DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

MISCELLANEOUS FIELD STUDIES
MAP MF-1405-C
PAMPHLET

MINERAL RESOURCE POTENTIAL OF THE LUSK CREEK ROADLESS AREA, POPE COUNTY, ILLINOIS

By

John S. Klasner, U.S. Geological Survey and Western Illinois University

T. M. Kehn, U.S. Geological Survey

and

Robert M. Thompson, U.S. Bureau of Mines

1983

Studies Related To Wilderness

Under the provisions of the Wilderness Act (Public Law 88-577, September 3, 1964) and related acts, the U.S. Geological Survey and the 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 begin 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. The act directs that the results of such surveys are to be made available to the public and be submitted to the President and the Congress. This report discusses the results of a mineral survey of the Lusk Creek Roadless Area (09-106) in the Shawnee National Forest, Pope County, Ill. The area was classified as a further planning area during the Second Roadless Area Review and Evaluation (RARE II) by the U.S. Forest Service, January 1979.

MINERAL RESOURCE POTENTIAL SUMMARY STATEMENT

The 6,703-acre Lusk Creek Roadless Area lies in the Shawnee National Forest, Pope County, Ill., about 12 mi south of Harrisburg, Ill. and 2 mi northeast of Eddyville, Ill. (fig. 1). The area has high potential for deposits of fluorite and associated barite, galena, and sphalerite, contains minor amounts of poor-quality construction materials, has thin discontinuous seams of coal, and has a low potential for the occurrence of oil and gas. Roughly 89 percent of the surface rights and 58 percent of the mineral rights are under Federal ownership. Applications have been filed for lease of oil and gas rights on about 36 percent and for mineral prospecting on 14 percent of the study area. These applications account for about 70 percent of the Federally owned mineral rights. Commerical extraction of fluorspar has occurred from one mine within the study area and from two mines just outside of the study area.

The Lusk Creek Roadless Area lies near the southern edge of the Illinois basin and south of the intersection of two major fault zones, one of which is associated with the Mississippi Embayment, and the other with the 38th Parallel Lineament. It also is along the western edge of the Illinois-Kentucky fluorspar district, the major fluorspar-producing area within the conterminous United States.

Deposits of fluorite and associated minor barite, galena, and sphalerite are the most important mineral resources in the Lusk Creek Roadless Area. Geological and geochemcial data indicate that the eastern third of the study area has a high fluorspar resource potential—principally along the Lusk Creek and Shawneetown fault zones where fluorspar, galena and sphalerite are observed. A belt about 0.5 mi on either side of the fault zone also has high fluorspar resource potential because of the possibility of strata-bound deposits adjacent to the faults. Geochemical data also indicate that the other zones within the Lusk Creek Roadless Area have moderate resource potential for fluorspar and most of the area may have some potential for fluorspar resources.

Limestone, shale, and sandstone in the study area have limited value as construction material. Although some limestone within the area is of high-calcium quality, its exposure and acreage are not indicative of a potential resource. The shale has low potential for use in lightweight aggregate and for firing material, but is of limited thickness and the overburden is excessive. Sandstone within the area is generally of low quality, and similar deposits exist in southern Illinois nearer to transportation facilities.

The potential for significant oil and gas resources is low. Only traces of oil and gas have been encountered by wells drilled near the study area. One dry well near the study area penetrated a structural trap that is at a higher elevation than any that could exist beneath the study area, thus making the potential for significant accumulations of oil and gas highly unlikely.

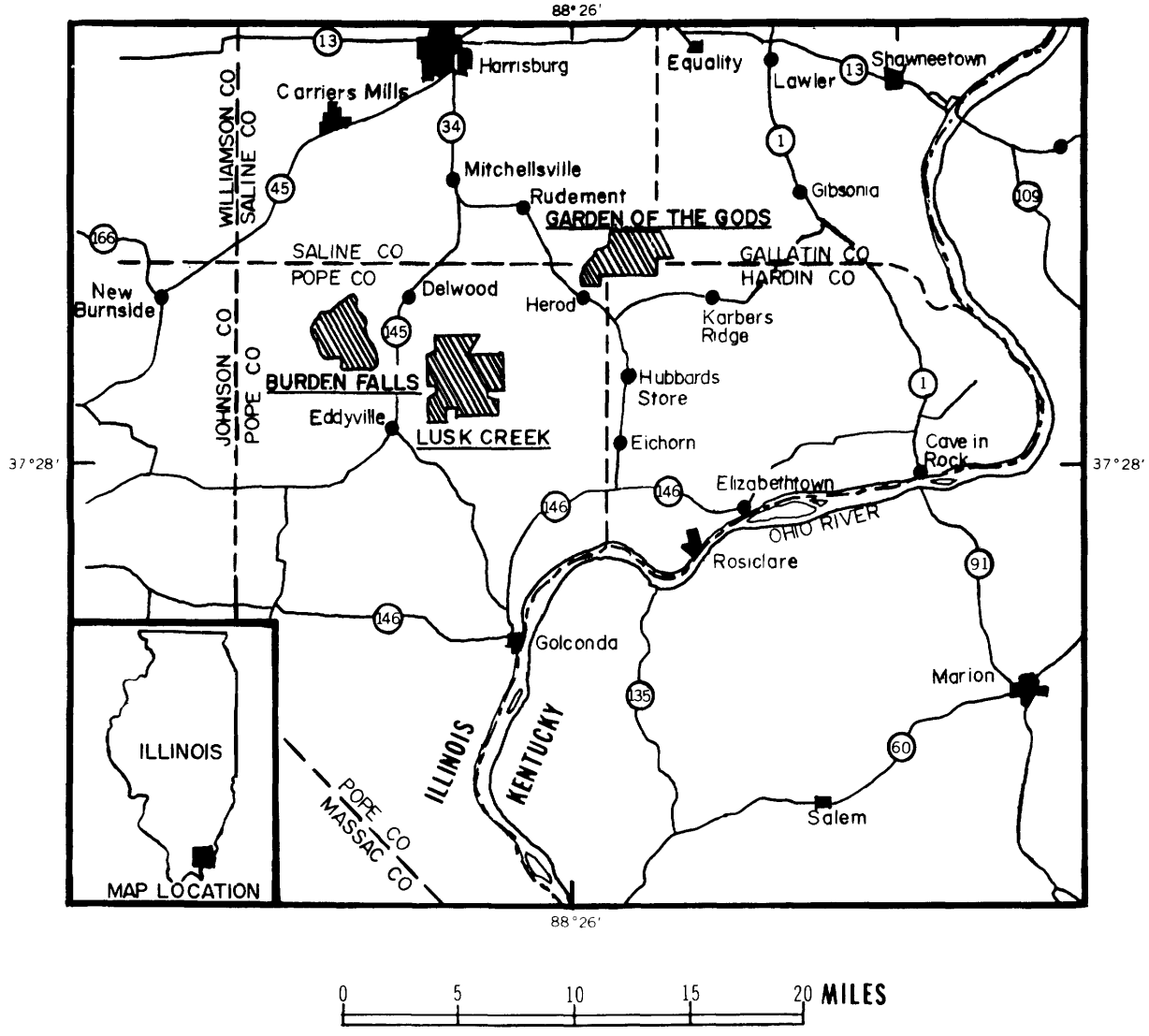


Figure 1.--Index map showing location of the Lusk Creek Roadless Area and other roadless areas in southeastern Illinois.

INTRODUCTION

The Lusk Creek Roadless Area comprises 6,703 acres located in Shawnee National Forest, Pope County, Ill., T. 11 S. and 12 S., R. 6 E. (fig. 1). The area is bounded by Illinois state highways 145 on the west, 34 on the north and east and 146 on the south. It is approximately 2 mi northeast of Eddyville and 5 mi southwest of Herod. Access is good via a network of light-duty county roads. Several hiking and horseback-riding trails cross the area, and old logging and tractor roads provide interior access to cleared farm plots along Lusk Creek.

Past utilization of the area has been directed toward agriculture and mining, as indicated by the remains of abandoned buildings, lanes, fences, wells, mine shafts, prospects, and equipment. Farming resulted in the clearing of nearly all forested land within the study area. The present vegetative cover consists predominantly of second-growth hardwoods. Some segments have been reforested by the introduction of conifers whereas others remain as brushy lots.

Elevations range from about 390 ft at the southern boundary, where Lusk Creek flows out of the study area, to about 835 ft in the north, near New Liberty Church. Although maximum relief of the study area is roughly 445 ft, local relief is typically less than 200 ft. Drainage is provided by Lusk Creek and its tributaries—Little Lusk Creek, East Fork of Little Lusk Creek, Ramsey Branch, Bear Branch, Little Bear Branch and an unnamed tributary that flows through Dog Hollow.

