MINERAL RESOURCE POTENTIAL MAP OF THE BIG SANDY, WEST ELLIOTTS CREEK, AND REED BRAKE ROADLESS AREAS, TUSCALOOSA, HALE, AND BIBB COUNTIES, ALABAMA

By
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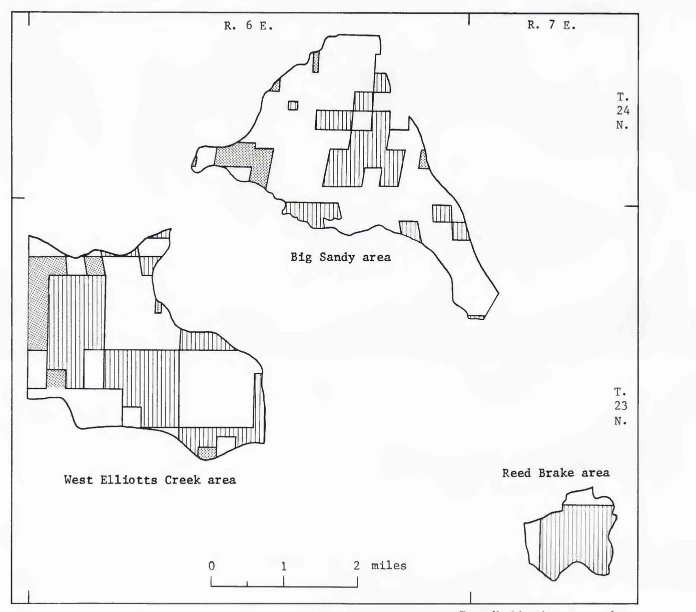
Figure 1.—Location of the Big Sandy, West Elliotts Creek, and Reed Brake Roadless Areas, Alabama.

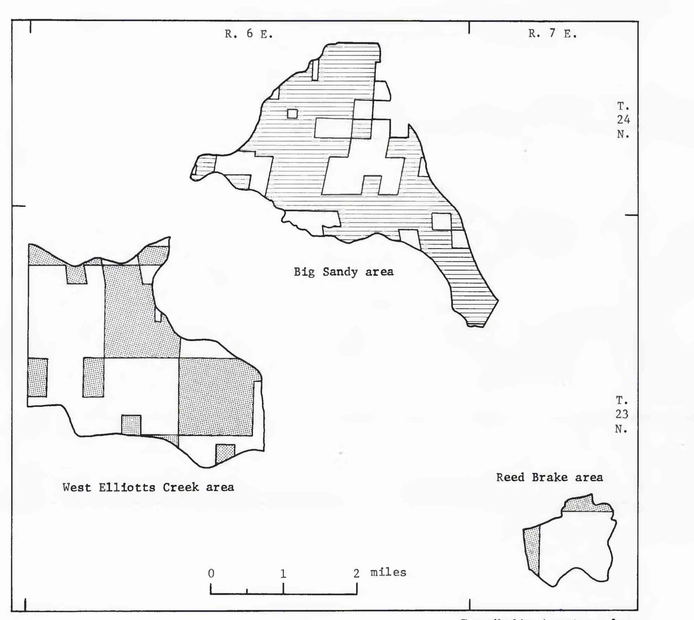


Compiled by Armstrong from data provided by the U.S. Bureau of Land Management

EXPLANATION

- Federally acquired land; no mineral rights outstanding or reserved
- Federally acquired land; mineral rights held privately in perpetuity
- Privately owned surface and mineral rights

Figure 4.—Surface- and mineral-rights ownership in the Big Sandy, West Elliotts Creek, and Reed Brake Roadless Areas.



Compiled by Armstrong from data provided by the U.S. Bureau of Land Management

EXPLANATION

- Issued leases, effective May 1, 1981
- Lease application filed; no action as of September 1981

Figure 5.—Oil and gas lease-application status in Big Sandy, West Elliotts Creek, and Reed Brake Roadless Areas.

