MINERAL RESOURCE POTENTIAL OF THE SIPSEY WILDERNESS AND ADDITIONS, LAWRENCE AND WINSTON COUNTIES, ALABAMA

By

Stanley P. Schweinfurth,[1] Peter C. Mory,[2] Robert B. Ross, Jr.,[2]
and Paul T. Behum[2]

[1]U.S. Geological Survey [2]U.S. Bureau of Mines

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 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 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. 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 Sipsey Wilderness and additions, William B. Bankhead National Forest, Lawrence and Winston Counties, Alabama. The Sipsey Wilderness was established by Public Law 93-622, January 3, 1975. The Sipsey Addition (08068) and Borden Creek (08208) roadless areas were classified as proposed wilderness areas, and the Thompson Creek (08206), Hagood Creek (08207), Montgomery-Borden Creek (08209), Brushy Fork (08210), and Rabbittown Addition (08211) roadless areas were classified as further planning areas during the Second Roadless Area Review and Evaluation (RARE II) by the U.S. Forest Service, January 1979 (fig. 1).

SUMMARY

The combined Sipsey Wilderness and seven roadless areas, hereinafter called the study area, comprise 42,370 acres in the William B. Bankhead National Forest, Lawrence and Winston Counties, Alabama. These tracts are about 14 mi south-southwest of Moulton, Ala., the county seat of Lawrence County. The U.S. Government owns about 95 percent of the surface and mineral rights in the study area. The study area is in the Cumberland Plateau section of the Appalachian Plateaus physiographic province and is near the northern edge of the Warrior coal field.

The study area is deemed to have a low economic potential for mineral resources. Limestone, shale, and sandstone are the principal mineral resources; no potential was found for metallic minerals. Limestone has been quarried by the Forest Service for road metal and construction material. Possible uses for shale include structural products and expanded lightweight aggregate. The sandstone may be suitable for silica, construction sand, and dimension stone.

A small amount of coal has been identified in thin, nonpersistent beds. Several beds have been mined locally for domestic and blacksmithing use, but present economic potential for coal in the study area is considered to be very low. Resources are estimated to total about 727,000 short tons. However, none of this coal exceeds 28 in. in thickness, and therefore does not constitute a resource from which a reserve base[1] can be estimated for the study area.

Oil and (or) natural gas production may be possible if suitable structural traps exist in the subsurface. Small amounts of asphaltic sandstone and limestone, commonly referred to as "tar sands", may also occur in the subsurface.

[1]Reserve base includes beds of bituminous coal 28 in. or more thick that occur at depths to 1,000 ft (U.S. Bureau of Mines and U.S. Geological Survey, 1976). The reserve base includes coal from only the measured and indicated categories of reliability.

INTRODUCTION

The Sipsey Wilderness and additions are accessible via State Route 33 from either Moulton, in Lawrence County, or Double Springs, in Winston County, or from Haleyville via State Route 195 and Cranal Road. Altitudes of the plateau surface in the study area range from about 1,050 ft along the northern boundary to about 880 ft along Cranal Road, which marks the southern boundary of the area. Topographic relief averages approximately 400 ft throughout the study area.

Past Investigations

The earliest geologic investigation of the study area and vicinity largely pertained to coal. Historical information concerning coal mining and locations of mines, prospects, and exposures is contained in two reports by McCalley (1886 and 1891). Reconnaissance coal investigations in northern Alabama were conducted by Vestal and Mellen (1936) for the Tennessee Valley Authority (TVA). During this TVA study coal mines on Penitentiary Mountain (1.5 mi north of the study area) were examined, and an attempt was made to locate other coal exposures reported by McCalley (1891), but with little success. Also examined and described were exposures of a coal bed called the Bear Creek bed, and four mines in this bed within 3 mi west and southwest of the study area.

The Bear Creek bed in the Pottsville Formation and several other coal beds in the underlying Parkwood Formation of the Warrior coal field were briefly discussed by Culbertson (1964, p. B20-21).

