the Lott, Morris, and Snows mines; and moderate in the area between Mount Hope and Snows mine, and along Yellow Creek. The potential for reworked placer gold in areas covered by Quaternary glacial deposits is low to moderate.

INTRODUCTION

Field investigations of the study area during 1980-82 consisted of geologic mapping and geochemical sampling by the U.S. Geological Survey and an examination of mines, prospects, and mineralized zones by the U.S. Bureau of Mines. The U.S. Bureau of Mines searched the U.S. Bureau of Land Management master title plats, U.S. Forest Service files, and records of Butte and Plumas Counties for locations of patented and unpatented mining claims. This report summarizes the findings of these investigations and includes a map showing mineral resource potential in the roadless areas. The majority of the geologic mapping and stratigraphic descriptions utilized in this report are generalized from Hietanen (1973, 1981).

LOCATION, SIZE, AND GEOGRAPHIC SETTING

The Bucks Lake and Chips Creek Roadless Areas are on the west slope of the Sierra Nevada approximately 20 mi west of Quincy, county seat of Plumas County, Calif. (fig. 1). The two areas are separated by California Highway 70 and the canyon of the North Fork of the Feather River. In both areas, the uplands support thick growths of manzanita, ceanothus, and other plants of the chapparal assemblage, and the slopes and drainages are heavily forested. Elevations range from 2,200 ft in the canyon of the North Fork of the Feather River to 7,067 ft at Mount Pleasant.

The Bucks Lake Roadless Area comprises 19,400 acres in Plumas National Forest. The south boundary is accessible by paved road from Quincy. Terrain consists of a northwest- to north-trending ridge flanked by steep north and east slopes and somewhat gentler south and west slopes.

The Chips Creek Roadless Area comprises 43,400 acres in Lassen and Plumas National Forests. The northwest boundary is reached by unpaved roads from Butte Meadows. Terrain consists of gently rolling uplands dissected by narrow steep-walled drainages.

GEOLOGIC SETTING

The Bucks Lake and Chips Creek Roadless Areas are in the northern part of the western Sierra Nevada metamorphic belt. Steeply dipping faults divide the region into four north- to northwest-trending belts of Paleozoic and Mesozoic metasedimentary and metavolcanic rocks that have been intruded by Mesozoic granitoid plutons and partially covered by Cenozoic volcanic rocks. The roadless areas are in part of one of the fault-bounded belts of mainly metasedimentary rocks.

Metasedimentary and metavolcanic rocks in the Bucks Lake-Chips Creek area (Sorensen and Pietropaoli, 1982) were assigned to the Paleozoic Calaveras Formation by Hietanen (1973), who later reported a conodont fauna of Pennsylvanian or Permian age from rocks continuous with the Calaveras

Formation of the Bucks Lake area (Hietanen, 1981, p. 4). Because the rocks that contain the conodont fauna are intruded by a Permian amphibolite, the Calaveras Formation in the Bucks Lake-Chips Creek area is considered to be Pennsylvanian in age (Hietanen, 1981, p. 17).

In the study area, the Calaveras Formation consists of phyllite, metachert, and metavolcanic rocks, bordered on the west by metavolcanic rocks of the fault-bounded Franklin Canyon Formation and on the east by ultramafic rocks that occupy the Melones fault zone. Rocks of the Calaveras have been tightly folded about north- to northwest-trending axes and are strongly foliated parallel to the axial planes of these folds.

The Calaveras Formation consists principally of sedimentary deposits accumulated in a marine basin between the continent and an offshore volcanic island arc during late Paleozoic time. Paleozoic and early Mesozoic underthrusting along the Melones fault zone resulted in the subduction of most of the basin and its deposits. Basinal deposits not subducted are preserved as the Calaveras Formation; remnant ocean-floor material originally underlying the depositional basin is now represented by ultramafic rocks east of the Calaveras Formation (Hietanen, 1981, p. 7).

The accreted Calaveras Formation and associated metamorphic rocks were intruded by granitoid plutons during late Mesozoic time. The area was elevated above sea level, eroded, and partially covered by volcanic deposits by late Tertiary time. In places, the upper Tertiary volcanic rocks cover lower Tertiary stream gravels which locally contain placer gold.

MINING ACTIVITY

The Bucks Lake and Chips Creek Roadless Areas are near the north end of the principal zone of placer gold deposits of the western Sierra Nevada. Tertiary and Quaternary placer gold deposits in and near the study areas have been mined by hydraulic and drift methods at various times since 1850 when gold was discovered at Rich Bar (fig. 1) on the East Branch of the North Fork of the Feather River (Fariss and Smith, 1882, p. 247). Lode claims have been filed in and near the study area for deposits of chromite, copper, gold, lead, silver, and zinc; however, with the exception of limited production from the Shenandoah mine (fig. 2) within the Bucks Lake Roadless Area, very little production is recorded for any of these metals from deposits within the roadless areas. Currently, within the Bucks Lake Roadless Area, Callahan Mining Corporation is conducting an evaluation of the Shenandoah mine, and placer gold is being mined from a gravel bar at the Bud Lee mine. Within the Chips Creek Roadless Area, current mining activity consists of assessment work and recreational gold panning and dredging on Chips and Yellow Creeks.

GEOLOGY, GEOCHEMISTRY, AND GEOPHYSICS PERTAINING TO MINERAL RESOURCE ASSESSMENT

GEOLOGY

Several areas in geologic environments with mineral resource potential were delineated during the current study.