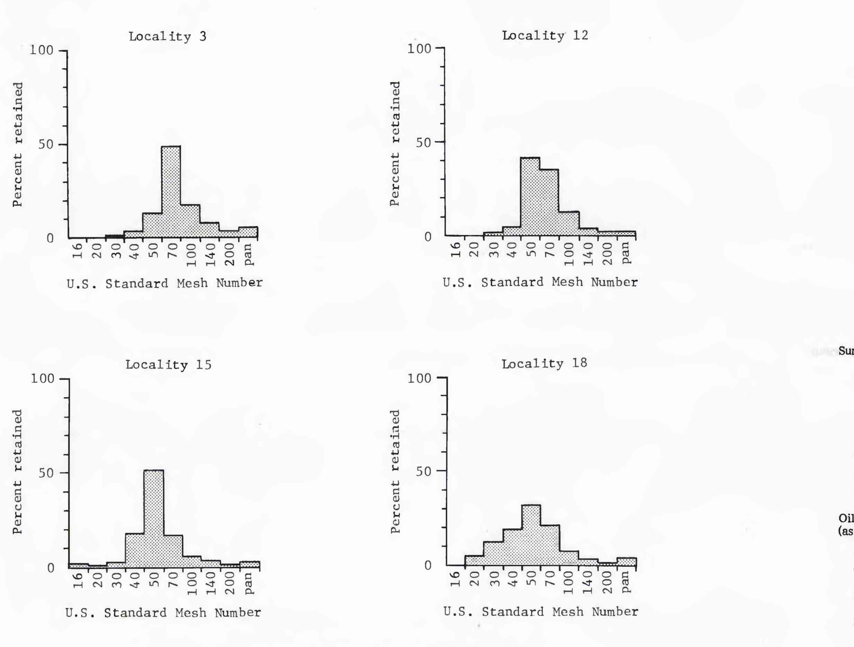


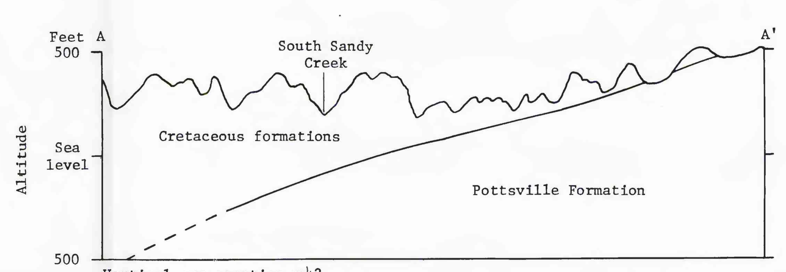
Figure 6.—Histograms of sieved samples collected in and near the Big Sandy, West Elliotts Creek, and Reed Brake Roadless Areas.

Base from U.S. Geological Survey Birmingham, 1969; Montgomery, 1969

Map compiled from Chaffin and others (1976), Beg and others (1978), Paulson and others (1962), Clarke (1966, 1970), and Kidd (1976). Localities of ceramic clay and lightweight aggregate samples from Szabo and Nordstrom (1974) and Clarke (1966)

SCALE 1:250 000

Contour interval north of lat. 33°, 100 ft; south of lat. 33°, 50 ft



EXPLANATION

- K — Cretaceous formations
- Pp — Pottsville Formation
- Pzu — Pre-Pottsville Paleozoic formations, undifferentiated
- Brown iron ore district
- Red iron ore occurrence
- Quarry; D-dolomite, L-limestone, C-chert
- Sand or gravel pit
- Clay pit
- Barite occurrence
- Locality of ceramic clay sample
- Locality of lightweight-aggregate sample
- Drill hole in which altitude of top of Pottsville Formation was determined
- Drill hole where Pottsville Formation is missing and pre-Pottsville formations were penetrated
- Inferred contact; indicates northern extent of conterminous Cretaceous formations. Outliers not shown
- Axis of anticline
- Fault; dashed where projected under Cretaceous formations
- Thrust fault; sawteeth on upper plate. Dashed where projected under Cretaceous formations
- 700 — Contour on eroded surface of Pottsville Formation; numbers indicate altitude in feet. Long dashed where inferred

Figure 2.—Locations of mines, pits, and quarries, clay sample localities, and contours on the eroded surface of the Pottsville Formation in the region of the Big Sandy, West Elliotts Creek, and Reed Brake Roadless Areas.