Summary information on the geology and mineral resources of the Bee Branch Area, a designated scenic area that is now part of the Sipsey Wilderness, as well as a geologic map at a scale of about 1:127,000, are contained in an administrative report by Smith (1971). Similar information was provided in an administrative report by Bennett (1978) for the Sipsey River Corridor, which lies partly within the Sipsey Wilderness. This report contains a geologic map at a scale of 1:24,000.

A gravity survey of Winston County (Clements and Sandy, 1970) includes the southern parts of the Sipsey Wilderness and the Sipsey Addition, and all of the Rabbittown Addition (fig. 1). In 1972 the Geological Survey of Alabama published a summary report on the mineral, water, and energy resources of Winston County (Smith, 1972).

Present Investigations

U.S. Geological Survey (USGS) investigations were conducted by Stanley P. Schweinfurth, Virgil A. Trent, and Edward D. Helton in the fall of 1978 and the spring of 1979. Stratigraphic sections and coal beds were measured, altitudes

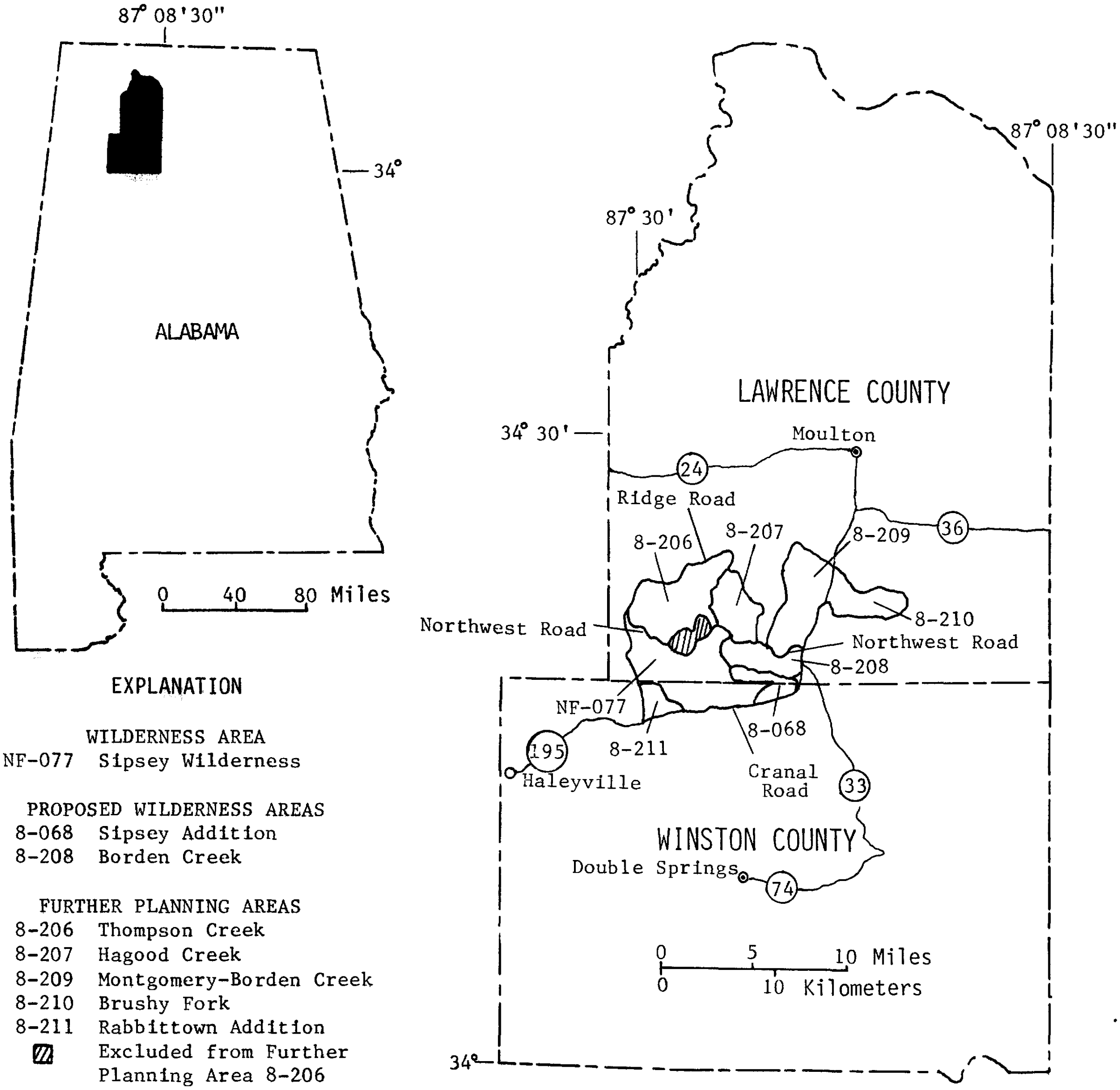

Figure 1.—Index map showing the Sipsey Wilderness and additions. Individual tracts are designated by their Forest Service numbers.

of individual stratigraphic units, mines, and prospects were determined with an altimeter, and mappable units and geologic structure were delineated in and adjacent to the study area (Schweinfurth and others, 1981). Andrew E. Grosz, assisted by P. G. Schruben, R. M. Turner, and W. H. Wright, Jr., conducted geochemical investigations in November 1978 and April 1979. A total of 53 representative rock samples and 271 bulk stream-sediment samples were collected. These samples were analyzed for as many as 36 elements, including the common metals having the greatest economic importance (Grosz, 1981; Siems and others, 1981). Boyd R. Haley performed an evaluation of the oil, natural gas, and "tar sand" potential of the study area in September 1981 (Haley, 1981).