Tertiary stream deposits

Lower Tertiary stream deposits that are locally auriferous occur at several localities within both roadless areas. Small areas of Tertiary stream deposits are exposed northeast of Bucks Lake at Spanish Peak (fig. 1), north of Bucks Lake near the East Branch of the North Fork of the Feather River, and northwest of Bucks Lake at Mount Hope. Tertiary gravels also occur at Table Mountain in the southwest corner of the Chips Creek Roadless Area, where they are covered by Tertiary lava and Quaternary glacial deposits. Tertiary gravels exposed at Spanish Peak may extend under the Tertiary lava that caps the ridge crest. The Monte Cristo-Channel Peak drift mine (fig. 2) was opened at the base of the lavas near Spanish Peak to intercept these covered gravels, but production for this mine is not recorded. (The Monte Cristo and Channel Peak mines are separate mines that were opened at about the same time and worked by the same operator. The two mines have been combined in this report because of their common ownership and close proximity). Earlier investigators (Lindgren, 1911, p. 95; Haley, 1923, p. 102) concluded that auriferous gravels exposed at Mount Hope and covered by glacial deposits at the Snows mine south of Table Mountain were deposited by a southwest-flowing stream during early Tertiary time and suggested that extensions of these deposits may be present beneath the upper Tertiary lavas between Table Mountain and Mount Hope.

Quaternary surficial deposits

Quaternary glacial deposits cover several square miles north and northwest of Spanish Peak. Glacial deposits are also present south and southeast of Table Mountain and north of Chambers Peak. Similar deposits of Quaternary glacial material have been successfully mined for gold by hydraulic methods (Lindgren, 1911, p. 98).

Plutonic rocks

The Mordine and Moraine prospect is on the boundary of the Bucks Lake Roadless Area in sec. 5, T. 24 N., R. 7 E., northwest of Bucks Lake, and is the only deposit known within the plutonic rocks. The Mordine and Moraine is listed as a copper deposit with an unstated production of 0 to 100,000 lb of copper and secondary gold and silver (Eric, 1948, p. 288).

Calaveras Formation

The Shenandoah mine, a gold-quartz lode (sec. 28, T. 25 N., R. 7 E.), has produced a small amount of gold (Averill, 1928, p. 295) from workings in silicified rocks of the Calaveras Formation near the contact of the Calaveras with ultramafic rocks within the Melones fault zone. The proximity of the Melones fault zone to the Shenandoah mine and to several other mines outside of the roadless areas suggests that mineral-rich solutions may have migrated along the Melones fault and formed deposits at favorable locations. Ultramafic rocks within the Melones fault are in contact with the Calaveras Formation along the northeast borders of the Bucks Lake and Chips Creek Roadless Areas.

Melones fault zone

Chromite has been mined from one deposit within the Melones fault zone. Slightly less than 3 tons of relatively low-grade ore was shipped from the Shenandoah 1 and 2 claims (sec. 25, T. 25 N., R. 7 E.) in 1943 according to Rynearson (1953, p. 291). Ultramafic rocks occupying the Melones fault zone underlie the Shenandoah 1 and 2 claims and approximately 3 mi^2 in the northeastern part of the Bucks Lake Roadless Area.

GEOCHEMISTRY

A geochemical sampling program was conducted as an aid in the mineral resource evaluation of the roadless areas. A total of 157 rock samples and 454 panned concentrates of stream-sediment samples were collected from the Bucks Lake, Chips Creek, and nearby (20 mi south) Bald Rock and Middle Fork Feather River Roadless Areas and analyzed by atomic-absorption, fire-assay, and semiquantitative spectrographic methods (Sorensen and others, 1982). Although the geochemical data for rocks and stream-sediment concentrates from the Bucks Lake and Chips Creek Roadless Areas indicate local high values for various trace elements, most of the high values are ascribed to higher-than-average background values in the nearby bedrock. Very local low-grade mineralization is indicated by high manganese, silver, tin, and tungsten values for samples of a micaceous quartz vein that intrudes a serpentine body in sec. 15, T. 25 N., R. 5 E. Gold present in stream-sediment concentrates from Yellow Creek (sec. 13 and 24, T. 25 N., R. 6 E.) apparently is derived from Tertiary auriferous stream deposits traversed by Yellow

Creek north of the Chips Creek Roadless Area.

GEOPHYSICS

Aeromagnetic and gravity maps of the Bucks Lake and Chips Creek Roadless Areas were prepared to aid in the evaluation of the mineral resource potential. The magnetic anomalies and patterns on the aeromagnetic map are caused by variations in the amount of magnetic minerals, commonly magnetite, in the rock units and are closely related to geologic features. The anomalies and patterns on the gravity map are caused by variations in density between the rock units and are also closely related to geologic features.

Examination of the aeromagnetic map (Andrew Griscom, unpub. data, 1982) indicates that most of the magnetic anomalies and irregularities in magnetic patterns occur over the fault-bounded ultramafic bodies and mafic volcanic rocks. The magnetic expression of the granitoid rocks as well as the metasedimentary and metavolcanic rocks is generally one of low-amplitude anomalies and relatively smooth magnetic field. Anomalies associated with the ultramafic rocks enable one to trace these rocks beneath the younger volcanic rocks at the northern part of the Chips Creek Roadless Area. The magnetic patterns closely reflect the rock units on the geologic map and in general do not provide any specific information for identification of mineral deposits, except for the possibility of chromite occurrences in the ultramafic rocks beneath the volcanic rocks in northern Chips Creek Roadless Area.

The gravity maps of the region (Oliver and others, 1982a, b) indicate a small gravity high of about 12 mGal associated with the dense pyroxene diorite in the central part of the Bucks Lake pluton (Hietanen, 1973). The gravity map is otherwise relatively featureless and provides no evidence with which to identify mineral deposits.

MINING CLAIMS AND MINERALIZED AREAS

The U.S. Bureau of Mines studied the mines, prospects, and mining claims in and near the roadless areas. One hundred sixty-eight lode samples were collected at mines and prospects and in mineralized areas; all were analyzed by atomic-absorption and fire-assay methods. Several samples from each mine or prospect were also analyzed for 42 elements by semiquantitative spectrographic methods. One hundred sixteen placer gravel and alluvial samples, collected from major streams and from Tertiary stream deposits in the roadless areas, were analyzed. U.S. Bureau of Mines sample descriptions and analytic data are available for public inspection at the U.S. Bureau of Mines, Western Field Operations Center, Spokane, Wash.