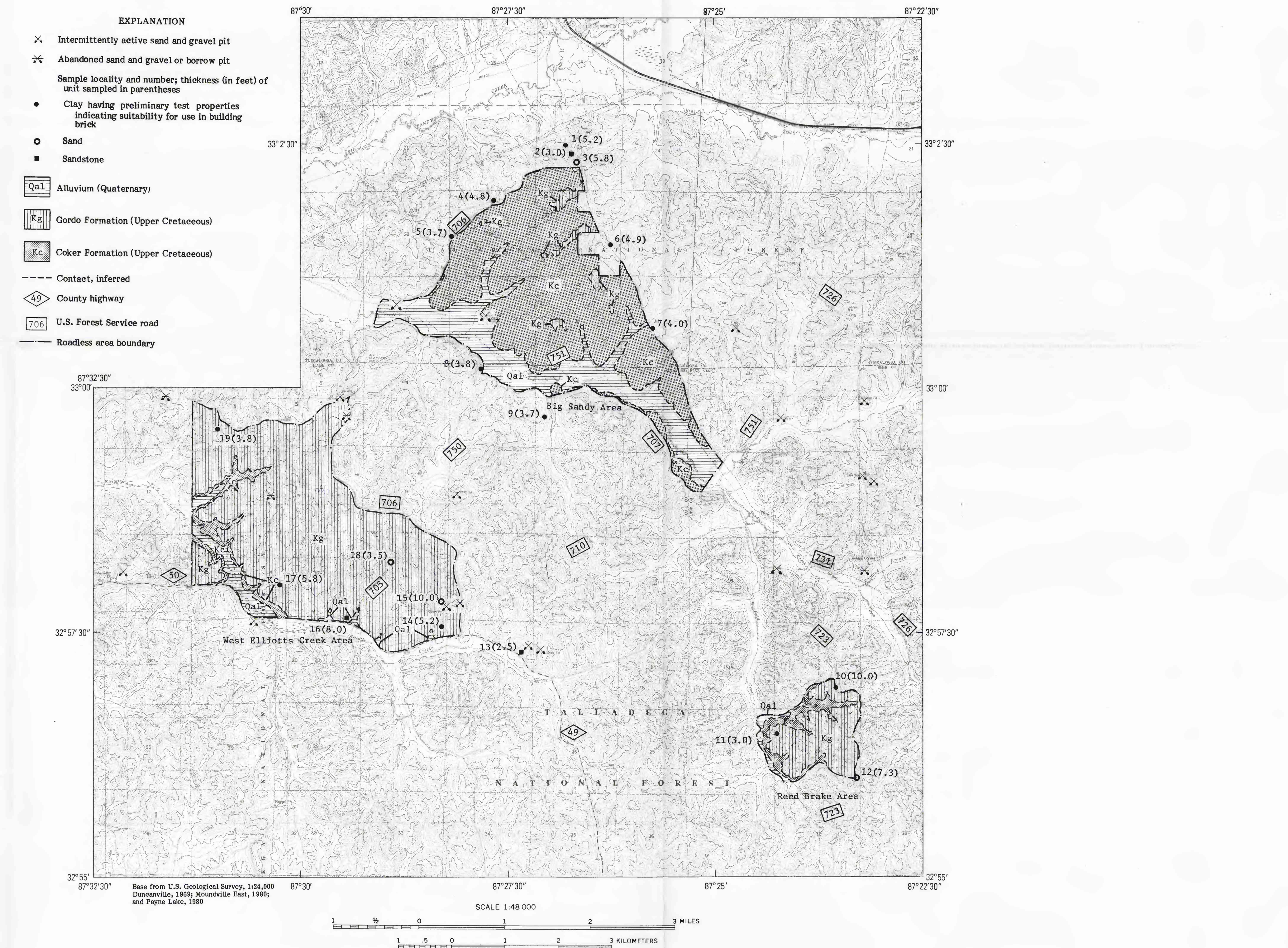
Table 1.—*Surface- and mineral-rights ownership and oil and gas lease status, Big Sandy, West Elliotts Creek, and Reed Brake Roadless Areas*[1]

	Big Sandy area	West Elliotts Creek area	Reed Brake area	Total
Surface- and mineral-rights ownership				
Federally acquired land; no mineral rights outstanding or reserved	2,597 acres (72%)	1,629 acres (44%)	127 acres (20%)	4,353 acres (55%)
Federally acquired land; mineral rights outstanding in perpetuity	756 acres (21%)	1,484 acres (40%)	509 acres (80%)	2,749 acres (34%)
Privately owned surface and mineral rights	251 acres (7%)	604 acres (16%)	0	855 acres (11%)
Oil and gas lease status (as of September 1981)				
Land with issued leases (effective May 1, 1981)	54 acres (1%)	1,625 acres (44%)	131 acres (20%)	1,810 acres (23%)
Land with lease applications filed (no action as of September 1981)	2,601 acres (72%)	0	0	2,601 acres (33%)

[1]Acreages were planimetered on U.S. Forest Service land-status maps by Armstrong and percentages are based on these measurements. Acreages do not agree with those of the U.S. Forest Service (1979).