Acknowledgments

Several people provided information and assisted in this study. Jack A. Simon, Director of the Illinois State Geological Survey, provided access to unpublished data. James C. Bradbury and James W. Baxter, geologists of the Survey who had worked in the area, spent several hours discussing the geology of the region and provided well-log data and geologic reports. U.S. Forest Service personnel from the Vienna Ranger District and Harrisburg Forest Supervisors office provided trail maps and land-status data. Mr. J. D. Quarrant, Rosiclare, Ill., authorized examination of the Lost 40 and Rock Candy Mountain mines, which he owns. Thomas M. Crandall, Peter C. Mory, Bradford B. Williams, and Roy H. Grau, III, U.S. Bureau of Mines, and Daniel Shuart and Donald O'Brien, U.S. Geological Survey, assisted during portions of the field investigations. Glenn Larsen and Katherine Portner, U.S. Geological Survey, assisted in preparation of the report.

Previous Investigations

The earliest geologic and mineral investigations covering the study area were undertaken by Engelmann (1866), who described the areal geology of northern Pope County and discussed several mineral commodities, including coal, galena, sphalerite, and fluorspar. Smith (1957) reported on the strippable coal reserves of Pope County. Previous geologic mapping of the study area is limited to the southern half (Desborough, 1964) and the eastern margin (Baxter and others, 1967). Weller (1940) investigated the oil and gas potential of Pope County.

Present Studies

Fieldwork was conducted by the U.S. Geological Survey (USGS) and U.S. Bureau of Mines (USBM) during the fall of 1979 and winter and summer of 1980. It consisted of geologic mapping and the study of mines, propects, and rock exposures. A special reconnaissance survey, in addition to the field mapping, was conducted to evaluate the coal resources. Some 84 rock specimens, as well as 42 stream-sediment and 56 soil samples, were collected by the USGS for spectrographic analysis and/or microscopic study (Klasner and Day, in press). Also, 11 rock samples were collected by the USBM for spectrographic analysis and evaluation of ceramic properites where appropriate (Thompson, 1982).

SURFACE- AND MINERAL-RIGHTS OWNERSHIP

Forest Service records indicate Federal ownership of about 89 percent of the surface rights and 58 percent of the mineral rights within the Lusk Creek Roadless Area (fig. 2). These federal lands were acquired by purchase or exchange under the authority of the Weeks Act of 1911 by the U.S. Department of Agriculture, Forest Service.

Applications for lease of oil and gas rights have been filed on about 36 percent of the study area, and mineral-prospecting permit applications cover about 14 percent of the area. These applications account for about 70 percent of the Federally owned mineral rights (fig. 3).

GEOLOGY

The Lusk Creek Roadless Area lies within the unglaciated Shawnee Hills section of the Interior Low Plateaus Physiographic Province (Leighton and others, 1948). The Shawnee Hills are formed by a series of cuestas of resistant, northwest dipping Pennsylvanian sandstone which marks the southernmost extent of the Pennsylvanian system in Illinois. Rocks exposed within the study area range from the Palestine Sandstone of Late Mississippian age to the Abbott Formation of Pennsylvanian age (table 1). Principal rock types present are conglomerate, sandstone, shale, and limestone. Hilltops are draped with a blanket of loess, which is as thick as 15 ft (Leighton and Willman, 1950).

The study area lies near the southern edge of the Illinois basin and about 15 mi south of the intersection of two major tectonic features (fig. 4), the Mississippi Embayment (Ervin and McGinnis, 1975) and the 38th Parallel Lineament (Heyl, 1972), both of which are characterized by zones of intense faulting and associated igneous activity. As shown in figure 4, the area lies at the western edge of the northeast-trending zone of faulting associated with the Mississippi Embayment and the Illinois-Kentucky fluorspar district, the major fluorspar-producing area in the conterminous United States.

According to the geological structures, the study area can be divided into two parts: a faulted eastern part and a relatively undisturbed western part (Klasner, 1982). The Lusk Creek and Shawneetown faults, in the eastern part of the area (fig. 6), are marked by 1,000- to 2,000-foot-wide zones of intense deformation, including brecciation and block faulting. Fault blocks of Mississippian and Pennsylvanian rocks are exposed within both fault zones. Veins of fluorite,

