

**MINERAL-RESOURCE POTENTIAL OF THE  
ROCK PILE MOUNTAIN WILDERNESS STUDY AREA,  
MADISON COUNTY, MISSOURI**

By

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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 Rock Pile Mountain Wilderness Study Area, Madison County, Missouri.

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**MINERAL-RESOURCE POTENTIAL  
SUMMARY**

Although the Rock Pile Mountain Wilderness Study Area is within the general boundary of the Southeast Missouri mining district, it has no record of mineral production and there is no mining or prospecting activity at present. Exploratory drill holes on private land along the west side of the area encountered no economic mineralization.

Neither the Precambrian volcanic rocks nor the Cambrian sedimentary rocks contain any detectable evidence of economic mineralization. The area has no potential for coal resources, an unfavorable potential for oil and gas, and no known potential for geothermal energy. The volcanic rocks might be suitable for use as crushed stone, but similar rocks occur abundantly in more favorable locations elsewhere.

**INTRODUCTION**

**Location, Size, and Geographic Setting**

The Rock Pile Mountain Wilderness Study Area covers 4,170 acres (1,690 hectares) of the Mark Twain National Forest in Madison County, southeastern Missouri, about 100 mi (160 km) south of St. Louis, and 15 mi (24 km) southwest of Fredericktown. The St. Francis River and private land restrict access from the south and west sides. The north and east boundaries are readily accessible by good Forest Service roads connecting with County Highway C (fig. 1). A jeep trail from the east connects with jeep trails along the main ridges within the study area. A branch of the Missouri Pacific Railroad serves the Pilot Knob iron mine about 18 mi (29 km) northwest of the study area.

The study area is within the St. Francois Mountains. Rounded knobs of igneous rock are the usual topography. In places, the Paleozoic sediments deposited on the flanks of the Precambrian hills are carved into low bluffs. Maximum elevation is 1,305 ft

(398 m) on Little Grassy Mountain at the north boundary of the study area; relief is 780 ft (240 m).

**Present Investigation**

The present study includes both field and laboratory investigations, with contributions by both the U.S. Bureau of Mines and the U.S. Geological Survey. Field work for the U.S. Bureau of Mines was done by Clarence Elms, assisted by Jeanne Coursey, 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 at Fredericktown. The Missouri Geological Survey's drill-hole logs, mineral-occurrence files, and unpublished geologic maps were checked. The study area was traversed thoroughly to investigate occurrences of metallic and nonmetallic minerals. Prospects were sampled and panned concentrate samples were taken in major streams. Semiquantitative spectrographic analyses for 40 elements and fire assay for gold and silver, in all samples, were made at the U.S. Bureau of