Table 2.—*Generalized lithology of the stratigraphic units exposed in the Big Sandy, West Elliotts Creek, and Reed Brake Roadless Areas.*
[Modified from Szabo and Nordstrom, 1974]

System	Series	Geologic unit	Thickness (feet)	Lithology
Quaternary	Pleistocene and Holocene	Alluvium	0-50	Sand and gravel; lenticular beds of very fine- to coarse- grained sand, gravel, and clay.
Cretaceous	Upper Cretaceous	Tuscaloosa Group: Gordo Formation	100-400	Sand, very fine- to coarse-grained, crossbedded; gravelly in basal part; contains lenticular clay units.
		Tuscaloosa Group: Coker Formation	400-500	Sand, very fine- to coarse-grained, crossbedded; basal sand 100 to 200 ft thick; contains carbonaceous clay lenses.



Base from U.S. Geological Survey, 1:24,000 Duncanville, 1969; Moundville East, 1980; and Payne Lake, 1980

Figure 3.—U. S. Bureau of Mines sample localities and locations of sand and borrow pits in the vicinities of the Big Sandy, West Elliotts Creek, and Reed Brake Roadless Areas.

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 Big Sandy, West Elliotts Creek, and Reed Brake Roadless Areas in the Talladega National Forest, Tuscaloosa, Hale, and Bibb Counties, Alabama. The Big Sandy (08214) and West Elliotts Creek (08213) Roadless Areas were classified as further planning areas and the Reed Brake Roadless Area (08063) as a proposed wilderness during the Second Roadless Area Review and Evaluation (RARE II) by the U.S. Forest Service, January 1979.

SUMMARY

The Big Sandy area is mostly in Tuscaloosa County, and parts of it extend into Hale and Bibb Counties; the West Elliotts Creek area is in Hale County; and the Reed Brake area is in Bibb County. The three areas comprise about 8,113 acres.

Eighty-nine percent of the surface rights and 55 percent of the mineral rights are owned by the Federal Government; remaining surface and mineral rights are privately owned. Oil and gas leases covering 23 percent of the study areas have been issued. Lease applications covering an additional 33 percent are awaiting U.S. Bureau of Land Management action.

The exposed rocks in the three study areas consist of two gently dipping formations of Cretaceous age, and younger alluvium. The two formations comprise mainly sand, silt, gravel, and clay. Older subsurface rocks include the coal-bearing Pottsville Formation of Pennsylvanian age and pre-Pottsville Paleozoic formations.

The only potentially valuable mineral deposits in the exposed rocks are sand and plastic clay of the type used in making brick, terra cotta, tile, and pottery. Sand has been dug in one pit in the West Elliotts Creek area for use in road construction; this has been the only mining activity in the three areas in recent years. The sand and clay resources of the three study areas are large, but large resources of these materials are present outside the areas.

Hypothetical coal resources of as much as 100 million tons may occur in the Pottsville Formation beneath the Big Sandy and West Elliotts Creek areas.

The three study areas may also have potential for oil and gas, a conclusion based largely on geologic inferences and leasing activities and on seismic studies by private industry in the Talladega National Forest. However, extensive exploratory drilling would be necessary to determine the potential of oil and gas.

INTRODUCTION

The Big Sandy area (3,190 acres), West Elliotts Creek area (4,237 acres), and Reed Brake area (686 acres) are located in the Oakmulgee Division of the Talladega National Forest[1]. The study areas are about 15 mi south of Tuscaloosa, in west-central Alabama (figs. 1,2).

U.S. Forest Service roads provide access to the boundaries of each area (fig. 3). Interior access to Big Sandy and West Elliotts Creek areas is provided by two seasonally-gated roads and abandoned logging roads. A washed-out access road, along the pipeline defining the eastern boundary of the Big Sandy area, is suitable for use as a foot trail.

