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UNITED STATES GEOLOGICAL SURVEY

MISCELLANEOUS FIELD STUDIES
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PAMPHLET

MINERAL RESOURCE POTENTIAL OF THE BELL MOUNTAIN WILDERNESS STUDY AREA, IRON COUNTY, MISSOURI

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Studies Related to Wilderness

Under the provisions of the Wilderness Act (Public Law 88-577, September 3, 1964) and the Joint Conference Report on Senate Bill 4, 88th Congress, the U.S. Geological Survey and U.S. Bureau of Mines have been conducting mineral surveys of wilderness and primitive areas. Areas officially designated as "wilderness," "wild," or "canoe" when the Act was passed were incorporated into the National Wilderness Preservation System, and some of them are presently being studied. The Act provided that areas under consideration for wilderness designation should be studied for suitability for incorporation into the Wilderness System. The mineral surveys constitute one aspect of the suitability studies. This report discusses the results of a mineral survey of some national forest lands in the Bell Mountain Wilderness Study Area, Iron County, Missouri.

MINERAL RESOURCE POTENTIAL

SUMMARY

The Bell Mountain Wilderness Study Area is between the Old Lead Belt and Viburnum Trend within the highly productive Southeast Missouri mining district; however, no minerals have been produced from the area. Mining companies held prospecting permits for lead and zinc within and adjacent to the study area from 1954 to 1965, but no drilling was done in the study area itself. The released logs from drilling on federal lands adjacent to the area yielded negative results, so the potential for major deposits in the study area appears to be low. Small prospects on Shut-in Creek have been driven on sulfide-bearing quartz veins in rhyolitic tuffs. These veins have negligible value near the surface, but have not been explored at depth. The area has no potential for coal or for geothermal resources, and a very low potential for oil and gas. Although some rocks in the study area are suitable for aggregate, equally suitable rocks are abundant in more accessible locations elsewhere in the region.

INTRODUCTION

Location, Size, and Geographic Setting

The Bell Mountain Wilderness Study Area covers 8,533 acres (3,453 hectares) of the Mark Twain National Forest in Iron County, southeastern Missouri, about 110 mi (180 km) southwest of St. Louis and 20 mi (32 km) south of Potosi, Missouri (fig. 1). All sides of the study area are accessible by State, County, and Forest Service roads; however, access is best by paved County Highway 0 from Belleview, 5 mi (8 km) to the northeast. Jeep trails follow the main ridges within the study area.

The study area is on the western flank of the St. Francois Mountains, which form the core of the Ozark uplift. Rounded, heavily forested knobs of igneous rock form most of the highlands and the steep-walled, narrow gorges, locally known as "shut-ins." Sedimentary rocks of Paleozoic age that flank the igneous knobs have been eroded into more open valleys. Within the study area, 1,702-ft (519-m) Bell Mountain is the highest elevation. Relief is 762 ft (232 m). Ottery Creek flanks the west side of the study area, Imboden Creek the east side, and Shut-in Creek drains the center of the area.

Present Investigation

U.S. Bureau of Mines personnel, Clarence Ellis assisted by Jeanne Coursey, carried out field work beginning in January and ending in April 1978. Land-status records were checked for ownership of mineral rights at the U.S. Forest Service district office in Potosi. Drill-hole logs, geologic maps, and mineral-occurrence files of the Missouri Geological Survey were checked. The study area was traversed thoroughly to investigate occurrences of metallic and nonmetallic minerals. Prospects on Shut-in Creek (SE1/4 sec. 30, T. 34 N., R. 2 E.) were mapped, and 12 samples were taken. Semiquantitative spectrographic analyses for 40 elements and fire assay for gold and silver in all samples were made at the U.S. Bureau of Mines Reno Metallurgical Research Center, Reno, Nev. Three mineralized samples from an adit in the same location were also analyzed for lead, copper, and tungsten by atomic absorption.

Geologic reconnaissance of the Paleozoic rocks and geochemical sampling of the entire area by the U.S. Geological Survey were done in 1978 and 1979 by W. P. Pratt and R. L. Erickson (USGS) and Mark Middendorf (Missouri Geological Survey), assisted by S. P. Marsh, B. R. Berger, E. L. Mosier, and J. G. Viets.

