

UNITED STATES DEPARTMENT OF THE INTERIOR  
(BUREAU OF MINES)

SUMMARY REPORT

MINERAL INVESTIGATION OF THE SWEETWATER RARE II AREA  
(NO. 4-657), MONO COUNTY, CALIFORNIA AND DOUGLAS AND LYON COUNTIES,

NEVADA

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MLA 69-83

1983

This open file report summarizes the results of a Bureau of Mines wilderness study and will be incorporated in a joint report with the U.S. Geological Survey. The report is preliminary and has not been edited or reviewed for conformity with the U.S. Bureau of Mines standards and nomenclature. Work on this study was conducted by personnel from Western Field Operations Center, East 360 Third Avenue, Spokane, Washington 99202

## FOREWORD

The U.S. Bureau of Mines and U.S. Geological Survey jointly conduct mineral surveys of lands which in the U.S. Forest Service Second Roadless Area Review and Evaluation (RARE II) program have been designated for further planning. These evaluations are used in the RARE II program which conforms with the Multiple-Use Sustained-Yield Act of 1960 (74 Stat. 215; 16 U.S.C. 528-531), the Forest and Rangeland Renewable Resources Planning Act of 1974 (88 Stat. 476, as amended; 16 U.S.C. 1601 note), and the National Forest Management Act of 1976 (90 Stat. 2949; 16 U.S.C. 1600 note). Reports on these surveys provide the President, Congress, the U.S. Forest Service, and the general public with information essential for determining the suitability of land for inclusion in the National Wilderness Preservation System.

This report is on the Sweetwater RARE II area (No. 4-657), California and Nevada.

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## SUMMARY

The Sweetwater RARE II study area, in California and Nevada, was the subject of a U.S. Bureau of Mines mineral resource investigation in 1981 and 1982. Bureau personnel examined 62 mines and prospects in and near the study area; 60 are in California and 2 are in Nevada. Thirty mines and prospects, all in California, have mineral resource potential; 18 of these are within the study area. Based on the area's mining history and this investigation, principal mineral commodities found in and near the study area are silver and gold; iron, molybdenum, copper, uranium, tungsten, manganese, silica and geothermal energy also occur.

The Patterson mining district contains all of the California segment of the Sweetwater RARE II area. Production of 3,400,000 oz of silver, 3,000 oz of gold, and 35,000 lb of copper since 1880 has been estimated. Most production was from the Silverado Mine, with lesser amounts of silver and gold produced from the Kentuck and Monte Cristo Mines; all three mines are slightly outside of the study area. About 2,500 mining claims have been located in or near the RARE II area, mostly within 2 to 3 mi of the major mines. About 500 claims were current in 1982. Most of these occupy the area between Fryingpan and Sweetwater Canyons, east of the crest of the Sweetwater Mountains, and west of the eastern range front.

High potential for silver and gold resources exists in quartz veins and silicified rhyolite breccia in shear zones at the Star and Great Western Prospect, California Comstock Prospect, and Monte Cristo Mine (fig. 1, nos. 19, 22, and 49) in the study area, and at the Silverado, Kentuck, and Frederick Mines (fig. 1, nos. 36, 38, and 43) east of the area. Moderate potential for silver and gold resources occurs at the Silverado Extension No. 3, Red Dog, unnamed prospect no. 42, Boulder Flat, and Wheeler Peak Prospects (fig. 1, nos. 30, 34, 42, 44, and 45), inside the area. The Silverado Mine contains an estimated 120,000 tons of indicated and inferred subeconomic silver resources with a grade of 11 oz per ton. Moderate potential for iron resources exists at the Iron Cap Prospect (fig. 1, no. 14), where an occurrence of about one million tons of magnetite-rich tactite is estimated to average 52 percent iron. Low potential for gold, silver, copper, manganese, and molybdenum exists at eight other prospects in the RARE II area, and for gold, silver, uranium, molybdenum, silica, and geothermal energy resources at nine other prospects and "mines" 1/ adjacent to the area. Prospect no. 50 is a large claim group controlled by AMAX Exploration, Inc. It incorporates many of the other groups of prospects and mines and, based on surface features, has moderate potential for porphyry molybdenum resources at depth.

Sand and gravel occur in the study area but are unlikely to be developed because larger and more accessible deposits are available closer to potential markets.

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1/ "Mine" is the historical name, although no production is recorded.

## INTRODUCTION

The Sweetwater RARE II study area is in the Toiyabe National Forest in Mono County, California, and Douglas and Lyon Counties, Nevada. The area comprises 72,240 acres, approximately 80 mi south-southeast of Reno, Nevada. Elevation of the highest peak, Mount Patterson (fig. 1), is 11,673 ft; the lowest elevation is approximately 7,200 ft. Steep mountainsides support little vegetation above 10,000 ft. Slopes at lower elevations support growth of pine trees and sagebrush, and the larger canyons contain some dense brush and stands of deciduous trees.

Major highways near the east side of the area are Nevada State Highway 338 and California State Highway 182; U.S. Highway 395 is on the west and south boundaries. The area is accessible by unimproved roads. No major obstacles to road construction exist, but rock avalanches from steep, talus-covered slopes pose a maintenance and safety hazard, as do snow avalanches during the region's severe winters.

### Previous and Present Studies

Although the Sweetwater Mountains contain a major mining district, surprisingly little information related to the geology and mineral deposits is available. Three theses have been published, Halsey (1953), Hunter (1976), and Schweickert (1972). Between 1884 and 1940 many production and development statistics were published by the California Division of Mines and Geology. The area has also been briefly mentioned as containing mineral resources in other U.S. Geological Survey and California Division of Mines and Geology reports. Several mining companies have explored the study area, but the information has not been published. All land encompassed by the Walker Lake 2° quadrangle map, which includes the study area, was examined for uranium potential by the Department of Energy (1976, 1980). Major geologic mapping and geochemical sampling programs have been conducted by AMAX Exploration, Inc. and Molycorp, Inc. but the data has not been published.

The present evaluation was conducted during 1981 and 1982. U.S. Bureau of Mines personnel researched pertinent Federal and County mining claim records and files to determine claim locations and mining activity. Field examinations, which included mapping and sampling of mines and prospects were conducted for 400 man-days to determine mineral resources and potential. The Geological Survey constructed a geologic map, and conducted geochemical and geophysical surveys. This report summarizes the Bureau's findings and will be combined with Geological Survey information in a miscellaneous field (MF) series map and report.

Eight hundred forty-one lode samples were taken during the Bureau of Mines investigation. Three varieties of lode samples were taken: chip, grab, and select. Most were chip samples normal to a mineralized horizon or vein. Grab samples were collected from mine and prospect dumps to obtain an approximate grade. Select samples were often taken of the apparent highest grade material in a mineralized zone particularly in probable low-grade occurrences. Petrographic samples were taken at each prospect.

The samples were crushed, pulverized, and split at the Western Field Operations Center processing facility. Each was routinely examined for abnormally high radioactivity to test for uranium and examined for fluorescence to determine the presence of tungsten minerals. Most samples were analyzed for gold and silver by fire-assay methods. When required, quantitative values of other elements were measured by atomic absorption analysis, colorimetry, fluorimetry, cold-vapor atomic absorption, or inductively coupled argon spectrometry. At least one sample from each mineralized feature was checked by semi-quantitative emission spectroscopy for anomalous content of 42 elements 2/; anomalous contents were checked by more quantitative methods.

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2/ 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, titanium, vanadium, yttrium, zinc, and zirconium.



## Regional Mining Activity

The Sweetwater RARE II study area includes part of the Patterson mining district and is near two other historically significant gold-silver mining districts, Masonic (5 mi east) and Bodie (15 mi east). The Patterson district was discovered in the 1850's, and became inactive at the beginning of World War II. The most productive mines were the Silverado and Kentuck, which lie just outside the area's east-central border in the Clinton belt. Prospecting by major mining companies and individual prospectors continues in the district for gold, silver, porphyry molybdenum, iron, tungsten, and uranium. Sand and gravel at the mouth of Sweetwater Canyon are being mined.