The three areas are in the Fall Line Hills belt of the East Gulf Coastal Plain division of the Coastal Plain physiographic province (Fenneman, 1938, p. 65-83). The region is a dissected upland with a few broad, flat divides. The highest point in the areas is 541 ft above sea level, on the eastern boundary road of the Reed Brake area. Three hills in the West Elliotts Creek area are a little more than 520 ft high, and several hills in the Big Sandy area are higher than 400 ft. The lowest point in the three areas is at 174 ft altitude, where South Sandy Creek is crossed by the western boundary road of the Big Sandy area. All three areas except for a few square yards in the Big Sandy area are drained by westward-flowing South Sandy and Elliotts Creeks. Elliotts Creek flows directly into the Black Warrior River, and the South Sandy joins Big Sandy Creek which discharges into the same river.

SURFACE- AND MINERAL-RIGHTS OWNERSHIP AND LEASE STATUS

The Federal Government owns 89 percent of the surface rights and 55 percent of the mineral rights in the study areas. The remaining surface and mineral rights are privately owned (fig. 4, table 1).

Oil and gas lease applications on tracts within the study areas were filed with the U.S. Bureau of Land Management (BLM) between December 1973 and October 1980 (fig. 5, table 1). Leases covering 23 percent of the study areas were issued in May and June of 1981. Lease applications covering 33 percent of the study areas have had no BLM action as of September 1981. No drilling for oil and gas has taken place on the leased tracts. Oil and gas leases and lease applications on private tracts within the study areas are not on file at BLM. The lease status of these tracts was not assessed during the present investigation.

GEOLOGY

Stratigraphy

The exposed rocks in the three roadless areas consist of the Coker and Gordo Formations that make up the Cretaceous Tuscaloosa Group (table 2), and alluvium of Pleistocene and Holocene age (Szabo and Patterson, in press). The two formations consist chiefly of sand, silt, and clay and contain minor quantities of gravel and sandstone. The Coker is 400-500 ft thick and the Gordo is 100-400 ft thick. The alluvium is composed of lenticular beds of fine- to coarse-grained sand, gravel, and clay. It occurs under the floodplains of the major streams.

The Tuscaloosa Group is underlain unconformably by Paleozoic sedimentary rocks. The upper Paleozoic unit in the Big Sandy and West Elliotts Creek areas is the Pennsylvanian Pottsville Formation. Where exposed in the central and northern parts of Tuscaloosa County this formation consists of sandstone, shale, clay, and coal, and it has a thickness of 2,500 to 4,400 ft (Beg and others, 1978, table 1). The Pottsville is probably missing below the Cretaceous strata in the Reed Brake area where the Tuscaloosa Group is presumably underlain by one or more of the 19 pre-Pottsville formations known to be present in outcrops in easternmost Tuscaloosa County (Beg and others, 1978) and the central part of Bibb County (Chaffin, Szabo, and Daniel, 1976). The reasons the Pottsville is thought to be missing under the Reed Brake area are: 1. two wells drilled 5 to 6 mi northeast of the area penetrated older rocks subjacent to the Tuscaloosa Group; and 2. the Birmingham and Blue Creek anticlines, along which the Pottsville Formation is missing, trend toward Reed Brake, and the overthrust block of the Helena fault on which the Pottsville Formation is absent also trends toward Reed Brake. Pre-Pottsville rocks are probably present at depths of no greater than 700 to 800 ft below the surface of the Reed Brake area, if the configuration of the erosional surface on the top of the pre-Pottsville rocks is similar to that on the Pottsville rocks (fig. 2).

Structure

The Cretaceous-age Tuscaloosa Group in the three roadless areas has undergone little deformation, but older rocks are more disturbed. The strata in the Tuscaloosa Group dip uniformly to the southwest at 30-40 ft/mi (Paulson, Miller, and Drennen, 1962, p. 17), and no faults or folds were found in them in the three areas. The Pottsville Formation below the major unconformity between the Cretaceous and Paleozoic formations dips approximately 175 ft/mi to the southwest (Beg and others, 1978, p. 7). The pre-Pottsville rocks that probably underlie the Tuscaloosa Group in the Reed Brake area are likely to be folded and faulted much like those cropping out farther to the northeast (Chaffin, Szabo, and Daniel, 1976).

ASSESSMENT OF MINERAL RESOURCE POTENTIAL

Known mineral resources of the study areas are sand and clay. Although tests confirmed their suitability for construction materials and structural clay products, both sand and clay are available in abundant supply elsewhere in Tuscaloosa, Hale, and Bibb Counties.