U.S. Bureau of Mines (USBM) field reconnaissance was conducted by Peter C. Mory, Robert B. Ross, Jr., and Paul T. Behum, with the assistance of Bruce E. Potoka and Thomas M. Crandall, in the fall of 1978 and the spring and summer of 1979. Forty-five channel, chip, and grab samples of rock and eight samples of coal were collected in and near the study area. Rock samples were analyzed spectrographically for 40 elements by the USBM, Reno Research Center, Reno, Nev. Atomic-absorption, radiometric, chemical, and petrographic analyses were also performed on selected samples. Clay and shale samples were evaluated for ceramic and bloating properties by the USBM, Tuscaloosa Research Center, Tuscaloosa, Ala. Road-abrasion and polish tests were performed on two limestone samples to evaluate the suitability of this material for use as road metal. Coal samples were analyzed by the U.S. Department of Energy, Division of Solid Fuel Mining and Preparation, Coal Analysis Laboratory, Pittsburgh, Pa. During the field investigations, abandoned quarries, mines, prospects, and exposures in and near the study area were examined and sampled where possible. Details of the analyses performed on samples collected by USBM personnel are available in reports by Mory and others (1981, 1982).

Acknowledgments

The authors are grateful to landowners and to knowledgeable local residents who supplied prospect information and allowed the authors access to their properties to examine coal mines, prospects, and quarries. The Geological Survey of Alabama and several private companies provided core and drill logs and other pertinent information on the potential for coal, oil, and natural gas. U.S. Forest Service personnel in Montgomery and Haleyville, Ala. provided land-status, drill-hole, and prospect information. Appreciation is extended especially to William E. Bustin, former U.S. Forest Service District Ranger, Black Warrior Ranger District, Haleyville, Ala., who provided background information and logistic support for work in the study area.

SURFACE- AND MINERAL-RIGHTS OWNERSHIP

The Federal Government owns about 95 percent of the combined surface and mineral rights within the study area (fig. 2). Mineral rights are privately held on numerous small tracts totalling about 800 acres, or about 2 percent, of Federal surface-owned land. Privately owned combined surface and mineral rights on scattered tracts total about 1,200 acres, or about 3 percent, of the total area. This, combined with the 2 percent of private mineral ownership under the Federally owned surface makes a total of about 5 percent of the study area for which the Federal Government does not hold the mineral rights.