More than 1,200 mining claims have been located or relocated in the roadless areas since 1870. In the Bucks Lake Roadless Area, 378 placer and 220 lode claims have been located, 99 of which were on file with the U.S. Bureau of Land Management in 1981. Approximately 350 placer and 320 lode claims have been located in the Chips Creek Roadless Area, 87 of which were on file with the U.S. Bureau of Land Management in 1982. The Lott, Morris, and Galena properties are patented mining properties that together total 85 acres.

LODE DEPOSITS

The Shenandoah mine, located in the northern part of the Bucks Lake Roadless Area, is credited with the production of at least 95 oz of gold from a zone of irregular bunches and stringers of quartz (Averill, 1928, p. 295-296) in silicified metasedimentary rocks of the Calaveras Formation. The Edman and Megowen mines, just east of the roadless area, have produced approximately 2,100 oz of gold and 450 oz of silver from workings that are in geologic environments similar to that of the Shenandoah (Preston, 1890, p. 484-489).

In the Chips Creek Roadless Area, quartz veins with minor amounts of gold, silver, lead, and copper occur in metasedimentary rocks of the Calaveras Formation at the Belden and Galena mines and at the Dew Drop and Williams prospects. At the Garnet mine, a tactite body contains minor amounts of molybdenum, silver, copper, and tungsten; asbestos and marble occur in nearby peridotite bodies and limestone lenses.

PLACER DEPOSITS

In the Bucks Lake area, the Monte Cristo-Channel Peak and the Fales Hill mines were developed in Tertiary river gravel deposits between 1860 and 1890. More than 2,500 ft of drifts has developed gravel at the Monte Cristo mine (Fariss and Smith, 1882, p. 255) and more than 25 acres of gravel has been mined hydraulically at Fales Hill.

In the Chips Creek Roadless Area, the Lott and Morris mines were opened in the early 1880's on Tertiary river gravel deposits and hydraulicked when water was available; the Lott mine was operated continuously for 20 years and at one time had almost 1,300 ft of underground workings. Approximately five acres at the Lott and one acre at the Morris were hydraulicked. Incomplete records indicate at least 80 oz of gold and 9 oz of silver were produced from the Lott between 1934 and 1937. The Snows mine produced approximately 15,000 oz of gold before 1911 (Lindgren, 1911, p. 95) from at least four levels and more than 1,000 ft of drifts in an extension of the gravels exposed at the Lott and Morris workings. Several drift mines have been developed on similar deposits adjacent to the west boundary of the Chips Creek Roadless Area.

ASSESSMENT OF MINERAL RESOURCE POTENTIAL

Study of the geology, geochemistry, geophysics, and history of mines and prospects in the roadless areas indicates several areas with mineral resource potential. Where possible, mineral resources are identified for specific deposits; where resources are unknown, the potential for resources is described. The mineral resource potential of an area is classified as high, moderate, or low. A high mineral resource potential exists where nearly all conditions of a geologic environment favorable for ore accumulations in an area are met. Such areas may include known mining districts, as well as other areas where geologic, geophysical, geochemical, and other data demonstrate or suggest a high probability that mineralized rock exists. Moderate mineral resource potential exists where a favorable geologic model has been identified or may reasonably be interpreted to occur but where evidence for mineralization is less clearcut or has not yet been found. Areas lacking evidence for either a high or moderate potential are considered to have a low mineral resource potential. Mineral resource potential within the roadless areas is summarized in figure 3 and tables 1 and 2.

BUCKS LAKE ROADLESS AREA

Lode deposits

The Shenandoah mine (fig. 2) has produced 95 oz of gold from a zone of irregular bunches and stringers of quartz with local kidney-shaped enlargements (Averill, 1928, p. 295-296). Sampling data of the U.S. Bureau of Mines (Linne and Stebbins, 1983) indicate the presence of approximately 7,500 tons of indicated and inferred subeconomic resources averaging 0.19 oz gold per ton at the Shenandoah. The mineral potential of the Shenandoah mine is currently being evaluated by the Callahan Mining Corporation (R. D. Thomas, Callahan Mining Corp., written commun., 1981).

Claims are recorded for copper and chromite deposits, but the resource potential for these minerals in the Bucks Lake Roadless Area is low.

Placer deposits

The Bud Lee mine, operational in 1982, has an estimated 89,000 yd^3 of inferred subeconomic resources and inferred reserves of auriferous Tertiary stream gravels. U.S. Bureau of Mines sampling (Linne and Stebbins, 1983) indicates average gold values of \$0.27 per yd^3 (gold valued at \$400 per troy oz). The operator reports recovering an amount of gold equivalent to an average of \$10 per yd^3 from local pods in the

deposit.

At the Fales Hill mine, gold from Tertiary auriferous gravels has been reworked into underlying weathered bedrock during earlier hydraulic mining operations. Approximately 135,000 yd^3 of subeconomic resources containing gold values of $1.20 per yd^3, and 25,000 yd^3 of reserves containing gold values of $9.50 per yd^3, are indicated. Probable difficulties in extracting gold from the weathered bedrock at this deposit make mining using conventional methods difficult.

Approximately 56,000 yd^3 of subeconomic resources of auriferous Tertiary river gravels with an average value of $1.65 per yd^3 are inferred at the Monte Cristo-Channel Peak mine, located near Spanish Peak. The potential for the occurrence of additional resources at the Monte Cristo-Channel Peak is low. Tertiary river gravel deposits exposed at and west of Spanish Peak contain less than $0.01 gold per yd^3.

Quaternary surficial deposits may contain gold reworked from Tertiary stream deposits. Areas north and northwest of Spanish Peak have a low to moderate potential for reworked detrital gold in glacial deposits.