According to Clark (1970, p. 147-148), Bodie district deposits are epithermal (bonanza) quartz veins with high-grade, gold- and silver-bearing pods, and zones of disseminated gold in Tertiary andesite. The district, discovered in 1859, yielded \$30 million <sup>3/</sup> in gold plus an additional 1 million oz of silver from 1872 to 1884. Production ceased by World War II.

The Masonic district was discovered in 1860 (Clark, 1970, p. 150) and had a total gold and silver production of \$1.3 million <sup>3/</sup>. Peak production in the district occurred between 1902 and 1910, and all production ended shortly before World War II. Very fine gold and silver occur in the Masonic district as native metals and in sulfide minerals in veins and disseminated in granite and andesite to depths of a few hundred feet.

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<sup>3/</sup> Valuation is based on silver and gold prices at the time of production.

### Study Area Mining Activity and Production

The Patterson (Silverado) mining district is centered about 12 mi north of Bridgeport, California and includes all the California portion of the Sweetwater RARE II study area. Historically, this district is divided into three north-trending belts, the Comstock, Clinton, and Cameron, (Whiting, 1888, p. 358 and 360) along which major epithermal gold and silver deposits occur. Total production from the Patterson mining district is approximately 3,400,000 oz silver with lesser quantities of gold and copper. Some iron may have been mined for bulk metallurgical testing (W. McCaffery, personal communication, 1981).

Prospecting for precious metals began in the 1850's; by 1882, the Kentuck Mine was producing silver, and several major prospects were being developed (Whiting, 1888, p. 361). Total production was approximately \$450,000 (400,000 oz) of silver (Whiting, 1888, p. 361). A later source (Hamilton, 1917, p. 166), indicates total production of the Kentuck Mine was only \$250,000 and that during 1885 the mine ceased production, because of legal and financial difficulties. Recorded production in Bureau of Mines files from 1910 to 1911 was 24,000 oz silver and 156 oz gold, possibly from reworked dumps.

From 1882 to 1888 about \$50,000 (45,000 oz) in silver were produced elsewhere in the district. According to Whiting (1888, p. 361), during the period up to 1885 considerable development work was completed on other mines and prospects - notably the Monte Cristo, Thoroughbrace, Star and Great Western, and Frederick (fig. 1, nos. 49, 48, 19, and 43). From 1904 to 1925 production of 650 oz silver and 90 oz gold was recorded at the Monte Cristo Mine (Bureau of Mines files).

The veins at the largest mine in the district, the Silverado (fig. 1, no. 36), have been known since at least 1882. There have been three periods of production: sporadically from 1885-1920, 1925-1929, and 1933-1939. Total production from the mine is approximately 3,000,000 oz silver and 3,000 oz gold (D. P. Sinai, owner, written communication, 1982); recorded production in the Bureau of Mines files of the Silverado Mine and immediate vicinity is approximately 1,850,000 oz silver, 2,050 oz gold, and 35,000 lbs copper.

From 1932 to 1935, small amounts of coarse molybdenite were produced from quartz veins in altered granodiorite (Kirkemo and others, 1965, p. 38) at the Blue Speck Mine, a part of the Green Creek Prospect (fig. 1, no. 47).

Sporadic prospecting for silver and gold has occurred at the Silverado Mine and elsewhere in the district since World War II. Contact deposits of iron and tungsten peripheral to the district have also been examined during this time, as have uranium occurrences. A manganese deposit was examined at the Penrose Prospect (fig. 1, no. 15) by the Bureau of Mines (unpublished report) during World War II. Recently, the district has been explored for porphyry molybdenum and epithermal silver deposits by AMAX Exploration, Inc., Molycorp, Inc. and other companies.

### Mining Claims

Federal and county mining claim records indicate approximately 2,500 claims have been located in or adjacent to the study area. The majority of these are within 2 or 3 miles of the old mines, and almost all are lode claims. Approximately 300 claims in the study area and 200 claims adjacent to the area were maintained in 1982. The Star and Great Western claims which contain 39.36 acres, are patented and lie within the study area (fig. 1, no. 19). Twenty-four lode claims incorporating the Silverado-Kentuck Mine areas, have been patented, as have one lode claim at the Longstreet Mine (fig. 1, no. 53) and one lode claim and a millsite at the Monte Cristo Mine. During 1981 several holes were drilled near the area to establish a regional geothermal gradient (W. Frye, U.S. Forest Service, personal communication, 1983), but no geothermal lease applications have been filed.

### Geology of Deposits

The oldest rock unit in the study area is a weakly metamorphosed marine volcano-sedimentary sequence of late Triassic to early Cretaceous age which has been intruded by a composite Cretaceous pluton (Brem, 1983). Both are unconformably overlain by a Tertiary volcanic sequence which consists of, from oldest to youngest, the Relief Peak Formation (andesite flows and lahars), the Sweetwater rhyolite (flows, tuffs, and tuff-breccias), and the Stanislaus Group (latite). The dominant structural features are approximately north trending Basin-Range faults.

In the Patterson mining district, precious metal deposits are described by Whiting (1888, p. 358 and 360) as occurring predominantly in three fault-controlled, north-trending belts. The easternmost belt is the Cameron (gold-silver) which includes the Monte Cristo Mine (fig. 1, no. 49). The central Clinton belt (silver), contains the Silverado, Kentuck, and Frederick Mines (fig. 1, nos. 36, 38, and 43) and the westerly Comstock belt (gold-silver) includes the Star and Great Western, and California Comstock Prospects (fig. 1, nos. 19 and 22).

High-grade, silver-gold, epithermal (bonanza) deposits associated with the Sweetwater rhyolite occur mainly in the Clinton and Comstock belts. They consist of lenticular quartz veins from a few inches to several feet thick which contain podiform bodies of argentite with minor hessite, galena, argentiferous galena, and native silver. Gangue consists primarily of quartz, adularia, chalcedony, pyrite, fluorite, and rhyolite fragments. Veins at the Silverado Mine (fig. 1, no. 36) in the Clinton belt, strike north-northeast and dip 40° to 70° east. The known vertical extent of these veins is 500 ft with the lowest mine level still in argentiferous quartz. Principal properties in the Comstock belt, the Star and Great Western, and California Comstock (fig. 1, nos. 19 and 22), contain quartz veins striking north-northwest and dipping steeply to the east. This area of high-grade, silver-gold deposits within and adjacent to the Comstock and Clinton belts has been claimed and leased (where privately owned or previously claimed) by AMAX Exploration, Inc. AMAX has conducted an extensive geologic mapping and geochemical sampling program and a limited drilling program to determine the potential for a late Tertiary Climax-type porphyry molybdenum deposit at depth as well as epithermal silver deposits nearer the surface.

There are several features within the AMAX Prospect (fig. 1, no. 50) characteristic of the upper parts of a porphyry molybdenum system. These are the presence of fluorite and heubnerite (fig. 1, no. 39), breccia pipes and dikes (fig. 1, nos. 18, 27, and 50), abnormally high molybdenum values in rhyolite breccia (fig. 1, nos. 21, 22, and 38), and a potential molybdenum source indicated by surface occurrences of coarse molybdenite (fig. 1, nos. 35, 40, 47, 51, and 54). Silver is a common constituent of upper parts of Climax-type deposits and is prevalent in the area; the age of the mineralized Sweetwater rhyolite appears to coincide with an atectonic period characteristic of these deposits.

The Cameron belt chiefly represented by the Monte Cristo Mine (fig. 1, no. 49) is also in Sweetwater rhyolite. Anomalous amounts of gold and silver are distributed throughout a 2 sq mi pyritized area as well as concentrated in veins. Vein attitudes in the belt are erratic and poorly defined. They strike northwest to northeast, and dip moderately to steeply to the west. Economic minerals may be free gold and silver, and gold and silver in pyrite; dominant gangue minerals are adularia, chalcedony, quartz, and pyrite. The occurrence may be a disseminated deposit of hot springs origin.

