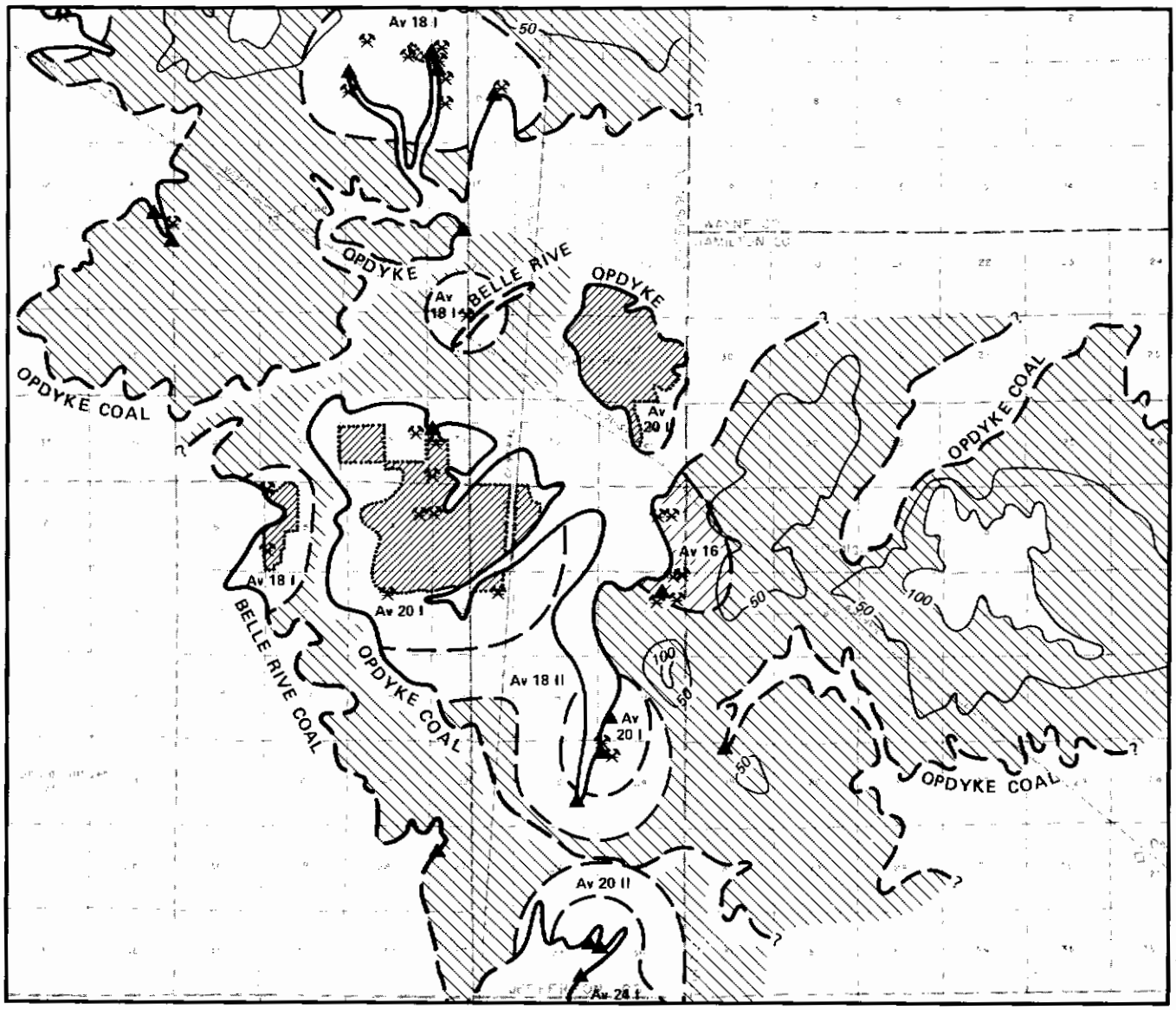
STRIPPABLE COAL RESOURCES OF ILLINOIS

Part 8–Central and southeastern counties

Roger B. Nance and Colin G. Treworgy



Illinois Institute of Natural Resources
STATE GEOLOGICAL SURVEY DIVISION, CHAMPAIGN
Jack A. Simon, Chief

CIRCULAR 515
1981

COVER: Coal resources map of Opdyke and Belle Rive Coals in Jefferson and Hamilton Counties in central Illinois.

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STRIPPABLE COAL RESOURCES OF ILLINOIS

Part 8–Central and southeastern counties

ABSTRACT

This report, the last in a series of eight reports summarizing available data on strippable coal resources in Illinois, describes coal stripping possibilities and associated stratigraphy in the south-central and eastern parts of the state (Area 8). Strippable coal resources are defined as coal 18 inches and greater in thickness with overburden not exceeding 150 feet. The stratigraphic position of the coals described in this report ranges from the Carbondale Formation (middle Pennsylvanian) to the Mattoon Formation (upper Pennsylvanian).

Maps of each of the principal coal beds show outcrops, mined-out areas, thickness of the coal, thickness of overburden, and reliability of the estimates. The estimated tonnage of strippable coal (categorized by coal thickness, overburden thickness, and reliability of estimate) is tabulated for each township and county.

More than 1.3 billion tons of strippable coal has been mapped in the Springfield (No. 5), Bristol Hill, Friendsville, Loudon, Belle Rive, Opdyke, Shelbyville, Calhoun, and Trowbridge Coals. The Bristol Hill, Keensburg, Loudon, Belle Rive, and Oconee Coals are new stratigraphic members named in this report.

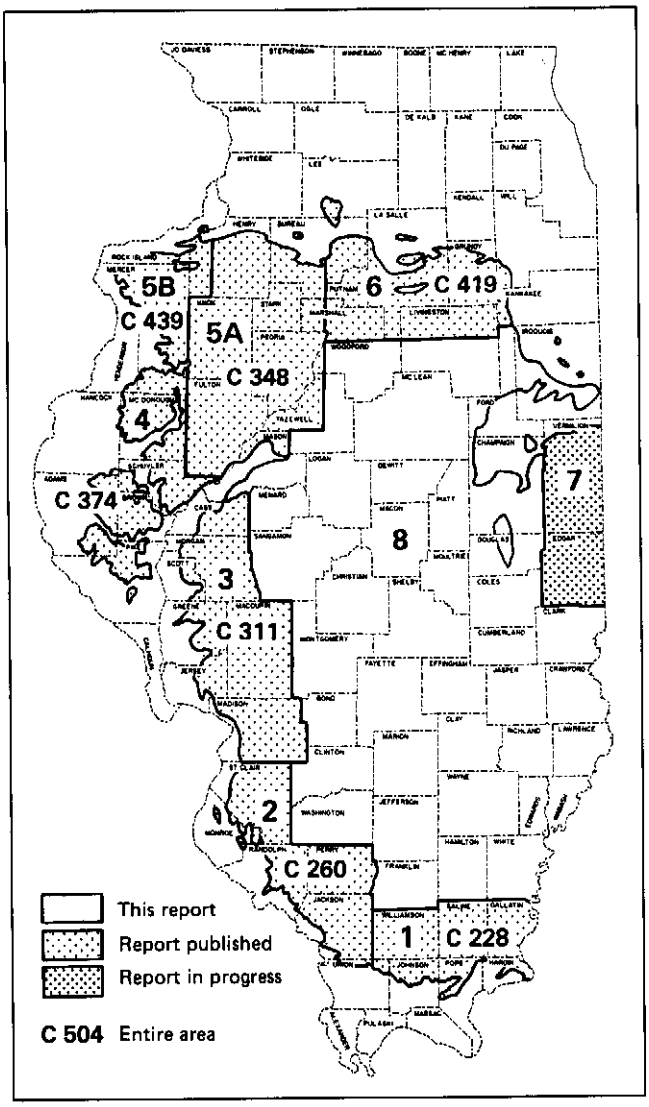


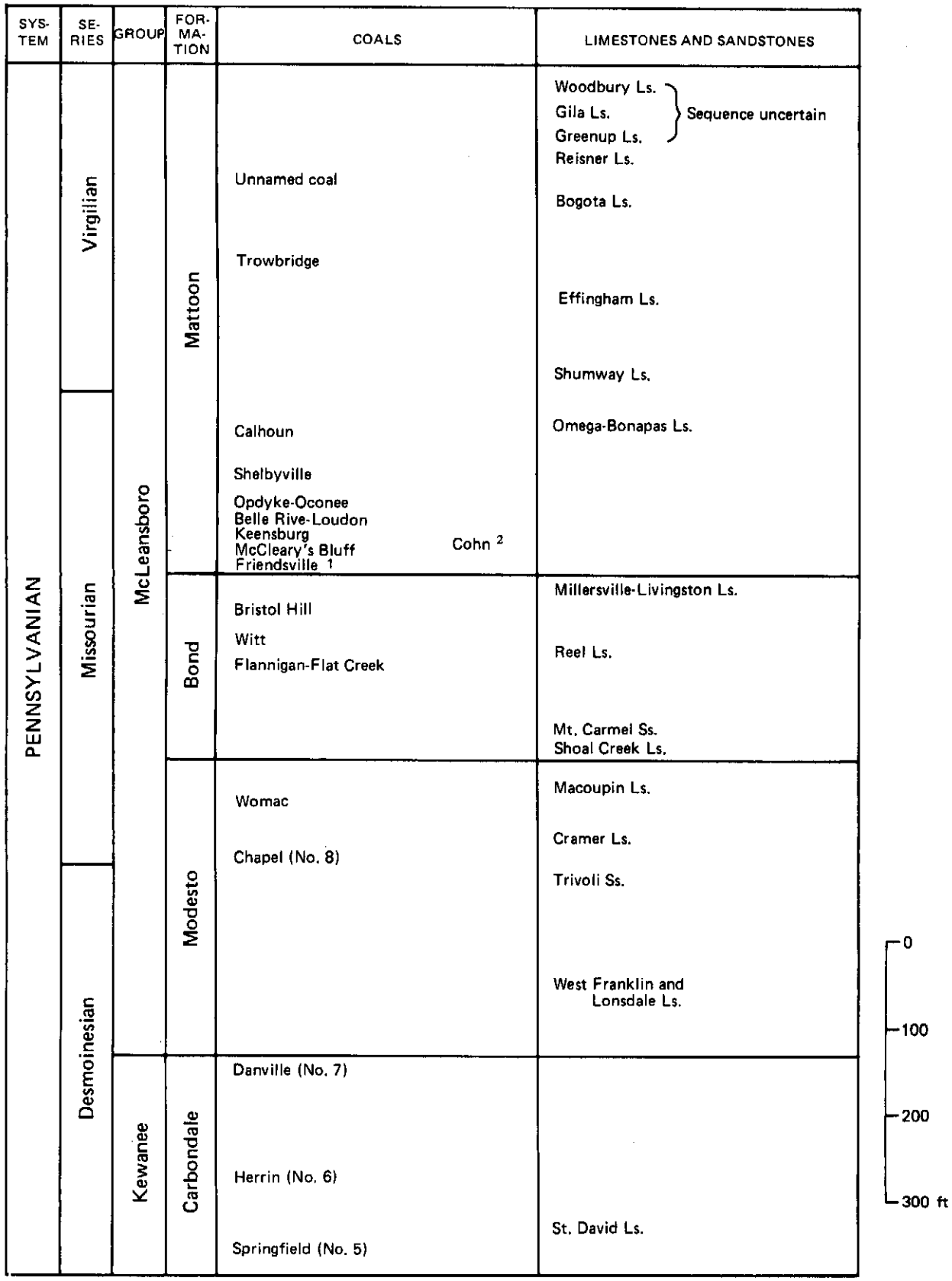
Figure 1. Strippable coal resource areas in Illinois.

