

EXPLANATION OF RESOURCE POTENTIAL

(A) AREA A--Moderate resource potential for silver in base-metal deposits; includes small area of high resource potential at Weston Pass indicated by stippled pattern.
 (B) AREA B--Low to moderate resource potential for gold and silver in vein deposits.
 (C) AREA C--Low to moderate resource potential for gold and silver in vein deposits and low resource potential for uranium in vein deposits.
 (D) AREA D--Low to moderate resource potential for uranium including a small low-grade uranium identified resource area around the Parkdale iron pit. Low to moderate resource potential for barite and lead in vein deposits. A small area along the northeast side of the Middle Fork of Salt Creek has low to moderate resource potential for silver in vein deposits; indicated by diagonal line pattern.
 (E) AREAS E AND F--Low resource potential for barite and lead in vein deposits as defined by geochemical studies.

CORRELATION OF MAP UNITS

Intrusive rocks	Sedimentary rocks	Geological Period
Qa	Qa	Holocene and Pleistocene
Td	Td	Pliocene and Miocene
Tr	Tr	Oligocene
Tr1	Tr1	Paleocene
Kr	Kr	Upper Cretaceous
Yd	Pzs	CRETACEOUS
Ykg	Ykg	PALEOZOIC
Ykd	Xm	PROTEROZOIC Y
		PROTEROZOIC Y and X
		PROTEROZOIC X

DESCRIPTION OF MAP UNITS

Qa ALLUVIUM, TERRACE AND FAN DEPOSITS, TALUS AND GLACIAL DEPOSITS (HOLOCENE AND PLEISTOCENE)
Td DRY UNION FORMATION (PLIOCENE AND MIOCENE)--Unconsolidated fluvialite deposits of sand, silt, and gravel; includes minor volcanic ash beds.
Tr RHYOLITE DIKES (OLIGOCENE)--Very light-gray dikes of the Fourmile Creek area.
Tv BUFFALO PEAKS ANDESITE AND BADGER CREEK TUFF UNDIVIDED (OLIGOCENE)--Both fine-grained and porphyritic andesite flows with intercalated ash-flow tuffs of Badger Creek near the base of the rhyolite stock of Rough and Tumbling Creek (PALOCENE)--Very light-gray, biotitic rhyolite stock.
Tr1 RHYOLITE DIKES (UPPER CRETACEOUS)--Very light-gray dikes of the Granite district.
Pzs SEDIMENTARY ROCKS, UNDIVIDED (PALEOZOIC)--Includes Mitten and Belden Formations, Leadville Limestone, Chaffee Group, Fremont Dolomite, Harding Sandstone, Manitou Dolomite and Sawatch Quartzite Undivided (Penny's, Mississippian, Devonian, and Ordovician).
Yd QUARTZ Diorite (PROTEROZOIC Y)
Ykg QUARTZ MONZONITE, ADAMILLITE, GRANITE, and GRANODIORITE PORPHYRY, UNDIVIDED (PROTEROZOIC Y and X)
Ykd QUARTZ Diorite (PROTEROZOIC Y and X)
Xm MIGMATITE (PROTEROZOIC X)--Chiefly migmatitic and sillimanitic biotite gneiss; includes some lenses of amphibolite and hornblende schist.

PROSPECT

x Pit
 + Shaft
 - Adit
 Trench
 - - - QUARTZ VEIN

(O) SAMPLE LOCALITY AND (OR) MINE OR PROSPECT LOCATION--Referred to in tables 2 and 3.
 --- APPROXIMATE BOUNDARY OF BUFFALO PEAKS WILDERNESS STUDY AREA

INTRODUCTION

The Buffalo Peaks Wilderness Study Area of 57,200 acres (89 mi²) is within the Mosquito Range and the Pike and San Isabel National Forests of Colorado. The Mosquito Range, which is contiguous with the Tenmile Range north of Weston Pass, is a part of the N. 30° W.-striking east flank of the largely completely faulted Sawatch anticline (Tweto, 1975). The anticline has a core of Precambrian igneous and metamorphic rocks and an east flank of eroded Paleozoic strata which dip 25°-20° eastward.

Present investigations by the U.S. Geological Survey and the U.S. Bureau of Mines include mapping an area of about 125,000 acres in and around the study area. The U.S. Geological Survey investigations include geologic mapping at a scale of 1:50,000 (Hedlund, in press), an aeromagnetic survey (Hedlund, in press), and a geochemical sampling of rocks, stream sediments, and spring water (Nowlan and Gerstel, in press; Nowlan and others, in press). The U.S. Bureau of Mines has reviewed past and present mining and prospecting activity, and numerous mines and prospects of the study area were examined and sampled by Wood (1983). During the period of this study no actual mining was observed although numerous claim notices and claim stakes (Earth Sciences, Inc., 1980) in the vicinity of Weston Pass and along Union Gulch were noted.