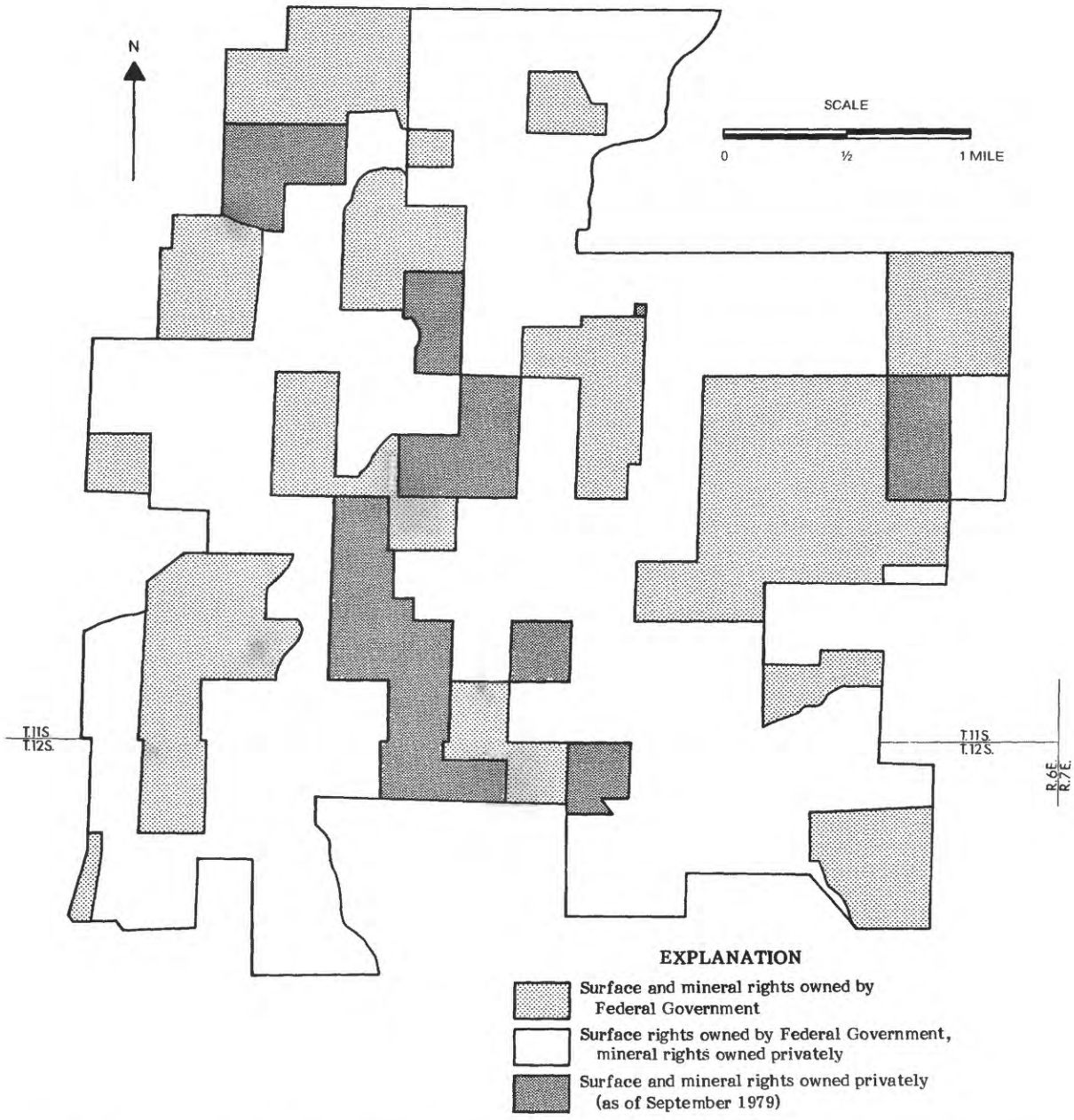


Figure 2.—Surface- and mineral-rights ownership of the Lusk Creek Roadless Area

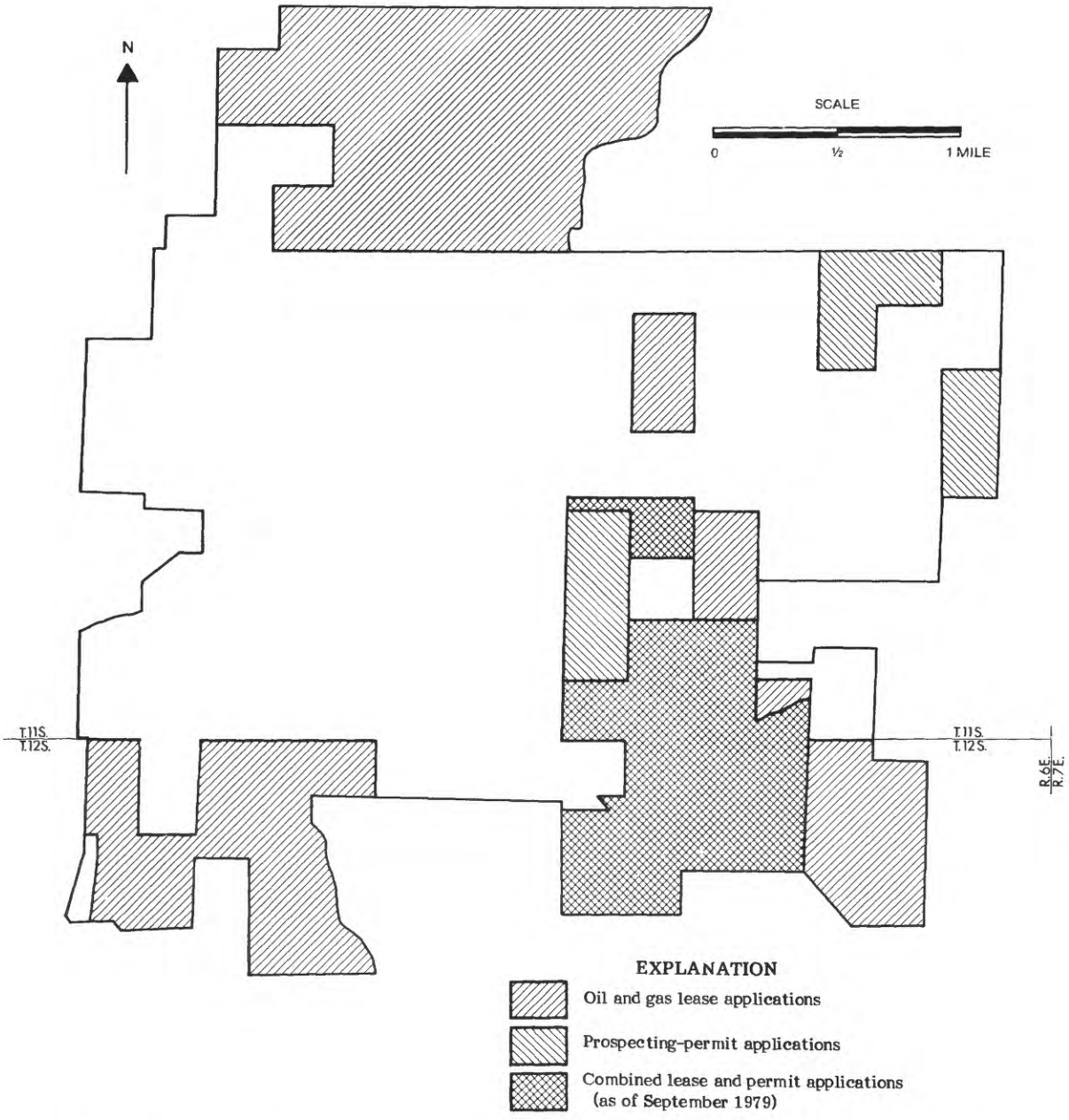


Figure 3.—Oil and gas lease applications and prospecting permit applications, Lusk Creek Roadless Area.

TABLE 1.— *Generalized stratigraphic column, Lusk Creek Roadless Area*

Unpublished data from county drill holes 156 and 20302 as interpreted from electric logs by E. Atherton, Illinois State Geological Survey, Urbana, Illinois; locations of wells are shown on figure 2.

System	Group	Formation	Member	Thickness (ft)
Pennsylvanian	McCormick	Abbott		750
		Caseyville		
Mississippian		Kinkaid		158
		Degonia		43
		Clore		99
		Palestine		68
		Menard		110
		Waltersburg		49
		Vienna		10
		Tar Springs		93
		Glen Dean		65
		Hardinsburg		105
	Golconda			122
	West Baden	Cypress		88
		Ridenhower		70
		Bethel		93
	Cedar Bluff	Downeys Bluff		24
		Yankeetown		31
		Renault	Shelterville	20
			Levias	12
		Aux Vases	Rosiclare	17
		Ste. Genevieve	Joppa	50
			Karnak	
			Spar Mountain	6
			Fredonia	164
		St. Louis		430
		Salem		429
		Ullin		480
		Fort Payne		152
		Springville		48

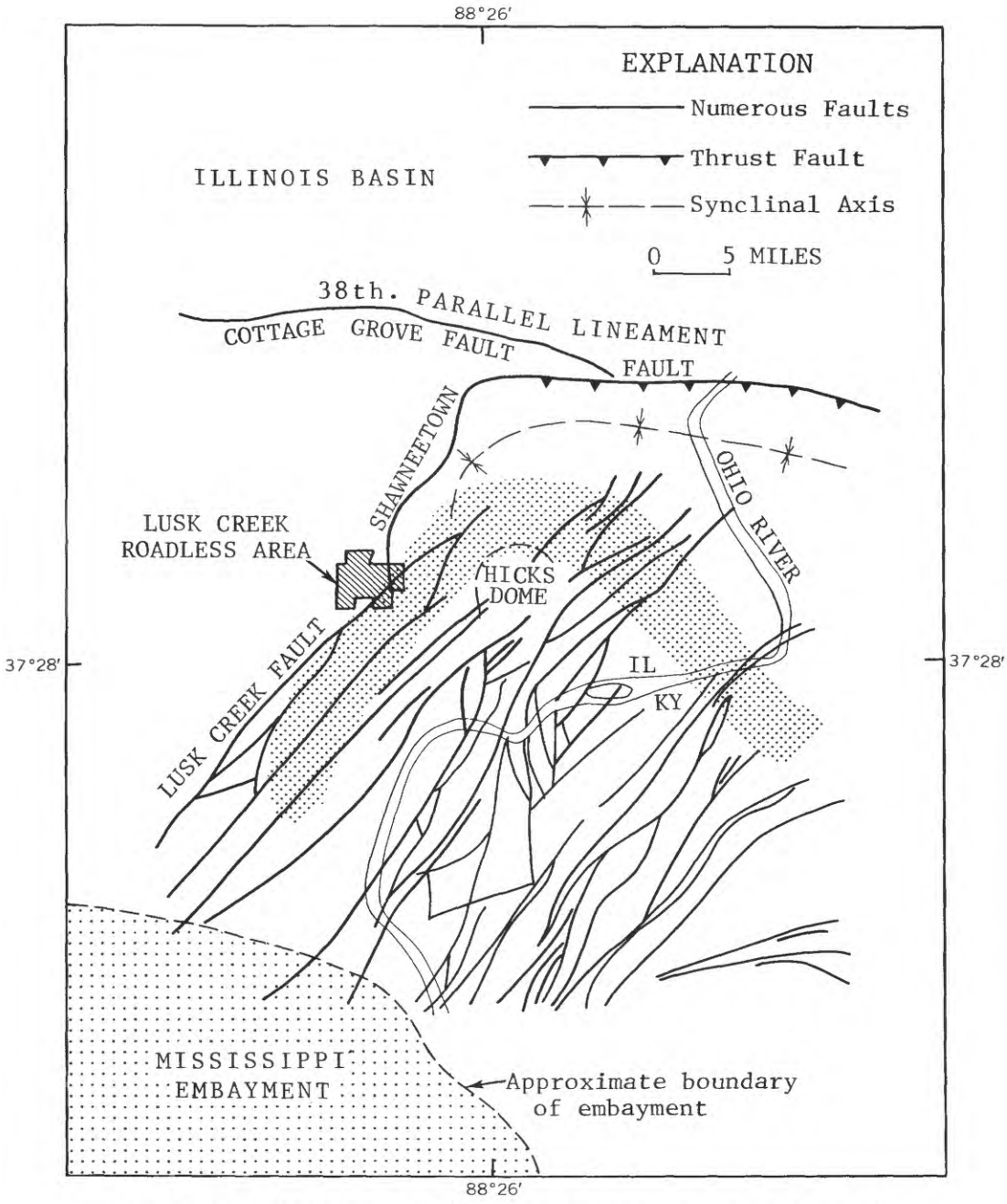


Figure 4.—Relationship of the Lusk Creek Roadless Area to the Mississippi Embayment fault zone, 38th Parallel Lineament, and the Illinois-Kentucky fluorspar district, after Brecke(1979) and Heyl and others(1965). The northeast and northwest boundaries of the fluorspar district are shown by the finer stippled pattern. Hicks dome (Baxter and Desborough, 1965) is a topographic high where stratified rocks dip outward from the dome center. Arcuate faults and a radial fracture pattern (too small to be shown here) surround the dome.

calcite, quartz, and lesser amounts of galena and sphalerite were observed in the Mississippian strata mainly in the Lusk Creek fault zone. All past mining activity in the study area was confined to this zone (fig. 5). In contrast to the intensely faulted eastern part, the western part of the study area is marked by gently dipping, relatively undisturbed Mississippian and Pennsylvanian rocks. As shown in figure 6, faults occur in this area, but deformation is far less intense than it is in the eastern part of the study area.

Nearly flat-lying Mississippian micritic and bioclastic limestone of the Kinkaid Limestone and siltstone of the Degonia Sandstone are exposed principally in the southwestern part of the area. Deeply incised valleys were cut into the Mississippian strata by south-southwest-flowing streams prior to deposition of the overlying Pennsylvanian strata. This produced a major unconformity that affected the deposition and thickness of the overlying Caseyville Formation of Pennsylvanian age (Potter and Desborough, 1965). The Caseyville Formation consists of about 500 ft of relatively flat-lying, commonly crossbedded and ripple-marked, relatively coarse-grained, conglomeratic quartz sandstone. The overlying Abbott Formation, also of Pennsylvanian age, is finer-grained than the Caseyville and tends to have a clayey-micaceous matrix. Both formations show local, intense, secondary iron-oxide enrichment.