The Cretaceous plutonic series is associated with several deposits. These are contact metasomatic iron-copper deposits, coarse molybdenite occurrences in north-trending quartz veins, and uranium occurrences. The contact deposits are magnetite and chalcopyrite replacement pods of the metamorphic rocks. These also contain traces of tungsten in some calcareous strata. Most occurrences are extremely small and lenticular, but one, the Iron Cap (fig. 1, no. 14), is several feet thick and traceable intermittently for approximately 1,000 ft. The metasedimentary unit also hosts the small low-grade uranium occurrences, which appear to be hydrothermal in origin; the underlying pluton locally contains allanite, a rare earth mineral which often contains uranium (Schweikert, 1976, p. 25). The scattered coarse molybdenite-in-quartz occurrences seem to be a variety common to the coastal plutonic belts (Davis and others, 1978, p. 23 and Bookstrom, 1981, p. 224) and not part of a Climax-type stock-work system.

One industrial mineral occurrence, a quartz pegmatite (fig. 1, no. 57) has been found. Three manganese deposits (fig. 1, nos. 11, 15, and 54) of possible late Tertiary or Quaternary hot springs origin have been found in Tertiary Age volcanic units. Fales Hot Springs (fig. 1, no. 59) may be a product of Tertiary vulcanism.

#### Mines and Prospects

Bureau of Mines personnel examined 62 mines and prospects (fig. 1) in 1981 and 1982. Sixty of these are in California; two are in Nevada. Because surface exposures of mineralized zones are scarce and most underground workings are inaccessible, data was not available to estimate resources at mines and prospects in the study area. However, high or moderate potential for mineral resources was identified at several mines and prospects. Table 1 briefly describes all mines and prospects in and near the area.

## ASSESSMENT OF MINES AND PROSPECTS

Bureau of Mines examinations of the 62 known mines and prospects in and near the Sweetwater RARE II area have identified 30 properties with mineral resource potential. They are all in California, and 18 of these properties are inside the RARE II study area. Scarcity of outcrops of mineralized zones and inaccessibility of most underground workings precluded the estimation of mineral resources in the study area.

Resource potential is classified as low, moderate, or high. High potential indicates a deposit with identified resources, recorded production, or significant development, and apparent continuity of favorable geological conditions. Moderate potential implies lower probability for continuity of favorable geologic conditions, and fewer and lower grade mineral occurrences. Low potential indicates grades much lower than minable deposits and few signs of continuity. Designation of potential as moderate or low may be caused by lack of adequate exposures.



### Inside the RARE II Area

Three properties, the Star and Great Western Prospect, the California Comstock Prospect, and the Monte Cristo Mine (fig. 1, nos. 19, 22, and 49) have high potential for silver and gold resources inside the study area. Five others, the Silverado Extension No. 3, Red Dog, unnamed no. 42, Boulder Flat, and Wheeler Peak Prospects (fig. 1, nos. 30, 34, 42, 44, and 45), have moderate potential for silver and gold resources. These properties have epithermal silver and gold occurrences in quartz veins and, silicified zones in rhyolite, and rhyolite tuff and breccia. Low potential for silver resources exists in similar shear zones at the Montague Mine (fig. 1, no. 21), and at two unnamed prospects (fig. 1, nos. 16, and 26).

The AMAX Prospect (fig. 1, no. 50) has moderate potential for porphyry molybdenum in an area which extends outside the study area.

The Iron Cap Prospect (fig. 1, no. 14) has moderate potential for iron resources in a contact metasomatic magnetite zone. An occurrence with about one million tons averaging possibly 52 percent iron has been identified. Several million tons of similar grade would be required for mining.

Low potential for manganese resources exists in possible hot springs deposits at the Penrose Prospect (fig. 1, no. 15) and at the Black Horse Prospect (fig. 1, no. 55) in fracture filling and breccia zones in dacite, respectively. The known molybdenum occurrences are small and sporadic. The Pits Prospect and an unnamed prospect (fig. 1, nos. 51 and 54) were the source of several samples with 0.05 to 0.15 percent molybdenum; low potential for coarse molybdenite resources exists in quartz veins and lenses in granitic rocks. The Apollo Prospect (fig. 1, no. 12) has low potential for iron resources with accessory gold and copper in shear zones and tactites of metamorphosed, interbedded volcanic and sedimentary rocks.

### Adjacent to the RARE II Area

The mine which produced most of the minerals recorded from the Patterson mining district, the Silverado (fig. 1, no. 36), is just east of the RARE II area. About 120,000 tons of indicated and inferred subeconomic resources averaging 11 oz silver per ton are estimated at the Silverado. High potential for additional silver and gold resources exists at this inactive mine and also at the Kentuck and Frederick (fig. 1, nos. 38 and 43) Mines. There is low potential for silver and gold resources at the Tiger I "Mine" and an unnamed prospect (fig. 1, nos. 39 and 34), and low potential for disseminated and vein gold-silver resources at the Thoroughbrace Prospect (fig. 1, no. 48). All these occurrences and deposits are epithermal and in quartz veins and shear zones in rhyolite and tuff breccia, as well as disseminated in the country rock. All are similar to silver and gold occurrences in the study area.

Low potential for uranium resources exists in marine calcareous and tuffaceous metasandstone and metasiltsone at the C and B Prospect and an unnamed prospect (fig. 1, nos. 8 and 9); but radioactivity and uranium values are low.

Low potential for molybdenum resources is indicated in quartz veins in monzonite at the Tiger II "Mine", an unnamed prospect, and the Green Creek Prospect (fig. 1, nos. 40, 41, and 47). Molybdenum content is locally more than 1 percent.

Pegmatitic quartz dikes at an unnamed prospect (fig. 1, no. 57) have low potential for decorative stone or smelter flux resources.

Fales Hot Springs, south of the study area, has been used for resort facilities. The property has low potential for geothermal energy resources.

Table 1.--Mines and prospects of the Sweetwater RARE II area (No. 4-657)

Underlined names indicate properties with identified mineral resources or potential; those not underlined are poorly exposed and may have mineral potential. "Mine" in quotation marks indicates historical name, there is no record or indication of production

Map no. (fig. 1)	Name (commodity)	Summary	Workings and production	Sample and resource data
1	Rickey "Mine" (water wells?)	Shafts sunk probably as water wells in alluvial and colluvial valley fill at the base of the Sweetwater Mountains in an area of intermittent springs.	Two shafts, 10 and 30 ft deep.	No samples. Location is a potential water source of unknown flow or reliability.
2	Golden Rule Prospect (silver)	Milky quartz vein from 2 to 4 ft thick strikes N. 8° E. and dips 45° SE. The vein, which is in a granitic country rock, can be traced by float to another vein outcrop 150 ft south of workings. Vein fractures are heavily iron-oxide stained.	One trench 30 ft long, 10 ft wide, and 5 ft deep; two small exploratory pits.	Three chip samples across the vein, two grab samples, and one select sample were taken. One chip sample had 0.13 oz silver per ton. Other samples assayed no more than 0.09 oz silver per ton.
3	Unnamed prospect (iron)	Massive, black magnetite float is abundant over an area of about 600 sq ft. Country rock is iron-oxide stained quartz monzonite.	None.	Two samples taken: one grab sample of magnetite float contained 66.3 percent iron; one chip sample across the quartz monzonite contained no significant metal values.
4	Unnamed prospect (silver)	Trench is in flow-banded, biotite rhyolite talus. Rock is iron-oxide stained with no obvious metallic minerals or alteration.	One 10 ft-long, 3 ft-wide trench.	One grab sample contained no significant metal values.
5	Unnamed prospect (silver)	The prospect is underlain by manganese-oxide stained, silicified rhyolite.	One pit, 22 ft long, 10 ft wide, and 2 ft deep; one caved adit of unknown length.	Two grab samples taken from the pit and the adit dump contained no significant metal values.
6	Iron King Prospect <u>1/</u> (iron, tungsten)	Contact zones between granitic rocks and calcareous metasedimentary rocks contain magnetite and minor amounts of copper. Magnetite occurs in pods and disseminations in metasediments exposed in two trenches. Tactite containing garnet and epidote is present along a contact between granite and a large marble unit at the south side of the property.	Twenty three exploratory bulldozer trenches up to 500 ft long.	Eight chip, six select, and one grab sample were taken of magnetite-bearing metasedimentary bedrock and float. One chip sample had 17.0 percent FeO, 25.7 percent Fe <sub>2</sub> O <sub>3</sub> , and 0.2 percent copper. Four select samples averaged 14.7 percent FeO and 18.6 percent Fe <sub>2</sub> O <sub>3</sub> . No significant amounts of tungsten were found.

