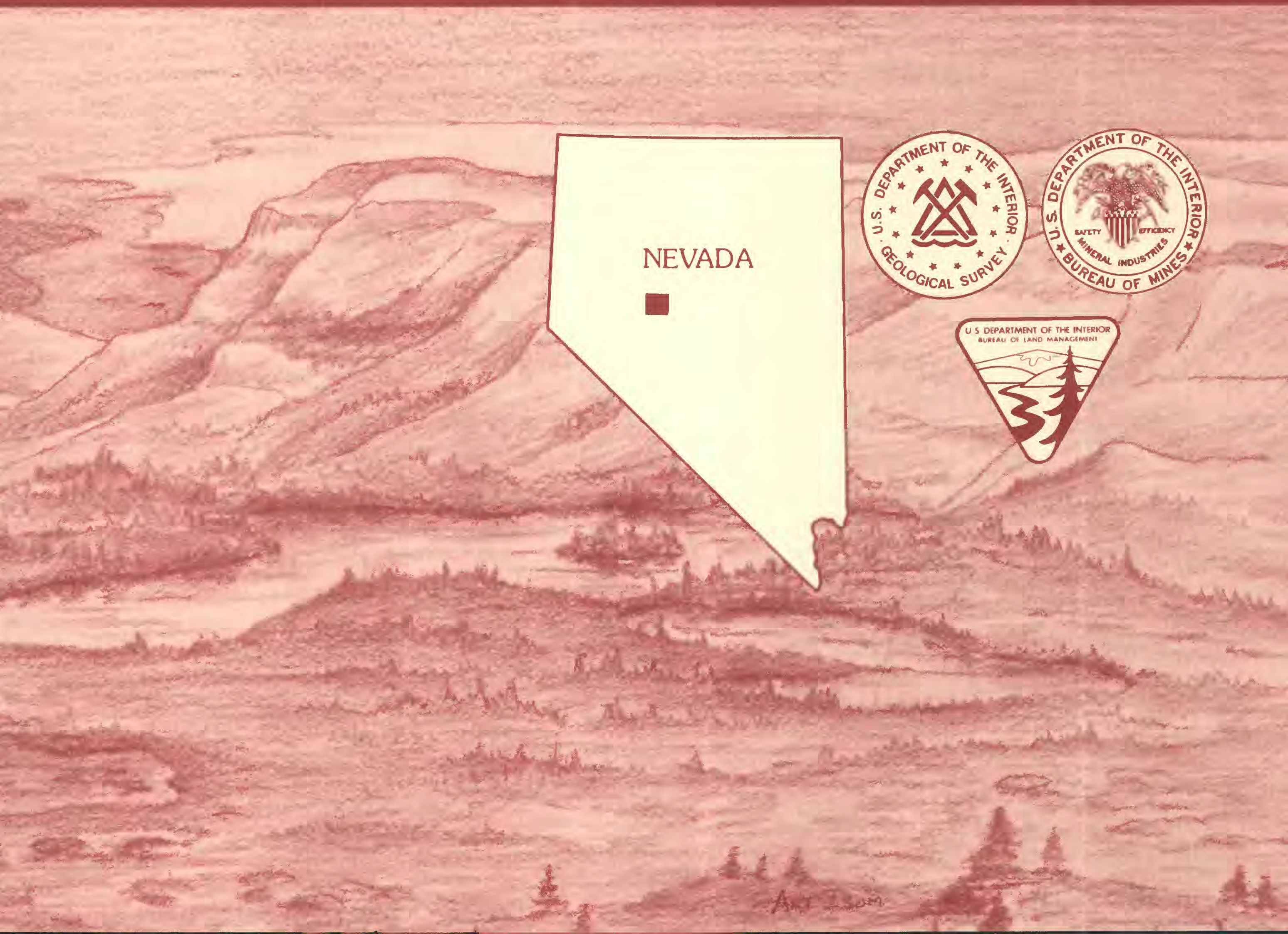
Mineral Resources of the Desatoya Mountains Wilderness Study Area, Churchill and Lander Counties, Nevada

U.S. GEOLOGICAL SURVEY BULLETIN 1727–A



Chapter A

Mineral Resources of the Desatoya Mountains Wilderness Study Area, Churchill and Lander Counties, Nevada

By EDWIN H. McKEE, HARLAN N. BARTON,
JAMES E. CONRAD, and DAVID A. PONCE
U.S. Geological Survey

DAVID A. BENJAMIN
U.S. Bureau of Mines

U.S. GEOLOGICAL SURVEY BULLETIN 1727

MINERAL RESOURCES OF WILDERNESS STUDY AREAS:
WEST-CENTRAL NEVADA

DEPARTMENT OF THE INTERIOR
DONALD PAUL HODEL, Secretary

U.S. GEOLOGICAL SURVEY
Dallas L. Peck, Director

UNITED STATES GOVERNMENT PRINTING OFFICE, WASHINGTON: 1987

For sale by the
Books and Open-File Reports Section
U.S. Geological Survey
Federal Center, Box 25425
Denver, CO 80225

Library of Congress Cataloging-in-Publication Data

Mineral resources of the Desatoya Mountains Wilderness
Study Area, Churchill and Lander Counties, Nevada

U.S. Geological Survey Bulletin 1727-A
Bibliography
Supt. of Docs. No.: I 19.3:1727-A
1. Mines and mineral resources—Nevada—Desatoya Mountains Wilderness. 2. Desatoya Mountains Wilderness (Nev.) I. Mckee, Edwin H. II. Geological Survey (U.S.) III. Series.
QE75.B9 No.1727-A 622 s 87-600283
[TN24.N3] [533'.09793'52]

STUDIES RELATED TO WILDERNESS

Bureau of Land Management Wilderness Study Area

The Federal Land Policy and Management Act (Public Law 94-579, October 21, 1976) requires the U.S. Geological Survey and the U.S. Bureau of Mines to conduct mineral surveys on certain areas to determine the mineral values, if any, that may be present. Results must be made available to the public and be submitted to the President and the Congress. This report presents the results of a mineral survey of part of the Desatoya Mountains (NV-030-110) Wilderness Study Area, Churchill and Lander Counties, Nevada.