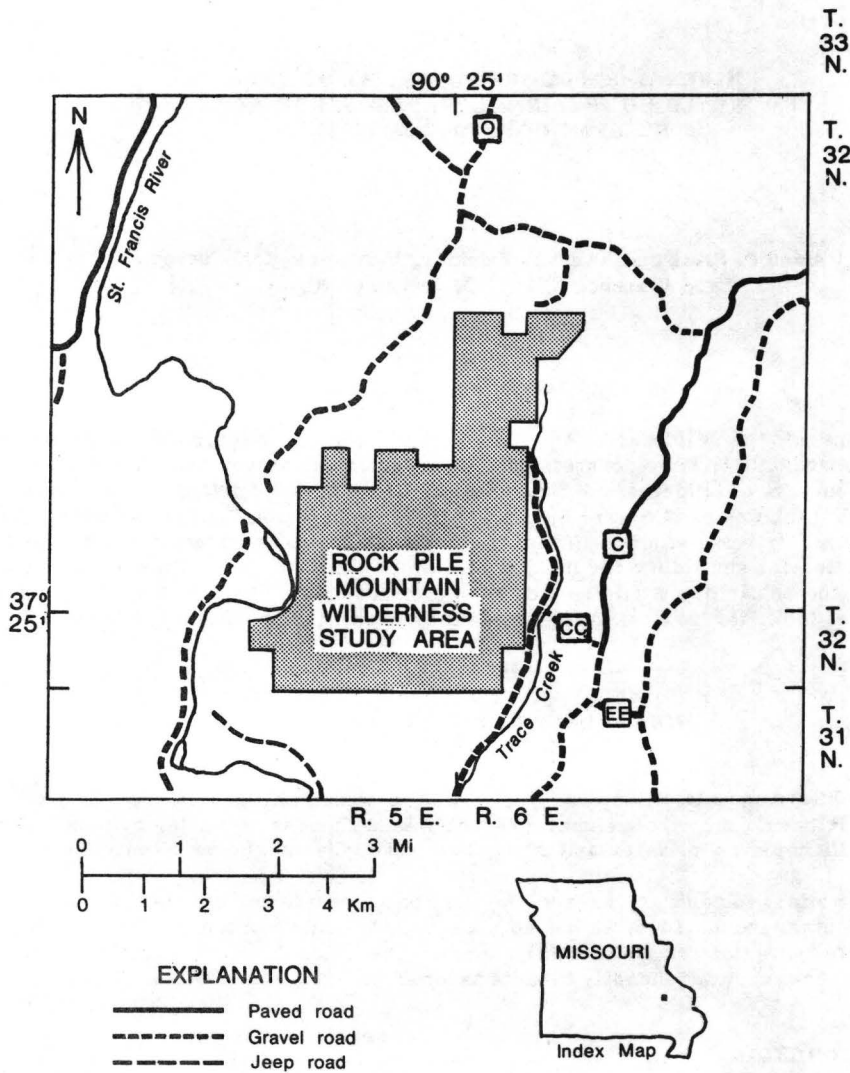


Figure 1.--Index map showing location of the Rock Pile Mountain Wilderness Study Area.

Mines Reno Metallurgical Research Center, Reno, Nev. These analytical results are available for inspection at the U.S. Bureau of Mines Intermountain Field Office, Denver, Colo.

Mapping and sampling by the U.S. Geological Survey was done in 1977-78. Geologic reconnaissance mapping of the Precambrian rocks was done initially in March 1977 by W. P. Pratt assisted by H. D. Elley, and in November 1977 by Pratt assisted by V. M. Brown and D. C. Smith. Geologic reconnaissance and geochemical sampling was completed in April and May 1978 by Pratt and R. L. Erickson, assisted by E. L. Mosler, J. G. Viets, and S. P. Marsh. The geology of the study area (fig. 2) is discussed in detail in a companion report (Pratt and Erickson, 1982).

#### Acknowledgments

The cooperation of Eva Kisvarsanyi, James Martin, Ardel Rueff, Ira Satterfield, and Heyward Wharton of the Missouri Geological Survey, and of District Ranger David E. Kline of the Fredericktown Ranger District, Mark Twain National Forest, is gratefully acknowledged. Special thanks are extended to Mr. Gary Inman of Fredericktown, a resident and arrowhead collector, for sharing his knowledge of the study area.

### MINING DISTRICTS AND MINERALIZATION

#### History and Production

The Rock Pile Mountain Wilderness Study Area lies in a region of scattered, inactive lead mines, all of which produced ore from the Bonnetterre Formation. None of these mines, however, is in the immediate vicinity of the study area; the nearest ones are in the Fredericktown-Mine La Motte area, 6.5 mi (10.5 km) northeast of the study area, and the Annapolis mine, 13 mi (21 km) west-southwest. A few of these mines also produced copper and silver. During and after World War II, cobalt and nickel were recovered at the Madison mine at Fredericktown, but their recovery ceased a year or two prior to 1961 (A. V. Heyl, written commun., 1980).

Lead and silver were produced from the Einstein mine, 11 mi (18 km) north of the study area, in the 1870's and 80's, from a quartz vein in the Precambrian Silvermine Granite (Pomerene, 1947). During World War I, the Apex mine produced tungsten from the same vein system. For a decade or so after the war, tungsten was produced from the Ozark mine in the same locale (Tolman, 1933). The Apex mine was reopened in 1960 and a small tonnage of tungsten concentrates was piled. It is not known if they were shipped (A. V. Heyl, written commun., 1980).

No mineral production has been recorded from the 7-mi (11-km) radius around the study area, although local legend says that mining and smelting were carried out by slaves in "Cobalt Hollow" (Gary Inman, oral commun., 1978). Occurrences of galena, chalcopyrite, and asbestos (reported in the Missouri Division of Geology and Land Survey's mineral-occurrence files) in or near the study area could not be verified in the field.

In Missouri, minerals cannot be claimed under the Mining Law of 1872. The U.S. Government purchased the national forest land piecemeal in the late

1930's and early 1940's. Prospecting and mining are carefully regulated on federal acquired lands. There is no record of prospecting permit applications for federal land within or in the near vicinity of the study area. All mineral rights in the Rock Pile Mountain study area have been held by the U.S. Government since 1967.