MINING ACTIVITY

Mining in the Illinois portion of the Illinois-Kentucky fluorspar district began with the extraction of galena near Rosiclare, Ill. in 1842. Fluorspar, synonymous with the mineral fluorite (CaF_2), did not become an important product from this mining district until about 1870 (Weller and others 1952). Galena, sphalerite, silver, and barite are often byproducts or coproducts of fluorspar production. Illinois accounted for 55 percent of the fluorspar produced in the United States from 1933 through 1977 (Hollenbeck 1967; U.S. Bureau of Mines Yearbook, 1966-1977). Commercial extraction of fluorspar has occurred within the study area at Rock Candy Mountain mine and adjacent to the study area at the Lost 40 and Ora Scott mines (fig. 5). Data on mines that were worked intermittently between 1941 and 1952 are shown in table 2. Most of the production came from the Rock Candy Mountain mine. Minor amounts of galena and sphalerite have been reported at all three mines (table 4 in Weller and others, 1952).

GEOCHEMICAL STUDIES

Spectrographic analyses of bedrock, soil, and stream-sediment samples collected by the USGS were performed to establish background concentrations of 33 elements in the study area and to delineate areas of anomalous elemental enrichment (Klasner and Day, in press). The results show that average concentrations of fluorine, barium, and lead in the study area are high relative to average crustal concentrations given by Turekian and Wedepohl (1961) for most similar rocks types. These elements are generally associated with deposits of fluorite in southern Illinois, and when taken together may be indicative of such deposits.

MINERAL RESOURCE POTENTIAL

Mineral commodities evaluated for their resource potential in the Lusk Creek Roadless Area included fluorite and associated minerals, coal, oil and gas, and construction materials including limestone, sandstone, and shale. Fluorspar deposits in the Illinois-Kentucky district commonly contain galena and sphalerite, which constitute an important resource along with the fluorspar (Grogan and Bradbury, 1968), as well as barite. They also tend to be near diatreme breccias and mafic dikes, expecially in the Hicks Dome area of southern Illinois (Grogan and Bradbury, 1968; Trace, 1976). Such associations make barium, beryllium, lead, and zinc, as well as fluorine, in bedrock, soils, and stream sediments important indicators of the distribution of fluorspar deposits. Barium, lead, and zinc are contributed by barite, galena, and sphalerite respectively, and beryllium may indicate the presence of diatreme igneous bodies. Thus, the distribution of above-average, high, and anomalous amounts of fluorine and other indicator elements in the study area may indicate fluorspar potential. Above-average, high, and anomalous refer to the amount of an element in a sample relative to the average—arithmetic mean—of that element in the sample population (each sample type—soil, rock, stream-sediment—is considered a sample population). Above-average signifies that the value is less than one standard deviation above the mean but nevertheless larger than the mean value, high means that the elemental value is one to two standard deviations above the mean, while anomalous values are over two standard deviations above the mean.

Resource potential is assigned in the following manner:

HIGH POTENTIAL:	Anomalous values of two or more indicator elements (fluorine, barium, lead, and zinc); presence of associated visible fluorite, barite, galena, or sphalerite; and presence of major faults.
MODERATE POTENTIAL:	Above-average, high, or anomalous values of two or more indicator elements and the presence of favorable structures; or localized above-average to anomalous concentrations of two or more indicator elements in a group of samples (such as soil samples 28-37, fig. 7)

Fluorospar and Associated Minerals

Geochemical data, along with geologic data, indicate that a zone along the Lusk Creek and Shawneetown fault systems, in the eastern part of the study area, has high resource potential for fluorspar and associated barite, galena, and sphalerite. Fluorite, galena, and sphalerite were observed in veins and shear

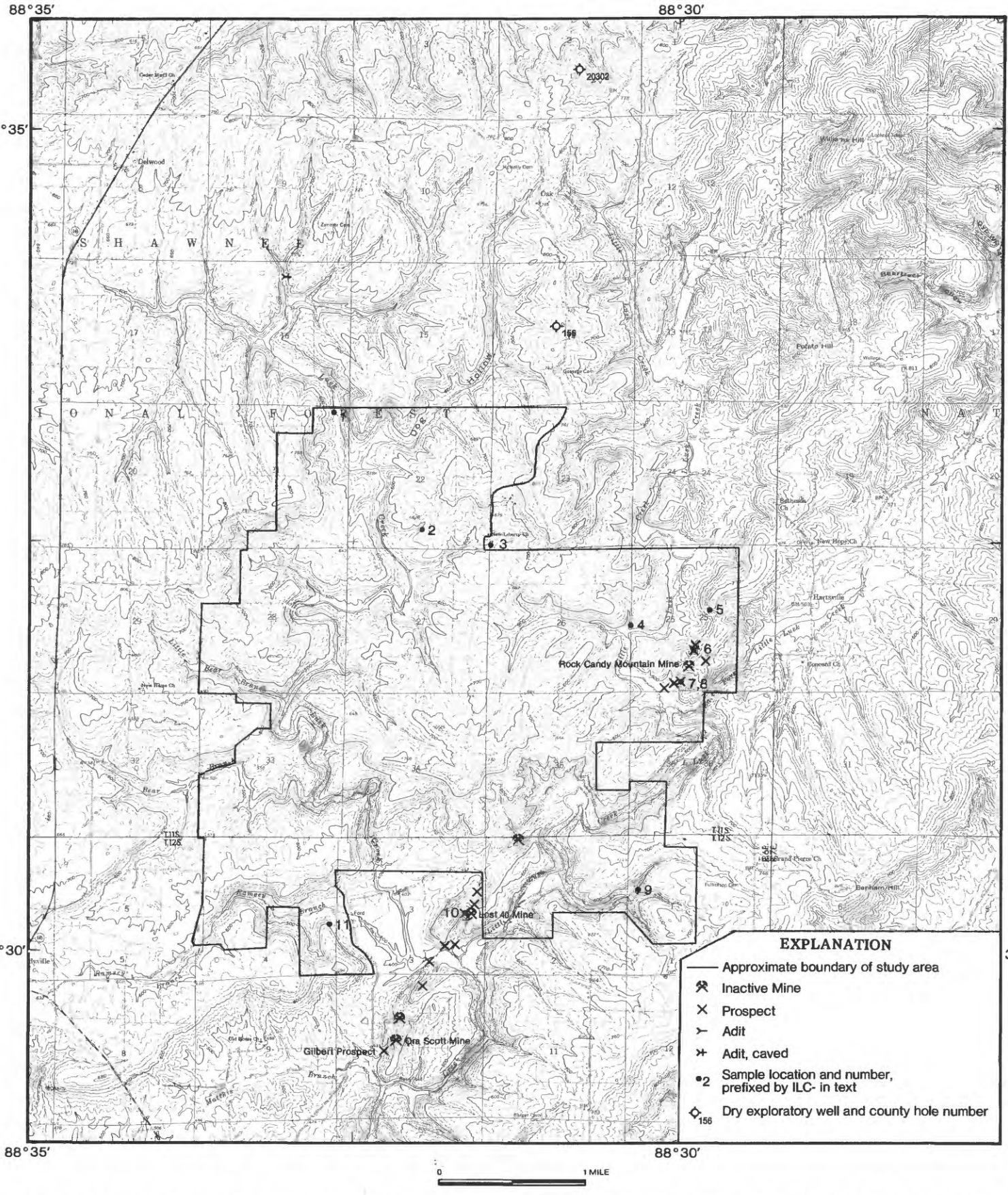
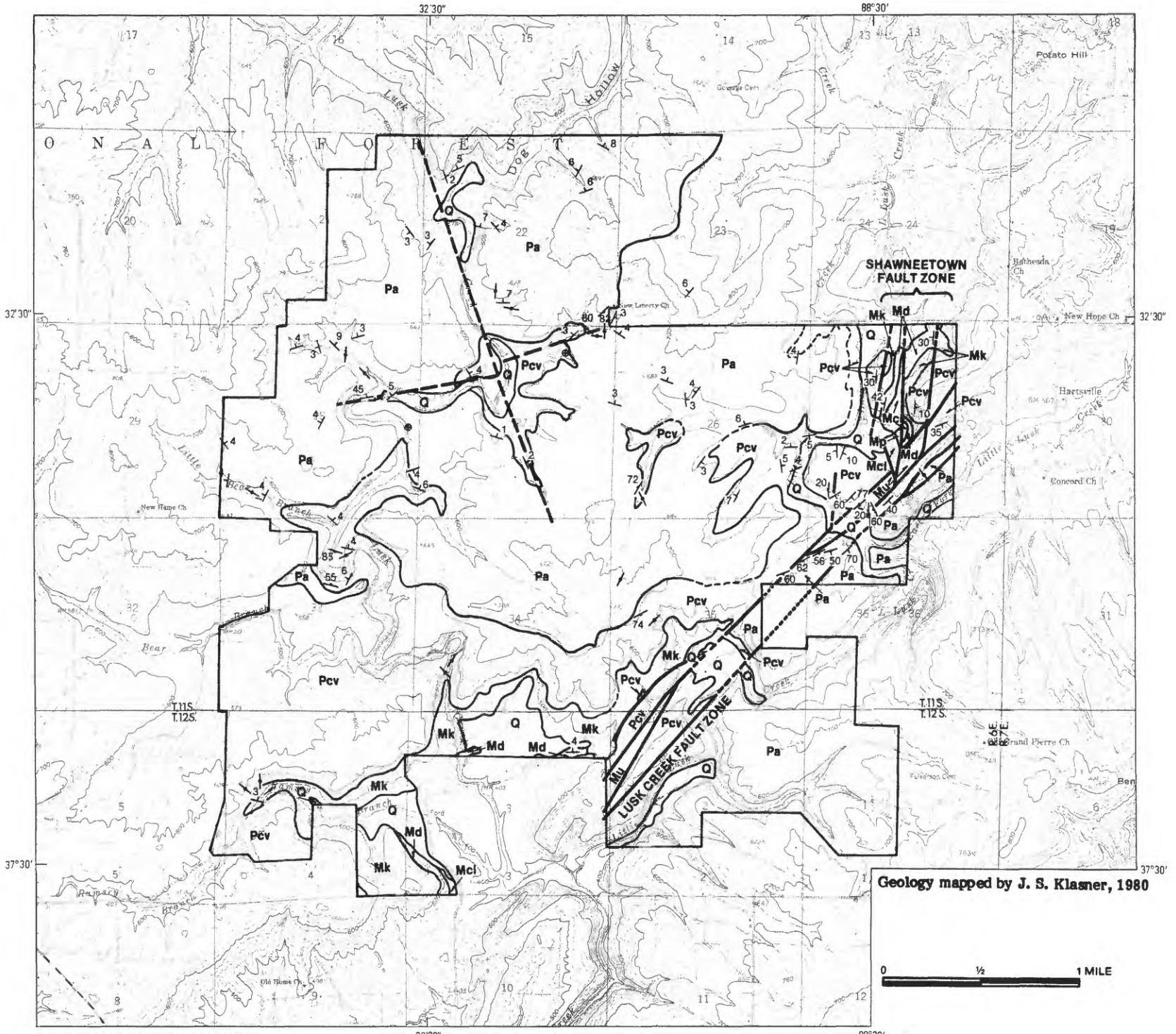