CONTENTS

FIGURES

TABLE

Mineral Resources of the Desatoya Mountains Wilderness Study Area, Churchill and Lander Counties, Nevada

By Edwin H. McKee, Harlan N. Barton, James E. Conrad, *and* David A. Ponce,
U.S. Geological Survey

David A. Benjamin
U.S. Bureau of Mines

SUMMARY

Abstract

The Desatoya Mountains Wilderness Study Area (NV-030-110) encompasses 51,262 acres of the central part of the Desatoya Mountains, Churchill and Lander Counties, Nev. Of this area, mineral surveys were requested on 43,053 acres and were studied for this report. The U.S. Bureau of Mines and the U.S. Geological Survey conducted geological, geophysical, and geochemical surveys to assess the mineral resources (known) and the mineral resource potential (undiscovered) of the study area. In this report, any reference to the Desatoya Mountains Wilderness Study Area refers only to that part of the wilderness study area on which the Bureau of Land Management requested mineral surveys and is referred to as the study area. An area that includes a tributary of Topia Creek on the east edge of the study area is assigned a moderate potential for gold and silver resources. In the northern part of the study area and in the Rock Creek and Gold Basin claim areas a low resource potential for gold and silver is indicated. The study area contains no identified mineral resources.

Character and Setting

The study area is in the Desatoya Mountains about 60 mi east of Fallon, Nev., and 40 mi west of Austin, Nev. (fig. 1). It includes the highest and most rugged parts of these mountains, with topographic relief as much as 3,500 ft between Desatoya Peak and the range front to the west. The west side of the mountains is precipitous; the eastern side is a dissected surface sloping gently to the east. The study area is underlain by a thick sequence of rhyolite welded tuffs and intrusive rocks mostly of Oligocene and (or) Miocene age (see appendixes for geologic time chart). These volcanic and intrusive rocks are the products of a volcano that collapsed to form a large caldera located in the central part of what is now the Desatoya Mountains. This caldera, which formed about 24 million years ago, was subsequently filled with volcanic material before being greatly modified by basin and range faulting and by erosion.

Identified Resources

No identified mineral or energy resources exist in the study area. Several areas with traces of gold and silver were recognized, but these occurrences do not qualify as resources. Parts of the study area are in the poorly defined Gold Basin and Eastgate mining districts. No mines are in the study area; there are seven claim groups or prospects in or within 0.5 mi of the study area boundary.

Mineral Resource Potential

An area in the northeastern part of the study area, near Topia Creek, has moderate mineral resource potential for gold and silver (fig. 2). This potential is indicated by gold and silver anomalies in a heavy-mineral concentrate sample and gold anomalies in two rock-chip samples.

Three areas have low mineral resource potential for gold and silver. These areas are the northern part of the study area north of Cold Springs Canyon, an area near the mouth of Rock Creek Canyon, and an area east of Carroll Summit. This assessment is based on small, scattered geochemical anomalies of gold and silver.

Several drainages in the central and southern parts of the study area showed weak anomalies of lead, tin, and bismuth from heavy-mineral concentrates from stream sediment.

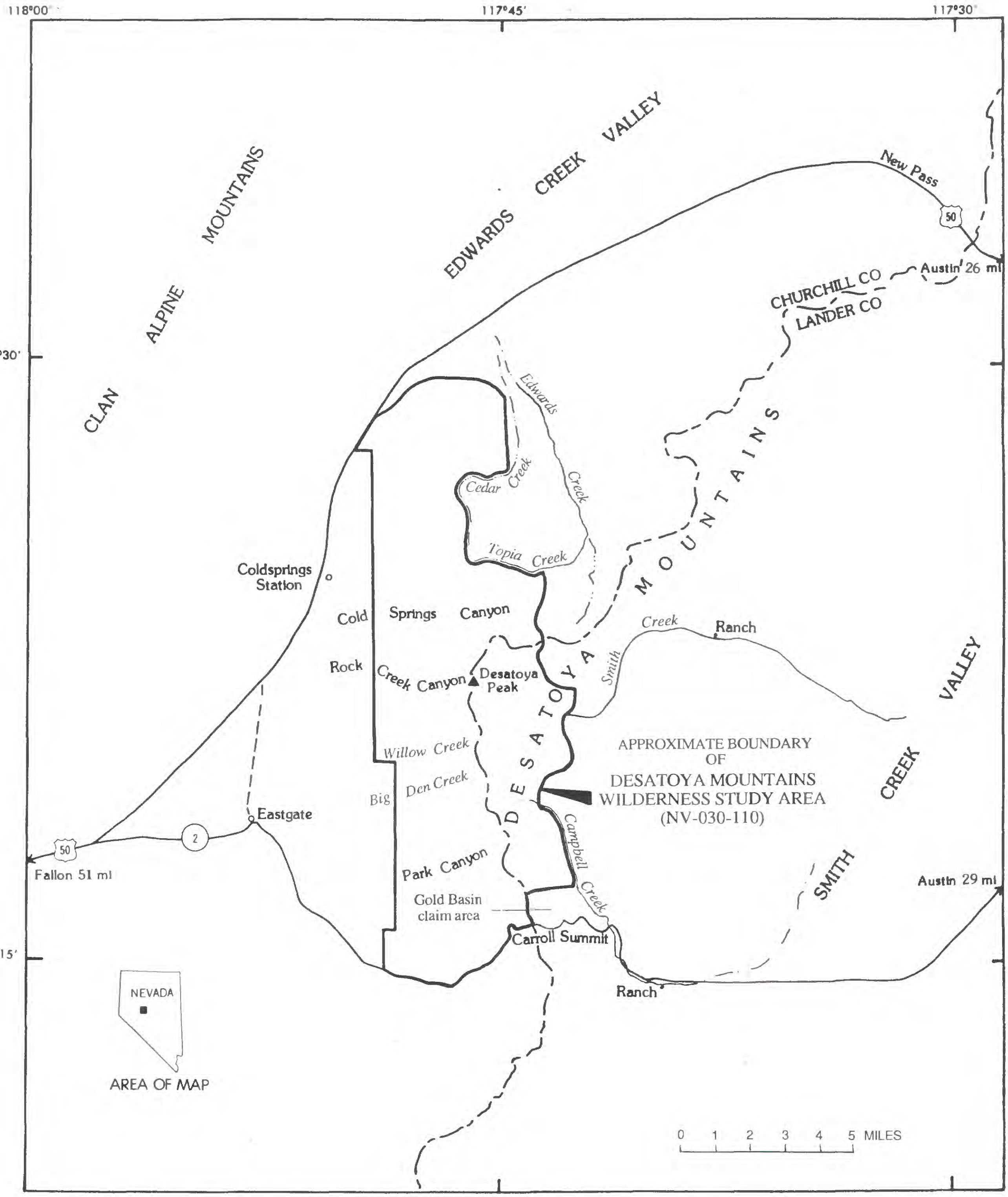


Figure 1. Index map showing location of the Desatoya Mountains Wilderness Study Area, Churchill and Lander Counties, Nevada.

These anomalies by themselves do not constitute enough evidence to indicate any mineral resource potential for these metals, and there is no other geological evidence for any resource potential for these metals.