ACKNOWLEDGMENTS

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GEOLOGY

Precambrian rocks comprise a little more than three-fourths of the outcrop area and consist of older Proterozoic migmatite, amphibolite, and granodiorite rocks that are intruded by younger Proterozoic Y granitic rocks. Paleozoic strata, about 8,500 ft thick, comprise the remnant east-dipping limb of the Sawatch anticline and include an extensive section of carbonate and quartzite strata in the lowest 750 ft of the sequence. Laramide intrusions include a biotitic rhyolite stock along the east side of Rough and Tumbling Creek and thin rhyolite dikes of the Granite district. Middle Tertiary flows and ash-flow tuffs of the Buffalo Peaks Andesite are as much as 1,600 ft thick near East Buffalo Peak in the southeast part of the study area.

MINERAL RESOURCE POTENTIAL SUMMARY STATEMENT

During 1981 and 1982 the U.S. Geological Survey and the U.S. Bureau of Mines conducted field investigations to evaluate the mineral resource potential of the Buffalo Peaks Wilderness Study Area. The study area encompasses about 57,200 acres (about 89 mi²) of the Pike and San Isabel National Forests in Lake, Park, and Chaffee Counties, Colo. Six separate areas (A-F) are determined to have mineral resource potential. Area A, along the northeast margin of the study area, has a moderate potential for silver resources in base-metal veins and bedded replacement deposits. Within Area A, a small zone near Weston Pass has high potential for silver resources in veins. The northeast part of the study area (Area B) has a low to moderate potential for silver and gold resources in quartz-pyrite veins. Most veins occur outside the study area. Area C is along the southwest margin of the study area and has a low to moderate potential for silver and gold resources in quartz-pyrite veins. Most veins occur outside the study area. In addition, area C has a low potential for uranium resources in veins. Area D has an identified uranium resource and a low to moderate potential for additional uranium resources in uraniferous jaspers in the Sawatch Quartzite along the southeast margin of the study area. In the rest of area D there is a low to moderate resource potential for lead and barite in fault-controlled deposits. Within area D a small zone along the northeast side of the Middle Fork of Salt Creek has low to moderate resource potential for silver in vein deposits. Anomalous amounts of barium (2,000-10,000 ppm) and lead (30-1,500 ppm) were discovered by geochemical sampling of stream sediments in areas E and F along the east margin of the study area. However, no bedded replacement or vein deposits of barite or galena were observed during geologic mapping and therefore a low to moderate resource potential is assumed for barite and lead in areas E and F. The six mineralized areas are largely related to fault systems and to Laramide intrusive activity. There is little uranium or indication for oil or gas, or geothermal energy resources in the study area.

DISCUSSION

Area A

Area A has a moderate potential for silver resources in base-metal deposits. A very small part of this area has high potential for silver resources, especially at Weston Pass where silver-bearing veins of the Gates mine extend into the study area. The rocks are chiefly Paleozoic carbonate strata that are displaced by numerous northeast-striking faults coextensive with the Weston fault system. Hosts of the past silver production was from the Ruby-Cincinnati, Gates, and Collin Campbell mines in the vicinity of Weston Pass; the production figures are not known but may have been much as 165,000 oz of silver. The veins are chiefly along silicified fractures and breccia zones in the Leadville Limestone, and in places the veins grade outward into bedded replacement deposits. The richest ore came from oxidized ore bodies in a zone of supergene enrichment, generally at depths of less than 300 ft (Behre, 1932).

Though the veins were extensively exploited in the Weston Pass district, other veins to the northwest near Union Gulch and to the southeast are relatively unexplored. The prospects in these peripheral areas are also fault controlled; the sulfides localized along silicified shatter zones, in breccias, and along vuggy, dolomitic, and "zebra-striped" carbonate strata. However, the silver values from a few of the sampled prospects are relatively low, about 0.2-0.5 oz/ton.

In summary, the northeast-striking faults of the Weston system are favorable sites for the occurrence of silver-bearing base-metal resources, especially where the faults displace carbonate strata. The metal values of the protore are chiefly in zinc, lead, and silver with anomalous amounts of arsenic as much as 1,500 ppm, and cadmium as much as 70 ppm.

Area B

Area B has a low to moderate potential for gold and silver resources in quartz-pyrite veins, and is largely outside the study area. The rocks are chiefly highly foliated migmatite gneisses that are cut by east-northeast-striking faults that are locally coextensive with rhyolite dikes (map unit Kr). Production of gold from the Granite district is estimated at 65,000-97,000 oz of silver from 1862 to 1878. The mines of the Two Bit district have been chiefly exploited for silver, but the production is not known.

