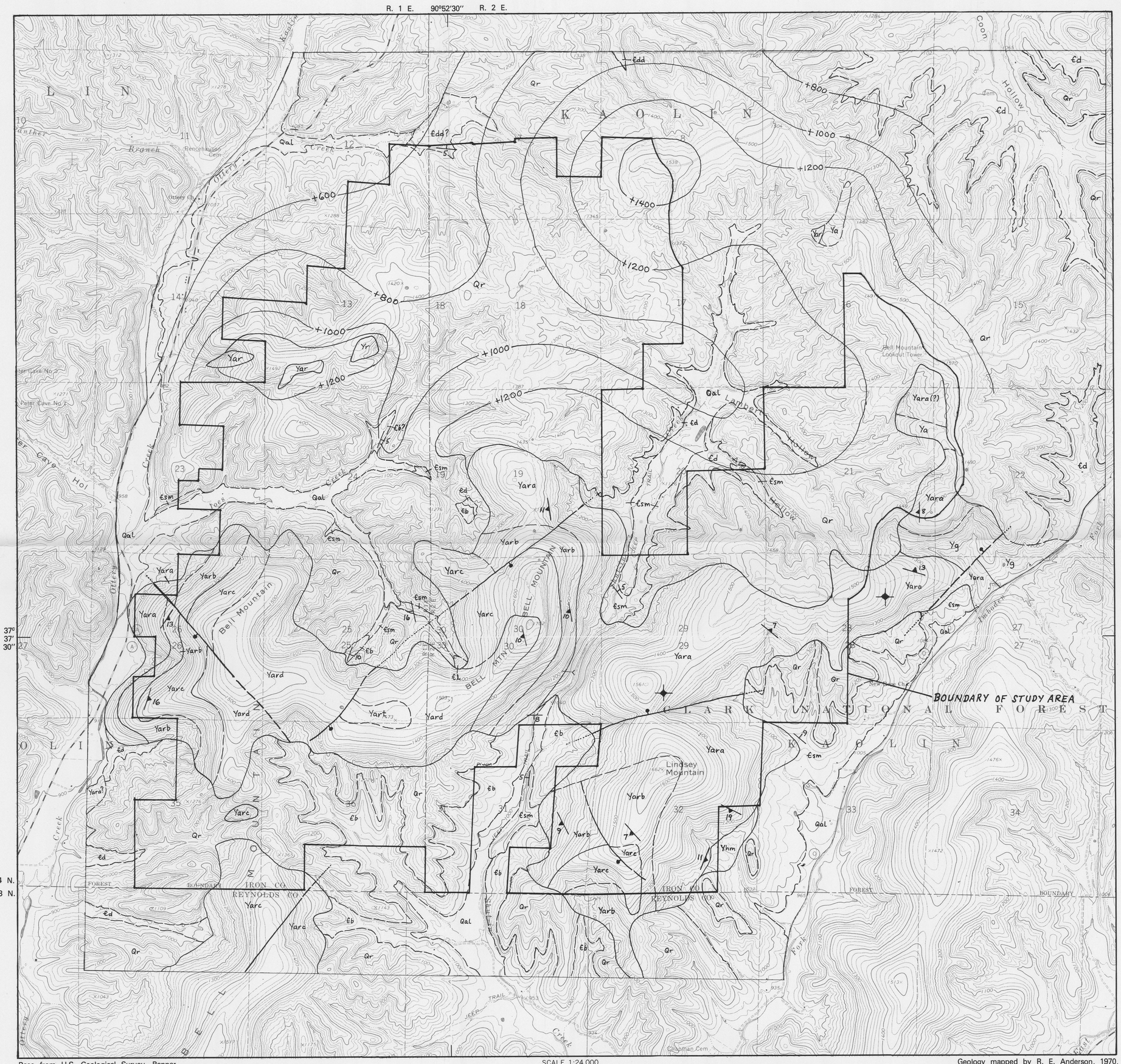
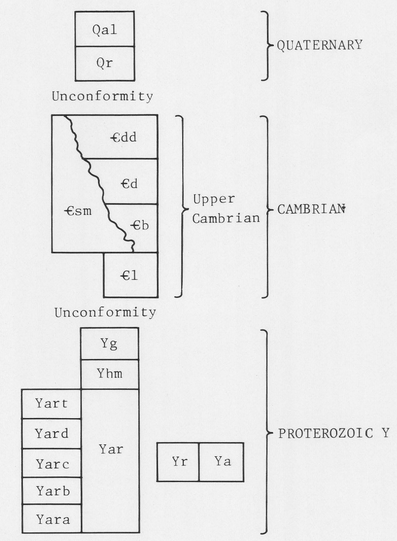
DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