INTRODUCTION

This mineral resource study is a joint effort by the U.S. Geological Survey and the U.S. Bureau of Mines. Mineral assessments methodology and terminology were discussed by Goudarzi (1984). Identified resources are classified according to the system described by U.S. Bureau of Mines and U.S. Geological Survey (1980). See appendix for the definition of levels of mineral resource potential, certainty of assessment, and classification of identified resources. Studies by the U.S. Geological Survey are designed to provide a reasonable scientific basis for assessing the potential for mineral resources by determining geologic units and structures, possible environments of mineral deposition, presence of geochemical and geophysical anomalies, and applicable ore-deposit models. The U.S. Bureau of Mines evaluates identified resources at individual mines and known mineralized areas by collecting data on current and past mining activities and through field examination of mines, prospects, claims, and mineralized areas.

Area Description

The Desatoya Mountains Wilderness Study Area covers 51,262 acres in the central part of the Desatoya Mountains in west-central Nevada (fig. 1). Of this area, mineral surveys were requested on 43,053 acres by the Bureau of Land Management and were studied for this report (fig. 1). The terrain is rugged and topographic relief is as much as 3,500 ft. Elevation ranges from 9,973 ft at Desatoya Peak to about 5,400 ft in Edwards Creek Valley at the north end of the area. The climate is semiarid and the vegetation is typical of the transition climatic zone.

The Desatoya Mountains are about 60 mi east of Fallon, Nev., and 40 mi west of Austin, Nev. The study area is bounded on the south by Nevada Highway 2 and by U.S. Highway 50 along the northwest corner of the area. Unimproved dirt roads reach the mouths of most of the canyons on the west side of the study area, and a few four-wheel-drive trails from the north, east, and south reach high points in the area.

Previous and Present Investigations

A geologic map of the Desatoya Wilderness Study Area was published by McKee and Conrad (1987). The eastern part of the area is briefly described in a report on the geology and mineral deposits of Lander County, Nev. (Stewart and McKee, 1977), and the western part in a report on the geology and mineral deposits of Churchill County, Nev. (Willden and Speed, 1974). Volcanic rocks collected from the study area have been radiometrically dated and are discussed in reports by McKee and Stewart (1971) and Willden and Speed (1974). Parts of the study area are included in the poorly defined Gold Basin and Eastgate mining districts. Both districts are briefly described in a report by Lincoln (1923), and more complete information about them is included in reports by Willden and Speed (1974) and Stager (1977). A report on the mining districts in Churchill County, including the western part of the study area, is in Vanderburg (1940). Later reconnaissance geophysical and geochemical studies that touch on all or part of the study area include: aeromagnetic maps (U.S. Geological Survey, 1971 and 1972); a Bouguer gravity map (Erwin and Bittleson, 1977); aerial radiometric and magnetic surveys (Geodata International Inc., 1979); and geochemistry of stream sediments (U.S. Bureau of Land Management, Great Basin G.E.M. Joint Venture, 1983a, b). Benjamin (1987) studied mines and prospects in and near the wilderness study area.

The U.S. Geological Survey carried out field investigations in the study area in the summers of 1985 and 1986. The work included geologic mapping, geochemical sampling, and geophysical (gravity) studies. Geochemical samples were collected from all stream drainages to obtain information about mineral suites and trace-element signatures associated with mineralizing systems.

The U.S. Bureau of Mines conducted a search of Churchill and Lander County mining records, and U.S. Bureau of Mines and U.S. Bureau of Land Management mining claim and mineral-lease records in 1984. Field studies in 1985 consisted of examination and geochemical sampling of areas of altered rock and those prospects and claims that could be found. Geochemical results for gold and silver were acquired by fire assay-inductively coupled plasma techniques combined with analyzed for 40 elements by semiquantitative spectrographic techniques. Zeolites were analyzed by X-ray diffraction. Detailed information and sample results are available from the Bureau of Mines, Western Field Operations Center, E. 360 Third Avenue, Spokane, WA 99202.

APPRAISAL OF IDENTIFIED RESOURCES

By David A. Benjamin
U.S. Bureau of Mines

Mining and Mineral Exploration History

Little mining activity has occurred in the Desatoya Mountains. Bureau of Land Management and historical government mining claim records indicate seven areas of claims are in or within 0.5 mi of the study area (fig. 2, Nos. 1-7; table 1). Historical mining claim records indicate several other claims may have been staked in or near the study area, but the location information is too vague for field identification. Descriptions of minor prospects and mineralized sites from which geochemical samples were gathered are listed in Benjamin (1987).

The first claims in the study area were staked in 1907 in the area northwest of Cold Springs Canyon (table 1; fig. 2, No. 3). The Cold Springs claim area has undergone a small amount of exploration work up to the present. The most recent exploration work has been done by Phelps Dodge Corporation