Figure 5.—Mine and prospect map of the Lusk Creek Roadless Area showing sample and well localities.



Base from U.S. Geological Survey, 1:24,000
Eddyville, 1961; Herod, 1959; and
Waltersburg, 1962

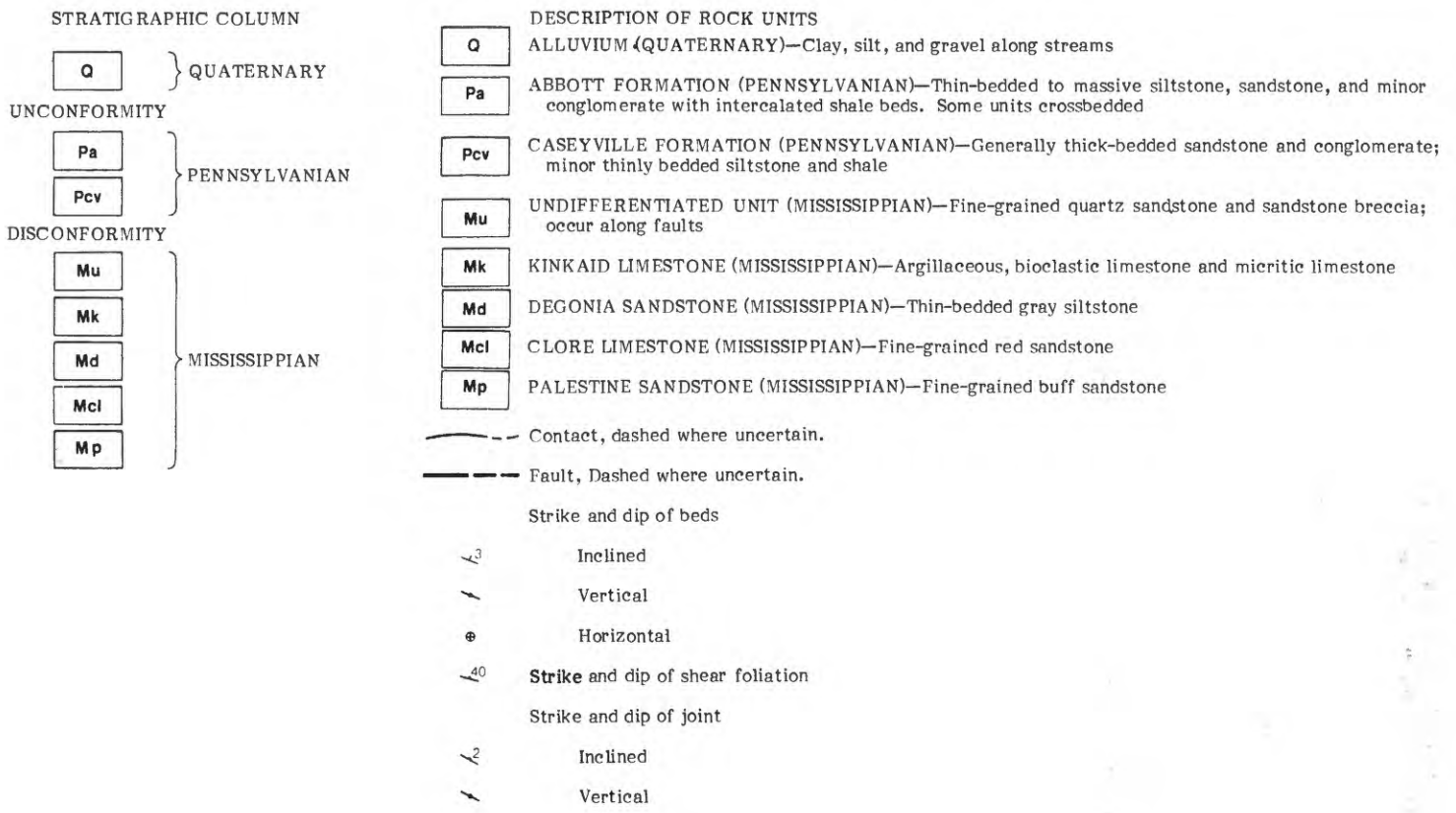


Figure 6.—Geologic map of the Lusk Creek Roadless Area.

TABLE 2.-- *Physical data on fluorspar mine workings along the Lusk Creek fault zone*

Data from Weller and others, 1952, and Bureau of Mines files, Pittsburgh, Pa; tonnages withheld to avoid disclosing individual company confidential data.

Mine	Period of operation	Dimensions (feet)				Vein orientation (strike, dip)
		Drift length	Shaft depth	Vein mean	Width max.	
Rock Candy Mountain	1943 to 1948	170	170	4	12+	N40°E, 85°SE
Lost 40	1941 to 1944	115	130	5	---	N20°E., 38°-73°SE
Ora Scott	1947 to 1952	irregular	60+	--	---	N10°-30°E, 70°-80°SE

zones along the fault zone. Samples of rocks, soils and stream sediments from within and along both sides of the Lusk Creek and Shawneetown fault system have anomalous or high concentrations of one or more of barium, fluorine, lead, and zinc (fig. 7). Also, bedded-replacement deposits of fluorspar in the northeastern part of the Illinois-Kentucky mining district are associated with minor faults that are subparallel to, and up to 0.5 mi from, major faults (Trace, 1974; Grogan and Bradbury, 1967). For these reasons, 0.5-mile-wide zones along both sides of the Lusk Creek and Shawneetown fault systems are also assigned high fluorspar resource potential (fig. 8).

Other zones within the study area have moderate fluorspar resource potential. Above-average to anomalously high values of fluorine, barium, lead, and zinc in rocks along intersecting faults in the north-central part of the area (figs. 7 and 8) indicate the presence of fluorspar occurrences along these faults. Also, elevated levels of indicator elements along soil profile 28-37 (fig. 7) suggest the presence of fluorspar in the underlying bedrock.

Pinckney (1976) noted that horst and graben structures in the Illinois-Kentucky fluorspar district have high potential for bedded-replacement deposits of fluorspar. This supports the high-resource-potential designation for the eastern third of the Lusk Creek Roadless Area, which is underlain by horst and graben structures.

The high average values of barium, fluorine, and lead in the study area relative to average crustal values in similar rock types elesewhere (Turekian and Wedepohl, 1961) suggest that the Lusk Creek Roadless Area may contain other occurrences of fluorspar besides those already mentioned. Several isolated samples, such as bedrock samples 237 and stream-sediment samples 19, 23, and 24 (fig. 7), have high or anomalous values of one or more of the indicator elements. Thus, there are parts of the study area that might be assigned moderate resource potential for fluorite. All of the Lusk Creek Roadless Area is considered to have at least low fluorspar resource potential.