The quartz-pyrite-gold veins of the Granite district are characterized by:

1. intensive silicic and chloritic wallrock alteration,
2. a relatively low base-metal content,
3. a gold to silver ratio of about 2.5:1,
4. gold values that range from 0.2-1.7 oz/ton and silver contents of 0.1-0.8 oz/ton,
5. the presence of tourmaline in many veins, and
6. a local, spatial association with rhyolite dikes with a potassium-argon age of 65.32 ± 4 m.y. (R. F. Marvin and others, written commun., 1983).

Many of the quartz-pyrite-gold veins could extend into the study area at depth, especially in areas of migmatite outcrop. However, surface geologic studies indicate that this is unlikely since alteration halos are generally absent.

Area C

Area C has a low to moderate potential for silver and gold resources in quartz-pyrite veins; most veins are outside the study area. Minor amounts of uranium occur in some of the veins at the Josephine mines near the Otero pumping station, but the potential for uranium resources is considered low.

The northwest-striking quartz-pyrite-gold veins of the Fourmile Creek area are chiefly in granitic to dioritic Precambrian rocks, and the reported gold production was low, about 53 oz from the Little Annie mine during the 1930's (Vanderbilt, 1947). The fissure veins are clearly fault controlled, locally branched, show numerous pinch-outs, are generally less than 3 ft wide, are locally brecciated, and have a hematitic alteration. Magnetite, specularite, and pyrite are locally common, but sphalerite, galena, and chalcopyrite are present in only minor amounts. Numerous fire assay analyses indicate gold values of 0.04-0.07 oz/ton. In summary, the area of quartz-pyrite-gold veins has a low to moderate resource potential because of the low values of most veins and because of evidence that the most important vein systems are outside the study area.

Anomalous radioactivity at the Josephine mines occurs along a N. 70° W.-striking vein near the Otero pumping station. The radioactivity is as much as twice background but the analyzed samples indicate only 6 ppm equivalent U₃₀₈. Some of the peridotite norphyry dikes in this area are slightly enriched and have been extensively prospected. The peridotite dikes deserve a second review for the presence of platinum metals.

Area D

The uranium deposit in the Parkdale iron pit area is a low-grade uranium resource and the rest of area D has a low to moderate potential for uranium resources in vuggy, uraniferous jaspers, and barite and lead in vein or bedded replacement deposits along the northeast side of the Middle Fork of Salt Creek has low to moderate resource potential for silver in vein deposits.

The uraniferous Jasperoid at the Parkdale iron pit and vicinity has received the most study and is along the study area boundary at the head of the Middle Fork of Salt Creek. At least 11 other small radioactive jaspers are known in this area and occur in or near the top of the Sawatch Quartzite that forms a N. 40° W.-striking ridge. In the mid 1950's about 52 tons of Jasperoid that averaged 0.2 percent U₃₀₈ and 0.20 percent U₂₃₅ was shipped to the uranium mill in Rifle, Colo. (Nelson-Moore and others, 1978, p. 365). These deposits were evaluated in the mid 1970's by J. V. Dodge and associates by trenching, geophysical and geochemical studies, and by some drilling. An estimated resource of about 4,000 tons per vertical foot of uraniferous Jasperoid averaging 0.04 percent U₃₀₈ and 0.20 percent U₂₃₅ is identified for an area of about 1,200 by 40 ft (J. V. Dodge, written commun., 1982). Only about 3-4 ft of Jasperoid is exposed in the Parkdale iron pit and is nearby trenches, but according to J. V. Dodge (oral commun., 1982) a drilled program conducted by Noranda Exploration, Inc., indicated that the uraniferous Jasperoid is as much as 45 ft thick at the Parkdale iron pit. Other estimates place the average thickness at 60 ft in an area 300 by 1,500 ft (J. V. Dodge, oral commun., 1983). No specific uranium mineral was identified in the Buffalo Peaks Wilderness Study Area. The two Bit districts that are within a Precambrian migmatite belt intruded by younger Precambrian granite. The gold-silver quartz-pyrite veins of area B strike east-northeast and locally occur in swarms, as on Yankee Blade Hill. Area C is also characterized by quartz-pyrite-gold veins but most deposits are small and are localized along north-northeast-striking faults in Precambrian granite. Both uranium and silver-bearing base-metal deposits occur in area D. The vuggy uraniferous jaspers at the head of the Middle Fork of Salt Creek contain as much as 200 ppm equivalent uranium and can be classified as an identified resource of low-grade uranium. Numerous small silver-bearing prospects occur along faults on the east side of the Middle Fork of Salt Creek, also in area D.

Areas E and F

A geochemical survey near the head of the North Fork of Salt Creek in Lake and Park Counties, Colorado, discovered anomalous barium and lead values in named stream concentrates. The source areas of barite and lead were not discovered during this study, and therefore both areas are considered to have low to moderate resource potential for barite and lead.