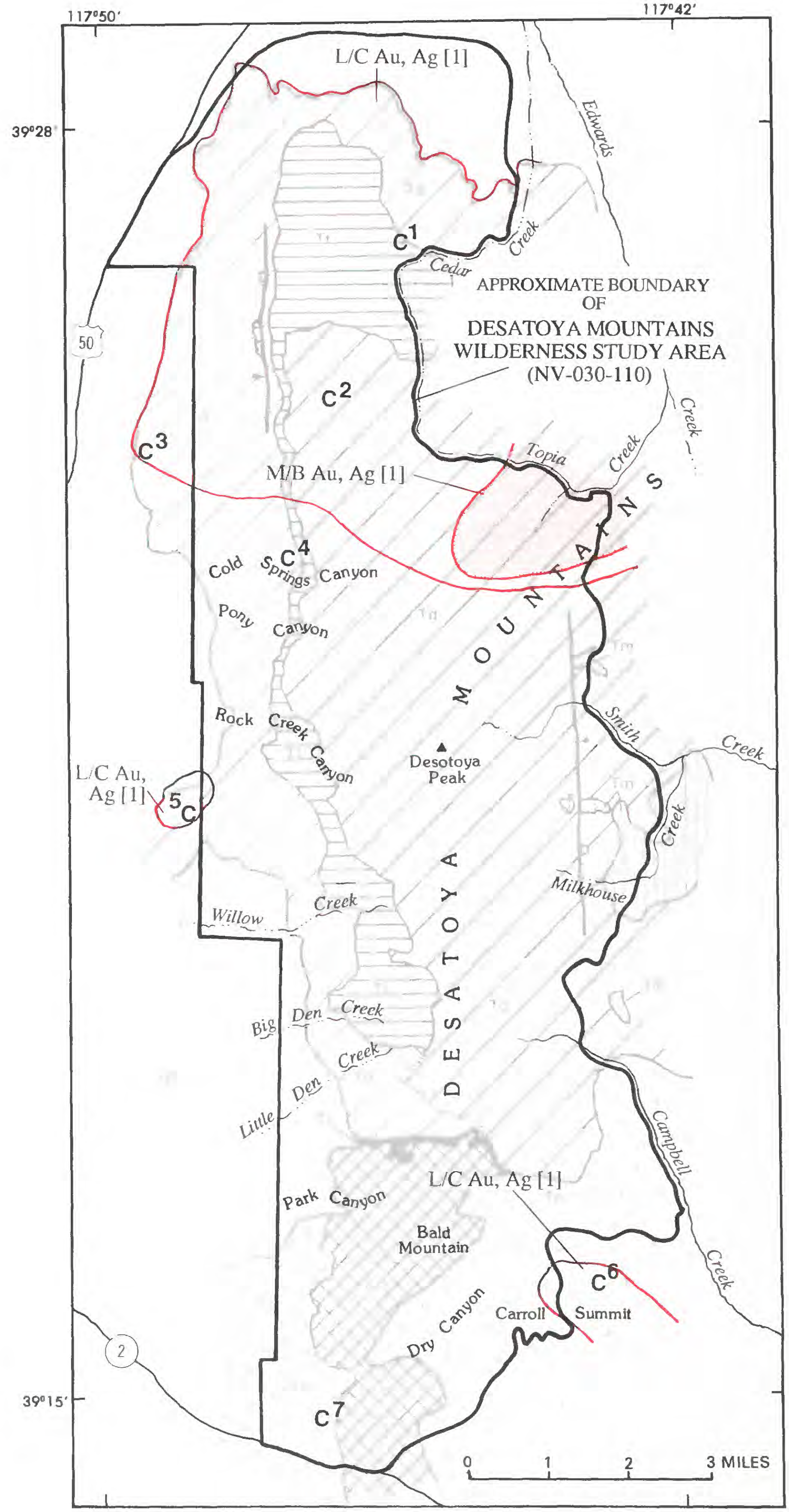


Figure 2. Mineral resource potential and generalized geology of the Desatoya Mountains Wilderness Study Area, Churchill and Lander Counties, Nevada. Geology from McKee and Conrad (1987).

EXPLANATION

Area with moderate resource potential

Area with low resource potential

See appendix for definition of levels of mineral resource potential and certainty of assessment

Commodities

Ag Silver
Au Gold

[ ] Deposit types

1 Epithermal gold- and silver-bearing quartz veins and silicified zones

Correlation of map units

Qa, Qoa	Holocene or Pleistocene	QUATERNARY
Tm, Tt, Td, Tr, Tc, Ta	Miocene and (or) Oligocene	TERTIARY

Description of map units

Qa Alluvium, colluvium, and talus (Holocene or Pleistocene)--Mostly stream sand and gravel, intermontane fans

Qoa Older alluvium (Holocene or Pleistocene)--Nonlithified, dissected alluvial fans

Tm Tuff of Milkhouse Creek (Miocene and (or) Oligocene)--Welded ash-flow tuff

Td Tuff of Desatoya Peak (Miocene and (or) Oligocene)--Welded ash-flow tuff

Tt Tuffaceous sedimentary rocks, rhyolite tuffs, and lava flows (Miocene and (or) Oligocene)--Soft, white to gray ashy sandstone, white to pink, crystal-rich welded tuff, and light-colored rhyolite lava flows. All units are lenticular on scale of 1 mi or less

Tr Rhyolite lava flows (Miocene and (or) Oligocene)--Flow-banded, pink to gray lava flows and local ash flows

Tc Rhyolite of Campbell Creek (Miocene and (or) Oligocene)--Densely welded white to lavender tuff, lava flows and intrusive rocks. Crystal-poor rhyolite containing phenocrysts of quartz, plagioclase, and sanidine

Ta Andesite lava flows (Miocene and (or) Oligocene)--Platy to blocky splitting, pink, red, and brown andesite to dacite lava flows containing plagioclase and alkali feldspar

Contact--Dashed where approximately located

Normal fault--Ball and bar on downthrown side

Trace of cooling breaks in tuff of Desatoya Peak

C1 Claim--See table 1 for description

1 Cheyenne claims
2 Last Chance claims
3 Cold Springs claim area
4 Rollo claims
5 Rock Creek claims
6 Gold Basin claim area
7 Great Basin Resources claim area

Figure 2. Continued.

and ASARCO. In 1911-12, the Cedar Creek area (the Cheyenne claims, fig. 2, No. 1) and the Gold Basin claims area (fig. 2, No. 6) were first explored. The Gold Basin claims area had minor gold and silver production in 1911-12 and 1940-41. The Cheyenne claims in the Cedar Creek area were restaked in 1985. In 1915 the Rock Creek claims (fig. 2, No. 5) were staked; they have undergone minor surface exploration. In 1919, the Last Chance claims (fig. 2, No. 2) were staked near the divide between Cold Springs Canyon and Cedar Creek. This area was explored using small surface pits and underground tunnels. In 1921 the Rollo claims (fig. 2, No. 4) were staked and explored by minor surface workings. The Great Basin Resources claim area (fig. 2, No. 7) was staked in 1981 in the southwest corner of the study area; no workings are on these claims.

Reserves and Identified Resources

No mineral or energy resources were identified within or adjacent to the study area.

Sand and gravel deposits suitable for construction are present in the study area. Because similar materials of equal or better quality are abundant closer to local markets, and the probable costs of mining exceed the present market value of these materials, their future development is highly unlikely.

Recommendations for Further Work

Electrical resistivity studies along four zones that include the Cheyenne, Last Chance, Cold Springs, and Gold Basin Resources claims might help to determine the presence of buried metal-bearing deposits. Further surface geochemical sampling is needed at: (1) Rock Creek claims, (2) east of the Great Basin Resource claim area, and (3) several sites in the northern part of the study area (Benjamin, 1987). This sampling would augment initial geochemical sampling (Benjamin, 1987) and could serve as an indicator of unrecognized gold and silver deposits.

ASSESSMENT OF MINERAL RESOURCE POTENTIAL

By Edwin H. McKee, Harlan N. Barton, James E. Conrad, *and* David A. Ponce
U.S. Geological Survey

Geology

Most of the rocks in the Desatoya Mountains Wilderness Study Area are late Oligocene and (or) early Miocene rhyolite welded ash-flow tuffs; lava flows and intrusive rocks of the same age are present in smaller amounts. These rhyolitic rocks intrude and overlie a thick sequence of andesite lava flows of Oligocene and (or) Miocene age that forms the basement in the area. The rhyolitic welded tuffs, lava flows, and intrusive bodies erupted from a late Oligocene and (or) early Miocene volcano located in the southeastern part of the study area. This volcano developed into a collapse caldera early in its eruptive period and was greatly modified by subsequent basin and range faulting and by later erosion. All physiographic and tectonic aspects of the caldera are obscured by the later tectonic and erosional events.