GEOLOGY

About 880 ft of Upper Mississippian to upper Lower Pennsylvanian sedimentary rocks crop out in the study area, and as much as 6,800 ft of older Paleozoic sedimentary rocks might be present in the subsurface (Moore and Daniel, 1972, p. 29). The basal part of the exposed section consists of marine limestone assigned to the Bangor Limestone of Late Mississippian age. This unit crops out principally in stream valleys in the east-central part of the study area. The Bangor Limestone is also exposed in the headwaters of streams draining the western part of the area. Overlying rocks of the Parkwood and Pottsville Formations of late Early Pennsylvanian age consist of interbedded, coarse- to fine-grained, clastic continental and marine sedimentary rocks. The Parkwood Formation crops out along valley walls of the area and the Pottsville Formation forms the upland throughout the study area. Unmapped deposits of locally derived colluvium mantle much of the valley walls. Alluvium, consisting of unconsolidated clay, silt, sand, gravel, and large boulders, lies along the valley floors.

The Bangor Limestone is separated from the overlying Parkwood Formation by an erosional unconformity, which may be angular in the eastern third of the study area. The Parkwood in turn is separated from the overlying Pottsville Formation by an erosional unconformity that is angular in the eastern third of the area (Schweinfurth and others, 1981). The Parkwood contains a few thin, nonpersistent coal beds.

The strata of the western part of the study area dip to the south at an average rate of about 55 ft per mi. The structural configuration of the eastern part of the area is dominated by a low-relief, southward-plunging structural nose. The average plunge of the crest of this nose is about 40 ft per mi to the south. The nose is believed to be the result of at least two periods of local uplift during Early Pennsylvanian time followed by southward tilting in post-Pennsylvanian time (Schweinfurth and others, 1981). Large positive gravity anomalies (Clements and Sandy, 1970) and magnetic anomalies (I. Zietz, USGS, oral commun., 1981) are associated with the structural nose.

No faults were found in the study area, but evidence from nearby areas suggests that normal faults having throws of as much as 100 ft may exist within the study area.

ASSESSMENT OF MINERAL RESOURCE POTENTIAL

Limestone, shale, and sandstone are the principal mineral resources in the study area. Limestone has been quarried by the Forest Service for road metal and construction materials. Possible uses for shale include structural products and expanded lightweight aggregate. Some sandstone may be suitable for silica, construction sand, and dimension stone. Coal has been mined locally for domestic and blacksmithing uses but its present economic potential is very low. The coal beds observed are thin and nonpersistent and are less than 28 in. in thickness. Commercial quantities of oil and natural gas may be present if suitable structural traps exist in the subsurface. Asphaltic sandstone and limestone may also occur in the subsurface. Metallic mineral deposits were not identified during the study and have not been reported in the literature. No major chemical anomalies were found as a result of the geochemical survey (Grosz, 1981), and the potential for metallic mineral deposits appears to be very low.

Limestone

A large tonnage of limestone has been quarried near the study area but most quarries have been abandoned. The Bangor Limestone underlies the study area. It crops out in the bottoms of all of the valleys in the northern half of the study area and crops out extensively in the eastern third of the area (accompanying map, fig. 4). Chemical analyses of 10 samples collected for this study from within and near the study area indicate that the sampled beds have a high calcium carbonate content, averaging 96.7 percent, are low in silica (generally less than 2 percent, although silica ranged up to 3.6 percent in one sample), and are low in magnesium carbonate, which ranges from 0.52 to 4.2 percent (Mory and others, 1981, table 1). Road-abrasion and polish tests performed on samples from two beds indicate the limestone is suitable for road metal and paving aggregates. Based on its durability and lack of porosity, the limestone may also be suitable for