Table 1.--Mines and prospects of the Sweetwater RARE II area (No. 4-657)--Continued

Map no. (fig. 1)	Name (commodity)	Summary	Workings and production	Sample and resource data
7	Unnamed prospect 1/ (iron, tungsten)	Workings are in metasediments and metabasalt (?) near the observed contact with silicic acidic intrusive rock. The metasedimentary rock protolithic assemblage was marine calcareous and tuffaceous clastic sediments which have been thermally metamorphosed to metasiltstone and metasandstone of the albite-epidote-hornblende facies (Brem, 1982, written communication). The only observed metallic minerals were magnetite blebs and disseminated magnetite and pyrite. Part of the strata is calcareous. Garnet, epidote and mica are common.	Eight trenches up to 200 ft long and 10 ft deep.	Six random grab samples, one select sample and one chip sample of magnetite-bearing metasedimentary bedrock and float. The select sample contained 23 percent FeO and 40 percent Fe <sub>2</sub> O <sub>3</sub> . The chip sample contained 8 percent FeO and 25 percent Fe <sub>2</sub> O <sub>3</sub> .
8	C and B Prospect 1/ (uranium)	The prospect consists of two distinct groups of workings, one north and one south of Deep Creek, within marine calcareous and tuffaceous metasandstone and metasiltstone. Regional trend is northwest, but the local trend is north-northeast. Poorly defined fractures and shear zones follow a similar trend and dip 30° - 50° southeast. Iron-oxide stains are prevalent; minor chrysocolla occurs on one thin shear zone in the northern group. Disseminated pyrite is common throughout the strata.	Northern workings consist of one trench 200 ft long, 30 ft wide, 15 ft deep, one drill hole, and two small pits. Southern workings consist of one 50 ft-long shallow trench, one 30-ft-long shallow trench, t pits, and seven drill holes.	Four chip samples, one grab sample, and two select samples. Three chip samples across a fracture in the north workings contained 0.01 to 0.05 percent U <sub>3</sub> O <sub>8</sub> . The richest sample also contained 0.04 percent vanadium. A chip sample across the copper-bearing shear zone contained 0.26 percent copper and 0.004 percent U <sub>3</sub> O <sub>8</sub> . A grab sample and two select samples at the southern workings contained 0.007 to 0.02 percent U <sub>3</sub> O <sub>8</sub> . The deposit has low potential for uranium.
9	Unnamed prospect 1/ (uranium)	Iron-oxide stained fractures are in a marble bed underlain by impure quartzite. Scintillometer readings in the area are six times normal background.	One caved inclined shaft and two, 4-inch diameter drill holes.	Three samples were collected, one grab sample of drill hole cuttings contained no uranium; two chip samples of the fractured quartzite contained no uranium oxide. Low potential exists for uranium resources.

Table 1.--Mines and prospects of the Sweetwater RARE II area (No. 4-657)--Continued

Map no. (fig. 1)	Name (commodity)	Summary	Workings and production	Sample data and assessment
10	Lobdell Lake Prospect <u>1</u> (iron)	Hornfels with massive, black magnetite, epidote, and garnet float are in sloughed trenches. These minerals indicate that a contact metasomatic magnetite zone underlies this colluvium and volcanic flow covered prospect.	Eight trenches, each averaging about 75 ft long, 12 ft wide, and 3 ft deep.	Nine samples were collected. Six grab samples of magnetite ranged from 52 to 67 percent total iron content. Three grab samples of hornfels with disseminated magnetite ranged from 5.8 to 20 percent total iron content.
11	Unnamed prospect (manganese)	Eight in. thick quartz vein with concentric black bands of manganese oxides. Vein strikes N. 33° E. and dips 68° NW. in granitic country rock.	One small prospect pit.	One chip sample of quartz vein contains 0.63 percent manganese and 0.05 percent $WO_3$ .
12	<u>Apollo Prospect</u> (iron, gold, copper)	Shear zones in interbedded metabasalt and metarhyolite contain quartz veins and stringers with magnetite, garnet, epidote, and copper-bearing minerals. Contact metasomatism of calcareous metasediments by granitic intrusions have formed iron- and copper-bearing skarn occurrences. One mineralized zone is a replacement of calcareous metasilstone and tends to parallel volcanic beds which strike N. 50° W. and dip 45° NE.	Two exploratory bulldozer cuts greater than 3,700 ft in combined length; two trenches with lengths of 100 and 200 ft; one caved adit estimated to be 50 ft long; and one pit 30 ft long, 10 ft wide, and 4 ft deep.	Nine samples were collected. Four chip samples of shear zones contained a weighted average of 0.17 oz gold per ton and 0.13 oz silver per ton and three of the chip samples also contained 0.1, 0.84, and 0.05 percent copper. One select sample of skarn had 13.5 percent $FeO$ . Another select sample of skarn had 1.93 percent copper. The occurrence has low potential for iron, gold, copper resources.
13	E. G. No. 1 Prospect (silver)	A 2 ft-thick shear zone strikes from N. 72° to 75° E. and dips 74° SE. in hornfels. The zone contains silicified hornfels with less than 1 percent finely disseminated sulfides.	One adit with 165 ft of workings.	Ten chip samples taken from the silicified hornfels and shear zone in the adit contained no significant metal values.
14	<u>Iron Cap Prospect</u> (iron)	A 4 to 10 ft-thick magnetite zone strikes from N. 54° E. to N. 36° W. and dips from 34° SE. to 44° NE. in calc-silicate and hornfels country rock. The magnetite is contact metasomatic in origin and is black and massive. The zone is inferred to be 1,050 ft long, 260 ft deep, and 6.0 ft thick.	In excess of 1,000 ft of roads and as much as 240 ft of shallow trenches are on the prospect.	Nine chip samples across the magnetite zone ranged from 30.3 percent to 63.0 percent total iron content. An estimated one million tons of magnetite-bearing skarn may average 52 percent iron. A moderate potential for iron resources exists.

Table 1.--Mines and prospects of the Sweetwater RARE II area (No. 4-657)--Continued

Map no. (fig. 1)	Name (commodity)	Summary	Workings and production	Sample and resource data
15	<u>Penrose (Lucky Joe) Prospect</u> (manganese)	A manganese-oxide occurrence of possible hot springs origin. It is probably a surficial phenomenon 100-200 ft in diameter and a few tens of ft thick with near-horizontal attitude.	Five trenches up to 30 ft long and 6 ft deep; eight small trenches and two short caved adits in adjacent tuff and breccia.	Three chip samples contained 1, 21, and 31 percent manganese; three select samples of nearby rhyolite contained negligible amounts of metals. The deposit is localized and has low potential for manganese resources.
16	<u>Unnamed prospect</u> (silver, gold)	Silicified zones in rhyolite contain breccia cemented by milky quartz. Finely disseminated sulfides appear as gray patches and veinlets in silicified rocks. Andesite near Sweetwater Creek contains disseminated pyrite. Some workings are in pyritized metasediments.	One caved adit estimated to be greater than 100 ft long, four caved adits estimated less than 40 ft long, three prospect pits.	Six samples were taken of silicified rhyolite breccia. One select sample contained 5.0 oz silver per ton, and 0.09 oz gold per ton. Two other select samples contained 0.41 and 1.1 oz silver per ton. Three grab samples ranged from 0.03 to 0.07 oz silver. A low potential for silver-gold resources is present in zones of silicified rhyolite breccia.
17	<u>Unnamed prospect</u> (silver)	A segment of a 4-ft-thick quartz vein is in iron-oxide stained, silicified rhyolite tuff breccia.	Eight trenches average 75 ft long, 12 ft wide, and 3 ft deep.	Twelve samples taken: eleven grab samples from the pits and one chip sample across the quartz vein contained no significant metal values.
18	<u>Unnamed prospect</u> (silver)	Brecciated rhyolite cemented by limonite and near a 15-ft-diameter breccia pipe. Disseminated pyrite locally present in rhyolite.	Two small prospect pits.	Three grab samples of rhyolite and rhyolite breccia contained no significant metal values.
19	<u>Star and Great Western Prospect</u> (silver, gold)	A precious metal mineral deposit is associated with silicified rhyolite. A 4 ft-thick silicified shear zone strikes N. 21° W. and dips 66° NE. in silicified rhyolite country rock. The zone is brecciated and contains about 80 percent quartz, 10 percent quartz clasts, 5 percent limonite, and 5 percent argentiferous sulfides. Other less prominent mineralized zones are also at the prospect.	Fifteen caved adits (estimated in excess of 2,200 ft of workings), six pits, and one adit 28 ft in length.	Twenty-six samples were taken; one chip sample across the only zone exposed contained 40.9 oz silver per ton. One select stockpile sample contained 77.8 oz silver per ton and 0.167 oz gold per ton; one select dump sample had 1.58 oz silver per ton and 0.26 oz gold per ton; 24 grab samples from dumps contained from 0.04 to 9.6 oz silver per ton. High potential for silver-gold resources exists.