The eruptive center and caldera are recognized by the large volumes of massive welded tuff and numerous small intrusions that are exposed in the southeastern part of the study area. North of this area, the welded tuffs display well-developed cooling breaks and are stratified. The intracaldera and out-flow facies of the welded tuffs from this volcanic center define the general location of the caldera.

Andesite lava flows and flow breccias are the oldest rocks in the study area. The base of this sequence of andesites is not exposed in the study area but the sequence probably unconformably overlies metavolcanic and metasedimentary rocks of Mesozoic age, as is the case with other late Tertiary rocks in central Nevada. The andesitic rocks are hues of brown and red and are noticeably darker than the rhyolitic rocks in the region. The lava flows are thin and platy to blocky splitting. Phenocrysts of plagioclase and alkali feldspar are visible in hand specimen and thin section. Interbedded with the lava flows are breccias consisting of angular fragments of dark andesite in a softer granular matrix. A potassium-argon age determined on a whole rock sample of andesite from Park Canyon is about 25 Ma.

The oldest rocks erupted from the Desatoya Mountains volcanic complex are rhyolite ash-flow tuffs, lava flows, and intrusive rocks called the rhyolite of Campbell Creek (McKee and Conrad, 1987). North of the highway at Carroll Summit and near Campbell Creek the unit consists mostly of rhyolite domes. Along the east side of the Desatoya Mountains, the rhyolite of Campbell Creek is massive welded tuff with no cooling breaks. Because of the great thickness (at least 500 ft thick) and the massive, highly compacted nature of this tuff, it is likely that much of it was deposited in a basin, probably a caldera that formed after the first ash-flow eruptions. The welded tuff has strong eutaxitic texture and is white, pink, or lavender with sparse crystals of quartz, sanidine, and plagioclase. Potassium-argon age determinations of sanidine from several localities indicate that the rhyolite of Campbell Creek is about 25 Ma.

The tuff of Desatoya Peak (McKee and Conrad, 1987) is the second and most voluminous ash-flow tuff erupted from the Desatoya Mountains volcanic center. This welded tuff forms most of the mountains from Park Canyon in the southern part of the study area to Edwards Creek north of the area. Spectacular exposures of this tuff form the cliffs along the west side of the range, where more than 3,500 ft of tuff is exposed in vertical section. The tuff consists of at least two ash-flow sequences separated in places by a lenticular sequence of tuffaceous sedimentary rocks, air-fall tuffs, volcanic breccias, and lava flows. These intervening rocks can be as much as several hundred ft thick and can be traced for about 10 mi before they pinch out. In the northern part of the Desatoya Mountains, about 5 mi northeast of the study area, the tuff of Desatoya Peak is less than 500 ft thick, has sharp upper and lower contacts, and is stratified. This thin, layered tuff is the outflow facies of the ash-flow sheet. The thick and massive tuff in the study area is the intracaldera facies of the same ash-flow sheet. The tuff of Desatoya Peak is pink to brown, densely welded, crystal-rich, lithic welded tuff. Phenocrysts are quartz, plagioclase, sanidine, and biotite; they are in a eutaxitic groundmass of devitrified glass shards. Chemical analysis suggests this tuff is a low-silica rhyolite or quartz latite.

The youngest volcanic rock unit in the study area is a thin (less than 70 ft) welded tuff called the tuff of Milkhouse Creek (McKee and Conrad, 1987). This tuff forms caps on peaks and spurs in the eastern part of the study area near Milkhouse Creek. Its contact with underlying units is sharp and probably unconformable; in places some sedimentary rock separates the tuff from the underlying rock unit. The tuff of Milkhouse Creek is pink to lavender, densely welded, crystal-poor tuff with scattered phenocrysts of quartz, sanidine, and plagioclase. Eutaxitic texture is strongly developed.

Sedimentary rocks comprise only a small part of the rocks in the study area. The oldest sedimentary rocks are lenticular strata that are found with lava flows and air-fall tuffs beneath the tuff of Desatoya Peak. Similar strata are present between the two major cooling units of the tuff of Desatoya Peak. These fine-grained, tuffaceous sandstones and siltstones are white to gray, thin bedded and fissile. Sedimentary features such as ripple marks and very small scale cross bedding indicate that they were deposited in water. Most of the individual beds can be traced for only a few tens on feet and entire sedimentary sequences pinch out in distances of about 1 mi.

In the southwestern part of the study area, a thick accumulation of coarse, poorly sorted, nonlithified alluvial fan material forms a series of subdued hills. These old alluvial fans are presently being dissected by west-flowing drainages and debris from the fans is being redeposited in active modern alluvial fans.

Geochemical Studies

A reconnaissance geochemical study consisted of analysis and evaluation of stream-sediment samples and heavy-mineral concentrate samples from stream-sediment from 116 sites. Samples were analyzed for 31 elements by a six-step semiquantitative emission-spectrographic method (Grimes and Marranzino, 1968). Details on sample preparation and analysis are in Barton and others (1987).

Areas or drainages with anomalous concentrations of metallic or metal-related elements were identified by comparing all values from the data set of 116 samples and on enrichment related to crustal abundance.

Geochemical anomalies for one or more elements were detected in twelve widely scattered drainages. Most of these anomalies are small and involve only a single element. A heavy-mineral concentrate sample from a tributary to Topia Creek in the northeastern part of the study area contains 100 parts per million (ppm) gold and 100 ppm silver. Two rock-chip samples from this area were analyzed by fire assay-induced coupled plasma techniques and found to contain 0.079 and 0.252 ppm gold and nil and 0.42 ppm silver (Benjamin, 1987). A stream-sediment sample from a tributary to Cedar Creek contains 1.5 ppm silver. In the southern part of the study area six drainages have anomalies of tin ranging from 70 to 300 ppm. Three drainages in the central part of the study area have anomalous lead concentrations of between 500 and 1500 ppm. Anomalous concentrations of bismuth accompanied tin in one drainage and anomalous concentrations of bismuth and copper were detected in another drainage.

Geophysical Studies

Geophysical investigations of the study area include aerial gamma-ray, gravity, and aeromagnetic techniques. Interpretation of aerial gamma-ray maps provides estimates of the apparent surface concentrations of potassium, equivalent uranium, and equivalent thorium. The available maps were compiled at a scale of 1:1,000,000 as part of the National Uranium Resource Evaluation program (Geodata International Inc., 1979). The Desatoya Mountains Wilderness Study Area has an overall moderate radioactivity with values of 2 to 3 percent potassium, 4 to 6.5 ppm equivalent uranium, and 11 to 16 ppm equivalent thorium. These values are typical of terrains composed mostly of rhyolitic rock. There are no anomalies within the boundaries of the study area nor in the immediate vicinity (J.S. Duval, written commun., 1985).