Fluorspar deposits in the Illinois-Kentucky district are of three general types: vein or fissure fillings, bedded-replacement deposits, and residual accumulations. The characteristics of these deposits are outlined in table 3. Combinations of these deposit types may be present at a single location. Studies by Grogan and Schrode (1952) and Freas (1961) indicate deposition of Illinois fluorite from hydrothermal solutions at temperatures between 83 and 172°C. E. A. Brecke (1964; 1979) suggests that upstructure migration of connate water from the Mississippi Embayment was the transporting mechanism.

Local stratigraphy (table 1) and data on mine workings (table 2) indicate the deepest known working at Rock Candy Mountain mine (fig. 5) to be more than 1,100 ft above the "typically" most-productive stratigraphic zone (see table 3) of vein-type deposits. The fluorspar veins at this mine are in Mississippian-age limestone and Pennsylvanian-age sandstone. Analyses of samples from these veins indicate that metallurgical-grade fluorspar is present, and additional ore might be available at depth if vein width and grade continues below the present mine workings (Thompson, 1982, p. 16-19).

Although information is not sufficient to allow calculation of reserves or even speculation as to the amount of ore that might be present, the potential for extractable quantities of fluorspar does exist.

Coal

Previous studies show the presence of coal at several localitites in the vicinity of the study area. Engelmann (1866) noted several outcrops of 8- to 10-inch-thick coal beds about 1.5 mi to the northeast. Studies by Smith (1957) suggest that much of the study area is underlain by the thin, discontinuous Reynoldsburg coal bed, the stratigraphically oldest Pennsylvanian-age coal bed that has lateral continuity in Illinois. Smith (1957, p 35) reported a 22-inch coal seam about 1.5 mi southeast of the study area, and Baxter and others (1967, p. 37) reported a 9-inch seam about 1 mi southwest of the area. Another coal bed is exposed about 1 mi north of the study area, near a caved adit (fig. 5). It measures 27 in. thick but thins to 18 in. 30 ft to the north.

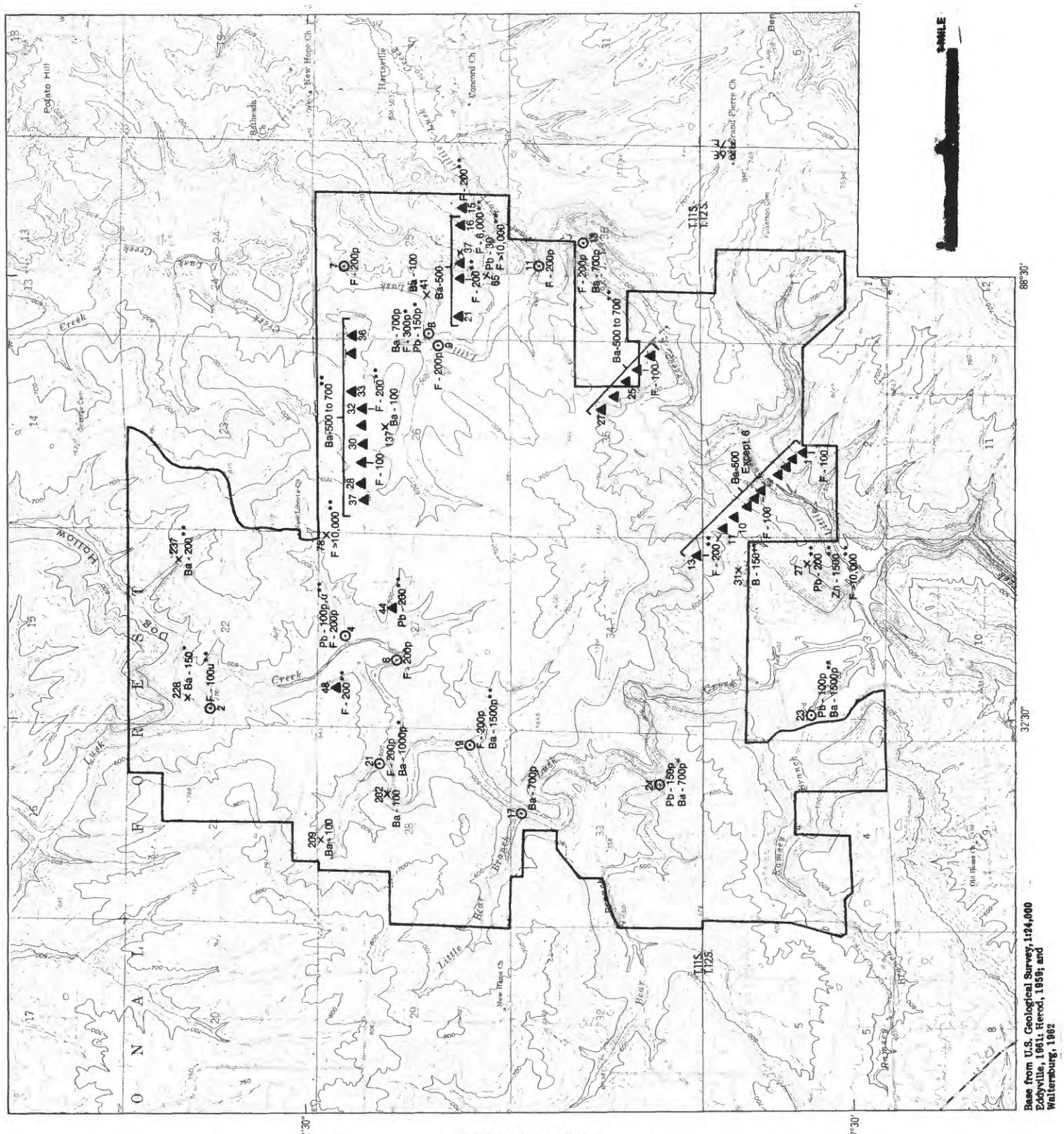
The geologic mapping, prospect studies, and coal-reconnaissance investigation undertaken during this study revealed little additional evidence for coal occurrences in the study area. Coal was noticed in dump material near a caved shaft on the south bank of a small tributary to Little Lusk Creek (SE1/4, SE1/4, Sec. 35, T. 11 S., R. 6 E.), and coal was observed along the west bank of Lusk Creek near sample locality ILC-1 (fig. 5). No other coal was observed, indicating that only thin, discontinuous deposits of coal lie beneath the Lusk Creek Roadless Area. Coal reserves were not calculated for the study area because coal beds of mineable thickness, 28 in. or more, were not found.

Construction Materials

Limestone exposures are limited to the southern part of the study area. Approximately 7 ft of lower Kinkaid limestone forms a topographic bench extending southeastward from the vicinity of sample locality ILC-11. The limestone might have limited use as road metal for local road construction, but similar rock is more accessible in nearby areas. Although chemical analyses of sample ILC-11 (Thompson, 1982, p. 18) indicate a high-calcium limestone (98.3 percent $CaCO_3$), the area is a long distance from a consumer market and the acreage amenable to development is limited by extensive sandstone and shale overburden.

Shales sampled in the study area are of Pennsylvanian age. They are interbedded with sandstones and tend to be silty, poorly exposed, and less than 36 in. thick. Samples ILC-1 and ILC-2 demonstrate a suitable firing range for brick manufacturing and sample ILC-1 shows potential as lightweight aggregate (Thompson, 1982, p. 18).

Sandstone units in the Caseyville and Abbott Formations are the most extensively exposed strata in the study area. They are partly conglomeratic, crossbedded sandstone layers interbedded with shale layers. The sandstone exhibits a high degree of iron-oxide staining, most prominently in crossbedded units. The resource potential of the sandstones is low because of poor quality as well as the existence of similar deposits outside the study area which are nearer to transportation facilities and consumer markets.



Base from U.S. Geological Survey, 1:24,000
Eddyville, 1961; Herod, 1959; and
Waltersburg, 1962

EXPLANATION

SAMPLE LOCALITY AND NUMBER		AVERAGES IN PPM			
		Ba	F	Pb	Zn
217 ×	Bedrock sample	68	Most less than 300[a]	Generally not detected	Generally not detected
29 ▲	Soil sample	383	Most less than 100	22	Not detected
	Stream-sediment sample				
6 ⊙ —	panned (p)	600[b]	144	68	Not detected
	unpanned (u)	148	Most less than 100	26	Not detected

[a]Some samples have exceedingly high concentrations (13,000 to 154,000 ppm) and are shown as F 10,000 ppm.

[b]Panned stream-sediment samples with barium concentrations of 500 ppm and above are shown; barium concentrations less than 500 ppm are not shown.

Figure 7.—Above-average, high,* and anomalous* values (in ppm) of indicator elements for fluorspar deposits in selected samples. See text for discussion.