CHIPS CREEK ROADLESS AREA

Lode deposits

In the vicinity of the Belden mine (sec. 17, T. 25 N., R. 6 E.), U.S. Bureau of Mines data indicate the presence of 6,400 tons of subeconomic resources and infer an additional 8,900 tons of subeconomic resources that average 0.08 oz gold per ton, 0.52 oz silver per ton, 0.52 percent copper, and 1.69 percent lead (Linne and Stebbins, 1983).

Assays of samples collected during this study from the Dew Drop, Galena, Garnet, and Williams properties indicate minor amounts of copper, gold, lead, molybdenum, silver, and tungsten, but the properties have low resource potential for these metals.

Placer deposits

A high potential for placer gold resources exists at Mount Hope where the Lott and Morris mines contain an estimated 188,000 yd^3 of auriferous Tertiary stream gravels that are within 3 ft of bedrock. Samples collected by the owners of the Lott mine in 1936 are said to have had an average gold value of $11.40 per yd^3. One sample collected from a tailings pond at the Lott mine during this study had a gold value of $12.55 per yd^3 (Linne and Stebbins, 1983).

A high potential for placer gold resources exists at Snows mine, southwest of the Lott and Morris mines. The deposit is not exposed at present, but the operators are said to have been working in gravel with a high gold content when operations were halted due to a cave-in (Lindgren, 1911, p. 96).

There is moderate potential for placer gold resources in the area between the Lott, Morris, and Snows mines, where Tertiary stream deposits mined at those properties are probably present beneath Tertiary volcanic rocks. Similarly, a moderate to low potential for placer gold exists in the northwest corner of the Chips Creek Roadless Area, where Tertiary volcanic rocks may overlie a concealed extension of the deposits mined at the Lott and Morris properties.

There is moderate potential for placer gold resources along Yellow Creek, near the east boundary of the Chips Creek Roadless Area. Panned concentrates of stream sediments collected during this study contained as much as 100 ppm gold (Sorensen and others, 1982). Tertiary auriferous gravel deposits traversed by Yellow Creek north of the roadless area have contributed reworked placer gold to the Yellow Creek drainage (Haley, 1923, p. 102). The presence of this gold is disclosed by chemical analysis and strongly suggested by numerous mining claims along Yellow Creek just north of the North Fork of the Feather River.

Quaternary surficial deposits may contain gold reworked from Tertiary stream deposits. An area north of Chambers Peak has a low to moderate potential for reworked detrital gold in glacial deposits.

REFERENCES

Averill, C. V., 1928, District reports of mining engineers, Redding field division, Plumas County, in Report XXIV of the State Mineralogist: California Division of Mines, p. 261-316.

Eric, J. H., 1948, Tabulation of copper deposits of California, in Jenkins, O. P., ed., Copper in California: California Division of Mines Bulletin 144, p. 199-357.

Fariss, and Smith, publishers, 1882, Illustrated history of Plumas, Lassen, and Sierra Counties, California, p. 246-256 (reprinted in facsimile edition by Howell-North Books, Inc., 1971)

Haley, C. S., 1923, Gold placers of California: California State Mining Bureau Bulletin 92, 167 p.

Hietanen, Anna, 1973, Geology of the Pulga and Bucks Lake quadrangles, Butte and Plumas Counties, California: U.S. Geological Survey Professional Paper 731, 66 p.

_____1981, Geology west of the Melones fault between the Feather and North Yuba Rivers, California: U.S. Geological Survey Professional Paper 1226-A, 35 p.

Lindgren, Waldemar, 1911, The Tertiary gravels of the Sierra Nevada of California: U.S. Geological Survey Professional Paper 73, 226 p.

Linne, J. M., and Stebbins, S. A., 1983, Mineral investigations of the Bucks Lake and Chips Creek RARE II Areas (Nos. 5168 and 5099), Plumas and Butte Counties, California: U.S. Bureau of Mines Open-File Report MLA 55-83, 22 p.

Mac Boyle, Errol, 1918, Mines and mineral resources of Plumas County: California State Mining Bureau, Sixteenth Report of the State Mineralogist, 188 p.

Oliver, H. W., Robbins, S. L., and Griscom, Andrew, 1982a, Bouguer gravity map of California, Westwood sheet (Susanville): California Division of Mines and Geology, scale 1:250,000.

Oliver, H. W., Robbins, S. L., Rambo, W. L., and Sikora, R. F., 1982b, Bouguer gravity map of California, Chico sheet: California Division of Mines and Geology, scale 1:250,000.

Preston, E. M., 1890, Plumas County, in 10th Report of the State Mineralogist: California State Mining Bureau, p. 484-489.

Rynearson, G. A., 1953, Geological investigations of chromite in California: California Division of Mines Bulletin 134, pt. 3, chap. 5, p. 171-321.

Sorensen, M. L., and Pietropaoli, Henry, 1982, Geologic map of the Chips Creek and Bucks Lake Roadless Areas, Butte and Plumas Counties, California: U.S. Geological Survey Miscellaneous Field Studies Map MF-1419-A, scale 1:62,500.

Sorensen, M. L., Pietropaoli, Henry, and Peterson, J. A., 1982, Geochemical analyses of rock and stream-sediment samples from Bald Rock, Bucks Lake, Chips Creek, and Middle Fork Feather River Roadless Areas, Butte and Plumas Counties, California: U.S. Geological Survey Open-File Report 82-776, 52 p., 2 maps, scale 1:62,500.