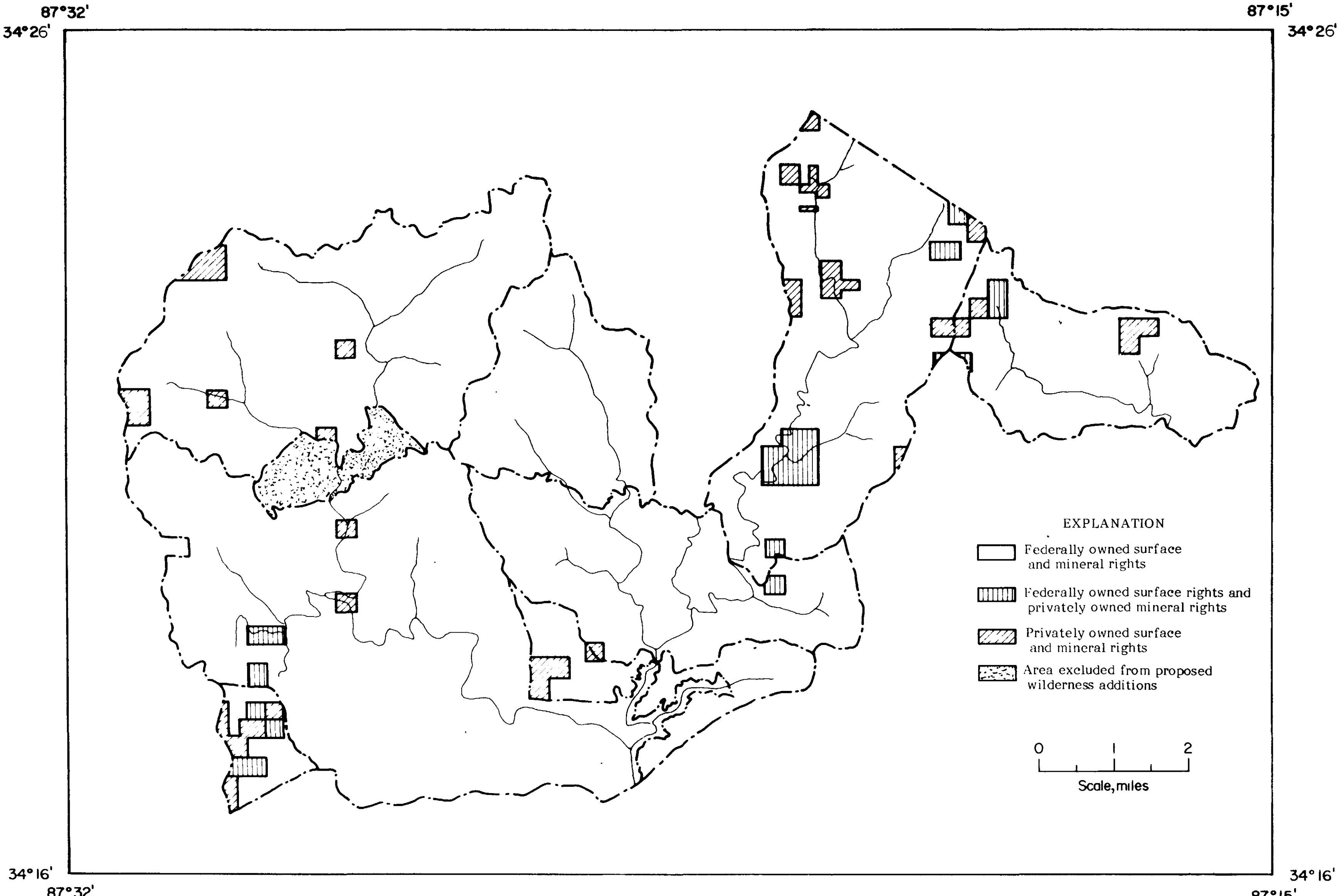

Figure 2.--Surface- and mineral-rights ownership in the Sipsey Wilderness and additions.

dimension stone. The U.S. Forest Service has used this limestone for road metal and for construction of bridge abutments but in recent years crushed stone has been trucked in from quarries outside the National Forest.

Other possible applications of the Bangor Limestone in the study area include its use in the manufacture of portland cement, high-calcium lime, and agricultural lime, and its use as steel-flux limestone, rock-dusting limestone, and limestone for general chemical uses. However, commercial potential of the limestone is low for all uses other than local road construction. Extensive deposits of Bangor Limestone occur north of the study area in the Moulton Valley where they are more favorably located relative to transportation routes and potential markets.