Table 1.--Mines and prospects of the Sweetwater RARE II area (No. 4-657)--Continued

Map no. (fig. 1)	Name (commodity)	Summary	Workings and production	Sample data and assessment
20	Angelo Mission "Mine" (silver)	Country rock is pyritized and slightly silicified rhyolite tuff and tuff breccia. The longer adit was apparently driven to crosscut a possible offset segment of the fault exposed on the California Comstock, and Star and Great Western properties. The shorter adit follows a vertical quartz vein which strikes north-northwest. Only minor quartz veining is in the adits.	Two adits, 700 and 300 ft-long.	Ten chip samples, one select sample, and two grab samples contained up to 0.007 percent molybdenum, but no significant silver.
21	Montague "Mine" (silver, gold)	Most development is in a northeast-striking, quartz breccia vein which is up to 50 ft thick. Country rock and apparently much of the breccia is rhyolite tuff. All rock types are pyritized. Andesite and andesitic lahar is abundant in the canyon south of the prospect. Quartz monzonite is exposed in the northern part of the prospect.	A 290 ft adit near the north end of the area, 17 pits and trenches up to 200 ft long in the central part of the area, 6 pits and trenches up to 40 ft long in the west-central part, and 25 pits and trenches up to 450 ft long and 2 caved adits at and near the Montague Mine.	Twelve chip samples of the quartz breccia vein and minor veinlets were taken; the highest content was 1.6 oz silver per ton. The others contained only background to trace amounts of silver. Twenty-four random samples were taken. The highest content was 0.8 oz silver per ton. One grab sample contained 0.06 percent molybdenum, and most samples contained trace amounts of molybdenum. Seven contained a trace of gold. The deposit has low potential for silver-gold resources.
22	California Comstock Prospect (silver, gold)	Mineralized quartz veins up to 3 ft thick are in a 20 to 40 ft thick silicified shear zone in rhyolite and rhyolite tuff-breccia. The silicified zone trends north, dips steeply to the east, and can be trace for 800 ft on the surface with a possible 300 ft extension to the south. Silver-bearing quartz veins contain finely disseminated argentite (?) occurring as gray to black patches and veinlets in milky quartz, and rhyolite quartz breccia.	Two caved adits; one adit blocked by ice; a caved shaft; exploratory bulldozer cuts totalling about 3,800 ft in length; ten short trenches; two open cuts about 30 ft in diameter; 13 prospect pits.	Forty-two samples were taken. Twenty-two chip samples across quartz veins contained a weighted average of 1.25 oz silver per ton. Twenty grab and select samples had silver values ranging from trace to 5.7 oz per ton. Samples contained up to 0.11 percent molybdenum. One shear zone contains an occurrence of 4,500 tons of argentiferous quartz averaging 7.8 oz silver per ton and 0.06 oz gold per ton. High potential for silver-gold resources is in silicified shear zones.
23	Unnamed prospect (silver)	Clear to milky quartz vein 9 in. thick in rhyolite. Vein strikes N. 5° W. and dips 33° NE.	One adit 5 ft long.	One chip sample across the quartz vein had a minor amount of silver.
24	Unnamed prospect (silver)	Rhyolite tuff breccia which is highly argillized and silicified and contains disseminated pyrite.	Nine exploratory bulldozer cuts totalling 950 ft in length.	Nine samples were taken. One select sample of silicified breccia contained 0.11 oz silver per ton. Eight grab samples had only minor amounts of silver.

Table 1.--Mines and prospects of the Sweetwater RARE II area (No. 4-657)--Continued

Map no. (fig. 1)	Name (commodity)	Summary	Workings and production	Sample data and assessment
25	Sweetwater Rose Prospect (silver)	Alluvium, colluvium and glacial drift of silicified rhyolite tuff, tuff breccia, and some vein quartz breccia with a light-gray matrix.	Five pits and trenches up to 200 ft long.	Two grab samples and one chip sample contained no significant metal values.
26	Unnamed prospect (silver, gold)	Silicified rhyolite breccia containing veinlets of gray quartz. Abundant vugs in the breccia filled with drusy quartz. Minor pyrite and heavy iron-oxide staining are present.	Two caved adits estimated to be 150 ft and 50 ft long.	Five samples were taken of silicified rhyolite. One chip sample contained 1.18 oz silver per ton. Three select samples had 0.09, 0.19, and 1.6 oz silver per ton. One grab sample had 0.09 oz silver per ton. This occurrence has low potential for silver resources.
27	Unnamed prospect (silver)	Breccia dike striking north with a steep easterly dip is about 6 ft thick and traceable for 200 ft. It has angular fragments of silicified rhyolite and andesite in a siliceous gray to black aphanitic matrix.	One small pit and one trench.	Two select samples: one contained 0.8 oz silver per ton and trace amounts of molybdenum. The other contained 0.2 oz silver per ton, 0.023 percent molybdenum and a trace of gold.
28	Unnamed prospect (silver)	Tertiary rhyolite quartz porphyry "neck" penetrating older granitic intrusive rock. The rhyolite is iron- and manganese-oxide stained and the contact is flooded with quartz veinlets.	One small trench.	One select sample of rhyolite contained trace amounts of silver and molybdenum.
29	Unnamed prospect (silver, gold)	Country rock is rhyolite tuff breccia and rhyolite dikes; rhyolite float with pyritic siliceous matrix is present. Chalcedony-filled fractures are common.	One small pit.	One select and one grab sample each contained no significant amounts of metals.
30	Silverado Extension No. 3 Prospect (silver, gold)	A poorly exposed shear zone striking N. 44° E., dipping near vertical is in rhyolite tuff breccia; this structure is probably a northerly extension of the Silverado vein. The 20 to 30 ft-thick zone is composed of quartz veins at least 2 ft thick and breccia with a gray aphanitic matrix. Very fine argentite/acanthite with pyrite occurs locally. Pyrite is disseminated in the country rock.	Three caved adits, the longest estimated to be 70 ft; eight pits, as much as 20 ft in diameter and 6 ft deep; five trenches up to 40 ft long.	Seven select samples of vein and breccia were taken. Six contained 0.5 to 1.0 oz silver per ton. Some contained minor traces of gold. The deposit has moderate potential for silver and gold resources.