Table 1.--Mines with identified mineral resources

Map no. (fig. 2)	Name	Type of occurrence	Classification of resources	Volume or tonnage	[1]Grade
			Bucks Lake area		
19	Shenandoah mine	Lode gold reported to be disseminated through sulfide-bearing, metamorphic rock with quartz veinlets and pods	Indicated and inferred subeconomic resources	7,500 tons	0.19 oz gold per ton
21	Bud Lee mine	Bench placer	[2]Inferred subeconomic resources and inferred reserves	89,000 yd^3	\$0.27 per yd^3 Local pods contain more than \$10.00 per yd^3
23	Fales Hill mine	Tertiary river-channel placer	Indicated subeconomic resources	135,000 yd^3	\$1.20 per yd^3
			Indicated reserves	25,000 yd^3	\$10.23 per yd^3
25	Monte Cristo-Channel Peak mine	do.	Indicated subeconomic resources	56,000 yd^3	\$1.65 per yd^3
			Chips Creek area		
6	[3]Belden "mine"	Quartz-vein lode	Indicated and inferred subeconomic resources	15,000 tons	0.08 oz gold per ton, 0.52 oz silver per ton, 0.52 percent copper, and 1.69 percent lead

[1]Placer gold values at \$400 per troy oz gold price
[2]Reserve grade is based on company production for 1982, the first year of operation
[3]"Mine" in quotation marks refers to historical name of property with no record or indication of production

Table 2.--Mines, prospects, and mineralized areas

[Names underlined are for properties with mineral resources or potential; those not underlined may have potential but are poorly exposed and a determination cannot be made. Quotation marks around mine indicates historical name only. A gold price of $400 per troy oz was used in calculating the value of placer samples]

Map no.	Name and commodity	Summary	Workings and production	Assessment of resource potential
			Chips Creek area	
1	Lott Lake prospect (gold, silver)	A lenticular quartz body trending N. 80, E. is 25 ft wide and 100 ft long, and a zone of silicified and altered Calaveras Formation is 6 ft wide and 100 ft long.	No workings.	Two samples contained traces of gold and silver.
2	Galena "mine" (gold, silver, copper, lead)	A 2- to 10-ft-thick quartz vein 226 ft long strikes N. 75, E. and dips 75, NW. The vein contains small pods of galena, pyrite, malachite, and limonite.	One adit 23 ft long and one trench 38 ft long. The mineral survey mentions a 6-ft winze in the adit and two 33-ft-long open cuts.	Five samples across the vein averaged trace gold and silver, and minor lead and copper. The property has a moderate potential for resources along strike and at depth.
3	Unnamed prospect (placer gold)	Volcanic agglomerate and gabbro may cover a segment of a Tertiary gravel deposit.	Three pits and one shaft in volcanic agglomerate. One caved adit in gabbro.	The prospect appears to have been for Tertiary gravel along a channel postulated by Haley (1923, p. 102). No gravel is exposed on the prospect.
4	Morris mine (placer gold)	Tertiary river gravel ranging from 30 to 300 ft in thickness underlies 11.9 acres. The gravel, capped by basalt, is underlain by metagabbro bedrock.	Approximately 90,000 yd^3 was hydraulicked on 1 acre. One adit on bedrock is caved and estimated to be about 100 ft. No production records are available.	An estimated 58,000 yd^3 of auriferous gravel occurs within 3 ft of bedrock but is not exposed. Thirty-seven samples of the same channel taken by the owners on the adjacent Lott mine in 1936 had an average value of $11.40 per yd^3. The property has a high potential for placer gold resources.
5	Lott mine (placer gold)	Contiguous with the Morris mine and on the same gravel deposit. Tertiary river gravel up to 300 ft thick underlies about 50 acres. Bedrock is irregular and consists of metagabbro; the deposit is capped by volcanic ash and basalt.	About 200,000 yd^3 were hydraulicked on 5 acres. Caved adits totaling over 1,200 ft were driven on bedrock and in gravel. In 1934, 1935, and 1937 a total of 80 oz of gold, and 9 oz of silver were mined. Production is unknown for the mine's peak development years from 1880 to 1900.	An estimated 130,000 yd^3 of auriferous gravel lies within 3 ft of bedrock. Thirty-seven samples taken by mine owners in 1936 had an average value of $11.40 per yd^3. Thirty-one thousand yd^3 of hydraulic tailings is in the top 5 ft of the tailings pond. One sample taken from these tailings had a value of $12.55 per yd^3. The mine has a high potential for placer gold resources.
6	Belden "mine" (gold, silver, copper, lead)	A quartz vein 2 to 9 ft thick trends N. 4, E., dips 70, E., and contains galena, malachite, pyrite, and limonite. The vein, in phyllite of the Calaveras Formation, is exposed on the surface for 200 ft.	Company reports indicate one inaccessible adit 200 ft long exposing the vein for 90 ft, another adit estimated to be less than 50 ft long, and one caved shaft.	Resources include 6,400 tons of indicated subeconomic resources and 8,900 tons of inferred subeconomic resources with an average grade of 0.08 oz gold per ton, 0.52 oz silver per ton, 0.52 percent copper, and 1.69 percent lead. The vein probably extends north and south along strike and has a moderate potential for additional resources.