ACKNOWLEDGMENTS

Fredrick N. Murray, assisted by Eric Christian, previously mapped several of the coal areas included within this report. These maps were later completed and in some cases modified by the authors.

The authors wish to thank the personnel of Eads Coal Company for providing samples and mine maps of the Opdyke and Belle Rive Coals.

Drafting: Sandra Stecyk (plates and figures); Sonja Williams (figures).



[1]The position of the Friendsville Coal relative to the Millersville Limestone is not certain.

[2]The position of the Cohn Coal relative to other coals in the lower part of the Mattoon Formation is not certain.

Figure 2. Generalized stratigraphic column showing position of named members mentioned in this report.

INTRODUCTION

This is the final report in a series published by the Illinois State Geological Survey (ISGS) summarizing the available information on strippable coal resources in Illinois. Earlier reports covered Areas 1 through 7 (fig. 1), where the minable coals of the McCormick (lower Pennsylvanian) and Kewanee Groups crop out along the margin of the Illinois Basin Coal Field (Smith, 1957, 1958, 1961, and 1968; Smith and Berggren, 1963; Reinertsen, 1964; Searight and Smith, 1969; and Jacobson and Bengal, in preparation.) Area 8 (covered in this report) embraces a large part of the deeper portion of the Illinois Basin, where coals of the Kewanee Group generally lie at depths too great for strip mining, and the shallow coals present are restricted mainly to the McLeansboro Group (fig. 2).

In this report an estimated 1.3 million tons of strippable resources are classified and mapped for the Trowbridge, Calhoun, Shelbyville, Oconee, Opdyke, Loudon, Belle Rive, Friendsville, Bristol Hill, and Springfield Coals. A detailed summary of mapped coal resources by township, county, coal seam, overburden, and reliability category is given in appendix 2. The Bristol Hill, Keensburg, Loudon, Belle Rive, and Oconee Coals are new stratigraphic members named in this report.

The reliability of mapped coal resources in Area 8 is lower than in the other previously mapped areas. Coals in Area 8 are thin and have not been extensively explored; consequently, few subsurface data are available. Many of the coal subcrop and overburden thickness lines were drawn by interpolation, using a bedrock topography map (Scale, 1:250,000) and structure maps of major marker strata (generally limestone). Additional drilling information will modify the provisional subcrop lines shown.

Worthen (1866 and 1875) was the first to describe the geology of several coal beds in the report area. Culver (1925) outlined areas in Richland and Wabash Counties of the Calhoun and Friendsville Coal Members that merited investigation for strippable coal. He also mentioned the occurrence of shallow coal in southwestern Effingham County (Calhoun Coal Member, this report), and in Marion and Jefferson Counties (mainly Belle Rive and Opdyke Coal Members, this report). Culver indicated the presence of a relatively shallow 1- to 2-foot-thick coal in northeastern Wayne and northwestern Edwards County, and a 30- to 36-inch-thick coal in southeastern Edwards County. The Wayne and Edwards County coals mentioned by Culver were probably described from water well records and have neither been established by coal test drilling nor been seen in outcrops.

Cady (1937) mapped the subcrop of the Trowbridge Coal Member in southeastern Shelby County and the adjoining portion of Cumberland County. Cady et al. (1955) calculated minable resources (28 inches or thicker) for the Trowbridge and Friendsville Coal Members in Wabash County. Cady et al. (1955) published a map of the Friendsville Coal showing the subcrop and the area with less than 50 feet of overburden. Kosanke et al. (1960) indicated the stratigraphic positions of many of the coal beds in the report area; their data for members within the Mattoon Formation were based partly on a study by Van Den Berg (1956).

PREPARATION OF RESOURCE ESTIMATES

Definition of strippable coal

Evaluation of strippable resources is based principally upon thicknesses of coal and overburden. In previous reports of this series, strippable coal resources included coal seams 18 inches or more thick with overburden up to 150 feet thick. Since the McLeansboro Group coals mapped in this report generally average less than 2 feet thick, only coals 18 inches or more thick with an overburden not more than 100 feet were included as a resource. (Thin coals with more than 100 feet of overburden are unlikely to be mined in the foreseeable future.) In the case of the Springfield (No. 5) Coal Member (Kewanee Group), however, a maximum overburden thickness of 150 feet was allowed.

Some of the resources will not be recoverable because they lie beneath towns, cities, highways, and other cultural features; however, these resources have not been excluded from this report. Resources of the Shelbyville and Trowbridge Coal Members, underlying Lake Shelbyville and Lake Mattoon, respectively, were excluded. The resource estimates are based on total coal in place, and no estimate of the percentage of the coal that may be recoverable is presented. A recent study by Treworgy et al. (1978) estimated the amount of legally and economically minable coal in this area. Using the coal thickness maps prepared

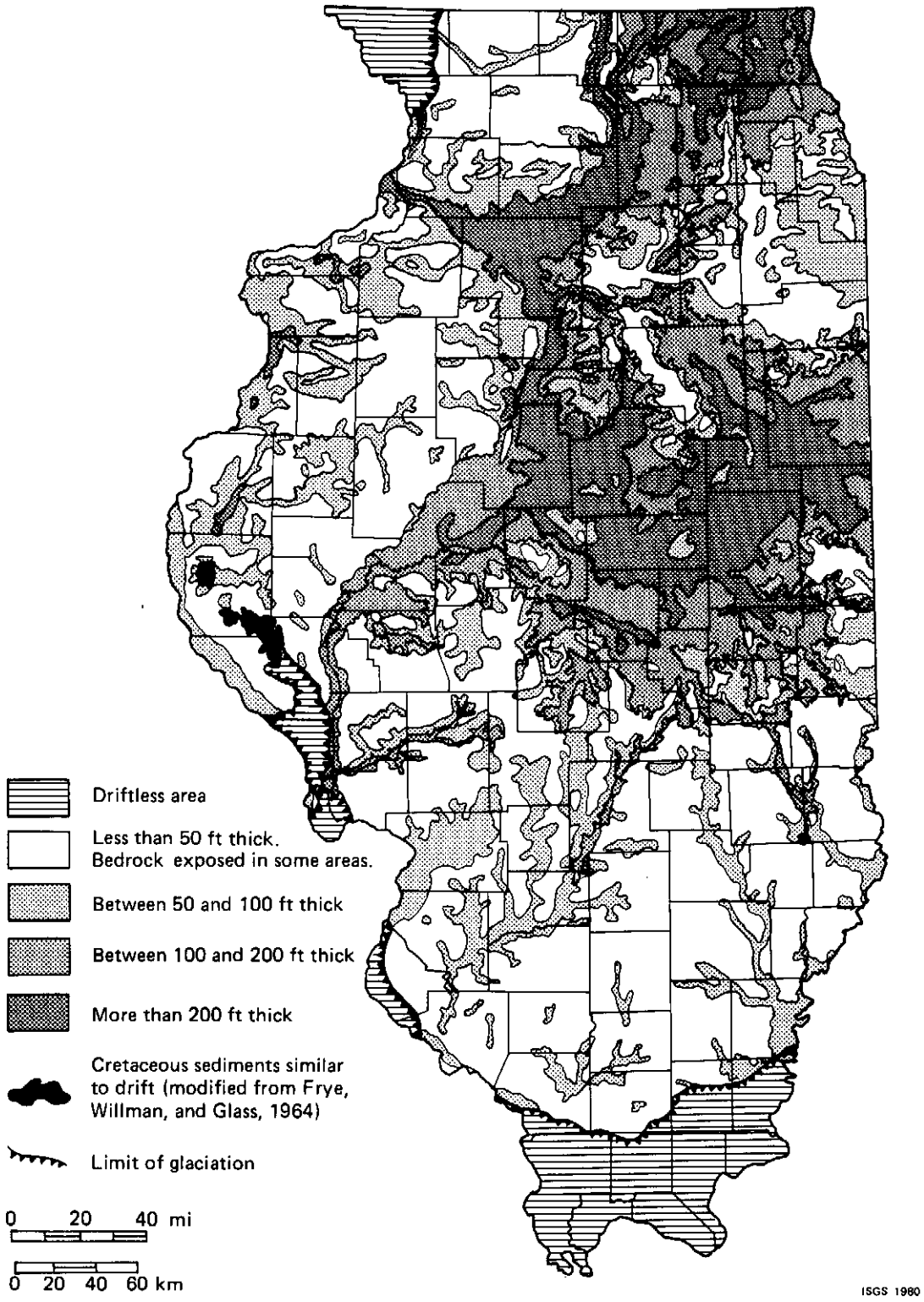


Figure 3. Generalized drift thickness in Illinois (Piskin and Bergstrom, 1975).

for this report, Treworgy et al. eliminated areas of coal (1) with high stripping ratios; (2) overlain by cities, highways, and other cultural features; and (3) situated in minable blocks with less than 6 million tons in place. Using these criteria, 363 million tons of coal (28 percent of the total mapped in this study) were classed as reserves (i.e., minable). Neither Treworgy et al. nor the authors of this report have considered the effect of dense drilling for oil and gas on minable areas. Oil and gas wells may be obstructions to surface mining, particularly in Wabash and Crawford Counties.