Clay and Shale

Clay and shale are present within the study area in the Parkwood Formation and in the Pottsville Formation (accompanying map, figs. 3 and 4). Preliminary ceramic tests performed on 14 clay and shale samples collected during this study show that all samples were suitable for structural clay products such as building brick, floor brick, and tile. Five samples bloated during quick-fire tests and may indicate material suitable for expanded lightweight aggregate (Mory and others, 1981, table 2).

Resources of clay and shale in the study area are large, but similar materials are available outside the area and are closer to transportation routes and markets.

Sandstone

Thick beds of high-silica sandstone occur in two units of the Pottsville Formation within the study area. Thinner beds of quartzose, feldspathic, and ferruginous sandstone occur also within both the Pottsville and the Parkwood Formations (accompanying map, figs. 3 and 4). Weakly cemented high-silica sandstone in the Pottsville may be suitable for use as filter, furnace, and abrasive (sand-blasting) sand. Two samples that were low in iron and alumina indicate that the sandstone may have marginal potential for use as molding sand and low-grade glass sand (Mory and others, 1981, tables 4 and 5). Other potential uses include construction sand, filler sand, and engine sand. Some dense, well-cemented sandstone within the area may be suitable for rough building stone, or dimension stone.

Thin zones of ferruginous sandstone, 0.3 to 3 ft thick and as much as 10 ft long in outcrop, occur locally near the bases of sandstone units in the Pottsville and Parkwood Formations. Ferruginous zones are common as crosscutting veins and thin beds, or as small lense-shaped nodules along bedding surfaces. Chemical analyses indicate that iron content is locally high and ranges from 10.7 to 46.5 percent (Mory and others, 1981, table 4). Commercial potential of ferruginous sandstone as a source of iron is very low, however, because the iron-bearing zones are thin and of limited extent.

Commercial potential of silica from the sandstone in the study area is low. More accessible silica resources are widely distributed throughout northern Alabama, and access to the Pottsville Formation within the study area is poor.

Coal

As many as five thin, lenticular, nonpersistent coal beds may be present in the Parkwood Formation in or near the study area (Schweinfurth and others, 1981). The authors were unable to correlate these beds with named beds elsewhere in the Warrior coal field so they are referred to as coal beds a through e in this report (accompanying map, fig. 3). One thin coal bed, named the Bear Creek coal bed, occurs in the Pottsville Formation near the study area. This bed was not observed within the study area, however, and probably it was never deposited there because of unfavorable geologic conditions (Schweinfurth and others, 1981).

Of the five coal beds observed in the Parkwood Formation within or near the study area only beds c and e (accompanying map, figs. 3, 5, and 6) are thick enough within the study area to contain resource quantities of coal[2]. However, neither of these beds is thick enough within the study area to contain reserve base quantities of coal.[1] Only weathered coal samples were available for analysis from coal bed c. The results of the analyses (Mory and others, 1981, table 7, sample numbers AS-23, -24, -51, and -53) indicate that this bed has a high ash content (22 to 45 percent on an as-received basis), and a low to high sulfur content (about 0.7 to 4.0 percent on an as-received basis). Coal bed c has been mined at several small adits (accompanying map, fig. 5) for local domestic and blacksmithing uses. Coal bed e contains abundant thin clay partings interbedded evenly with thin coal layers. Because of the high shale content samples of this bed were not taken for analysis (Mory and others, 1981, table 6; and fig. 4, map number 15). No mines were found in this bed within the study area.

Analyses of relatively fresh Parkwood coal samples from several small underground mines in one bed adjacent to the study area indicate that some Parkwood coal has a low ash content (3.9 to 6.6 percent on an as-received basis), and a moderate sulfur content (about 1.1 to 2.2 percent on an as-received basis) (Mory and others, 1982, table 1; and fig. 4, map numbers 6 and 7). Other Parkwood coal beds may be found by analogy to have similar ash and sulfur contents, but this can be proved only for fresh coal samples.