Bouguer gravity anomaly maps of the study area and vicinity were prepared at scales of 1:250,000 and 1:62,500 using existing data (Erwin and Bittleson, 1977) supplemented by recent data collected by the U.S. Geological Survey (R.N. Harris and J.M. Glen, unpub. data, 1986). Gravity data coverage is good throughout the study area, with measurements spaced at intervals of 3 mi or less in the Desatoya Mountains.

The southwestern part of the Desatoya Mountains is characterized by a complex subcircular gravity low of about 30 mGal. This probably represents a thicker section of volcanic rocks and may be related to a hypothesized caldera in the southern Clan Alpine and Desatoya Mountains (Riehle and others, 1972). The northern part of the Desatoya Mountains is characterized by a narrow north-trending gravity high of about 40 mGal that extends northward over Edwards Creek Valley. The highest values of the elongate gravity high coincide with exposures of the tuff of Desatoya Peak. The extension of the gravity high over Edwards Creek Valley may represent a pediment of moderately dense rhyolitic rocks at shallow depth. Alternatively, this high may represent fairly dense Mesozoic rocks buried at intermediate depths below the east half of the Desatoya Mountains.

A total-intensity aeromagnetic survey of the south end of the study area was flown at constant barometric elevation of 9,000 ft above sea level with an east-west flightline spacing of 1 mi (U.S. Geological Survey, 1971), and the remainder of the study area was flown at constant barometric elevation of 9,000 ft above sea level with an east-west flightline spacing of 2 mi (U.S. Geological Survey, 1972). The aeromagnetic map of the study area is complex and anomalies generally reflect relatively magnetic Tertiary volcanic rocks.

The most prominent magnetic feature of the study area is a 400-nT (nanoteslas) magnetic anomaly near Desatoya Peak. The crescent-shaped anomaly covers most of the study area and correlates with the tuff of Desatoya Peak. About 2 mi south of the southeast border of the study area, small outcrops of granitic rocks underlie a 150-nT anomaly.

MINERAL AND ENERGY RESOURCES

Data from geologic studies, geochemical sampling, and examination of prospects and areas of altered rock recognized by the presence of limonite staining and (or) silicification suggest that there is moderate and low potential for resources of gold and silver in parts of the Desatoya Mountains Wilderness Study Area. Geologic mapping and aeromagnetic data indicate that the Desatoya Mountains are comprised of a thick accumulation of crystal-rich, rhyolite welded tuff and crystal-poor rhyolite domes. The range is characterized by massive outcrops of unaltered rhyolitic rock; no prevailing fault system or throughgoing structures were mapped, and alteration is not widespread or pervasive. Locally, small quartz veins and silicified or limonite-stained outcrops indicate that some alteration and mineralization has taken place after emplacement of the volcanic rocks. Geochemical sampling of stream sediments and altered rock confirms the presence of scattered anomalous concentrations of various metals. Gold, silver, tin, and copper in rhyolitic host rock, associated with quartz veins and local alteration and silicification, suggests epithermal activity. The lack of clearly discernible faults, the scattered and local nature of veins, alteration and silicification, and the dispersed geochemical anomalies, suggest that this epithermal system was not large and that it did not produce large areas of mineralized rock. Because of the weak nature of the alteration the most useful guide to areas of mineral resource potential in the Desatoya Mountains is the location of geochemical anomalies.

The areas of moderate and low resource potential shown on figure 2 are located on the basis of geochemical anomalies. One tributary to Topia Creek yielded anomalous concentrations of gold and silver from heavy-mineral concentrates and two rock chip samples from 0.25 to 0.5 mi east of this drainage yielded gold anomalies. The area that includes the Topia Creek tributary has moderate resource potential for gold and silver, certainty level B, although no source or site of the mineralization was recognized in the field. The part of the study area north of Cold Springs Canyon, the west-central part, and the southeast corner of the study area all yielded scattered rock samples with minor amounts of gold, silver, and copper. These areas are assigned a low resource potential for gold and silver, certainty level C (fig. 2).

There is no potential for sand and gravel resources beyond the known occurrences within the study area. An assumption that is part of this conclusion is that the known occurrences extend to depth in approximately uniform quality.

Geologic data indicate a low probability for the occurrence of oil and gas in the Cenozoic rocks of the study area. Evidence for hydrocarbon potential is negligible; the volcanic rocks and fluviatile sedimentary strata immediately underlying the study area might include suitable reservoir rocks, but lack hydrocarbon source beds. Because of widespread pervasive geothermal heating, the Desatoya Mountains and surrounding areas are considered to have no potential for petroleum resources (Sandberg, 1983).

The wilderness study area has no geothermal energy resource potential. There is no evidence of geothermal activity in or near the study area.

REFERENCES CITED

Barton, H.N., Day, Gordon, and Malcolm, M.J., 1987, Analytical results and sample locality map for heavy-mineral-concentrate and stream-sediment samples from the Desatoya Mountains Wilderness Study Area, Churchill and Lander Counties, Nevada: U.S. Geological Survey Open-File Report [in press].

Benjamin, D.A., 1987, Mineral resources of the Desatoya Mountains Study Area, Churchill and Lander Counties, Nevada: U.S. Bureau of Mines Open-File Report, MLA 70-86, 28 p.

Erwin, J.W., and Bittleson, E.W., 1977, Bouguer gravity map of Nevada, Millett sheet: Nevada Bureau of Mines and Geology Map 53, scale 1:250,000, 1 sheet.

Geodata International, Inc., 1979, Aerial radiometric and magnetic survey, Millett national topographic map, Nevada: Prepared for the U.S. Department of Energy, Grand Junction, Colorado, GJBX-154(79), 62 p.

Goudarzi, G.H., 1984, Guide to preparation of mineral survey reports on public lands: U.S. Geological Survey Open-File Report 84-787, 51 p.

Grimes, D.J., and Marranzino, A.P., 1968, Direct-current arc and alternating-current spark emission spectrographic field methods for the semiquantitative analysis of geologic materials: U.S. Geological Survey Circular 591, 6 p.

Lincoln, F.C., 1923, Mining districts and mineral resources of Nevada: Reno, Nev., Newsletter Publishing Company, 20 p.

McKee, E.H., and Conrad, J.E., 1987, Geologic map of the Desatoya Mountains Wilderness Study Area, Churchill and Lander Counties, Nevada: U.S. Geological Survey Miscellaneous Field Studies Map MF-1944, scale 1:62,500.

McKee, E.H., and Stewart, J.H., 1971, Stratigraphy and potassium-argon ages of some Tertiary tuffs from Lander and Churchill Counties, Central Nevada: U.S. Geological Survey Bulletin 1311-B, 28 p.