In this report, as in earlier reports on coal resources in Illinois, the resource tonnage estimate is based on the assumption that there are 1,800 tons of coal per acre foot. This conforms to the figure used by the U.S. Geological Survey in estimating resources of high-volatile bituminous coal.

Mapping coal subcrops

Most of the bedrock occurring throughout the study area is masked by varying thicknesses of glacial drift and loess (wind-blown silt). Most of the northern counties of the report area are covered with surficial deposits more than 100 feet thick (fig. 3): This area has been excluded from study due to excessive drift thickness. In areas of thinner drift where sufficient information is available, provisional subcrop lines have been drawn on the maps representing the limits of the coal beneath these unconsolidated deposits. The approximate subcrop was mapped by interpolation, using contours of bedrock topography from Horberg (1950). As additional drilling information becomes available, the provisional subcrop lines shown will be modified; however, these lines are used as a basis for illustrating on the maps and discussing in the text where coal may be found at strippable depths.

Coal exposures and small mines appearing on the maps near the outcrops indicate, in a general way, areas of relatively close control. In contrast, a dashed outcrop line indicates areas where projections of the outcrop are based on limited data.

Mapping coal overburden

In areas where sufficient data were available, a structure contour map of the coal was prepared from mine, drill hole, and outcrop records in the Illinois State Geological Survey files in order to map overburden thicknesses by interpolation with surface topography. Where shallow subsurface coal data were lacking, a structure contour map of the Millersville, Shoal Creek, or West Franklin Limestone Members was prepared from electric logs of oil tests. By using known stratigraphic intervals between one of these limestones and the mapped coal seam, overburden thicknesses were interpolated.

STRIPPABLE COAL RESOURCES

Classification of resources

Previous reports in this series referred to the coal mapped as "reserves;" however, in order to conform more closely with terminology used by other state and federal agencies, the term "resources" is used in this report. The distinction between these terms as now used is that "reserves" are economically minable at the time of determination, whereas "resources" refers to a broader category of coal that is or may become economically minable (USGS, 1976).

As in previous reports in this series, coal resources are divided into two classes (primary and secondary resources) to designate the reliability of the estimate.

Class I: Primary resources. Class I resources include coal in areas in which enough information is available to establish the presence of coal with reasonable certainty. In the previous reports of this series, Class I resources ordinarily included all coal within two miles of a point where reliable information about coal thickness was available (from mines, outcrops, diamond drill holes, and churn drill coal test holes). This is equivalent to the proved (Class I-A) and probable (Class I-B) categories for resources in the state-wide inventory of coal resources compiled by Cady (1952). Because the McLeansboro coals are relatively thin and generally seem to be variable in thickness, a half-mile limit for Class I resources was used for this report. The two-mile limit for Class I resources was utilized only in compiling resources for the Springfield (No. 5) Coal, which is much more laterally continuous than the McLeansboro coals.

Class II: Secondary resources. Class II resources, as defined in the previous reports of this series, are (1) resources as extended (on the basis of geologic probability) to a 2-mile limit around Class I resources, or (2) resources within a 4-mile limit around sites with less reliable coal thickness data from geophysical well logs, drillers' logs of oil tests and water well logs. In this report the 4-mile maximum limit—or 2-mile maximum limit around Class I resources—for Class II resources was utilized only in mapping the Springfield (No. 5) Coals. For the thinner coals in the McLeansboro Group, Class II resources were figured only in areas in which geologic evidence strongly indicates the continuity of the coal. No Class II resources were mapped for several of these coals.

The Class II resources in this report correspond to those classified by Cady (1952) as II-A (strongly indicated).

Thickness of coal

Thickness of coal is indicated on plates 1 and 2 by average thickness categories. Estimated average thickness values were used to calculate the coal tonnage within each of the overburden and reliability classifications delineated.

For some areas shown, no reliable data are available concerning the thickness of the coals; however, enough information can be obtained from records of oil or water well drilling to permit making a structure map and classifying the coal into the various categories of overburden thickness outlined for this study. A specific pattern has been used on the map to indicate areas where the coal is thought to be at strippable depth, although no reliable thickness data are available.

Mined-out coal

All mines for which records are available are shown on the maps in this report. Most of the mines in the report area which have operated within McLeansboro Group coals consist of small drift, strip, and occasional shallow shaft mines for which no mined-out areas are shown on the maps. These mines are indicated on the maps only by an abandoned mine symbol, and no exclusions were made towards total coal resources. The mined-out coal areas shown on these maps are taken from maps previously compiled (Cady, 1952) which were later revised to include all mining to January 1, 1978.

Quality of the coals

Data on the quality of the coals described in this report are summarized in table 1. These values have been obtained from reports of analyses of Illinois coals collected by Survey geologists.

STRATIGRAPHY AND COAL RESOURCES

The report area (fig. 1) is located in the interior of the Illinois Basin Coal Field. Throughout most of this area the important economic coals of the Carbondale Formation lie at depths up to 1,300 feet below the surface and are too deep for strip mining. The McLeansboro Group forms the immediate bedrock surface in most of this report area. Although the coals in this group are thin and laterally variable in thickness, some of the coal horizons can be traced for long distances in the subsurface. Limestones and, in a few cases, sandstones, are useful marker units for exploring this stratigraphic succession. Figure 2 indicates the stratigraphic position of the named members mentioned in this report which are within the Pennsylvanian System. The principal geologic features of the more important members and their associated strata are discussed in the following sections, and strippable resources of coals mapped within the report area are described and discussed. Detailed summaries of the coal resources are presented in appendices 1 and 2. Generalized and interpretive geologic sections from several parts of the report area are included as an aid to coal exploration drilling.

Carbondale Formation

The Carbondale Formation (fig. 2) consists of a large number of named members, many of which possess remarkable lateral persistence in thickness and lithologic character. The sandstones and gray shales, however, exhibit extreme lateral changes and are primarily responsible for local and regional changes in the thickness of the formation. The formation varies from less than 150 feet in western and northeastern Illinois to more than 400 feet near its outcrop belt in southern Illinois.

The Carbondale Formation contains several very widespread coals, including the Colchester (No. 2), Springfield (No. 5), Herrin (No. 6), and Danville (No. 7) Coal Members. These coals constitute the bulk of the resources of Illinois. The strippable resources of these coals have been outlined along the outer margins of the Illinois Basin Coal Field in previous reports within this series. The Carbondale Formation is exposed beneath the drift only locally along the northern and northwestern boundaries of the report area.

The Springfield (No. 5) Coal is the only coal in the Carbondale Formation within the report area for which strippable resources are outlined (plate 2-A).

Springfield (No. 5) Coal Member. The Springfield (No. 5) Coal Member (fig. 2) is one of the most important and widespread coals in Illinois, although it is relatively thin in the northeastern and southwestern portions of the Illinois Basin coal field (Smith and Stall, 1975). In southern Illinois it is called the Harrisburg (No. 5) Coal Member and is of minable thickness in large areas east of the DuQuoin Monocline (fig. 4); west of the monocline it seems to be only locally developed. The Springfield Coal is present at known strippable depths in the report area only in parts of Sangamon and Menard Counties (plate 2-A).

The Springfield Coal was mined extensively by underground methods around the city of Springfield where the coal was about 200 to 250 feet deep. The coal gradually

becomes more shallow to the north and west. The subcrop of the coal in northern Menard County is beneath the thick surficial sediments of the Illinois River valley. Within northwestern Sangamon County the Springfield Coal lies at a depth of 150 feet or less only along the valleys of the Sangamon River and the east-west trending Spring, Prairie, and Richland Creeks. Within eastern Menard County the coal is at a depth of 150 feet or less in a narrow band along the subcrop boundary, along Clary and Rock Creeks, and in the southwestern corner of the county, south and west of Tallula.

The Springfield Coal averages between 5 and 6 feet thick within the mapped area (plate 2-A) but may be somewhat thinner along the western border of Sangamon and Menard Counties and in portions of Cass County (Smith and Stall, 1975, plate 2). The Springfield Coal thins south of Springfield and is 3 feet or less thick in most of the southern part of Sangamon County (Clegg, 1961).

Within the mapped area, the Springfield Coal lies approximately 40 feet below the Herrin (No. 6) Coal Member. The Herrin Coal is normally 2 feet or less thick in this area (Clegg, 1961) and is only locally present in areas where the Springfield Coal is 150 feet or less deep. The St. David Limestone Member is generally present 2 to 4 feet above the Springfield Coal and is normally 1 to 3 feet thick. The limestone is separated from the coal by a black shale often containing dense, calcareous, and pyritic concretions from a few inches to as much as 4 feet in diameter. A conspicuous feature associated with the Springfield Coal in Sangamon County and adjacent counties is the presence of claystone dikes ("horsebacks") that are from a few inches to 1 or 2 feet wide. These dikes are irregular and nearly vertical, and they extend downward from the overlying strata through, but not below, most or all of the coal (Clegg, 1961; Damberger, 1970, 1973). In some areas these dikes may be so numerous that the quality of the coal is impaired.