The presence of coal, oil, and gas beneath the three roadless areas has not been established, but extrapolations of stratigraphic and structural trends from exposed rocks to the north imply the presence of large tonnages of coal beneath the Big Sandy and West Elliotts Creek areas. Oil and gas potential is speculative. Extensive exploratory drilling would be necessary to determine the potential of these commodities.

Several types of mineral deposits occur in Paleozoic rocks in southeastern Tuscaloosa County and adjoining parts of Bibb County, a region located 5 to 20 mi northeast of the three roadless areas (fig. 2). Brown iron ore has been mined in the Woodstock district, and red iron ore has been mined at scattered localities nearby. Other minerals occurring in this region include barite, limestone, dolomite, and chert. Some of these minerals in the region may be at considerable depths beneath the three roadless areas. However, they have no current potential because of the high costs of deep mining.

Clay

Mining of clay in the Coker and Gordo Formations in Tuscaloosa County occurred as early as 1829 (Ries, 1900). Current production in the vicinity of the three roadless areas is limited to two intermittently active pits. One is about 10 mi southeast of the Reed Brake area (fig. 2). Plastic clay from this pit has been used in making terra cotta at a plant in Birmingham (Ben W. Fenton, oral commun., 1979). The other pit is located 12 mi farther southeast. The clay from this pit is used by a local pottery.

Plastic clay that may be suitable for use in structural clay products occurs in two zones in the Gordo Formation. A clay zone at the base of the Gordo is present in all three study areas. A zone near the middle of the formation is present in the West Elliotts Creek area and probably in the Reed Brake area. The clays in both zones are chiefly mixtures of kaolinite and quartz containing minor amounts of chlorite and muscovite.

Szabo and Nordstrom (1974) and Clarke (1970) reported that carbonaceous clays of the Coker Formation near the Talladega National Forest have bloating properties making them suitable for use in lightweight aggregate (fig. 2). Szabo and Nordstrom's map (1974) shows bloating clays extending over much of the Big Sandy area. However, no carbonaceous clay was found by the U.S. Bureau of Mines personnel during their fieldwork and none of the 12 clay samples tested had bloating properties.

Preliminary ceramic evaluations indicate that clays in the study areas may be suitable for structural clay products (Armstrong and Mory, 1982). However, potential use of the clay is low because of regional abundance of similar materials (fig. 2), (Szabo and Nordstrom, 1974; Clarke, 1966, 1970). Clay and shale moved during coal stripping and discarded on waste dumps in Tuscaloosa and Bibb Counties are another potential ceramic resource (Beg and others, 1978) and would be more economical to recover than any of the clays from the study areas.

Sand

The Tuscaloosa Group and alluvium in the three roadless areas and surrounding region contain enormous resources of sand and gravel that have been used for road construction and maintenance. Most deposits in the Tuscaloosa Group are in tabular and lenticular units having an average thickness of about 10 ft. Thin stringers of sandstone, cemented with iron oxide, and clay zones occur in some deposits. Little is known about the alluvium of the floodplains along South Sandy and Elliotts Creeks, but considerable quantities of sand are present in both lowlands. A pit consisting of three small workings is located in the eastern part of the West Elliotts Creek area (fig. 3). This pit is intermittently active and has been the only mining operation in the three areas in recent years.

Sand sampled at four localities (fig. 3, sample nos. 3, 12, 15, and 18) contained subangular to subrounded, very fine- to coarse-grained quartz and ranged in color from very pale orange to dark yellowish-brown, and light to moderate brown. Histograms of sieved samples (fig. 6) illustrate that about 96 percent of the sampled material is in the sand-size fraction. Gravel is present, but in quantities too small to consider significant.

Material from the deposits sampled could be used for construction purposes. Sample 18 meets American Society for Testing and Materials (1981) specifications for bituminous paving mixtures.

Potential use of the sand deposits in the three roadless areas is low because large resources are scattered elsewhere throughout the region. The U.S. Forest Service has several inactive borrow pits outside the three areas that are adequate for local needs. The city of Tuscaloosa, located about 10 mi north of the Big Sandy area, is amply supplied with extensive deposits of sand and gravel in the Tuscaloosa Group and in terraces along the Black Warrior River. Similar deposits occur along the Cahaba River, about 10 mi east of the areas.