The amount of original coal resources in the study area is estimated to have been about 727,000 short tons (table 1). Currently and in the forseeable future, however, the development potential of beds c and e is believed to be low because: 1) the coal beds are thin and lenticular; 2) the post-Parkwood erosional unconformity may have cut into or through either bed in an unpredictable manner; and 3) both coal beds are exposed in relatively steep valley walls and are overlain by a thick sequence (up to 300 ft) of massive beds of sandstone and shale of the Parkwood and Pottsville Formation (accompanying map, fig. 3; and Schweinfurth and others, 1981). In addition, the Surface Mining Control and Reclamation Act of 1977 (30 U. S. Code, 1272 (e)) prohibits surface mining of coal on the Federal lands in national forests. No attempt was made to quantify the amount of coal removed from coal bed c; past mining is considered negligible in the study area.

Oil and Gas

Heavy oil, dead oil, and oil staining have been reported from 15 rock units and shows of natural gas have been reported from 12 rock units where penetrated by tests drilled in or near the study area (accompanying map, fig. 7; table 2). However, neither oil nor natural gas has been produced in commercial quantities from wells in or near the study area.

The rocks in and near the study area dip generally to the south but in the eastern third of the area they are arched into a low, southward- plunging nose (Schweinfurth and others, 1981, fig. 4). This nose does not show structural closure at the surface but it is associated with strong, positive gravity anomalies (Clements and Sandy, 1970) and magnetic anomalies (I. Zietz, USGS, oral commun., 1981) and may contain closure at depth. Normal faults are present near and possibly within the study area (Schweinfurth and others, 1981). If faults occur within the study area they could produce, in conjunction with the structural nose, structural traps in the subsurface. Normal faults alone may also produce structural traps in the regionally southward-dipping strata lying to the east and west of the structural nose.

The structural nose has been tested by only one drill hole, the Brooks No. 1 U.S.A. test (State permit no. 919), located in sec. 26, T.7 S., R.8 W. This test, completed and abandoned in 1959, was drilled to a total depth of 1,815 ft in Upper Ordovician rocks (accompanying map, fig. 7; table 2). Oil shows were reported in the Bangor Limestone, Hartselle Sandstone, and Tuscumbia Limestone. This test did not penetrate the entire stratigraphic sequence of rocks, which are reported to have had shows of oil and gas in other tests in

[2]Resource quantities include beds of bituminous coal 14 in. or more thick that occur at depths to 6,000 ft (U.S. Bureau of Mines and U.S. Geological Survey, 1976).

Table 1.--*Estimated original bituminous coal resources in the Sipsey Wilderness and additions covered by less than 1,000 ft of overburden*
[Values in thousands of short tons as of December 31, 1980]

Formation	Coal bed	Original Resources		
		Measured	Indicated	Total
		In beds 14-28 inches thick	In beds 14-28 inches thick	In beds 14-28 inches thick
Parkwood	e	54	0	54
	c	417	256	673
	Total	471	256	727

northern Alabama (accompanying map, table 2). For example, a large show of natural gas was recorded in rocks of the Knox Group penetrated in a test hole about 8 mi southwest of the study area (State permit no. 2284, accompanying map, fig. 7; table 2). The Knox Group was not reached in the Brooks test, and it is considered by Haley (1981) to have the best potential for the discovery of commercial quantities of oil or gas in the area. Further exploration drilling will be necessary, however, before the Knox Group can be properly evaluated in the study area.

One other test hole was drilled in the study area. The Murphy Oil Corp. core test no. 2 (State permit no. 1587), located in sec. 17, T. 8 S., R. 9 W., was completed as a dry hole at a depth of 908 ft in the upper part of the Hartselle Sandstone (accompanying map, fig. 7; table 2). Slight shows of oil and asphalt were reported in the Hartselle.

"Tar Sands"

Limestone and sandstone beds of Mississippian age contain potentially valuable "tar-sand" deposits in northern Alabama (U.S. Bureau of Mines, 1965). Asphaltic sandstone has been mined from outcrops of the Hartselle Sandstone in northern Lawrence County and used as road metal (Haley, 1981). However, the Hartselle does not crop out in the study area and the two test holes drilled in the study area (accompanying map, fig. 7) did not penetrate any major "tar-sand"-impregnated intervals. Therefore, the "tar-sand" potential of the study area is believed to be low.

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