A total of 953,113,000 tons of strippable resources of the Springfield Coal was mapped in Sangamon and Menard Counties (table 2 and appendices). Since the unconsolidated surficial material varies from about 50 feet to a

TABLE 1. Selected chemical analyses of coals in Area 8.

Coal	Condition*	Moisture	Volatile matter	Fixed carbon	Ash	Total sulfur	Btu/lb
Trowbridge[a]	1	18.3	28.7	35.4	17.6	2.02	9,079
	2		35.1	43.4	21.5	2.47	11,106
Calhoun[b]	1	15.5	40.4	35.5	8.6	3.12	10,753
	2		47.8	42.0	10.2	3.69	12,718
Shelbyville[c]	1	16.7	36.1	38.1	9.1	3.35	10,396
	2		43.3	45.8	10.9	4.02	12,480
Oconee[d]	1	22.0	30.7	31.9	15.4	1.98	8,661
	2		39.3	41.0	19.7	2.54	11,099
Opdyke[e]	1	10.2	38.6	36.9	13.2	4.11	10,667
	2		43.1	41.2	15.8	4.58	11,882
Keensburg[f]	1	12.3	–	–	11.9	2.53	–
	2		–	–	13.6	2.88	–
Friendsville[g]	1	13.2	31.9	42.5	12.4	2.65	10,603
	2		36.8	48.9	14.3	3.06	12,217
Chapel (No. 8)[h]	1	14.2	–	–	14.5	3.53	10,031
	2		–	–	16.9	4.12	11,691
Springfield (No. 5)[i]	1	13-17	34-39	36-41	9-12	3-5	10,400-11,000

* 1: as received; 2: moisture free

[a] Collected from active strip mine, now abandoned.

[b] Composite of two samples collected from limestone quarry (bottom 7 in. of 50-in. seam excluded).

[c] Collected from abandoned strip mine.

[d] Weathered sample.

[e] Average of two samples collected from active strip mine, now abandoned.

[f] Core sample.

[g] Core sample, from Cady, 1948.

[h] Core sample, 3-in. pyrite layer excluded from 28-in. bed.

[i] Range of typical analyses, from Smith and Stall, 1975.

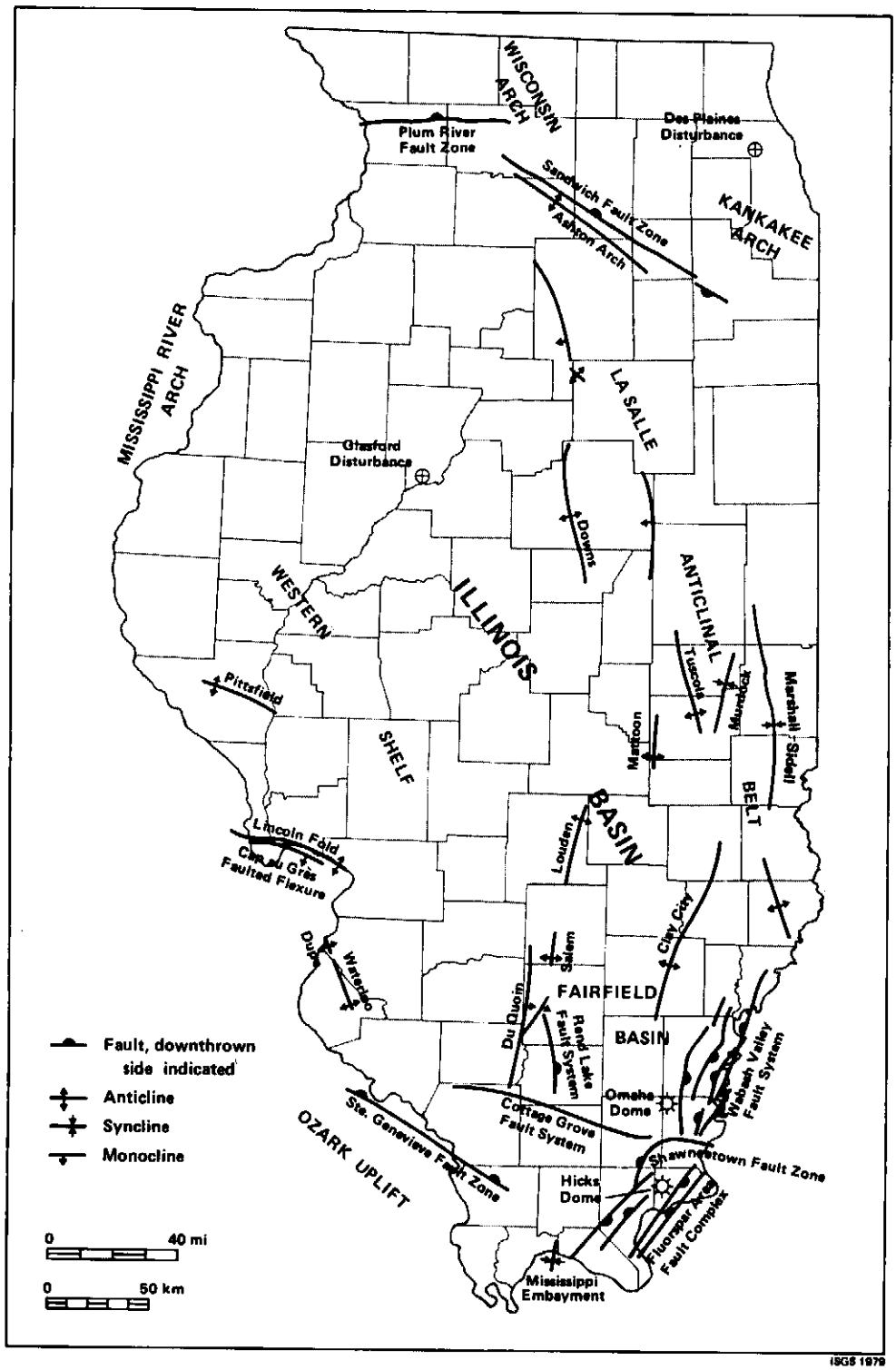


Figure 4. Major geologic structures of Illinois, compiled by Janis D. Treworgy, Dec. 1979.

little more than 100 feet (fig. 3), only 0.25 percent of these resources is in the 0- to 50-foot overburden class and about 13 percent is in the 50- to 100-foot overburden class. Of the total strippable resources 67 percent is in the Class I reliability category, with an average thickness of approximately 70 inches.

Herrin (No. 6) Coal Member. The Herrin (No. 6) Coal Member (fig. 2) is the most important economic coal in Illinois; it is present throughout much of the area of Pennsylvanian rocks, and is 6 to 8 feet thick over extensive areas (Smith and Stall, 1975, plate I). The Herrin Coal constitutes 42 percent of the total coal resources

and 34 percent of the strippable resources in Illinois. No strippable resources of the Herrin Coal have been mapped in the report area. However, this coal may locally lie at shallow depths in the relatively unmapped areas in the extreme northern and northwestern portions of the study area and along the LaSalle Anticlinal Belt in Douglas and Clark Counties.

Danville (No. 7) Coal Member. The Danville (No. 7) Coal Member (fig. 2), the uppermost member of the Carbondale Formation, averages 5 to 6 feet in thickness over large areas of Vermilion County, and has been extensively strip mined in the Danville area (Jacobson and Bengal, in preparation). The Danville Coal has also been mined, mainly by underground methods, in Livingston, McLean, LaSalle, and Marshall Counties. No strippable resources of the Danville Coal have been mapped in the report area. However, the Danville Coal is reported to vary between 17 and 33 inches (plate 1-B) in a few exposures in Menard County (Sec. 25 and 36, T. 18 N., R. 7 W.). The Danville Coal may also locally lie at shallow depths in the relatively unmapped areas in the extreme northern and northwestern portions of the study area, in extreme eastern Clark County and along the LaSalle Anticlinal Belt in Douglas and Clark Counties.

Modesto Formation

The Modesto Formation (fig.2) includes all strata between the top of the Danville (No. 7) Coal Member and the base of the Shoal Creek Limestone Member. The formation contains several prominent marine limestones and a few thin coals. Most of the relatively thick limestones occur in the lower half of the formation and appear to be associated with the West Franklin Limestone Member (fig. 2).

The Chapel (No. 8) Coal Member is the only coal member in the Modesto Formation to attain a thickness of 18 inches or more within the report area. However, a coal possibly equivalent to the Womac Coal (fig. 2), which is locally referred to as the "Dillingham Coal," has been mined south of the report area (Sec. 14 and 15, T. 8 S., R. 4 E., Williamson County). This coal was recently stripped from a small pit known as the Malone Mine (NE ¼ NE ¼, Sec. 15, T. 8 S., R. 4 E.) where it was 24 to 30 inches thick, overlain by gray shale, and reported to have a sulfur content of less than 1 percent. This is the only known occurrence of relatively low sulfur coal reported from coals stratigraphically above the Danville (No. 7) Coal.

Because of a lack of data, no detailed mapping has been done of the coals within the Modesto Formation. Resources of these coals have never been estimated, and no attempt has been made to estimate strippable resources of the Chapel and Womac Coal Members in this report.

West Franklin Limestone Member. The West Franklin Limestone Member (fig. 2) occupies a position near the middle of the Modesto Formation and is present only in the southeastern portion of the report area; however, it probably correlates with the Lonsdale Limestone Member to the northwest and may in part be equivalent to the Scottville Limestone Member to the west. Andresen (1956) reported on the possible correlation of the lower bench of the West Franklin Limestone with the Piasa Limestone Member, which occurs near the base of the Modesto Formation in the southwestern portion of the report area. The Piasa, Scottville and West Franklin Limestone Members often consist of a grain-supported crinoidal calcarenite facies or an Osagia facies along with a mud-supported phylloid algal facies. The Lonsdale Limestone consists typically of a gray biomicrite with irregular limestone nodules.