Area E, in the vicinity of Spring Creek, yielded barium values of 2,000 and 10,000 ppm in analyzed stream concentrates (Nowlan and Gerstel, in press). Other metals detected were 30 ppm lead, 10 ppm copper, and as much as 500 ppm zinc.

In area F, similarly high barium values (15,000 ppm) were obtained from named concentrates along Willow Creek. Some of these concentrates are also high in lead (1,500 ppm). This area may be coextensive with area A and may represent a supra-ore halo of epithermal-type mineralization that was synchronous with the ore deposition in the Weston Pass district.

CONCLUSIONS

The mineral resource potential of the Buffalo Peaks Wilderness Study Area is summarized in table 2. Areas A-F are delineated on the basis of a geochemical survey that discovered anomalous lead and barium values in analyzed stream-panned concentrates.

ASSESSMENT OF MINERAL RESOURCE POTENTIAL

The six areas of mineral resource potential (A-F) are discussed in greater detail in the following sections. Evidence of mineralization is provided by the numerous mine workings and prospects along fault systems, and by the anomalous metal values discovered in analyzed rock and vein samples and in stream-sediment panned concentrates. The six mineralized areas are largely related to fault systems and to Laramide rhyolitic intrusive activity.

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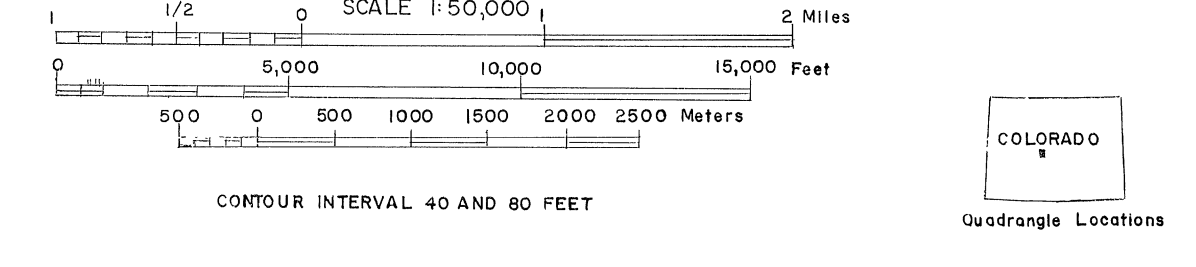
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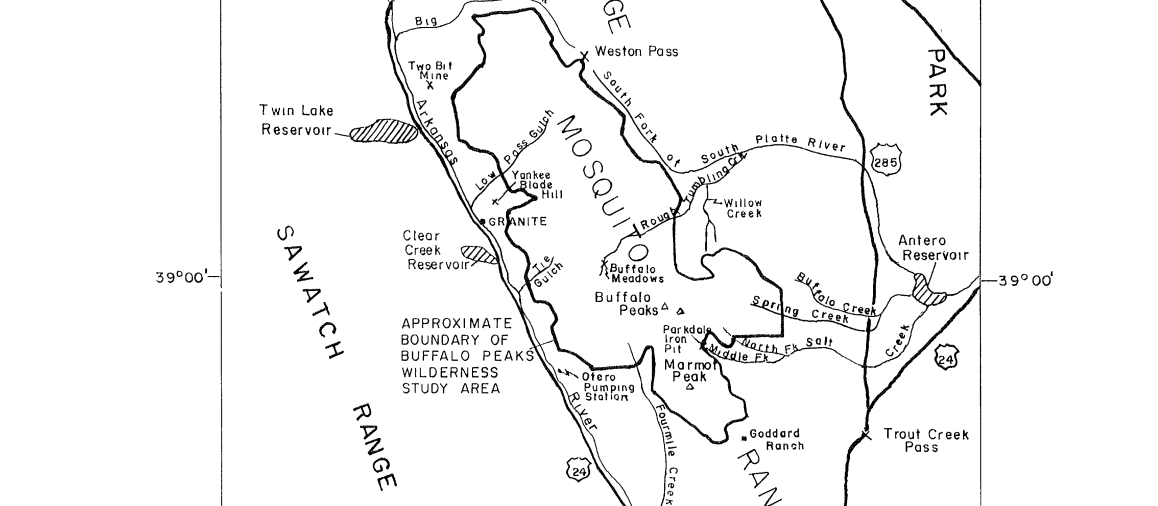
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Geology from reconnaissance mapping by D. C. Hedlund, 1982



MINERAL RESOURCE POTENTIAL MAP OF THE BUFFALO PEAKS WILDERNESS STUDY AREA, LAKE, PARK, AND CHAFFEE COUNTIES, COLORADO

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INDEX MAP SHOWING LOCATION OF THE BUFFALO PEAKS WILDERNESS STUDY AREA