Table 1.--Mines and prospects of the Sweetwater RARE II area (No. 4-657)--Continued

Map no. (fig. 1)	Name (commodity)	Summary	Workings and production	Sample and resource data
31	Unnamed prospect (silver)	Country rock is rhyolite tuff; some andesite float is present. No obvious structure. This may be part of Silverado Extension No. 3.	One small pit.	One select and one grab sample of float contained traces of silver.
32	Cottonwood Canyon Prospect (silver)	Silicified zones are in rhyolite to andesite breccia. Sparse silicified rhyolite breccia (found mostly as float) contains finely disseminated sulfides in gray to black silicic matrix. This prospect is on the projected trend of the Silverado vein system.	Exploratory bulldozer cuts totalling 3,400 ft long, and 28 prospect pits.	Ten select samples of silicic rock and 30 grab samples contained up to 0.05 oz silver per ton. Four grab samples have silver values between 0.1 and 0.25 oz per ton.
33	Unnamed prospect <u>1/</u> (silver)	Workings are in bedrock and rubble of rhyolite tuff and tuff-breccia with traces of disseminated pyrite. Area is in vicinity of rhyolite intrusive dikes and adularia veins. One ft-thick siliceous vertical shear zone in rhyolite strikes N. 50° E.	Two, 80 ft-long trenches and one small pit in rubble and one 30 ft trench in bedrock.	Two select samples of rhyolite rubble with only normal background metal contents. One chip sample of siliceous shear contained minor amounts of silver.
34	<u>Red Dog Prospect 1/</u> (silver, gold)	Workings in bedrock and talus of silicified and pyritized rhyolite tuff and tuff breccia in shear zones with adularia veins and rhyolite dikes. The adularia veins are a few inches thick, vertical, and strike northeast. Shear zones are up to 3 ft thick, and the silicified fractures contain light gray argentite (?) lenses.	Five small pits, a 30 ft trench, two 100 ft trenches, and two short, caved adits in talus.	One chip sample of a shear zone at the portal of a caved adit contained 9.0 oz silver per ton; one select dump sample contained 8.0 oz silver per ton and 0.03 oz gold per ton; eight other select samples ranged from 0.1 to 1.1 oz silver per ton. Most samples contained a trace of molybdenum. The deposit has moderate potential for silver and gold resources.
35	Unnamed prospect <u>1/</u> (molybdenum)	Quartz vein contains coarse molybdenite, tourmaline, and pyrite in monzonitic intrusive rock and aplite. The vein trends northeast and dips steeply northwest. A sericite envelope surrounds the vein. Some molybdenite occurs in the country rock.	One 6 ft adit.	Two select samples and 3 chip samples were taken. All contained a trace of molybdenum and one select sample contained 0.18 percent molybdenum and .002 percent tin.

Table 1.--Mines and prospects of the Sweetwater RARE II area (No. 4-657)--Continued

Map no. (fig. 1)	Name (commodity)	Summary	Workings and production	Sample and resource data
36	Silverado Mine 1/ (silver, gold)	<p>Workings are in faults within highly altered and pyritized silicified rhyolite tuff, tuff breccia, quartz porphyry dikes, and coarse feldspar porphyry rhyolite dikes. Productive workings were in high grade ore "shoots" in a fault which strikes approximately N. 15° E. and dips 40° to 70° NW. Nearby exploratory workings are in north-northwest striking, steeply west-dipping silicified shear zones. Mine depth may have been controlled by de-watering problems rather than lack of ore. Primary ore minerals are acanthite, hessite, and a trace of galena and chalcopyrite in a highly siliceous matrix. The structure is probably the same as that at the Kentuck Mine and perhaps the Frederick Mine. Twenty-four claims have been patented.</p>	<p>The Silverado Mine contains 1,840 ft of haulage drift and 9 levels with 13,780 ft of development and production drifts excluding raises and stopes. Only portions of the haulage drifts were open. Total production from approximately 1885 to 1938 was about 3,000,000 oz silver, 3,000 oz gold, and 35,000 lb copper. Ancillary nonproducing workings are four adits ranging from 15 ft to 75 ft; two 150 ft trenches, several small pits, and two drill holes.</p> <p>Several mills have been constructed in this vicinity; most were at the mine mouth and destroyed by avalanches. The most recent mill at the mouth of Silverado Canyon operated from 1925 to 1926 and 1934 to 1938. Originally a cyanide process for silver recovery was used. The mill was converted to a flotation process in 1935.</p>	<p>In the Silverado Mine most workings are caved and the large ore "shoots" could not be sampled. Seventy-six samples were taken. Sixty-one chip samples of nonsilicified zones in the faults contained background or slightly higher amounts of silver. One chip sample in a small open stope contained 56 oz silver per ton. Two select and two grab samples contained only trace amounts of metals. In the ancillary workings, two of three chip samples of silicified shear zones contained, 3 oz silver per ton and 9.0 oz silver per ton; five select samples of dump material contained no significant metal values; and two select dump samples of vein material contained 6.5 oz silver and 0.34 oz gold per ton and 12.4 oz silver and 0.02 oz gold per ton. Based on the analyses of 680 chip samples illustrated on old mine maps, the mine contains 120,000 tons of indicated and inferred subeconomic resources with an average grade of 11 oz silver per ton.</p> <p>Eight grab samples of mill tailings contained 1.04 to 1.65 oz silver per ton and from 0.01 to 0.16 percent tellurium. The mill tailings contain 35,000 tons with of average grade of 1.3 oz silver per ton.</p> <p>Based on sample analyses on old production maps, and production history this mine has high potential for silver and gold resources.</p>

Table 1.--Mines and prospects of the Sweetwater RARE II area (No. 4-657)--Continued

Map no. (fig. 1)	Name (commodity)	Summary	Workings and production	Sample and resource data
37	Unnamed prospect 1/ (silver, gold)	Two trenches in breccia rhyolite and one in andesite landslide rubble.	Three trenches 80 ft to 150 ft long.	A chip sample and a select sample contained no significant amounts of metals.
38	Kentuck Mine 1/ (silver, gold)	Brecciated and silicified shear zones in rhyolite, rhyolite porphyry and volcaniclastic rhyolite contain finely disseminated argentite (?) and hessite (?) which appear as gray to black patches and veinlets in the matrix of quartz veins; pyrite locally is present. Mineralized zones are poorly exposed, but tend to be oriented approximately north with moderate to steep dips to the west. Iron- and manganese-oxide staining is common along mineralized zones.	There are more than 1,600 ft of underground workings in caved adits and a 150 ft winze. Development was on three levels (Whiting, 1888, p. 361) with a stope to the surface above the highest level. Ancillary workings include: four adits less than 25 ft long; a caved adit estimated to be 150 ft long; four caved adits; a caved shaft; a bulldozer cut 250 ft long; and 13 prospect pits. Production from the Kentuck Mine is reported to have been 250,000 oz of silver (Hamilton, 1917, p. 166).	Thirty-six samples were taken. Two 0.5 ft chip samples across quartz veins contained 14.8 and 2.51 oz silver per ton. Thirteen chip samples had silver values ranging from 0.02 to 1.44 oz per ton. Two select samples of quartz vein dump material had 28.9 and 5.8 oz silver per ton. Eleven other select samples contained silver values ranging from 0.01 to 1.28 oz per ton. Eight grab samples contained from a trace to 37.7 oz silver per ton. High silver-gold potential in silicified shear zones is identified.
39	Tiger I "Mine" 1/ (silver, gold)	Poorly defined quartz veins occur in granite, rhyolite, and rhyolite volcaniclastics. Veins of clear to milky quartz with accessory fluorite are up to 8 in. wide. Argentite (?) occurs as finely disseminated gray to black patches and veinlets; gold and huebnerite are visible in vein rock on the dump. Limonite staining is present on quartz vein fractures.	Four caved adits, each with estimated lengths over 100 ft, two adits, two trenches, each 130 ft long, and eight prospect pits.	Eight samples were taken. Four select samples from the dumps had from 0.40 to 1.54 oz silver per ton; and two select samples from the dumps had 0.01 and 0.014 oz gold per ton. Low potential exists for silver and gold resources in quartz veins.
40	Tiger II "Mine" 1/ (molybdenum)	Coarse molybdenite in quartz in altered quartz monzonite (?). Some molybdite is present.	One 85 ft adit in landslide rubble, and one caved adit estimated to have 500 ft of workings.	A select sample from a stockpile contained 0.3 percent molybdenum and minor silver. The occurrence has low potential for molybdenum resources.
41	Unnamed prospect 1/ (molybdenum)	Very fine molybdenite (?) and pyrite occur in a poorly defined silicified shear zone in highly altered quartz monzonite (?).	One 6 ft long adit.	One shear zone and one chip sample contained 0.025 and 0.03 percent molybdenum and trace amounts of silver. The occurrence has low potential for molybdenum resources in the shear zone.