The West Franklin Limestone occurs as one to three benches, varying in thickness from 2 to 10 feet and separated by a few feet of shale. The limestone was used as a datum where other marker beds higher in the section were unrecognizable or absent. This datum was utilized in studying stratigraphic relations of units in the Bond and Mattoon Formations in the southeastern part of the report area and in preparing structure contour maps for interpolation of overburden thickness for the Bristol Hill, Friendsville, and Calhoun Coal Members (fig.2).

Chapel (No. 8) Coal Member. The Chapel (No. 8) Coal overlies the Trivoli Sandstone Member and underlies the Cramer Limestone Member (fig. 2). In the vicinity of its

TABLE 2. Strippable resources of the Springfield (No. 5) Coal Member (in thousand tons).

	Class I resources at overburden thickness (ft)				Class II resources at overburden thickness (ft)				Total	Mined out
County	0-50	50-100	100-150	Total	0-50	50-100	100-150	Total	I & II	(sq mi)
Menard	2,306	60,237	309,221	371,764		22,207	141,111	163,318	535,082	0.03
Sangamon		32,808	233,575	266,383		11,530	140,120	151,649	418,031	3.6
Total	2,306	93,045	542,796	638,147		33,737	281,231	314,967	953,113	3.63

type area (SW ¼, Sec. 3, T. 8 N., R. 5 E., Peoria County) near Trivoli, the Chapel Coal is approximately 27 feet above the Lonsdale Limestone Member. The intervening Trivoli Sandstone Member is only about 15 feet thick in this area.

The Chapel Coal is exposed in Sangamon County near Springfield, where, before the discovery of the deeper Springfield Coal, the coal was mined from small drifts run in from outcrops along the banks of ravines and steep hill sides. Plate 1-B shows several reported exposures and mine entries of the Chapel Coal along the banks of the Sangamon River and its tributaries. In Williams Township (NE ¼, Sec. 21, T. 17 N., R. 4 W.) the Chapel Coal is reported to be 18 inches thick along the east bank of Fancy Creek. Several exposures with 30-inch thick coal occur along the west bluff of the Sangamon River west and northwest of Riverton in Clear Lake Township (T. 16 N., R. 4 W.). In Springfield Township (T. 16 N., R. 5 W.) the Chapel Coal averages 26 inches in thickness along the banks of Spring Creek and its tributaries. Coal 20 inches thick is exposed along Cantrall Creek northeast of Cantrall in Fancy Creek Township (Sec. 9, T. 17 N., R. 5 W.).

In these areas the Chapel Coal lies 165 to 180 feet above the Springfield (No. 5) Coal and is overlain by 2 to 4 feet of black shale and up to 3.5 feet of Cramer Limestone. The Lonsdale Limestone is generally not well developed in this area, but the Trivoli Sandstone may be 30 or more feet thick.

The Chapel Coal apparently thins southward, so that where it is exposed in Washington County (Sec. 32, T. 3 S., R. 4 W.) it is only a few inches thick. In the eastern part of the report area, the Chapel Coal is normally thin and lies within 20 feet above the West Franklin Limestone with the intervening Trivoli Sandstone being thin to absent. The Chapel (No. 8) Coal has been correlated with the Ditney Coal Member in Indiana (Hopkins and Simon, 1975).

Bond Formation

The Bond Formation (fig. 2) includes all the strata from the base of the Shoal Creek Limestone Member to the top of the Millersville-Livingston Limestone Member. The formation is usually characterized by the development of thick limestones as its bounding units. The strata between these limestones consists predominantly of shale, although fairly thick sandstones such as the Mt. Carmel Sandstone Member may be locally well developed (fig. 6). Coal members are generally not more than a foot thick; however, the Flannigan Coal Member and the equivalent Flat Creek Member along with the overlying Witt Coal Member, appear to be widely traceable. The Flannigan Coal Member and younger Bristol Hill Coal Member (newly named here), are known locally to attain a thickness of 2 to 3 feet.

Near the type area the Bond Formation is approximately 250 feet thick, and it may attain a thickness of about 350 feet to the southeast in Illinois. East of the LaSalle Anticlinal Belt in east-central Illinois and also in northern Illinois the formation is 150 feet or less thick.

Shoal Creek Limestone Member. The Shoal Creek Limestone Member (fig. 2) is present in most of the area within the limits of the Bond Formation. The limestone ranges from 5 to 15 feet thick, but may be somewhat thicker in the extreme northern portion of the report area. The limestone constitutes an excellent stratigraphic marker except in the very eastern part of the report area, where its development is somewhat erratic, and in areas where its position is replaced by the overlying Mt. Carmel Sandstone Member. The Shoal Creek Limestone is usually medium gray and dense, containing calcareous shell fragments and medium dark gray, wavy shale laminations. A structure contour map of the Shoal Creek Limestone was utilized in mapping the Belle Rive and Opdyke Coals. This limestone was also used as a stratigraphic datum in preparing the included cross section (plate 1-A).

Flannigan Coal Member. The Flannigan Coal Member (fig. 2) is named for Flannigan Township, Hamilton County, Illinois (Newton and Weller, 1937). The type section (Hopkins and Simon, 1975) consists of an exposure along a southwest-flowing tributary of the Middle Fork Saline River (SW ¼ NE ¼ NE ¼, Sec. 17, T. 7 S., R. 5 E.). At this location the coal is 14 inches thick, overlain by a thin black shale, and estimated to lie about 130 feet above the Shoal Creek Limestone. The Flannigan Coal is correlated with the Flat Creek Coal Member, which was named from an exposure in Bond County, Illinois (NE ¼ SE ¼, Sec. 24, T. 6 N., R. 5 W.). The Flat Creek Coal is 8 to 12 inches thick in this locality and lies approximately 70 feet above the Shoal Creek Limestone. The Flannigan Coal is also considered equivalent to the Fairbanks Coal Member exposed near Fairbanks in Sullivan County, Indiana. The Fairbanks Coal lies 30 to 40 feet above the Shoal Creek Limestone and ranges from 1 to 4 feet thick in the Fairbanks type area (Shaver et al., 1970).

An 18-inch thick coal thought to be the Flannigan Coal is exposed in Hamilton County (SW ¼, Sec. 36, T. 6 S., R. 6 E.). Further east, a coal reportedly 12 to 18 inches thick which occupies a similar stratigraphic position was formerly mined in White County (SW ¼, Sec. 23, T. 6 S., R. 8 E.) (plate 1-B).

On the southeast flank of the Marshall Syncline (fig. 4), a coal 22 to 30 inches thick equivalent to the Flannigan Coal was mined in several localities along the Wabash River southeast of Palestine in Crawford County (plate 1-B). This coal was mined from several shafts, approx-

imately 40 feet in depth, along the river bluff in Crawford County (Sec. 7, T. 6 N., R. 10 W.). Near the center of the S ½, Section 8 of this township the coal reportedly had been dug in the bed of the Wabash River during low water. The Flannigan Coal is exposed along No Business Creek in Crawford County (SW ¼, Sec. 20, T. 6 N., R. 10 W.). At this exposure the coal is 22 inches thick and is overlain by medium gray silty shale.

In the Crawford County area, the Flannigan Coal (fig. 5) lies approximately 50 feet above the Shoal Creek Limestone and about 70 feet below the Bristol Hill Coal Member, which is exposed along the southern margin of the Marshall Sycline near Flat Rock in Crawford County. A 3-inch thick coal overlain by about 3 feet of black shale lies approximately 35 feet above the Flannigan Coal in the vicinity of Palestine. This thin coal is tentatively correlated with the Witt Coal (figs. 2, 5), which is named from an exposure in Montgomery County, Illinois (Kosanke et al., 1960).

Approximately 1.5 miles north of Mt. Carmel in Wabash County the Flannigan Coal is reportedly 6 to 18 inches thick below 1 to 3 feet of the Reel Limestone Member (fig. 6) (NE ¼, Sec. 8, T. 1 S., R. 12 W.). Southwest of Mt. Carmel, the Reel Limestone and approximately 1 foot of the Flannigan Coal are reportedly exposed at low water level in the bed of the Wabash River at Rochester (N ½ NE ¼, Sec. 14, T. 2 S., R. 13 W.). Within this area the Flannigan Coal is estimated to lie 85 to 100 feet above the Shoal Creek Limestone, approximately 35 feet below the Witt Coal, and 100 to 150 feet below the Friendsville Coal, Mattoon Formation (fig. 6).

No detailed mapping has been done in these areas because of a lack of data on the Flannigan and Flat Creek Coals. Resources of these coals have never been estimated and no attempt has been made in this report to estimate their strippable resources.

Bristol Hill Coal Member (new). The Bristol Hill Coal (fig. 2) is named here as a member of the Bond Formation from an exposure along Bristol Hill in Crawford County (near the center of the NE ¼ NE ¼, Sec. 12, T. 6 N., R. 11 W., Heathsville 7½-minute Quad). Within a ravine here is exposed 10 inches of coal overlain by 18 inches of marine limestone at the base of the drift. This limestone attains a thickness of 4 feet in this area and is tentatively correlated with the lower portion of the Livingston Limestone Member. In Clark County to the north, the lower bench of the Livingston Limestone consists of approximately 14 feet of limestone above a 5- to 10- foot section of interbedded argillaceous limestone and shale. The above section overlies a coal approximately 6 inches thick thought to be the Bristol Hill Coal. West of the LaSalle Anticlinal Belt in Shelby and Christian Counties the Livingston Limestone is correlated with the Millersville Limestone Member, commonly underlain by a silty shale or siltstone, and the Bristol Hill Coal is not normally recognized.