Riehle, J.R., McKee, E.H., and Speed, R.C., 1972, Tertiary volcanic center, west-central Nevada: Geological Society of America Bulletin, v. 83, p. 1383-1396.

Sandberg, C.A., 1983, Petroleum potential of wilderness lands in Nevada: U.S. Geological Survey Circular 902-H, p. H1-H11.

Stager, H.K., 1977, Mineral Deposits, in Geology and mineral deposits of Lander County, Nevada: Nevada Bureau of Mines and Geology Bulletin 88, pt. 2, p. 60-102.

Stewart, J.H., and McKee, E.H., 1977, Geology, in Geology and mineral deposits of Lander County, Nevada: Nevada Bureau of Mines and Geology Bulletin 88, pt. 1, p. 1-59.

U.S. Bureau of Land Management Great Basin G.E.M. Joint Venture, 1983a, Geochemical sample collection and chemical analyses for WSA's NV-030-102 and NV-030-110, Nevada region, U.S. Bureau of Land Management, Denver Service Center, Denver, Colo., 33 p.

___1983b, Desatoya Mountains GEM resources area (GRA No. NV-06) technical report, prepared for U.S. Bureau of Land Management, Denver Service Center, Denver, Colo., 30 p.

U.S. Bureau of Mines and U.S. Geological Survey, 1980, Principles of a resource/reserve classification for minerals: U.S. Geological Survey Circular 831, 5 p.

U.S. Geological Survey, 1971, Aeromagnetic map of parts of the Tonopah and Millett 1° by 2° quadrangles, Nevada: U.S. Geological Survey Geophysical Investigations Map GP-752, scale 1:250,000, 1 sheet.

___1972, Aeromagnetic map of parts of the Lovelock, Reno, and Millett 1 by 2 degree quadrangles: U.S. Geological Survey Open-File Report 72-386, scale 1:250,000, 1 sheet.

Vanderburg, W.O., 1940, Reconnaissance of mining districts in Churchill County, Nevada: U.S. Bureau of Mines Information Circular 7093, 57 p.

Willden, Ronald, and Speed, R.C., 1974, Geology and mineral deposits of Churchill County, Nevada: Nevada Bureau of Mines and Geology Bulletin 83, 95 p.

APPENDIXES

DEFINITION OF LEVELS OF MINERAL RESOURCE POTENTIAL AND CERTAINTY OF ASSESSMENT

Definitions of Mineral Resource Potential

LOW mineral resource potential is assigned to areas where geologic, geochemical, and geophysical characteristics define a geologic environment in which the existence of resources is permissive. This broad category embraces areas with dispersed but insignificantly mineralized rock as well as areas with few or no indications of having been mineralized.

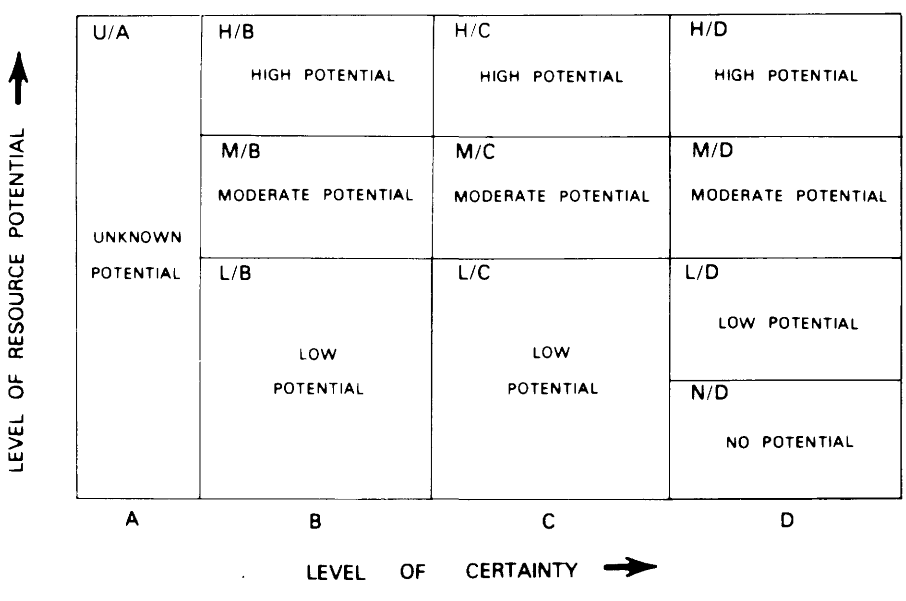
MODERATE mineral resource potential is assigned to areas where geologic, geochemical, and geophysical characteristics indicate a geologic environment favorable for resource occurrence, where interpretations of data indicate reasonable likelihood of resource accumulation, and (or) where an application of mineral-deposit models indicates favorable ground for the specified type(s) of deposits.

HIGH mineral resource potential is assigned to areas where geologic, geochemical, and geophysical characteristics indicate a geologic environment favorable for resource occurence, where interpretations of data indicate a high degree of likelihood for resource accumulation, where data supports mineral-deposit models indicating presence of resources, and where evidence indicates that mineral concentration has taken place. Assignment of high resource potential to an area requires some positive knowledge that mineral-forming processes have been active in at least part of the area.

UNKNOWN mineral resource potential is assigned to areas where information is inadequate to assign low, moderate, or high levels of resource potential.

NO mineral resource potential is a category reserved for a specific type of resource in a well-defined area.

Levels of Certainty



A. Available information is not adequate for determination of the level of mineral resource potential.
B. Available information suggests the level of mineral resource potential.
C. Available information gives a good indication of the level of mineral resource potential.
D. Available information clearly defines the level of mineral resource potential.

Abstracted with minor modifications from:

Taylor, R. B., and Steven, T. A., 1983, Definition of mineral resource potential: Economic Geology, v. 78, no. 6, p. 1268–1270.

Taylor, R. B., Stoneman, R. J., and Marsh, S. P , 1984, An assessment of the mineral resource potential of the San Isabel National Forest, south-central Colorado: U.S. Geological Survey Bulletin 1638, p. 40–42

Goudarzi, G. H., compiler, 1984, Guide to preparation of mineral survey reports on public lands: U.S. Geological Survey Open-File Report 84–0787, p. 7, 8.

RESOURCE/RESERVE CLASSIFICATION

	IDENTIFIED RESOURCES			UNDISCOVERED RESOURCES	
	Demonstrated		Inferred	Probability Range	
	Measured	Indicated		Hypothetical	Speculative
ECONOMIC	Reserves		Inferred Reserves		
MARGINALLY ECONOMIC	Marginal Reserves		Inferred Marginal Reserves		
SUB-ECONOMIC	Demonstrated Subeconomic Resources		Inferred Subeconomic Resources		

Major elements of mineral resource classification, excluding reserve base and inferred reserve base. Modified from U.S. Bureau of Mines and U.S. Geological Survey, 1980, Principles of a resource/reserve classification for minerals: U.S. Geological Survey Circular 831, p. 5.