MISCELLANEOUS FIELD STUDIES
MAP MF-1178-B



CORRELATION OF MAP UNITS



EXPLANATION

LIST OF MAP UNITS

Qal	ALLUVIUM (QUATERNARY)
Qr	RESIDUUM (QUATERNARY)
	UNCONFORMITY
Edd	DERBY-DOERUN DOLOMITE (UPPER CAMBRIAN)
Ed	DAVIS FORMATION (UPPER CAMBRIAN)--Interbedded shale and dolomite
Eb	BONNETERRE FORMATION (UPPER CAMBRIAN)--Dolomite
Esm	STROMATOLITE/MUD FACIES (UPPER CAMBRIAN)--Dolomite
El	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

Base from U.S. Geological Survey, Banner Edgehill, Johnson Mountain and Johnson Shut-ins quadrangles, 1968, 1:24,000.

SCALE 1:24 000

1 ½ 0 1 MILE

1 .5 0 1 KILOMETER

Geology mapped by R. E. Anderson, 1970, and W. P. Pratt, R. L. Erickson, and S. P. Marsh, 1978-79. Paleozoic in part modified from Dake, 1930.

Mineral Surveys
Studies Related to Wilderness

The Wilderness Act (Public Law 88-577, September 3, 1964) and related Acts require the U.S. Geological Survey and the U.S. Bureau of Mines to survey certain areas on Federal lands to determine their mineral-resource potential. 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-resource-potential survey of 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

The U.S. Bureau of Mines and U.S. Geological Survey made a mineral and geological survey of the Bell Mountain Wilderness Study Area, southeast Missouri, in 1978-79. The study area covers 8,533 acres (3,453 hectares) of the Mark Twain National Forest in Iron County, about 110 mi (180 km) southwest of St. Louis and 20 mi (32 km) south of Potosi, Missouri. All sides of the study area are accessible by State, County, and Forest Service roads.

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 rocks 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.

GEOLOGY

The Bell Mountain Wilderness Study Area is dominated by rounded ridges of Precambrian volcanic rocks that are overlapped by early Paleozoic sedimentary rocks. The prominent topographic features of the area, Bell Mountain and Lindsey Mountain, are composed of Precambrian alkali-rhyolites, part of a widespread volcanic complex that underlies most of the St. Francois Mountains. Flat to gently dipping Cambrian dolomites and minor sandstones flank the Precambrian rocks but are exposed only in small areas in some of the drainages; elsewhere these sedimentary rocks are covered by chert- and sandstone-bearing residuum of unknown thickness, derived by dissolution of the carbonates. The geology of the area is discussed in detail in a companion report (Pratt and Erickson, 1982).

GEOCHEMISTRY

Geochemical studies (Pratt and Erickson, 1982) tested the distribution and abundance of a suite of metals (Pb, Zn, Cu, Ni, Co) in panned concentrates of stream-sediment samples at 31 sample sites in and adjacent to the study area. The panned concentrates are composed chiefly of yellow- to orange-brown, limonitic iron oxide and maroon to black hematitic iron oxide. The limonite is metal rich and shows a wide range in metal content whereas the hematite is metal poor. We believe that the limonite is derived from oxidation of pyrite and marcasite disseminated in Paleozoic carbonate rocks and that the hematite is mostly primary and derived from Precambrian volcanic rocks. The relative proportion of these two forms of iron oxide varies from one sample site to another.