West of Flat Rock (Crawford County) and southwest of the type section, the Bristol Hill Coal (locally called "Flat Rock Coal") was locally mined along several of the tributaries to Brushy Creek. The coal in this area was reported to vary in thickness from 18 to about 36 inches and to have an average thickness of approximately 20 inches. The coal is overlain by a few feet of argillaceous limestone. A thin coal possibly equivalent to the Cohn Coal Member (figs. 2, 5) lies approximately 30 feet above the Bristol Hill Coal. West of Brushy Creek and south of Palestine within the mapped area of the Bristol Hill Coal (plate 1-C) very little reliable coal thickness data are available; however, the coal apparently thins to 18 inches or less.

In the vicinity of the type area (plate 1-C), the Bristol Hill Coal (fig. 5) lies 35 to 40 feet above a black shale and thin coal (tentatively correlated with the Witt Coal Member), 70 to 80 feet above the Flannigan Coal, and about 130 feet above the Shoal Creek Limestone. Because the Shoal Creek Limestone is not easily recognizable on well records from this area, the West Franklin Limestone was used as a datum for interpolating the structure of the Bristol Hill Coal. The West Franklin Limestone lies approximately 280 feet below the Bristol Hill Coal.

The subcrop of the Bristol Hill Coal in the Flat Rock area (plate 1-C) lies east of the steep westward dip of the east flank of the Fairfield Basin and is near the southern margin of the Marshall Syncline (fig. 4). The Bristol Hill Coal is truncated along the western boundary (plate 1-C) by thick surficial deposits in the valleys of the Embarrass River and Honey Creek, but should be present beneath the drift a few miles to the west as the coal begins to dip more steeply towards the center of the Fairfield Basin.

TABLE 3. Strippable resources of the Bristol Hill Coal Member (in thousand tons).

	Class I resources at overburden thickness (ft)			Class II resources at overburden thickness (ft)			Total	Mined out
County	0-50	50-100	Total	0-50	50-100	Total	I & II	(sq mi)
Crawford	15,370	2,957	18,326	11,448	12,383	23,830	42,157	0.1

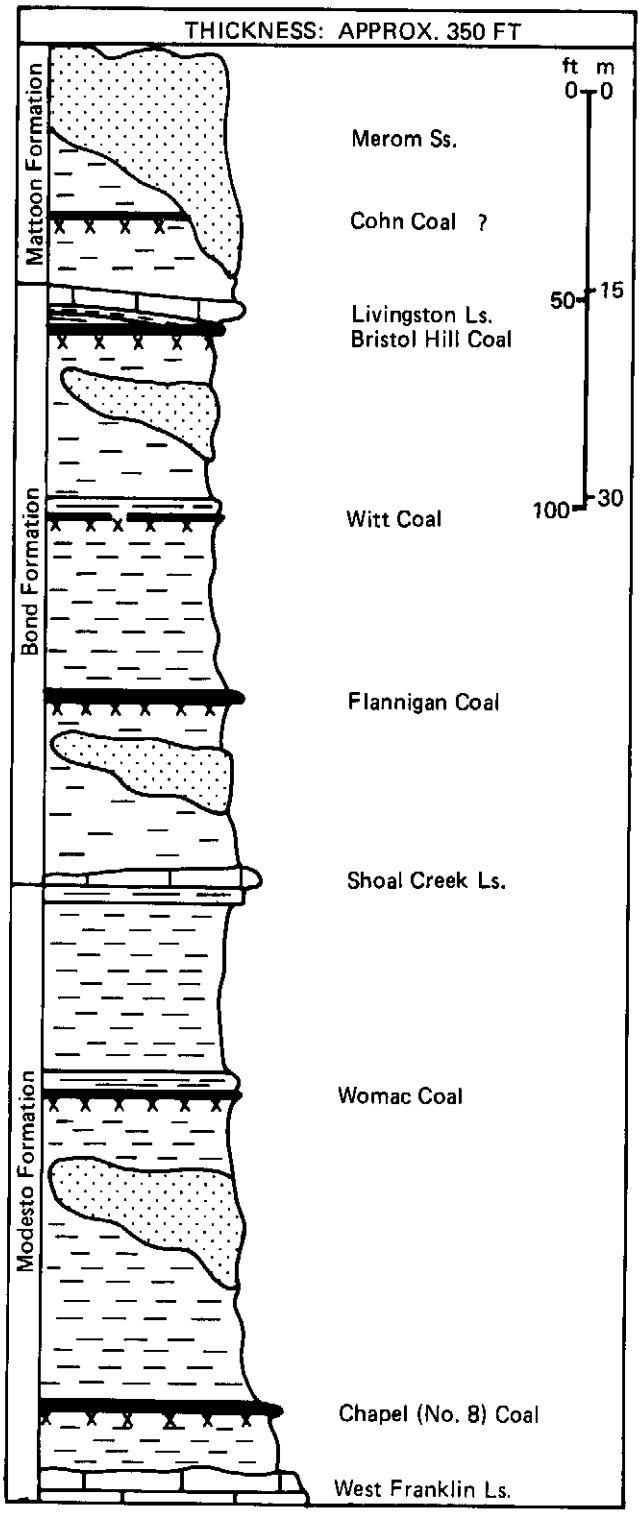


Figure 5. Generalized geologic section above the West Franklin Limestone Member in Crawford County, interpreted from drill hole data and surface exposures.

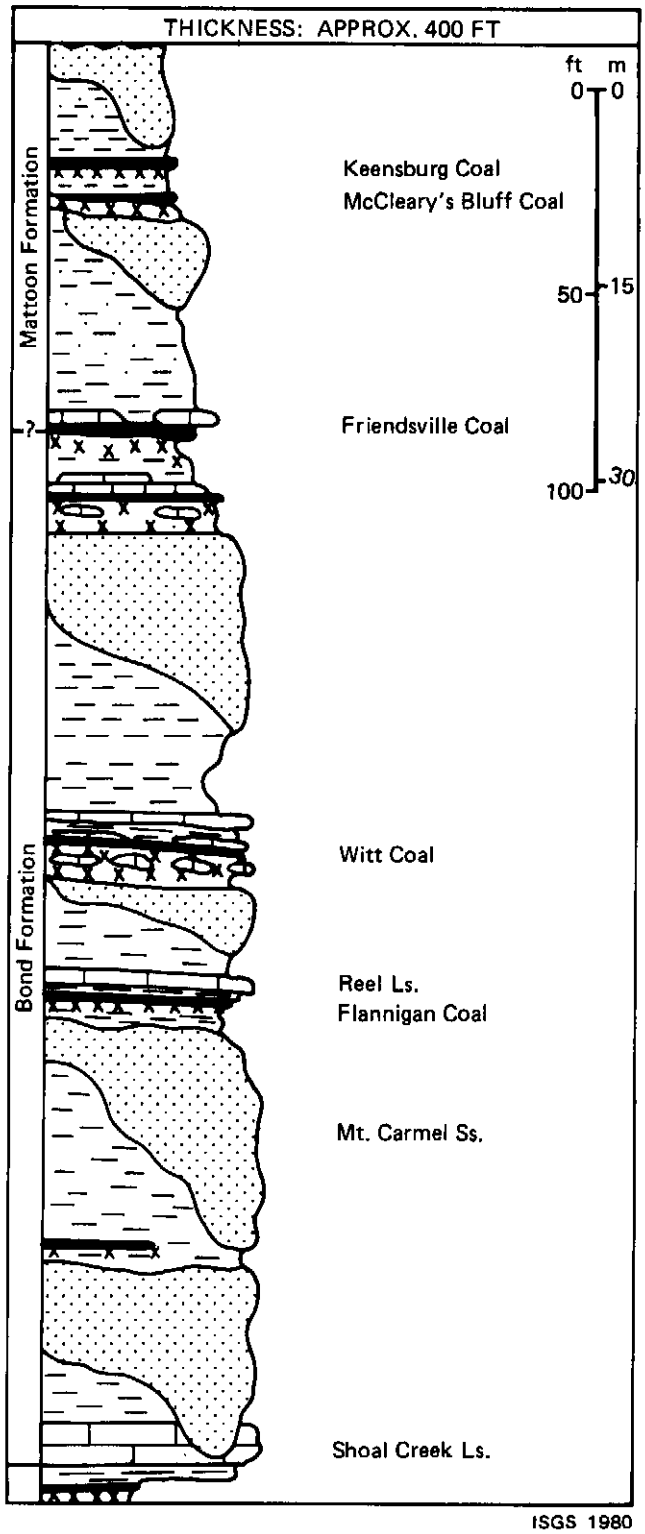


Figure 6. Generalized geologic section of the Bond and Mattoon Formations in Wabash County, interpreted from drill hole data and surface exposures.

In the northern part of Crawford County, the Bristol Hill Coal is exposed at three localities (plate 1-B) along the east flank of the Marshall Syncline (fig. 4). In the SE ¼ SW ¼ NE ¼, Section 23, T. 7 N., R. 11 W., the Bristol Hill Coal is reported to be 20 inches thick and overlain by 4.5 feet of limestone with a few feet of either gray shale or black shale intervening between the limestone and coal. The Bristol Hill Coal is reported to be 2 feet thick and overlain by 17 feet of gray shale lying below 5 feet of limestone in the NW corner of Section 17, T. 8 N., R. 11 W. A similar sequence has been recorded in the SE ¼ of Section 1, T. 8 N., R. 12 W.; however, only 1 foot of coal was observed here. On the west flank of the Marshall Syncline (fig. 4), in the N ½ of Section 18, T. 8 N., R. 13 W., Crawford County, a 14- to 24-inch thick coal is reported at two localities. This coal is tentatively considered to be the Bristol Hill Coal. South and southwest of Crawford County, in the area where the Livingston-Millersville Limestone is absent, the Bristol Hill Coal has not been definitely recognized.

Resources of the Bristol Hill Coal have not been previously mapped. A total of 42,157,000 tons of strippable resources for the Bristol Hill Coal are mapped (table 3 and appendices) in the area of Flat Rock, Crawford County. Approximately 40 percent of the total resources are mapped as Class I, with an average thickness of about 20 inches. Approximately 64 percent of the resources lie at depths of 50 feet or less. Some areas of Bristol Hill Coal have been densely drilled for oil and gas (1 well every 10 acres). These wells may be an obstruction to surface mining; no estimate has been made of the coal which may be unminable.