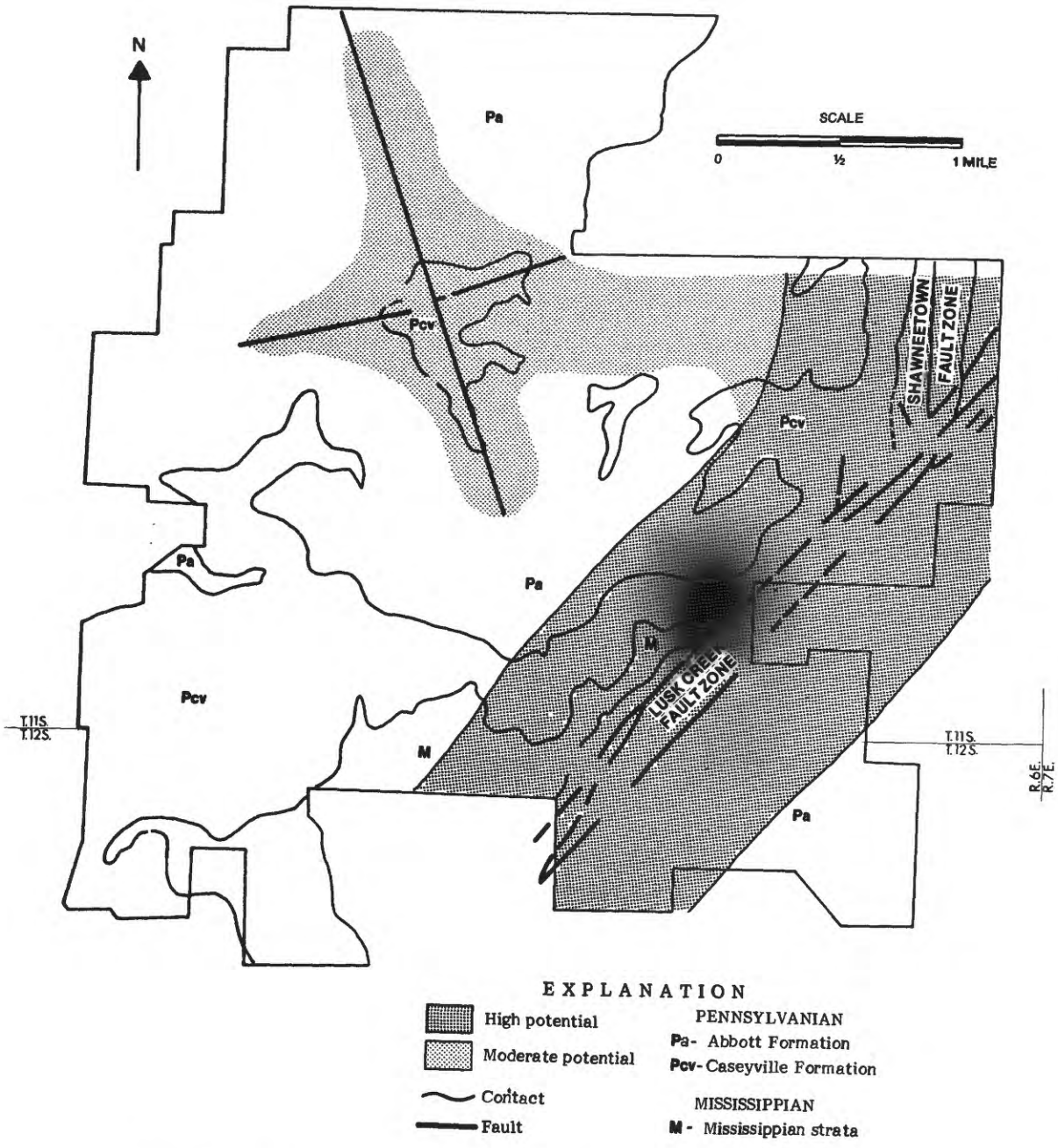


Figure 8.—Resource potential of the Lusk Creek Roadless Area.

TABLE 3.-- *Characteristics of Illinois fluorspar deposits*

Type of deposit	Occurrence	Orebody Geometry	Most favorable stratigraphic position	Remarks
Vein or fissure filling	Associated with faults having 100 to 500 ft of displacement in limestone and sandstone	Steeply inclined tabular or lenticular masses that are discontinuous over their length	The most productive portions occur below the Renault Formation (Finger and others, 1960, fig. 3)	Have accounted for most of the production in Illinois
Bedded replacement	Associated with limestones having well developed joints or minor faults having 20 ft or less displacement	Essentially horizontal, 4 to 15 ft thick, 200 to 10,000 ft long and 50 to 300 ft wide with an irregular outline	At the top of the Downeys Bluff Formation and the tops of the Joppa and Fredonia Members of Ste. Genevieve Formation (Bradbury and others, 1968)	Generally have higher galena and sphalerite values than the vein type deposits (Finger and others, 1960)
Residual	Formed by decomposition and partial erosion of mineralized country rock	A boulder-clay-fluorite surface residuum that may attain a width of 60 ft over major veins (Weller and others, 1952)		Economic deposits of this type are not longer known to exist in the mining district

Oil and Gas

The southern Illinois region near the Lusk Creek Roadless Area has had considerable oil and gas activity. Oil and gas lease applications have been filed over about 36 percent of the study area (fig. 3). Numerous dry wells have been drilled throughout the region, a few showing trace amounts of hydrocarbons. Two dry exploratory wells, 20302 and 156 on figure 5 (labeled A and B on figure 9), are about 2.5 and 1.5 mi, respectively, north of the study area. These wells were drilled to depths of 14,942 ft and 2,297 ft. respectively. Hole 156 encountered oil shows and tarry residue in the Palestine, Tar Springs and Cypress Sandstones. Another well in sec. 12, T. 11 S., R. 5. E. about 5 mi northwest of the study area, also had occurrences of free hydrocarbons (Weller, 1940). Liquid and solid bitumen are often encountered during fluorite mining as vug fillings and inclusions in fluorite crystals (Weller, 1940, p. 14; Weller and others, 1952, p. 120). This suggests that petroleum was escaping along the faults during emplacement of fluorspar. The nearest discovery of oil to the study area is about 7 mi to the north in sec. 15, T. 10 S., R. 6 E.

Important criteria in the evaluation of an area for deposits of oil and gas are the presence of appropriate oil-producing strata and the presence of structural or stratigraphic traps. Data from Bell and others (1964) indicate that a stratigraphic section of approximately 12,000 ft of Paleozoic sedimentary rocks lies beneath the Lusk Creek Roadless Area. The upper part of this section includes about 6,000 ft of Ordovician and younger strata that have a history of oil production elsewhere in Illinois, the Mississippian and Pennsylvanian strata being the most productive (Bell and others, 1964).

Although strata with known oil-producing potential elsewhere in Illinois exist beneath the study area, available data suggest that the potential for structural or stratigraphic entrapment of oil is low. A structure-contour map of the Beech Creek Limestone, the basal formation of the Golconda Group (table 1), shows that the Lusk Creek Roadless Area lies on the southeast flank of a structural basin (fig. 9). Geologic mapping (fig. 6) shows north-northwest dipping beds consistent with the northwest dipping Beech Creek strata, and with no evidence of an anticline in the area. A potential structural trap exists, however, where the northwest dipping strata are truncated along the Lusk Creek-Shawneetwon fault zone. But because hydrocarbons are known to have leaked along the faults, and because oil was not discovered in wells drilled on an anticline that has a strucutrally higher position than the Lusk Creek area (see anticline on the NW side of Burden Falls Roadless Area, fig. 9), it is unlikely that potential resource deposits of oil exist beneath the Lusk Creek Roadless Area.

CONCLUSION

The eastern part of the Lusk Creek Roadless Area along the Lusk Creek-Shawneetown fault zone has a high potential for deposits of fluorspar and associated barite, galena, and sphalerite. Geochemical data indicate fluorspar mineralization was widespread in the study area so that the potential for deposits of fluorspar away from the fault zone is moderate.

Deposits of limestone, sandstone, and shale could be used as sources for construction materials, but similar deposits outside the area are nearer to transportation facilities and consumer markets.

Our investigations indicate that minable deposits of coal are not present in the study area, and the potential for commercial accumulations of oil and natural gas is low.

REFERENCES CITED

Baxter, J. W., and Desborough, G. A., 1965, Areal geology of the Illinois fluorspar district, part 2—Karbers Ridge and Rosiclare quadrangles: Illinois State Geological Survey, Circular 385, 40 p., 2 maps.

Baxter, J. W., Desborough, G. A., and Shaw, C. W., 1967, Areal geology of the Illinois fluorspar district, part 3—Herod and Shetlerville quadrangles: Illinois State Geological Survey, Circular 413, 41 p., 2 maps.

Bell, A. H., Atherton, Elwood, Buschbach, T. C., and Swann, D. H., 1964, Deep oil possibilities of the Illinois basin: Illinois State Geological Survey, Circular 368, 38 p.

Bradbury, J. C., Finger, G. C., and Major, R. L., 1968, Fluorspar in Illinois: Illinois State Geological Survey, Circular 420, 64 p.

Brecke, E. A., 1964, A possible source of solutions of the Illinois-Kentucky fluorspar district: Economic Geology, v. 59, no. 7, p. 1293-1297.