Table 2.--Continued

Map no.	Name and commodity	Summary	Workings and production	Assessment of resource potential
7	Porcupine "mine" (placer gold)	Metasedimentary rocks of the Calaveras Formation, mainly phyllite, are capped by basalt. The owners believe that a Tertiary river channel, similar to the Lott deposit, underlies the property.	One adit with 570 ft of underground workings and one adit 43 ft long.	Ten samples of the phyllite contained no significant metal values. Workings were driven to prospect for a Tertiary river channel. The gravel is not exposed on the surface, in either adit, or in any of three raises. No resources were identified, but there is a low potential for placer gold resources.
8	Dew Drop prospect (silver, lead)	A quartz vein 1 to 4 ft thick trends N. 45, E., dips 68, NW., and contains galena, pyrite, and malachite. The vein is exposed intermittently for 30 ft.	One trench, 30 ft long and 15 ft wide.	One grab sample of the vein contained 0.06 oz silver per ton and 4.05 percent lead. One chip sample of the vein and a narrow shear zone contained insignificant amounts of metals. The property has a low potential for resources of silver and lead.
9	Williams prospect (silver, copper, lead, zinc)	A zone of quartz up to 10 ft wide, with as much as 50 percent country rock, is exposed intermittently for 350 ft on the surface.	One pit 6 ft in diameter and one caved adit.	One sample across the zone assayed 0.26 percent copper. 0.47 percent lead, and minor zinc. Two grab samples from the adit dump and pit contained minor amounts of silver, copper, lead, and zinc. The property has a low potential for resources.
10	Sugar Pine prospect (gold, silver)	A massive quartz outcrop with vugs and iron-oxide stains is exposed on the surface.	Twenty-foot-long open cut.	One sample of quartz assayed no gold and trace silver.
11	Unnamed prospect (gold, silver)	Quartz stringers up to 1 in. thick trend N. 60, W. in granodiorite.	One 170-ft-long adit.	One sample contained no gold and trace silver.
12	Minnesota and High Channel No. 4 placer prospect (placer gold)	A bench placer indicated by mineral survey lies above Yellow Creek.	Hydraulic cut, approximately 400 ft long.	No concentrations of placer gold were found.
13	Sleeping Beauty prospect (marble)	A body of friable dolomitic marble 155 ft long and 40 to 80 ft wide and a smaller body 230 ft to the north which is 30 ft wide and 60 ft long are exposed on the surface.	No workings.	One sample assayed 41.7 percent CaO, 14.6 percent MgO, 0.48 percent Al_2O_3, 1.5 percent SiO_2, and 0.38 percent Fe_2O_3. This material is probably only usable for flux in certain types of metal refining.
14	Asbestos King prospect (asbestos)	Asbestos stringers and veins up to 6 in. thick strike N. 43, E. and dip vertically in peridotite.	One shaft 22 ft deep and two shallow pits.	Four samples consisted primarily of anthophyllite. The property has no identified potential for asbestos resources.
15	Garnet "mine" (molybdenum, silver, copper, tungsten)	A poorly exposed tactite body 250 ft long and 25 ft wide lies between limestone of the Calaveras Formation and the Grizzly pluton. The body contains garnet, calcite, epidote, pyrite, molybdenite, chalcopyrite, and malachite.	One trench 260 ft long and 25 to 60 ft wide and one adit 37 ft long.	One sample of tactite contained 0.04 percent molybdenum, 0.09 percent copper, and a trace of tungsten. One select sample of dump material contained 0.27 percent molybdenum, 0.74 oz silver per ton, 2.4 percent copper, and 0.35 percent tungsten trioxide. A low potential for resources of molybdenum, copper, silver, and tungsten exists near the Calaveras Formation-Grizzly pluton

Table 2.—Continued

Map no.	Name and commodity	Summary	Workings and production	Assessment of resource potential
16	Garnet Ridge prospect (asbestos)	Asbestos veinlets up to 2 in. thick have random orientations but generally cross the lineation of peridotite.	Five trenches and two pits. Trenches are from 25 to 100 ft long. Deepest pit is 5 ft deep.	Four samples consisted of anthophyllite, antigorite, talc, and chlorite. The property has no identified potential for asbestos resources.
17	Snows mine (placer gold)	Lindgren (1911, p. 96) reports the Magalia Tertiary river gravel is up to 8 ft thick and 100 to 200 ft wide at the mine. The deposit is covered by 50 ft of glacial till and basalt. The gravel and granitic bedrock were cut by several northeast-trending faults that lowered the southern portion of the deposit.	Approximately 5 acres was worked hydraulically. No underground workings were found, but Lindgren (1911, p. 96) reports drifts at elevations of 5,430 ft, 5,175 ft, and 5,110 ft, with total length of over 500 ft. Lindgren (1911, p. 95) reported $300,000 worth of gold (approximately 15,000 oz) produced before 1911.	The deposit is not exposed: no samples were taken. The channel on which this mine is located is inferred to extend northeastward under Table Mountain (Lindgren, 1911, p. 94-96; Haley, 1923, p. 103). A high potential for placer gold resources exists at the Snows mine and extends under Table Mountain.
18	Stones mine (placer gold)	Glacial moraine up to 30 ft thick covers about 1 acre of metasedimentary rocks of the Calaveras Formation.	Approximately 1 acre mined hydraulically.	The property was reportedly mined out.
			Bucks Lake area	
19	Shenandoah mine (gold)	Gold is disseminated in pyrite-bearing schists, slates, phyllites, hornfels, siderites, and quartz stringers of the Calaveras Formation.	Five adits totaling over 1,150 ft. Bureau of Mines production records show 95 oz of gold was recovered.	The mine has 7,500 tons of indicated and inferred subeconomic resources averaging 0.19 oz gold per ton. Callahan Mining Corp. is conducting an exploration drilling program at the property, and is encouraged by initial results. Drilling results show the deposit continues at depth, and may have lateral extensions. A high potential exists for a large, low-grade gold deposit.
20	Pacific Foundation prospect (placer gold)	Several small deposits of gravel occur in the main channel, in an abandoned channel, and scattered among large boulders and outcrops near the stream.	Two drifts, each less than 40 ft long, intersect an abandoned channel 1,000 ft outside the study area.	Of four samples taken, one contained $0.05 per yd^3 and the others were barren. Most of the prospect lies outside the area; gravel deposits inside the boundary are not large. No identified potential for resources exists.
21	Bud Lee mine (placer gold)	A gravel bar covering about 3 acres and averaging 21 ft thick overlies slates and schists of the Calaveras Formation.	One pit, 100 ft long, 50 ft wide, and 20 ft deep. More than 63 oz of gold was recovered in 1982.	The deposit is currently being mined with a backhoe, trommel-and-sluice combination capable of handling 120 yd^3 of gravel per day; owners report recovering an amount of gold equivalent to an average of $10 per yd^3 in place. About 89,000 yd^3 of inferred subeconomic resources and inferred reserves[1] remains at the mine. Bureau of Mines assay results of these resources average $0.27 per yd^3. A high potential exists for gold resources.