GEOLOGIC TIME CHART

Terms and boundary ages used by the U.S. Geological Survey in this report

EON	ERA	PERIOD		EPOCH	AGE ESTIMATES OF BOUNDARIES (in Ma)
Phanerozoic	Cenozoic	Quaternary		Holocene	0.010
				Pleistocene	1.7
		Tertiary	Neogene Subperiod	Pliocene	5
				Miocene	24
			Paleogene Subperiod	Oligocene	38
				Eocene	55
				Paleocene	66
	Mesozoic	Cretaceous		Late	96
				Early	138
		Jurassic		Late Middle Early	205
		Triassic		Late Middle Early	~240
	Paleozoic	Permian		Late Early	290
		Carboniferous Periods	Pennsylvanian	Late Middle Early	~330
			Mississippian	Late Early	360
		Devonian		Late Middle Early	410
		Silurian		Late Middle Early	435
		Ordovician		Late Middle Early	500
		Cambrian		Late Middle Early	~570[1]
Proterozoic	Late Proterozoic				900
	Middle Proterozoic				1600
	Early Proterozoic				2500
Archean	Late Archean				3000
	Middle Archean				3400
	Early Archean				(3800?)
pre-Archean[2]					4550

[1]Rocks older than 570 Ma also called Precambrian, a time term without specific rank.

[2]Informal time term without specific rank.

TABLE 1. *Claims in and near the Desatoya*

[nil, element not detected in sample; detection limits for

Location (fig. 2)	Name	Summary
1	Cheyenne claims	Area first claimed in 1911-12 (16 claims in all). Mr. Stan Maestretti of Austin, Nev. restaked the area in 1985 as the Cheyenne claims. A N. 60° W.-trending zone of silicified, argillized breccia containing minor quartz veins is in rhyodacite tuff. Zone extends for at least 4,000 ft along strike.
2	Last Chance claims	No claims filed in the area since original claims in 1919. A N. 60° W.-trending shear zone that locally contains quartz veins cuts a rhyolite tuff. Many parts of zone contain fresh-looking tuff. Zone is irregular in shape both parallel and perpendicular to strike. Zone is as thick as 400 ft and extends for at least 1,200 ft along strike.
3	Cold Springs claim area	Area first claimed in 1907. In the 1950's area was restaked as the Oroplata claims by Mr. Gale Peer of Austin, Nev., who drove 2,000 ft of adits and drifts, 400 ft of shaft, and performed surface stripping with a bulldozer. From 1979 to 1985 minor exploration work was undertaken by Phelps Dodge and ASARCO, Inc. No production is recorded. A large silicified breccia zone in rhyolite tuffs trends N. 20° to 80° W. through the area. Breccia zone does not appear to extend into study area.
4	Rollo claims	Claims originally staked in 1921, but no claims staked in area since then. N. 45° to 60° W.-striking zones of alteration area in rhyolite tuff. Zones are poorly defined in outline, as wide as 100 ft, and several hundred ft long. Alteration consists of argillization, bleaching, iron oxide staining, and minor quartz veining.
5	Rock Creek claims	Area first staked in 1915; no claims staked in the area since 1928. A N. 80° E.-striking zone of strongly silicified rhyolite with sparce quartz veinlets trends through area. Zone has strong iron oxide staining on fracture surfaces. Zone is at least 20 ft wide.
6	Gold Basin claim area	Since early 1970's the Thunder claims have covered area (Mr. Charles Winrod and Mr. Stan Maestretti, Austin, Nev., owners). Country rock in area is rhyolite ash-flow tuff. Rock in mined area bleached, argillized, and silicified. Areas of brecciation with moderate to strong iron oxide staining. Individual zones of alteration trend N. 40° W. to N. 20° E. Mineral deposits do not appear to extend into the study area.
7	Great Basin Resources claim area	County rock in area is Tertiary rhyolite ash-fall tuff, and intrusive and extrusive rhyolite. No evidence of mining activity or mineralized areas were observed.

gold and silver 0.007 and 0.3 ppm, respectively]

Workings	Sample data
One 10-ft shaft, four trenches, and 14 pits.	Twelve chip samples from veins, breccia zones, and country rock contained nil to 0.20 ppm gold and nil to 11.55 ppm silver. Eight grab samples from dump material contained nil to 0.25 ppm gold and 0.54 ppm to 8.83 ppm silver.
One 50 ft adit, one trench, and four pits.	Three chip samples from the adit contained 0.04 to 0.088 ppm gold and 2.10 to 12.02 ppm silver. Seven chip samples from workings and outcrop contained nil to 0.06 ppm gold and nil to 9.16 ppm silver. Four grab samples from dump material contained 0.018 to 0.09 ppm gold and 0.4 to 8.54 ppm silver.
Several shafts, adits, pits, trenches, and drill pads.	Four chip samples taken from quartz vein material and silicified tuff contained from 0.07 to 2.71 ppm gold and 2.55 to 31 ppm silver. Four dump grab samples contained from 0.03 to 4.13 ppm gold and 0.5 to 80 ppm silver.
Two shallow pits and a 10-ft adit.	One chip sample from the adit contained 0.01 ppm gold and nil silver. One dump grab sample from a pit contained 0.036 ppm gold and nil silver. One float sample contained nil gold and 0.92 ppm silver.
Shallow pit 400 ft west of study area boundary.	Grab sample of dump material contained 0.11 ppm gold and 25.32 ppm silver. Two outcrop chip samples contained 0.045 and 0.047 ppm gold and 1.82 and 3.86 ppm silver.
During 1911-12 a 250-ft-deep shaft was sunk with 700 ft of underground workings, producing 751 oz gold and 8,677 oz silver. During 1940-41 1,384 short tons were produced with 231 oz gold and 1,409 oz silver recovered. Presently the workings consist of four bulldozer cuts, a caved shaft, and an adit.	Four chip samples from altered rock exposed both in workings and in outcrop; contains 0.103 to 0.19 ppm gold and 1.14 to 4.82 ppm silver.
None	Fifteen chip and one grab (float) samples were taken. Thirteen samples contained nil gold and silver. One sample contained 0.02 ppm gold and nil silver. Three of the 13 samples were analyzed for uranium; no anomalous values were obtained. Three samples were also inspected for zeolites; none were detected. Two samples of rhyolite taken several hundred ft east of the claims contained 0.03 and 0.10 ppm gold and nil silver.

GPO 785-048/77400

U.S. DEPARTMENT OF THE INTERIOR

March 3, 1849