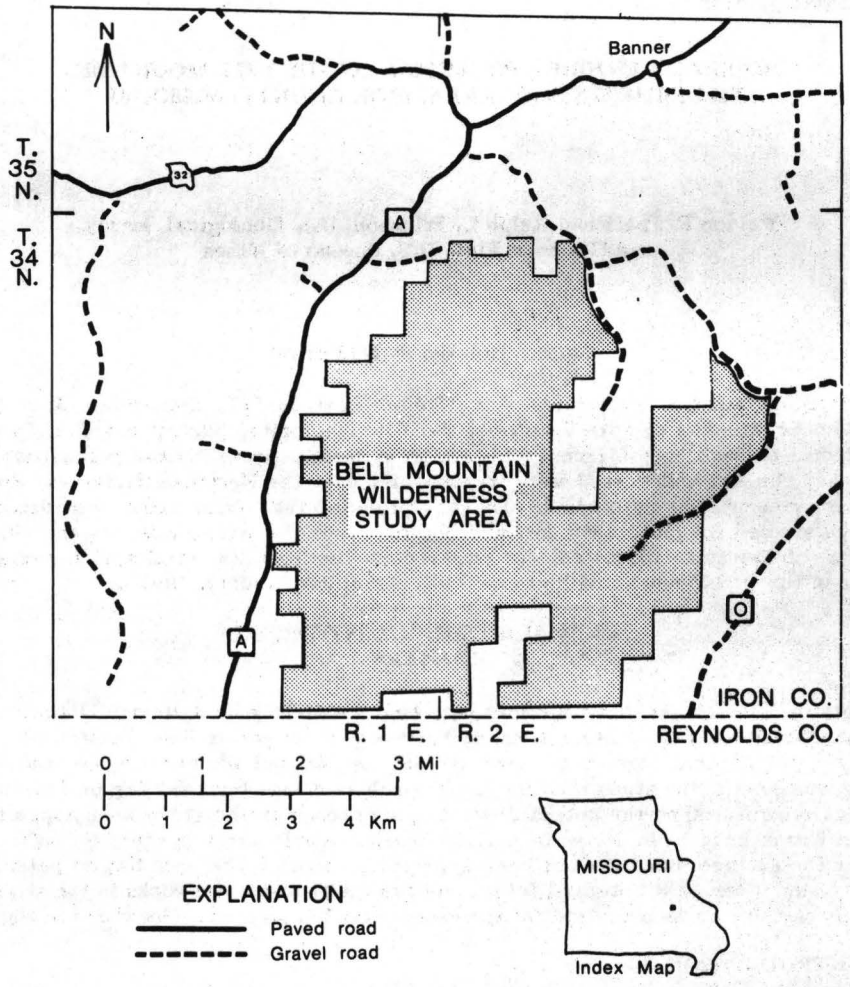


Figure 1.--Map showing location of the Bell Mountain Wilderness Study Area.

The geology of the study area (Fig. 2) is discussed in detail in a companion report (Pratt and Erickson, 1982).

Acknowledgments

The cooperation of Ardel Rueff and Eva Kisvarsanyi of the Missouri Geological Survey and of U.S. Forest Service personnel of the Potosi Ranger District, Mark Twain National Firest, is gratefully acknowledged.

MINING DISTRICTS AND MINERALIZATION

History and Production

The Bell Mountain Wilderness Study Area is within the Southeast Missouri mining district which has produced over $2 billion worth of lead since mining was begun in 1720. The value of other minerals produced has exceeded half a billion dollars. However, until 1960, the closest lead mine to the study area was the past producer at Annapolis, 18.1 mi (29.1 km) southeast. All production in the district is now from the Viburnum Trend, about 12 mi (19 km) west of the study area.

No mineral production has been recorded from the study area or its immediate vicinity. Iron is being mined from a magnetite deposit in rhyolitic tuff at Pilot Knob, about 9 mi (14.5 km) east of the study area. Granite was quarried for dimension stone at Graniteville, about 8 mi (13 km) east of the study area.

Mineral Rights

In Missouri, minerals cannot be claimed under the Mining Law of 1872. The U.S. Government purchased the land piecemeal in the late 1930's and early 1940's, and prospecting and mining are carefully regulated on federal acquired lands. Except for 160 acres (64.8 hectares) of the NE1/4 sec. 21, T. 34 N., R. 2 E., all mineral rights have belonged to the U.S. Government since 1959.