In the late 1940's, American Metal Co., Ltd. (now AMAX) drilled a number of exploratory holes for lead-zinc mineralization on private land in this general area. Drill logs are on file with the Missouri Division of Geology and Land Survey. Seven of these holes were along the north and west sides of the study area. One hole in the NW1/4SW1/4NW1/4 sec. 25, T. 32 N., R. 5 E., encountered a trace of galena; the rest, however, were barren.

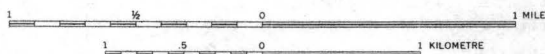
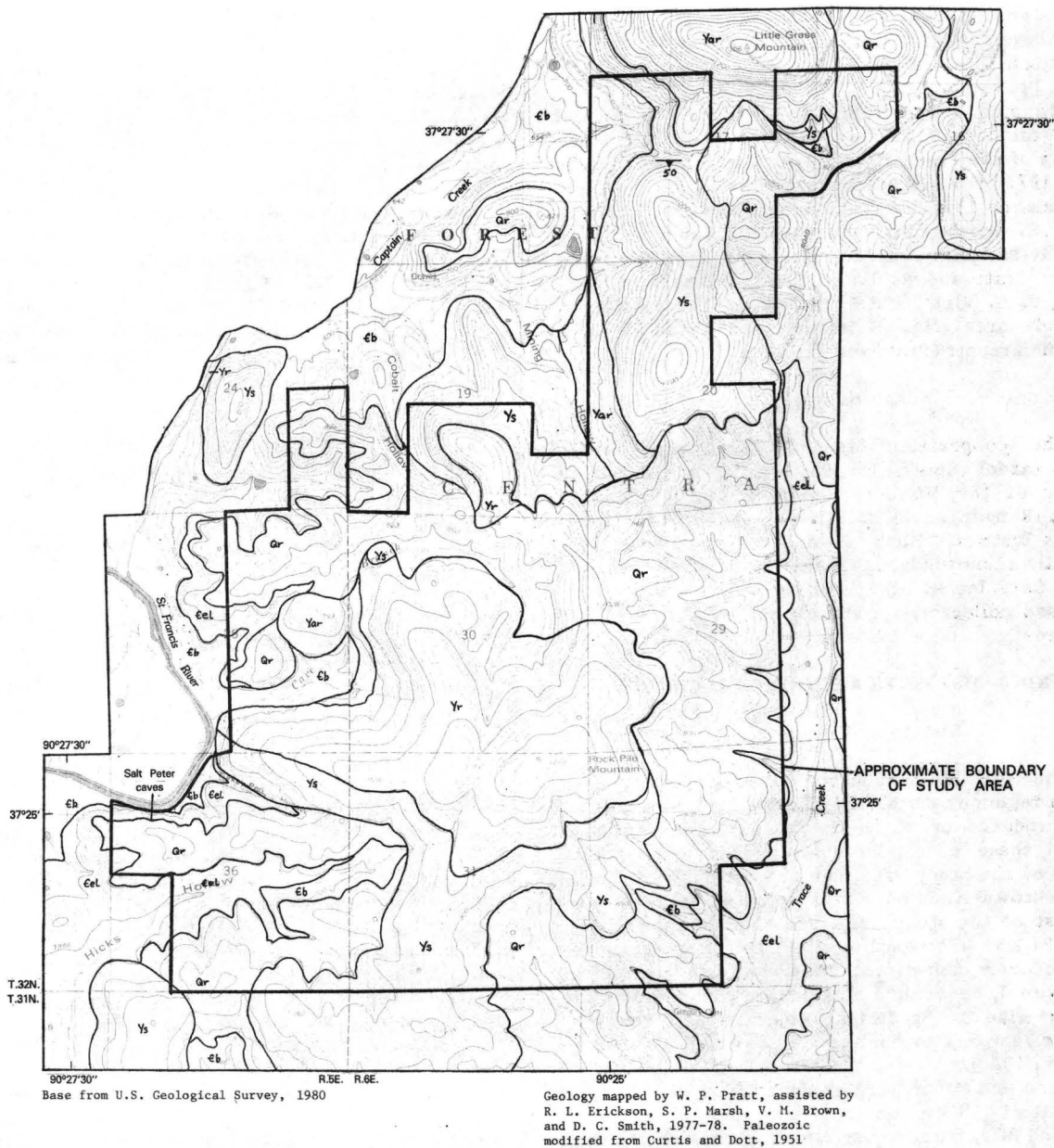
#### Prospects