Millersville Limestone Member. The Millersville Limestone Member (figs. 2 and 5) is the upper member of the Bond Formation and is equivalent to the Livingston Limestone Member east of the LaSalle Anticlinal Belt in Illinois and Indiana. The Millersville and Livingston Limestones are commonly 20 to 50 feet thick and may contain several shale benches. The limestone becomes thinner to the south in Crawford County and the southern portions of Jasper, Effingham, and Fayette Counties (Horne, 1968). In the southern part of the report area the Millersville Limestone is absent and its stratigraphic position seems to be occupied by up to 150 feet of sandstone and shale with probably a few thin coals (plate 1-A).

Where the Millersville and Livingston Limestones are well developed they constitute excellent markers for determining stratigraphic relationships for members within the overlying Mattoon Formation.

Mattoon Formation

The Mattoon Formation (fig. 2) is the youngest Pennsylvanian formation in Illinois. The formation is underlain by the Bond Formation, and the top is an erosional surface overlain for the most part by Pleistocene glacial deposits. A maximum of slightly more than 600 feet of Mattoon strata is preserved in the central part of the Illinois Basin in Jasper County. Outcrops are widely scattered, and reliable subsurface data, except for electric logs of oil tests, are scarce. Consequently, the lateral extent of many of the named units either has not been determined or has not been firmly established.

The stratigraphic position of several of the named members, especially in the upper part of the Mattoon Formation (*Virgilian Series*, fig. 2) is uncertain. The stratigraphic order (fig. 2) is based on Hopkins and Simon in Willman et al., 1975; but now it is thought that while the Greenup Limestone should lie above the Reisner Limestone, it should also lie below the Gila Limestone and probably the Woodbury Limestone as previously indicated by Newton and Weller, 1937, and Van Den Berg, 1956 (fig. 11).

Friendsville Coal Member. *The Friendsville Coal Member* (figs. 2, 6, 9) was named in the Patoka folio (Fuller and Clapp, 1904) for a coal mined in Wabash County near the town of Friendsville (Sec. 13 and 24, T. 1 N., R. 13 W.). The Friendsville Coal has been recognized with assurance only in this area in Wabash County, where it is commonly 30 to 48 inches thick. The coal lies approximately 50 to 55 feet below the Keensburg Coal Member, 390 to 410 feet above the West Franklin Limestone Member, and 250 feet above the Shoal Creek Limestone Member (fig. 6). The stratigraphic position of the Friendsville Coal is closely related to that of the Millersville Limestone Member, which

TABLE 4. Strippable resources of the Friendsville Coal Member (in thousand tons).

	Class I resources at overburden thickness (ft)			Class II resources at overburden thickness (ft)			Total	Mined out
County	0-50	50-100	Total	0-50	50-100	Total	I & II	(sq mi)
Wabash	34,531	12,422	46,953	64,009	40,758	104,767	151,720	0.14

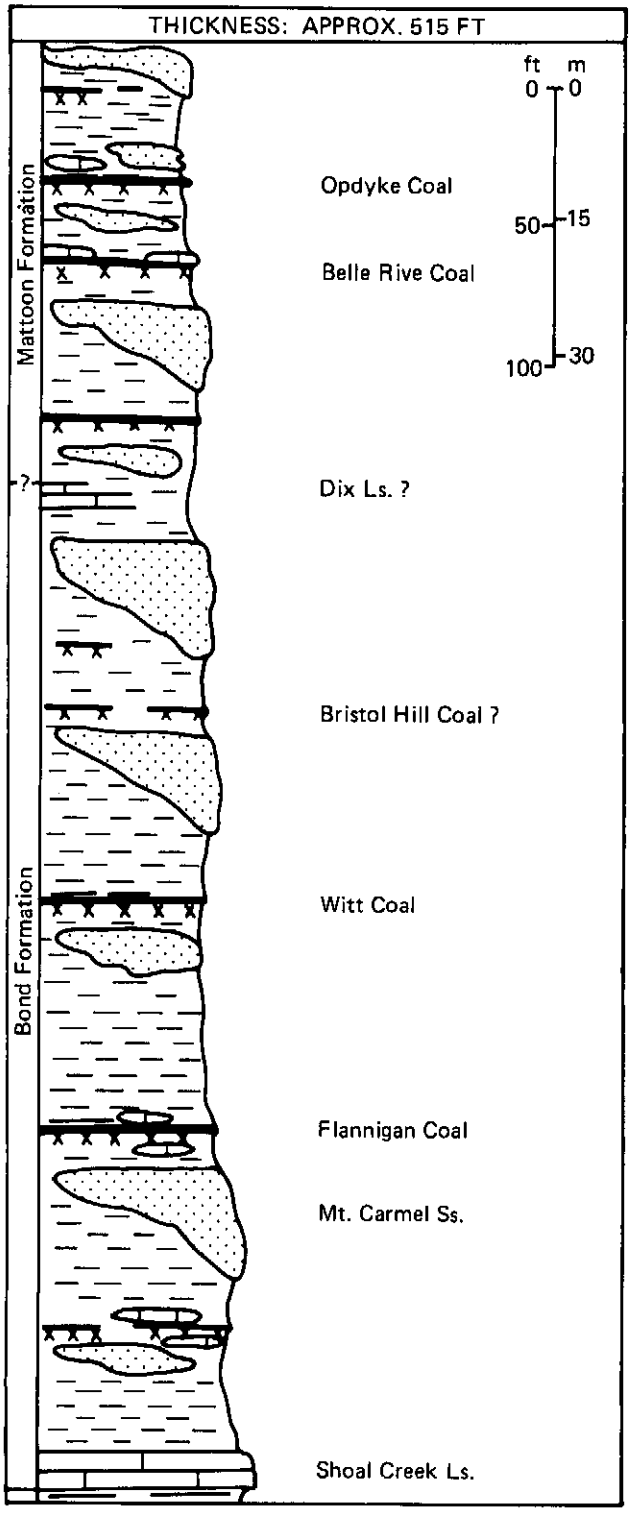


Figure 7. Generalized geologic section of the Bond and Mattoon Formations in the vicinity of Belle Rive, Jefferson County, interpreted from drill hole data and surface exposures.

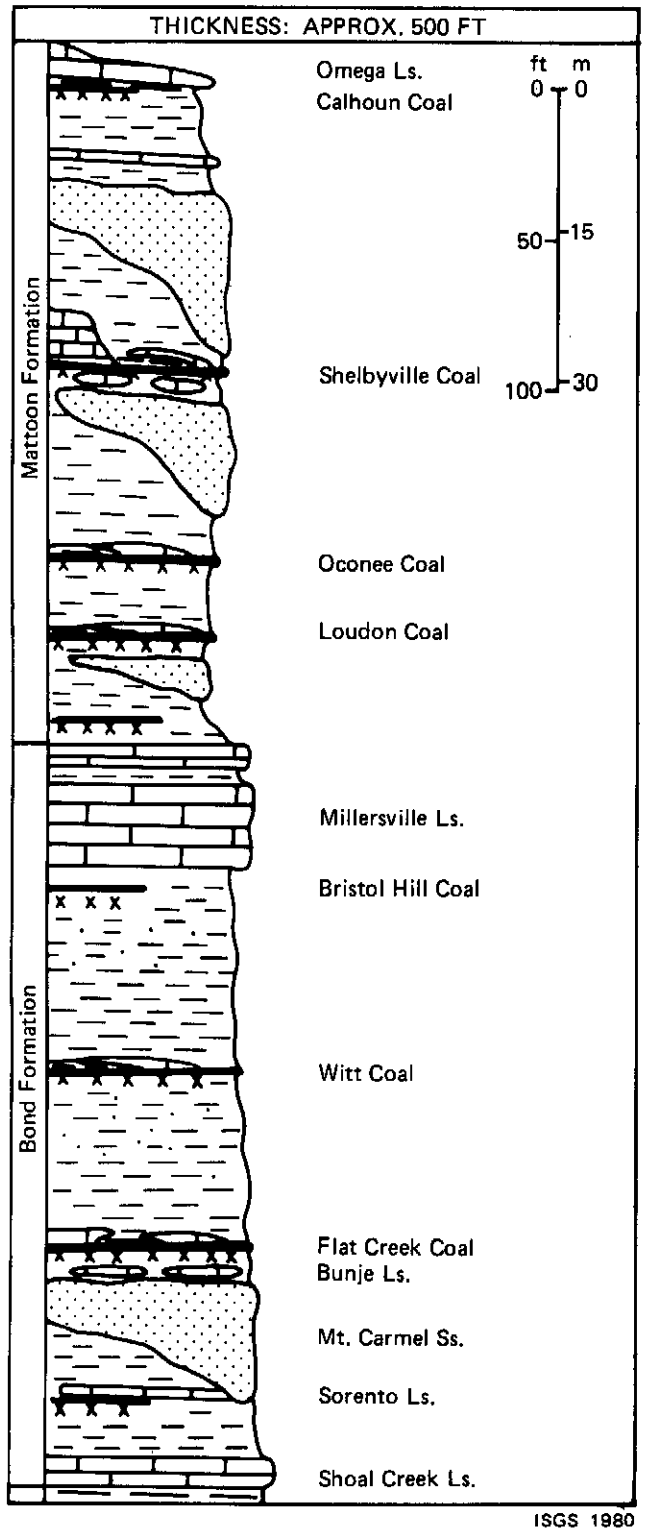


Figure 8. Generalized geologic section of the Bond and Mattoon Formations in the vicinity of Fancher, Shelby County, interpreted from drill hole data and surface exposures.

is not developed in Wabash County. Kosanke et al., 1960 (following Wanless, 1956) placed the Friendsville Coal stratigraphically above the Millersville Limestone and near the base of the Matoon Formation. The above stratigraphic interpretation will be retained for this report, although it is possible that the Friendsville Coal may correlate with the Bristol Hill Coal Member, which lies below the Millersville Limestone and within the Bond Formation.