Mining and Prospecting Activity

There is no mining activity in the area at present. The only prospects located within the study area are on the west side of Shut-in Creek in the NE1/4 SE1/4 sec. 30, T. 34 N., R. 2 E. Mineral rights on this site were reserved by the seller for 20 years, but have belonged to the U.S. Government since 1956. The workings consist of a water-filled shaft and prospect pit, and an adit.

Country rock around the prospects is a rhyolitic ash-flow tuff (Ironton Rhyolite of Berry, 1976). Quartz veining, uncommon in the Precambrian of Missouri, is locally abundant. Most veins strike approximately east-west, and are less than 2 in. (5 cm) wide. Dip is near vertical. Noticeable alteration does not extend over 8 in. (20 cm) from the veins.

The widest vein strikes about N. 50° E., dips vertically, and appears to be the vein explored by the pit. An 8.6-ft (2.7-m) chip across the vein assayed 0.1 oz/ton (3 g/mt) silver. A sample taken on a grid of the quartz vein material, which makes up the dump from the prospect pit, assayed the same.

The shaft is on a northeast-trending, high-angle fault. In some samples of wall rock on the dump, feldspar phenocrysts appeared to be hydrothermally altered. Minor amounts of quartz-vein material are on the dump. A composite sample taken on a grid from the 26 ft x 33 ft x 16 ft high (8 m x 10 m x 5 m high) dump assayed 0.3 oz/ton (10 g/mt) silver.

The adit is only a yard (meter) or so above the creek; thus most of the dump has been washed away. The adit was driven 57.7 ft (17.6 m) N. 85° W. on a sulfide-bearing quartz vein about 2 in. (5 cm) wide. Galena is visible but sparse; chalcopyrite and chrysocolla are rare. A 5.6-ft (1.7-m) chip sample across the back 16.7 ft (5.1 m) from the portal assayed 0.1 oz/ton (3 g/mt) silver, 0.42 percent lead, and 150 ppm copper. A 4.9-ft (1.5-m) chip across the back, taken 37.8 ft (12.4 m) from the portal, contained 140 ppm lead, 60 ppm copper, and 400 ppm tungsten. At 52.5 ft (16 m) from the portal, the vein is cut off by a N. 43° E. vertical fault with minor quartz veinlets on its northwest side. The adit follows the fault southwest 50.5 ft (15.4 m), where the veinlets pinch out. Two samples were taken across the fault on the right rib, and two more taken across the back, along the fault. These samples contained only slightly anomalous amounts of lead, copper, and silver.

A specimen sample of vein material from the dump assayed 0.08 percent copper, 1.98 percent lead, 0.2 oz/ton (7 g/mt) silver, and a trace of gold.

Quartz veins are exposed in only a limited area, and metal values are well below ore grade. Drilling would be required to determine whether mineralization improved at depth. Vein-type deposits with very low metal values are poor exploration targets.

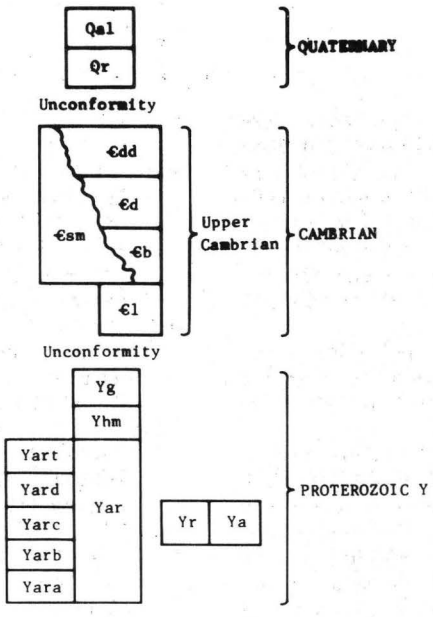
According to information on file with the Missouri Division of Geology and Land Survey, the American Zinc, Lead and Smelting Co., during 1964-1965, drilled 16 holes on Forest Service land along the northeast side of the study area; the nearest drill hole was within 1/4 mi (0.4 km) of the study area. No mineralization was found and no assays were reported for any of the drill samples. Drilling permits on the west side of the study area were held briefly, but no drilling was done on government land.