Table 2.—Continued

Map no.	Name and commodity	Summary	Workings and production	Assessment of resource potential
22	DJR prospect (placer and lode gold)	Sulfide-bearing slates and phyllites of the Calaveras Formation underlie the prospect. Several small gravel deposits have also been explored.	Three adits; one 15 ft long, another 132 ft long, and a third 75 ft long. Evidence of several drifts in gravel also exists.	Seven samples of sulfide-bearing metamorphic rocks contained no significant values. No gold was found in any of the three placer samples taken. No resources were identified.
23	Fales Hill mine (placer gold)	Gold from an auriferous Tertiary river channel migrated from the gravel into underlying weathered serpentinite and peridotite during hydraulic mining operations.	A pit covering over 25 acres has been excavated by hydraulic methods.	Nearly 135,000 yd^3 of subeconomic resources containing $1.20 per yd^3 is indicated; an additional 25,000 yd^3 of reserves containing $9.50 per yd^3 is also indicated. Although the gold lies within 2 ft of the surface, low overall gold values and difficulties incurred in extracting gold from the claylike bedrock would make economic extraction using conventional methods difficult.
24	Spanish Creek prospect (gold, silver)	A quartz vein and quartz stringers trend N. 55, W., and dip near vertically in sulfide-bearing slates and schists of the Calaveras Formation.	Several hand-dug pits and trenches.	Six samples of quartz contained no significant amounts of minerals. Of the three samples taken of sulfide-bearing slates and schists, one contained 0.054 oz gold per ton and 0.3 oz silver per ton; another contained no gold and 0.2 oz silver per ton; and a third contained no significant amounts of minerals. A favorable geologic setting indicates a moderate potential for low-grade gold and silver resources.
25	Monte Cristo-Channel Peak mine (placer gold)	Auriferous gravel in a Tertiary river channel capped by andesite occurs at the property. The channel trends N. 25, W. and, if continuous, is over 2 mi long, 500 to 800 ft wide, and 40 ft thick.	Over 2,500 ft of development drifts are currently inaccessible (Fariss, 1882, p. 255; Mac Boyle, 1918, p. 70).	Approximately 56,000 yd^3 of subeconomic resources averaging $1.65 per yd^3 is inferred at the south end of the deposit. Remaining exposed gravel contains less than $0.01 of gold per yd^3. Little data is available on the geology under the volcanic cap. Based on available information, a low potential exists for the occurrence of additional subeconomic resources.
26	Edman Extension prospect (gold)	Stringers, veinlets, and lenses of quartz occur along and across slates and schists of the Calaveras Formation.	One adit 115 ft long.	Seven samples contained no significant amounts of metals. The lack of sulfides indicates that this prospect has no identified potential for gold resources.

[1]Reserves grade is based on company production in the first year (1982) of production.