The stream sediments and their contained iron oxides are derived chiefly from formations higher in the stratigraphic section than the Bonneterre Formation. However, the high metal values may be leakage halos caused by the migration of metals from mineralized Bonneterre rocks in the subsurface, into overlying formations that later have been reduced to residuum through chemical weathering and dissolution of carbonate. Thus the metal-rich iron oxides that probably were derived in large part from formations which are no longer present in the area, may be indicators of mineralization in the Bonneterre Formation in the subsurface.

Spectrographic and chemical analyses of 27 rock samples from outcrops of Precambrian volcanic rocks show no evidence of mineralization.

GEOPHYSICS

The study area is located on the north side of a broad, poorly defined, positive regional gravity anomaly, but there are no gravity stations within the area and the detailed gravity structure of the area is unknown. As shown on an aeromagnetic map of the region (Pratt and Erickson, 1982), the principal magnetic feature in the study area is a poorly defined magnetic ridge that trends northwest across the study area; individual highs along this trend are associated with rhyolite knobs.

MINING DISTRICTS AND MINERALIZATION

There is no mining activity in the study area at present, and no mineral production has been recorded from the study area or its immediate vicinity.

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. They were opened on sulfide-bearing quartz veins in Precambrian rhyolitic ash-flow tuff; the principal contained metals are lead, copper, and traces of silver. The veins are exposed in only a limited area, and metal values are well below ore grade.

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 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 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 does not contain any anomalies interpreted to be caused by magnetite deposits (Pratt and Erickson, 1982).

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° x 2° quadrangle, which includes the Bell Mountain Wilderness Study Area, has been published recently (Pratt, 1981).

REFERENCES

Kisvarsanyi, E. B., 1967, Refractory dolomite, in Mineral and water resources of Missouri: Missouri Division of Geological Survey and Water Resources [Report], 2d ser., v. 43, p. 192-196.

Pratt, W. P., ed., 1981, Metallic mineral-resource potential of the Rolla 1° x 2° quadrangle, Missouri, as appraised in September 1980: U.S. Geological Survey Open-File Report 81-518, 77 p.

Pratt, W. P., and Erickson, R. L., 1982, Geologic, geochemical, and geophysical maps of the Bell Mountain Wilderness Study Area, Iron County, Missouri: U.S. Geological Survey Miscellaneous Field Studies Map MF-1178-A.

Wharton, H. M., Martin, J. A., Rueff, A. W., Robertson, C. E., Wells, J. S., and Kisvarsanyi, E. B., 1969, Missouri minerals, resources, production, and forecasts: Missouri Geological Survey and Water Resources, Special Publication No. 1, xi + 303 p.

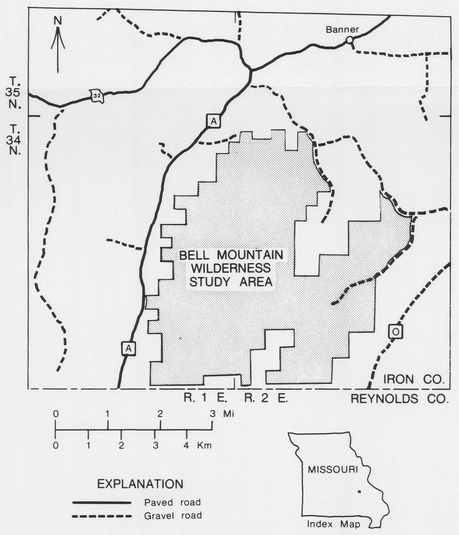


Figure 1.--Map showing location of the Bell Mountain Wilderness Study Area.

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

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