Table 1.--Mines and prospects of the Sweetwater RARE II area (No. 4-657)--Continued

Map no. (fig. 1)	Name (commodity)	Summary	Workings and production	Sample and resource data
42	<u>Unnamed prospect</u> (silver, gold)	A series of adits on a talus slope follow a quartz vein striking N. 10° W., dipping 45° SW., in pyritized rhyolite porphyry country rock. The vein, which is up to 2.5 ft thick, contains a gray matrix.	One 75 ft long adit, two caved adits, each estimated to be less than 50 ft long, and the remains of a mill.	One of five chip samples of the vein in the open adit contained 15 oz silver per ton and 0.09 oz gold per ton; the remaining samples contained no gold or silver. Grab samples of vein and float contained 0.4 and 0.3 oz silver per ton respectively. The occurrence has moderate potential for silver and gold resources in the quartz vein.
43	<u>Frederick "Mine" 1/</u> (silver, gold)	Silicified shear zones in rhyolite and rhyolite porphyry contain argentite (?) in clear to milky quartz veins up to 3 ft thick. Brecciated rhyolite is cemented by quartz along margins of veins. Argentite (?) is finely disseminated and occurs as gray-black veinlets, patches, and breccia fragments in quartz veins. The main mineralized vein strikes N. 28° W. and dips 48° NE. Iron- and manganese-oxide staining along the shear zones. Talus covers the main structure on the surface.	Underground workings include 1,280 ft of drifts, stopes, and crosscuts. Ancillary workings include a 30 ft adit; an inaccessible adit estimated to be 200 ft long; and four prospect pits. In 1980, a 1,100 ft-deep hole was drilled near the main adit portal by Molycorp.	Twenty-four samples were taken. Two 0.5 ft chip samples across the main Frederick vein had 31.6 and 162 oz silver per ton with 0.96 and 0.24 oz gold per ton, respectively. Eighteen chip samples ranged from 0.06 to 2.1 oz silver per ton. Four select samples from dumps ranged from 0.41 to 1.49 oz silver per ton. High potential for silver and gold resources exists in silicified shear zones.
44	<u>Boulder Flat Prospect</u> (silver, gold)	Talus of silicified rhyolite, tuff, tuff breccia, and andesite covers the prospect area. Massive, iron-oxide stained, white quartz float occurs in the talus near and in the sloughed workings.	Three caved adits, seven pits, and two trenches are obscured by talus debris. One caved adit is probably in excess of 400 ft long, based on the dump size.	Seventeen grab samples from dumps contained from 0.04 to 2.72 oz silver per ton. Potential is moderate for silver and gold resources in talus-covered quartz veins.
45	<u>Wheeler Peak Prospect</u> (silver, gold)	Workings are in silicified rhyolite tuff and breccia along the same general structural trend as the Frederick "Mine." Weakly defined zones of 1 in. thick quartz veins with some gray quartz are in shear zones and in fractures. General strike of the shear zones is northerly, dip is 50° to 70° E. The collective width of the group of shear zones is approximately one-quarter mi.	Part of the workings are outside the study area; 33 small pits and trenches, a 15 ft long adit, and five caved adits.	Forty-six samples were taken. Twelve chip samples of individual silicified shear zones contained from 0.005 to 0.09 oz gold per ton and 0.2 to 0.6 oz silver per ton. Of twenty-seven select samples of vein outcrops and float, nine contained from a trace to 0.16 oz gold per ton and a trace to 1.5 oz silver per ton. Only one select sample contained 0.12 oz gold and 11.5 oz silver per ton. Seven grab samples of country rock and vein float contained no significant metal contents. The deposit has moderate potential for silver and gold resources in the shear zones.

Table 1.--Mines and prospects of the Sweetwater RARE II areas (No. 4-657)--Continued

Map no. (fig. 1)	Name (commodity)	Summary	Workings and production	Sample and resource data
46	M and T Prospect (silver)	Workings are in andesite lahar and rhyolite talus near a contact with older granitic rock.	Eleven small trenches and pits; two caved adits (one of which is possibly 100 ft long).	Eleven select and 9 grab samples of andesite and rhyolite contained no significant metal values.
47	Green Creek Prospect 17 (molybdenum)	Occurrence of coarse molybdenite and minor chalcopyrite is in north-northeast striking, southeast dipping quartz veins up to a few inches thick in argillized monzonitic and aplitic rock.	Three trenches, 100 to 250 ft long. On the south end of the prospect are three caved adits and 2,000 ft of road. There are four drill holes on the north end.	Six chip samples were taken: two across the quartz veins contained 1.26 percent and 0.01 percent molybdenum; four in altered intrusive rock and vertical, north-striking shears contained 0.01 to 0.03 percent molybdenum; and two dump samples of aplite from the dump contained no significant metal content. The deposit has low potential for molybdenum resources in the quartz veins.
48	Thoroughbrace Prospect 17 (gold, silver)	A 2 ft thick, iron oxide-stained, massive, white, quartz vein strikes N. 65° W. and dips 45° SW. in iron oxide-stained, silicified tuff, and tuff breccia. The quartz and tuff breccia contain about 1 percent finely disseminated sulfides, mainly pyrite.	Three caved adits, two caved shafts, and two sloughed pits are on the prospect. In 1888, three adits totalling 725 ft and a 260 ft shaft were on the prospect (Whiting, 1888, p. 362).	Twenty-two samples were taken; one chip sample across the quartz vein contained no significant metal values; twenty-one grab samples from dumps contained from 0.2 to 0.85 oz silver per ton. Potential for gold and silver resources is low in the quartz vein.
49	Monte Cristo Mine (gold, silver)	Silicified rhyolite breccia and rhyolite porphyry in shear zones striking generally northeast and dipping moderately to steeply northwest contain finely disseminated sulfides. Silver minerals are associated with gray to black veinlets in silicified breccias. Green, gray, and black chalcedony is commonly present in silicified zones. Disseminated silver and gold may occur in extensive alteration zones. Talus covers main structures.	Main workings include an open cut at the surface, and more than 1,000 ft of inaccessible underground workings in 4 caved adits (Whiting, 1888, p. 361). Ancillary workings include a 20 ft long adit; four adits, each with an estimated length over 100 ft; three caved adits, three caved shafts, and 34 exploratory pits and small trenches. According to Bureau of Mines production records 90 oz gold and 650 oz silver have been produced from the Monte Cristo Mine, but production records are probably not complete.	Seventy-four samples were taken. Four chip samples across parallel shear zones in the open cut contained a weighted average of 0.10 oz gold per ton and 0.52 oz silver per ton. Ten select samples of in-situ vein and dump material had values between 0.02 and 1.2 oz silver per ton and gold values from a trace to 0.28 oz per ton. Fifty-six grab samples ranged from a trace to 0.05 oz gold per ton, and three others contained 0.06 to 0.13 oz gold per ton. One grab sample of silicified rhyolite breccia had 0.28 oz silver per ton and 0.54 oz gold per ton. Potential is high for gold-silver resources in silicified shear zones, and disseminated in rhyolite.

Table 1.--Mines and prospects of the Sweetwater RARE II areas (No. 4-657)--Continued