_____1979, A hydrothermal system in the midcontinent region: Economic Geology, v. 74, no. 6, p. 1327-1335.

Bristol, H. M., 1967, Structure map on the base of the Beech Creek (Barlow) limestone in Illinois: Illinois State Geologic Survey, Circular, map scale 1 in. = 6 mi.

Desborough, G. A., 1964, Geologic map of the proposed Lusk Creek impoundment in Pope County, Illinois: Unpublished map prepared for the U.S. Forest Service.

Engelmann, Henry, 1866, Geology of Pope County, north of Big Bay River: *in* Worthen, A. H., Economical Geology of Illinois: Illinois State Geological Survey, v. 1, chapter 17, p. 456-495.

Ervin, C. P., and McGinnis, L. D., 1975, Reelfoot Rift--Reactivated precursor to the Mississippi Embayment: Geological Society of America Bulletin, v. 86, no. 9, p. 1287-1295.

Finger, G. C., Risser, H. E., and Bradbury, J. C., 1960, Illinois fluorspar: Illinois State Geological Survey, Circular 296, 36 p.

Freas, D. H., 1961, Temperatures of mineralization by liquid inclusions, Cave-In-Rock fluorspar district, Illinois: Economic Geology, v. 56, no. 3, p. 542-556.

Grogan, R. M., and Bradbury, J. C., 1967, Origin of the stratiform fluorite deposits of southern Illinois: Economic Geology Monograph 3, p. 40-50.

_____1968, Fluorite-zinc-lead deposits of the Illinois-Kentucky mining district, *in* Ridge, J. D. (ed.), Ore Deposits of the United States, 1933-1967, The Graton Sales Volume: American Institute of Mining, Metallurgical and Petroleum Engineers Inc., V. 1, pp. 370-399.

Grogan, R. M., and Shrode, R. S., 1952, Formation temperatures of southern Illinois bedded fluorite as determined from fluid inclusions: American Mineralogist, v. 37, nos. 7-8, p. 555-566.

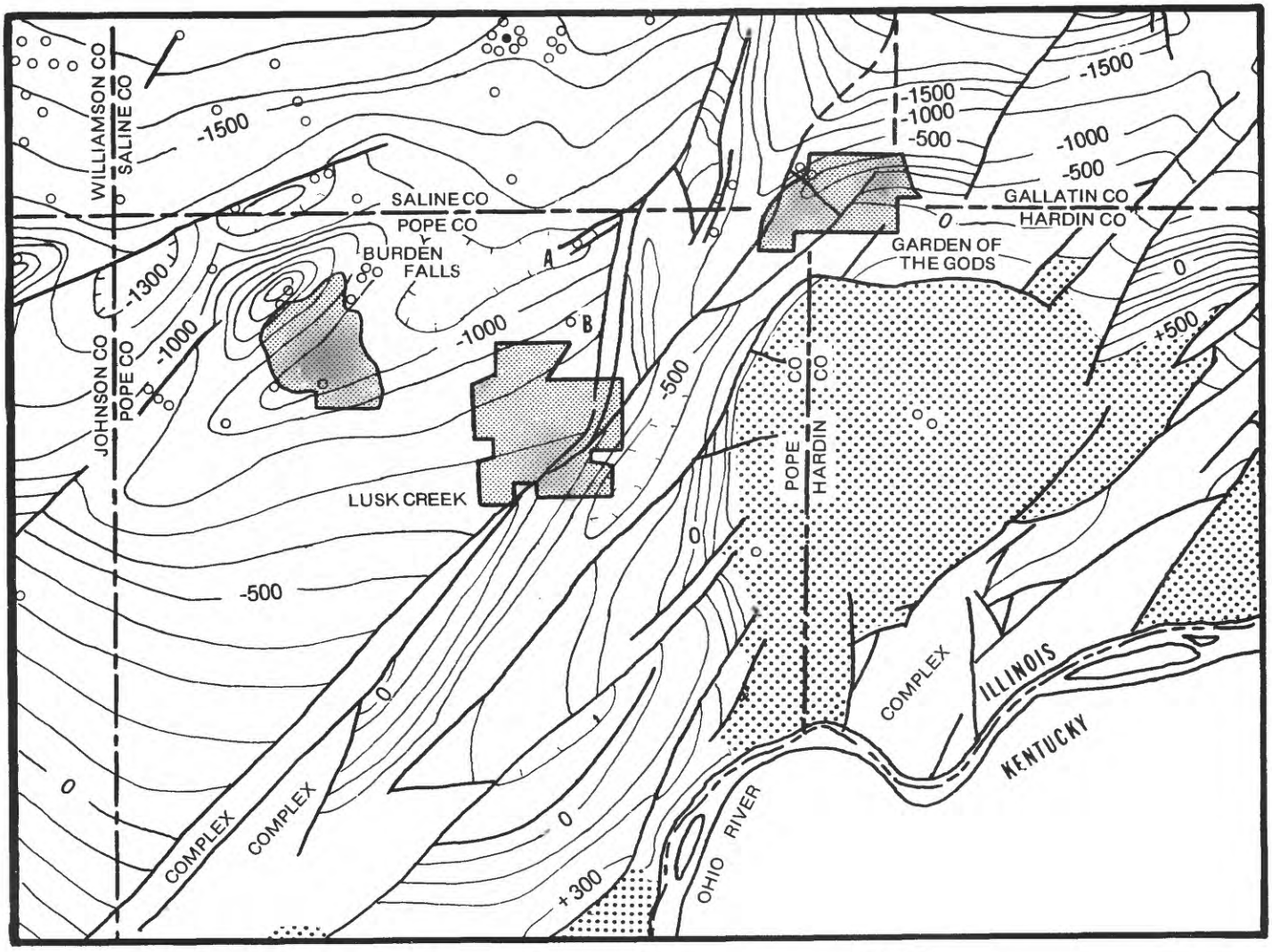


Figure 9.—Structure-contour map of the Beech Creek Limestone and location of oil and gas wells relative to the Lusk Creek Roadless Area. Structure from Bristol, 1967.

Heyl, A. V., 1972, The 38th Parallel Lineament and its relationship to ore deposits: Economic Geology, v. 67, p. 879.

Heyl, A. V., Brock, M. R., Jolly, J. L., and Wells, C. E., 1965, Regional structure of the southeast Missouri and Illinois-Kentucky mineral districts: U.S. Geological Survey Bulletin 1202-B, p. B1-29, and maps.

Hollenbeck, R. P., 1967, Fluorspar in the eastern states: U.S. Bureau of Mines Information Circular 8339, 35 p.

Klasner, J. S., 1982, Geologic map of the Lusk Creek Roadless Area, Pope County, Illinois: U.S. Geological Survey Miscellaneous Investigations Map MF-1405-A.

Klasner, J. S., and Day, G. W., in press, Geochemical survey of the Lusk Creek Roadless Area, Pope County, Illinois: U.S. Geological Survey Miscellaneous Field Studies Map MF-1405-B.

Leighton, M. M., Ekblaw, G. E., and Horberg, Leland, 1948, Physiographic divisions of Illinois: Illinois State Geological Survey Report of Investigations 129, 33 p.

Leighton, M. M., and Willman, H. B., 1950, Loess formations of the Mississippi Valley: Illinois State Geological Survey Report of Investigations 149, 27 p.

Pinckney, D. M., 1976, Mineral resources of the Illinois-Kentucky mining district: U.S. Geological Survey Professional Paper 970, 15 p.

Potter, P. E., and Desborough, G. A., 1965, Pre-Pennsylvanian Evansville Valley and Caseyville (Pennsylvanian) sedimentation in the Illinois basin: Illinois State Geological Survey Circular 384, 16 p.

Smith, W. H., 1957, Strippable coal reserves of Illinois, part 1—Gallatin, Hardin, Johnson, Pope, Saline, and Williamson Counties: Illinois State Geological Survey Circular 228, 39 p.

Thompson, R. M., 1982, Mineral resource investigation of Lusk Creek RARE II Further Planning Area, Pope County, Illinois: U.S. Bureau of Mines Open-File Report MLA 6-82, 28 p.

Trace, R. D., 1974, Illinois-Kentucky fluorspar district in A symposium on the geology of fluorspar: Proceedings of the ninth forum on geology of industrial minerals, Kentucky Geological Survey, series x, special publication 22, p. 58-76.

_____1976, Illinois-Kentucky fluorspar district: in Shawe, D. R. (ed.), Geology and resources of fluorine in the United States: U.S. Geological Survey Professional Paper 933, p. 63-74.

Turekian, K. K., and Wedepohl, K. H., 1961, Distribution of the elements in some major units of the earth's crust: Geological Society of America Bulletin, v. 72, 175-192.

U.S. Bureau of Mines, Minerals Yearbook, 1966-1977, Chapter on fluorspar.

Weller, J. M., 1940, Geology and oil possibilities of extreme southern Illinois—Union, Johnson, Pope, Hardin, Alexander, Pulaski, and Massac Counties: Illinois State Geological Survey Report of Investigation 71, 71 p., map.

Weller, J. M., Grogan, R. M., and Tippie, F. E., 1952, Geology of the fluorspar deposits of Illinois: Illinois State Geological Survey Bulletin 76, 147 p. and 4 maps.