Small pits are common in the study area and are concentrated on the west side of a drainage in SW1/4 sec. 19, T. 32 N., R. 6 E., locally known as Cobalt Hollow. The east slope of the drainage is underlain by quartz latite and has no pits. Outcrops are limited to a few ledges of dolomite near the saddle on the ridge west of the drainage. Pits are nearly filled by slope wash. The dumps of five pits across the slope were sampled, as was one near the top of the slope. Material excavated from the dumps was the same as that found in the residual soil: chert, quartz druse, and soil; the pits did not reach bedrock. The largest pit is in the saddle on the ridge west of the drainage, but the dump is missing. A chip sample was taken from a ledge of dolomite adjacent to the pit. Analytical results indicate that mineralization was not present; the pits may not have been related to mineral activity.

Two caves, known as Salt Peter Caves, are in the bluffs above the St. Francis River in sec. 36, T. 32 N., R. 5 E. Bat guano was allegedly mined from one or both for use as saltpeter, a component of black powder. Neither cave is extensive and very little guano is found. No decoration by travertine or other mineralization is present.

### ASSESSMENT OF MINERAL-RESOURCE POTENTIAL

The rocks of the Rock Pile Mountain Wilderness Study Area contain no evidence of mineralization of possible economic significance (Pratt and Erickson, 1982). Neither surface observations nor geochemical analysis of selected rocks, stream sediments, or pan concentrates show any significant anomalous metal content. Available geophysical data show no anomalies of economic significance. Approximately 40 percent of the area is known or presumed to be underlain at depths of a few hundred feet (several tens of meters) or less by the Cambrian Bonnetterre Formation, which is the principal host rock for lead sulfide ore deposits elsewhere around the St. Francois Mountains. The surface geochemical sampling study does not adequately test this formation in the subsurface. However, drill-hole information from adjacent areas suggests that the Bonnetterre Formation in this area is not favorable for mineral discovery (Erickson and others, 1978; 1979). No prospecting permit applications have been filed for acreage within the study area at any time. The known ore trends in



CORRELATION OF MAP UNITS	
Qr	QUATERNARY
Unconformity	
Cel	CAMBRIAN
Eb	
Unconformity	
Yar Yr Ys	PROTEROZOIC Y

— CONTACT  
 — STRIKE AND DIP OF LAYERING—In volcanic rocks  
 — APPROXIMATE BOUNDARY OF STUDY AREA

LIST OF MAP UNITS	
Qr	RESIDUUM (QUATERNARY)
UNCONFORMITY	
Cel	ELVINS GROUP (UPPER CAMBRIAN)— Thin-bedded dolomite
Eb	BONNETERRE FORMATION (UPPER CAMBRIAN)— Massive dolomite
UNCONFORMITY	
Yar	ALKALI RHYOLITE (PROTEROZOIC Y)— Potassium feldspar-bearing porphyry
Yr	RHYOLITE (PROTEROZOIC Y)— Potassium feldspar- and albite-bearing porphyry
Ys	QUARTZ LATITE (PROTEROZOIC Y)— Albite-bearing porphyry

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

the region closely parallel limestone-dolomite interfaces in the Bonneterre Formation, and no such interfaces are known to exist within about 12 mi (20 km) of this area. However, the possible occurrence of lead mineralization of the Annapolis mine type—in coarse-textured dolomite close to the contact with Precambrian rocks—cannot be entirely ruled out. Similar occurrences were mined in parts of the Fredericktown and Doe Run areas.

The study area has little potential for economic resources of industrial or energy minerals. Precambrian rocks like those that occur in the study area have been quarried elsewhere in the region for use as crushed stone ("felsite"), but abundant supplies of similar rocks are available in more favorable locations outside the study area. The Bonneterre Formation is a major source of refractory dolomite in Missouri, but is widely exposed and can be quarried at more desirable locations outside the study area (Kisvarsanyi, 1967). The Ozark uplift is considered unfavorable for oil and gas exploration (Wharton and others, 1969, p. 82). Missouri coal deposits are in rocks of Pennsylvanian age, none of which are near the study area. No evidence exists that geothermal energy could be developed in the study area.

A comprehensive appraisal of the metallic mineral-resource potential of the Rolla 1°x 2° quadrangle, which includes the Rock Pile Mountain Wilderness Study Area, has been published recently (Pratt, 1981).

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