ASSESSMENT OF MINERAL-RESOURCE POTENTIAL

The Viburnum Trend lead ore deposits are located about 12 mi (19 km) west of the west border of the study area and are mostly in the Bonneterre Formation. To our knowledge, no mineralization of economic importance has been discovered in the intervening area. Drilling for lead and zinc on Forest Service lands northeast of the study area yielded negative results. Much of the exposed Bonneterre Formation in the study area consists of the "white rock facies" of local usage which is considered unfavorable host rock for ore discovery. Therefore, although the mineral potential of the subsurface Bonneterre Formation can be tested only by drilling, the available geologic and geochemical data (Pratt and Erickson, 1982) suggest that the potential of the Bell Mountain Wilderness Study Area for ore deposits of the magnitude of the Viburnum Trend deposits is low. However, low-grade lead mineralization that may be an important resource in the future may be present in the Bonneterre Formation in and adjacent to the northern and western parts of the study area. The

Figure 2.--Geologic map of the Bell Mountain Wilderness Study Area.

CORRELATION OF MAP UNITS



EXPLANATION

LIST OF MAP UNITS

Qal	ALLUVIUM (QUATERNARY)
Qr	RESIDUUM (QUATERNARY)
	UNCONFORMITY
Cdd	DERBY-DOERUN DOLOMITE (UPPER CAMBRIAN)
Cd	DAVIS FORMATION (UPPER CAMBRIAN)--Interbedded shale and dolomite
Cb	BONNETERRE FORMATION (UPPER CAMBRIAN)--Dolomite
Csm	STROMATOLITE/MUD FACIES (UPPER CAMBRIAN)--Dolomite
Cl	LAMOTTE SANDSTONE (UPPER CAMBRIAN)
	UNCONFORMITY
Yg	GABBRO (PROTEROZOIC Y)
Yhm	GRANITE (PROTEROZOIC Y)
Yar	ALKALI-RHYOLITE (PROTEROZOIC Y)
Yart	Brick-red, very well bedded tuff
Yard	Reddish-purple to dusky red welded tuffs
Yarc	Grayish- to reddish-purple welded tuffs
Yarb	Medium-gray, very dense welded tuff
Yara	Pale-red to reddish-brown bedded tuff
Yr	RHYOLITE (PROTEROZOIC Y)
Ya	ANDESITE (PROTEROZOIC Y)

——— CONTACT--Dashed where approximately located

———•———• FAULT--Dashed where approximately located; dotted where concealed; bar and ball on downthrown side

STRIKE AND DIP OF LAYERING--In volcanic rocks

Horizontal

STRIKE AND DIP OF BEDS

MINE ADIT

—+800— STRUCTURE CONTOURS--On buried Precambrian basement-rock surface, modified slightly from Kisvarsanyi (1979); contour interval 200 feet

sulfide-bearing quartz veins in the Precambrian rocks are of negligible value at present. They have not been explored at depth; their potential for ore deposits at depth is unknown, but is thought to be low on the basis of experience elsewhere in the St. Francois Mountains Precambrian terrane. The aeromagnetic map of the area (Pratt and Erickson, 1982) does not contain any anomalies interpreted to be caused by magnetite deposits.

Coal is not found in Ordovician and older rocks. The potential for oil or gas is considered poor in the Ozark uplift (Wharton and others, 1969, p. 82). Evidence of geothermal energy is lacking.

Except for shaly parts of the Davis Formation, the rocks of the area are suitable for aggregate. The Bonneterre Formation is a major source of refractory dolomite in Missouri, and the Eminence Dolomite, which may be present beneath the residuum, is a potential source of pure dolomite in some areas (Kisvarsanyi, 1967). The other dolomites are not sufficiently pure to be used for other than agricultural lime or aggregate. These formations are present over a wide area, and similar rocks are abundant in more accessible locations in the region.

A comprehensive appraisal of the metallic mineral-resource potential of the Rolla 1^{o}x 2^{o} quadrangle, which includes the Bell Mountain Wilderness Study Area, has been published recently (Pratt, 1981).

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