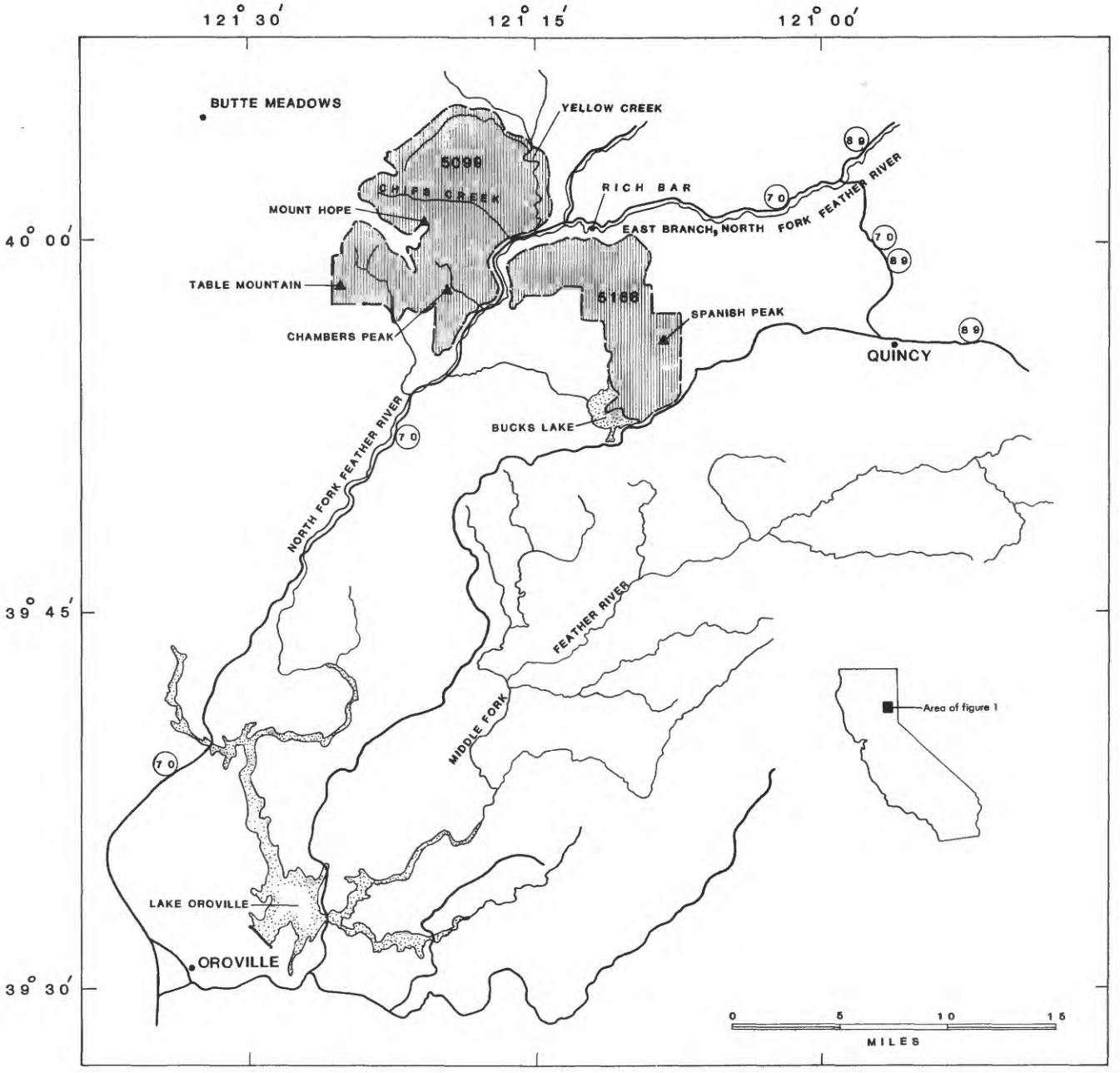
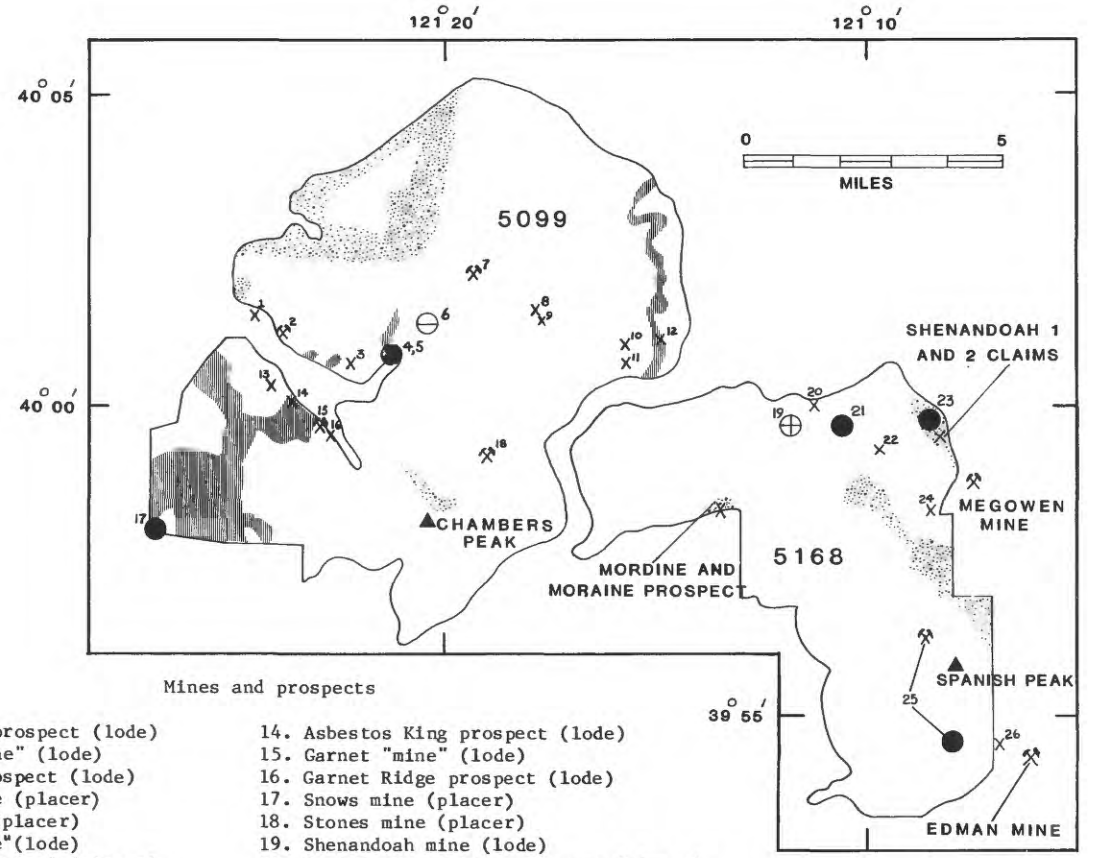


Figure 1.--Index map showing location of Bucks Lake (5168) and Chips Creek (5099) Roadless Areas, Calif.



Mines and prospects

1. Lott Lake prospect (lode)
2. Galena "mine" (lode)
3. Unnamed prospect (lode)
4. Morris mine (placer)
5. Lott mine (placer)
6. Belden "mine" (lode)
7. Porcupine "mine" (placer)
8. Dew Drop prospect (lode)
9. Williams prospect (lode)
10. Sugar Pine prospect (lode)
11. Unnamed prospect (lode)
12. Minnesota and High Channel No. 4 prospect (placer)
13. Sleeping Beauty prospect (lode)
14. Asbestos King prospect (lode)
15. Garnet "mine" (lode)
16. Garnet Ridge prospect (lode)
17. Snows mine (placer)
18. Stones mine (placer)
19. Shenandoah mine (lode)
20. Pacific Foundation prospect (placer)
21. Bud Lee mine (placer)
22. DJR prospect (placer/lode)
23. Fales Hill mine (placer)
24. Spanish Creek prospect (lode)
25. Monte Cristo-Channel Peak mine (placer)
26. Edman Extension prospect (lode)

Note: "Mine" (in quotation marks) refers to historical name of property with no record of other indications of production

EXPLANATION

LODE DEPOSIT

⊕ Locality with high potential for gold

⊖ Locality with moderate potential for copper, gold, lead, and silver

● PLACER DEPOSIT--Locality with high potential for gold

AREA WITH MODERATE POTENTIAL FOR GOLD

AREA WITH LOW TO MODERATE POTENTIAL FOR GOLD

MINE OR PROSPECT--Number refers to list of mines and prospects and tables 1 and 2

⚒4 Mine

×7 Prospect

—— BOUNDARY OF ROADLESS AREA

Figure 2.--Areas with mineral resource potential and selected mines and prospects in the Bucks Lake (5168) and Chips Creek (5099) Roadless Areas, Calif.