Map no. (fig. 1)	Name (commodity)	Summary	Workings and production	Sample data and resources
50	<u>AMAX Prospect</u> (molybdenum)	This large area is a consolidation of three large claims groups, many small claim groups, individual claims, and 28 patented claims; it overlies mines and prospects 18 through 28, 30, and 32 through 48 discussed elsewhere in this table. Most of the exposed rock is highly altered rhyolitic flows, dikes, tuffs, and tuff-breccias of the "Sweetwater Volcanic Center" (Brem, oral communication, 1982). Alteration appears to be related to the epithermal deposits, but many features in the numerous prospects are characteristic of a Climax-type porphyry molybdenum system. These characteristics include: the presence of fluoride and tungstate minerals; an explosive rhyolite volcanic sequence with above normal amounts of contained molybdenum; numerous silver occurrences; and several breccia pipes and dikes.	Besides the workings mentioned in other prospect descriptions, approximately 20 mi of access has been constructed or improved.	During a geologic mapping and geochemical sampling program conducted by AMAX Exploration, Inc. several hundred rock chip samples were taken. Anomalous molybdenum ( $\geq 24$ ppm) was identified in a 1.5 mi wide, belt beginning on Wheeler Peak and extending for 3 mi to the north. The Montague and Kentuck Mines vicinity also had anomalous molybdenum values. Anomalous silver contents ( $> 1$ ppm) corresponded closely with molybdenum anomalies. Moderate potential for molybdenum resources exist.
51	<u>Pits Prospect</u> (molybdenum)	Occurrence of coarse molybdenite and pyrite in a quartz vein in Cretaceous monzonitic intrusive rock. Strike of the quartz vein is N. 20° W., dip is 55° NE.	One small pit.	A chip sample of the vein contained 0.081 percent molybdenum; two select samples from dumps contained as much as 0.15 percent molybdenum, 0.02 oz gold per ton and 0.34 oz of silver per ton. There is low potential for molybdenum resources in quartz veins.
52	<u>Unnamed prospect 1/</u> (tungsten)	Calc-silicate rock containing epidote, garnet, and minor pyrite and pyrolusite is present at the pit. White, rhyolitic, welded ash with disseminated pyrite is in the trench.	One exploratory bulldozer cut 60 ft long; one pit 20 ft long, 15 ft wide, and 8 ft deep is 200 ft west of the bulldozer cut.	One select sample of calc-silicate rock contained 0.07 oz silver per ton and 0.005 percent $W_3O_8$ . One grab sample of rhyolitic rock had 0.02 oz silver per ton.
53	<u>Longstreet "Mine" 1/</u> (tungsten)	Xenoliths up to 60 ft wide of silicified metasediments are in granite. Disseminated pyrite (up to 5 percent of rock) is in portions of the metasedimentary blocks, and sparse pyrite is in shear zones in the granite.	One adit 90 ft long.	One chip, one grab, and one select sample of siliceous, pyritic rock contained no significant metal values.
54	<u>Unnamed prospect</u> (molybdenum)	Clear to smoky quartz lenses up to 5 ft long are in granite. Molybdenite, ferrimolybdenite, and pyrite are in quartz lenses; empty cavities indicate much crystal weathering.	One shaft 10 ft deep, and one open cut 8 ft long.	Two select samples had 0.05 and 0.08 percent molybdenum and 0.08 and 0.22 oz silver per ton. Low potential for molybdenum resources exists in quartz lenses.
55	<u>Black Horse Prospect</u> (manganese)	Botryoidal psilomelane and manganite (?) occur as 1 to 3 in. stringers in dacite and in a brecciated zone about 1 ft thick, which strikes N. 60° W. and dips 70° SW. Dacite fragments are cemented with psilomelane in the brecciated zone.	A caved adit about 15 ft long; an open cut 28 ft long, 4 ft wide, and 15 ft deep at the face.	A chip sample of psilomelane breccia contained 41 percent manganese. A chip sample of dacite contained 0.43 percent manganese. Low potential for manganese resources is in the breccia zones.

Table 1.--Mines and prospects of the Sweetwater RARE II areas (No. 4-657)--Continued

Map no. (fig. 1)	Name (commodity)	Summary	Workings and production	Sample and resource data
56	Sims Prospect (silver)	The occurrence is a pyritized, 30-ft-thick shear zone in hornblende andesite. The zone strikes north, dips 50° E., and is about 1,500 ft long, silicified, iron-oxide stained, and vuggy. Selenite is common.	One 10 ft long adit and two small pits.	One chip sample of the shear zone contained minor amounts of silver.
57	Unnamed Prospect 1/ (quartz)	Two vertical (?) circular pegmatites--each approximately 300 ft in diameter--and several small pegmatites to the east-southeast trend N. 70° W. All are dominantly milky quartz with a thin feldspar shell. Host is a granitic intrusive rock.	None.	An estimated 600,000 tons of quartz occurs on the prospect. No samples. The deposit has low potential for decorative stone or silica smelter flux resources.
58	Quartz Hill No. 6 Prospect 1/ (silver, gold)	Rhyolite dikes intruding quartz monzonite. Both rock types are cut by a poorly defined, vertical silicified easterly trending shear zone about 6 ft thick, and are altered and pyritized.	One 20 ft long open cut.	Three samples taken: two grab samples of dump rock and one sample across the sheared rhyolite contained no significant metal values.
59	Fales Hot Springs 1/ (geothermal energy)	Several hot springs discharging into Hot Creek have formed extensive tufa deposits.	One well 416 ft deep; bathing and swimming facilities with overnight accommodations.	Several springs discharge at more than 260 gallons/minute at temperatures to 142°F. Reservoir temperature is estimated to be 241°F and reservoir volume is estimated to be 0.8 mi <sup>3</sup> (Muffler, 1979, p. 64). The deposit has low potential for geothermal energy resources.
60	Red Gold Prospect 1/ (mercury)	Pods of brecciated milky quartz in 40 ft thick shear zones are in granite. Red oxides of iron and manganese are in the shear zone and along fractures. Strike of the zone is N. 70° E.; dip is 65° N.	One 15 ft deep shaft.	One select sample of quartz contained no significant metal values.
61	Unnamed prospect 1/ (silver)	Colluvium and residual arkose of Cretaceous intrusive rock with minor amounts of quartz.	Four shallow 20 ft long trenches.	Two select samples with no anomalous metal contents.
62	Unnamed prospect (silver)	Two heavily iron-oxide stained shear zones are in granite. One 10 in. thick zone strikes N. 36° W., and dips 45° SW., the other is 12 in. thick, strikes N. 6° W., dips 37° SW. and can be traced by iron-oxide stained float for 500 ft along the surface.	Three trenches from 20 to 40 ft long; and one small prospect pit.	Two chip samples across the shear zones contained 0.04 oz silver per ton. One grab sample of iron-oxide stained granite contained 0.03 oz silver per ton.

1/ Outside the study area boundary

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**EXPLANATION**

Sweetwater RARE II (No 4-657) study area boundary

Approximate boundary, patented mining claim

Secondary road

Unimproved road

(Au) (Ag)

Mine or prospect with mineral resources or resource potential, showing commodity

Commodity

Ag -silver	Mn -manganese
Au -gold	Mo -molybdenum
Cu -copper	Si -quartz
Fe -iron	U -uranium
G -geothermal energy	W -tungsten

X Prospect with no identified mineral resources or potential

- Mines and Prospects**
1. Rickey "mine" /
  2. Golden Rule Prospect
  3. Unnamed prospect
  4. Unnamed prospect
  5. Unnamed prospect
  6. Iron King Prospect
  7. Unnamed prospect
  8. C and B Prospect
  9. Unnamed prospect
  10. Lowell Prospect
  11. Unnamed prospect
  12. Apollo Prospect
  13. E. G. No. 1 Prospect
  14. Iron Cap Prospect
  15. Penrose Prospect
  16. Unnamed prospect
  17. Unnamed prospect
  18. Unnamed prospect
  19. Star and Great Western Prospect
  20. Angelo "Mission" Mine /
  21. Montague "mine" /
  22. California Comstock Prospect
  23. Unnamed prospect
  24. Unnamed prospect
  25. Sweetwater Rose Prospect
  26. Unnamed prospect
  27. Unnamed prospect
  28. Unnamed prospect
  29. Unnamed prospect
  30. Silverado Extension No. 3 Prospect
  31. Unnamed prospect
  32. Cottonwood Canyon Prospect
  33. Unnamed prospect
  34. Red Dog Prospect
  35. Unnamed prospect
  36. Silverado Mine
  37. Unnamed prospect
  38. Kentucky Mine
  39. Tiger I "Mine" /
  40. Tiger II "Mine" /
  41. Unnamed prospect
  42. Unnamed prospect
  43. Frederick "Mine" /
  44. Boulder Flat Prospect
  45. Wheeler Peak Prospect
  46. Mt. T. Prospect
  47. Green Creek Prospect
  48. Thoroughbred Prospect
  49. Monte Cristo Mine
  50. AMAX Prospect
  51. Pitts prospect
  52. Unnamed prospect
  53. Longstreet "Mine" /
  54. Unnamed prospect
  55. Unnamed prospect
  56. Sims Prospect
  57. Unnamed prospect
  58. Quartz Hill No. 6 Prospect
  59. Fales Hot Springs
  60. Red Gold Prospect
  61. Unnamed prospect
  62. Unnamed prospect
- / Mine indicates a record of production; "Mine" indicates a historical name, although no production is recorded.

Figure 1. - Mines and prospects of the Sweetwater RARE II area