Coal

Bituminous coal of the outcropping Pottsville Formation is currently mined in the Warrior Basin in northern and central Tuscaloosa County, and in the southern portion of the Cahaba Coal Field, in northeastern Bibb County. Eight coal groups, each containing two to six coal beds, are recognized in Tuscaloosa County (Beg and others, 1978). Approximately half of the estimated 34 coal beds exposed in the county have been mined commercially (Beg and others, 1978). Coal has been mined 9.5 mi northeast of the Big Sandy area in Tuscaloosa County and has been mapped on the surface 5.5 mi northeast of this area (Daniel, pl. 2, in Beg and others, 1978).

Contours on top of the Pottsville Formation indicate its presence at depths ranging from less than 350 ft below the Big Sandy area to about 750 ft below the West Elliotts Creek area (Kidd, 1976). Metzger (1965) states that the Pottsville Formation dips gently to the southwest and thickens in that direction. Although coal has not been proven to exist beneath these areas, its presence is highly likely if the subsurface geology of the Pottsville Formation in this location is similar to that in the Warrior Basin. Regional structural trends of the Birmingham anticline and the Helena thrust fault northeast of the roadless areas (Szabo and Patterson, in press) suggest that the Pottsville Formation is absent under the Reed Brake area.

Hypothetical coal resources in the Pottsville Formation underlying the Big Sandy and West Elliotts Creek areas at depths of not more than 4,000 ft are probably as much as 100 million tons. This estimate was made by multiplying the total acreage of the two areas times the average coal resources of about 15,400 tons per acre in Tuscaloosa County. The total of coal resources in the county, estimated to be about 6.5 billion tons, was calculated by Boone and Daniel (1980). In making their calculation they multiplied the total acreage covered by the Pottsville Formation, 423,000—as measured on a coal resource map (Daniel, pl. 2, in Beg and others, 1978)—by 15,400.

Complex subsurface structure related to the systems of folds and faults on the border between Tuscaloosa and Bibb Counties may exist beneath the Big Sandy and West Elliotts Creek areas, complicating the geology of the Pottsville Formation. Exploratory work, including drilling and geophysical investigations, would have to be conducted to properly evaluate the potential for coal beneath the two roadless areas.

Lignite occurs sporadically in the lower part of the Coker Formation in the southern and western parts of Tuscaloosa County (Beg and others, 1978). The lower part of this formation is not exposed in the study areas and no lignite occurrences were noted during this investigation.

Oil and Gas

Coal bed gas is presently produced in two degasification projects in the region of the three study areas, and gas has been found in two other fields (Thomas Sexton, oral commun., 1982). The producing Brookwood Degasification Field extends over more than 75 mi², and its southern boundary is only about 15 mi northeast of the Big Sandy area. The other producing field, the Oakgrove Field, is farther northeast. The nonproducing gas areas are the Wiley Dome and Lexington fields, which are located about 35 mi north of the Big Sandy area (fig. 2). The gas in both fields is in the Late Mississippian(?)-age Parkwood Formation (Frank Hinkle, oral commun., 1982).

The three areas may have potential for oil and gas, a conclusion based largely on industry activities in the Talladega National Forest and on geologic inferences. During the past seven years, numerous applications for oil and gas leases in the three study areas have been submitted to the BLM (table 1, figure 5), and several leases were in effect in May 1981. Periodic seismic studies made by private industry along roads throughout the national forest (Ben W. Fenton, oral commun., 1980) also indicate continuing interest by oil and gas companies. However, little is known about possible hydrocarbon host rocks at depth under the areas. The region appears as favorable for the occurrence of gas as northern Tuscaloosa County, where the Wiley Dome and Lexington fields have been found; the Parkwood Formation, which contains gas in these two fields, probably is present at depths of no more than 5,000 ft in the region. However, this likelihood is only an inference because no deep holes have been drilled near the areas. Coal beds, thought to be present in the Pottsville Formation under the Big Sandy and West Elliotts Creek areas, would be even more likely to contain gas than the degasification fields to the north because of greater depth of burial. Porous clastic beds in the Pottsville Formation may also serve as traps for hydrocarbons, because containing seals are likely to have been provided by impermeable zones in the upper part of the formation. Such zones are known to be too impermeable to permit the flow of groundwater (Paulson, Miller, and Drennen, 1962, p. 20).

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[1]Acreage figures are those of the U.S. Forest Service (1979) and do not agree with those of more recent calculations (table 1).

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