The Friendsville Coal is present only in the western two-thirds of Wabash County and has been removed by erosion along drift-filled valleys and bedrock highs in part of this area. The coal is truncated along its eastern boundary (south of Mt. Carmel) by NE-SW trending faults of the Wabash Valley Fault System. The faults shown on plate 1-E are downthrown on the west and have up to 100 feet displacement (Bristol and Treworgy, 1979). Along the western boundary of Wabash County, the Friendsville Coal generally lies at depths of over 100 feet and becomes progressively deeper to the west in Edwards County.

The Friendsville Coal was mined in southern Wabash County from several shafts as deep as 90 feet (along McCleary's Bluff, Sec. 20, 21, and 29, T. 2 S., R. 13 W.). The seam was 3.5 to 4 feet thick with the upper 1 to 1.5 feet canneloid in appearance. The Friendsville Coal in this area was overlain by a limestone up to 6 feet thick (Fuller and Clapp, 1904) containing elongate fragments of phylloid algae. This limestone reportedly was lenticular and in some places was underlain by 3 feet or less of medium gray, calcareous shale becoming black in the lower portion. North of McCleary's Bluff the Friendsville Coal is more commonly overlain by medium-gray silty shale to argillaceous sandstone.

In the northern half of Wabash County the Friendsville Coal appears to thin slightly, averaging about 3 feet in thickness; however, the coal was reported to be 45 inches thick in the Lancaster Coal Company Mine (near the center of Sec. 27, T. 1 N., R. 13 W.) in Wabash County. The last coal mine to operate in the Friendsville Coal was the Allendale Coal Company strip pit, abandoned in 1965, located in Wabash County (NW ¼ NW ¼, Sec. 5, T. 1 N., R. 13 W.). The coal at this locality averaged about 3 feet in thickness and was overlain by gray silty shale. One massive calcareous coal ball approximately 6 feet in diameter was observed in this mine.

The Friendsville Coal cannot be traced with assurance northward into Lawrence County. However a coal reported to be 24 inches thick was mined (plate 1-B) approximately 3 miles south of Bridgeport (NE ¼ NW ¼ SE ¼, Sec. 29, T. 3 N., R. 12 W.). This coal is tentatively correlated with the Friendsville. The Friendsville Coal is probably present at shallow depths only in a fairly narrow band trending N-S through Lawrence County. Approximately 3 miles west of the mine near Bridgeport the bedrock begins to dip fairly steeply (150 ft/mi) toward Richland County, where the higher Calhoun Coal Member (fig. 2) is exposed off the east flank of the Clay City Anticline (fig. 4).

Resources amounting to 151,720,000 tons (table 4 and appendices) were calculated for the Friendsville Coal. All resources lie within Wabash County. Approximately 31 percent of these resources are within the Class I category, with an average thickness of about 38 inches. Approximately 65 percent of the resources is estimated to lie under 50 feet or less overburden. Some areas of Friendsville Coal have been densely drilled for oil and gas (1 well every 10 acres). These wells may be an obstruction to surface mining; no estimate has been made of the amount of coal which may be unminable.

Keensburg Coal Member (new). The Keensburg Coal (figs. 2, 6, 9) is here named as a member of the Mattoon Formation, McLeansboro Group, from an exposure on McCleary's Bluff 2.5 miles south of the village of Keensburg in Wabash County, Illinois (NW ¼ SW ¼ SE ¼, Sec. 29, T. 2 S., R. 13 W.). The Keensburg Coal is approximately 1 foot thick at its type exposure and lies about 7 feet above the McCleary's Bluff Coal Member and 50 to 55 feet above the Friendsville Coal. The McCleary's Bluff Coal (Kosanke et al., 1960) is a 3-inch-thick coal split by a thin claystone band and is known only from exposures at McCleary's Bluff and on Keys Hill in Wabash County (Sec. 25, T. 1 S., R. 13 W.).

The Keensburg Coal is not known to be exposed anywhere except at McCleary's Bluff; however (Cady et al., 1955), it is probably represented by coal cuttings at a depth of 23 feet from a well in Wabash County (NW ¼, Sec. 36, T. 1 S., R. 13 W.). This coal is probably fairly persistent in at least the southern half of Wabash County, and its subcrop limit would lie between the 50- and 100- foot overburden contours for the Friendsville Coal (plate 1-E). No resources have been estimated for the Keensburg Coal.

Loudon Coal Member (new). The Loudon Coal (figs. 8, 10) is named in this report as a member of the Mattoon Formation, McLeansboro Group, following unpublished field notes by M. E. Hopkins (1966) on file at the Illinois State Geological Survey. The name is derived from Loudon Township and the type locality is designated as an exposure in the south cut bank of Moccasin Creek in Loudon Township, Fayette County, Illinois (NE ¼ SW ¼ SE ¼, Sec. 23, T. 8 N., R. 3 E.). At this exposure the Loudon Coal is 15 inches thick and is overlain by 3 inches of medium-gray shale which occurs below the unconsolidated surficial material. Approximately 500 feet downstream the Loudon Coal is overlain by 8 feet of medium-dark gray to dark gray, fossiliferous shale. Occuring above this shale is a medium-gray limestone which attains a thickness of 1.5 feet and

weathers to a yellowish brown. This limestone has a sparry calcite cement and contains abundant crinoid plate and stem fragments, bryozoans, gastropods, and pelecypods (*Myalina* common).

The Loudon Coal lies approximately 30 to 40 feet above the Millersville Limestone and 25 to 40 feet below the Oconee Coal Member (fig. 8). The Loudon Coal has been recognized from surface exposures in only a small area on the east flank of the Louden Anticline (fig. 4). However, its position can be traced in the subsurface throughout most of the northern portion of the Fairfield Basin by utilizing electric logs. It is tentatively correlated with the Belle Rive Coal Member in the southern part of the report area, where the underlying Millersville Limestone is not developed.

Just east of the type section (NW ¼ SE ¼ SW ¼, Sec. 24, T. 8 N., R. 3 E.), the Loudon Coal attains a thickness of 20 inches. The coal is reported to be 16 to 18 inches thick approximately a half mile south of the above locality (NE ¼ NW ¼ NW ¼, Sec. 25, T. 8 N., R. 3 E.).

A total of 1,430,000 tons of strippable resource (table 5, and appendices) are mapped for the Loudon Coal in the above mentioned area (plate 2-E). All these resources are mapped at an average thickness of 18 inches, are in the Class I reliability category, and lie at a depth of 50 feet or less.

Belle Rive Coal Member (new). The Belle Rive Coal (figs. 2, 7) is named in this report as a member of the Mattoon Formation, McLeansboro Group, from an exposure located along a tributary to Goose Creek approximately 6 miles south of the village of Belle Rive in Jefferson County, Illinois (SE ¼ SE ¼ NE ¼, Sec. 35, T. 4 S., R. 4 E.). The coal at this locality is 24 inches thick and overlain by 3 feet of black shale. Approximately 4 feet of fairly thin-bedded limestone overlie the black shale. Near the center of the SE ¼ of the above section, the coal is also 2 feet thick, but is overlain by a medium-gray and somewhat silty shale. A pit was opened to the Belle Rive Coal (E ½, Sec. 5, T. 4 S., R. 4 E., Jefferson County) by Eads Coal Company in the summer of 1973. Operations were suspended in January, 1974. The coal averaged about 18 inches in thickness and was overlain by a medium-gray shale. The coal was also mined many years ago from a small pit just northwest of the town of Belle Rive in Jefferson County (NW ¼ NW ¼ NE ¼, Sec. 27, T. 3 S., R. 4 E.), where it was reportedly 18 inches thick. Within the vicinity of these localities, a total of 9,917,000 tons of strippable resources (table 6 and appendices) are mapped (plate 1-D) for the Belle Rive Coal in Jefferson County and adjacent Franklin County. Of the total resources, 59 percent are mapped within the Class I category, with an average thickness of 21 inches. All the strippable resources are estimated to lie at depths of 50 feet or less.

Within the mapped area, the Belle Rive Coal (fig. 7) lies 35 to 40 feet below the Opdyke Coal Member and 390 to 400 feet above the Shoal Creek Limestone. The latter interval thins to the north (plate 1-A) so that the Belle Rive Coal is tentatively correlated with the Loudon Coal Member, which lies 300 feet above the Shoal Creek Limestone in Fayette County.

While the stratigraphic position of the Belle Rive Coal can be traced on electric logs northward of the above area into Marion County, only the following coal exposures have been tentatively correlated with this coal: (1) A coal 2 feet thick reportedly exposed in Jefferson County (near the NW corner, Sec. 35 and near the center N ½, Sec. 36, T. 1 S., R. 2 E.). The coal contains a claystone split up to 5 inches thick near the middle of the seam, not an unusual occurrence in the Belle Rive Coal further south. (2) A coal approximately 370 feet above the Shoal Creek Limestone, reportedly 14 inches thick, was stripped in Jefferson County (SE ¼ SE ¼, Sec. 4, T. 1 S., R. 2 E.). (3) A coal 2 feet thick at about the same interval above the Shoal Creek Limestone was stripped in Marion County (NE ¼ NE ¼, Sec. 33, T. 2 N., R. 2 E.). This same coal was reported to be 15 inches thick where it was exposed near the center, Section 34, of this township. (4) The Belle Rive Coal may possibly correlate with a 20- to 24-inch coal reported in Marion County (NE ¼ NE ¼, Sec. 34, T. 4 N., R. 2 E.).

The Belle Rive Coal has not been traced in the subsurface east of the type area and no coal exposures have been correlated with this coal along the southern and eastern margins of the Fairfield Basin (fig. 4); however, southeast of the type area (in the northern portions of Sec. 4, 5, and 6, T. 6 S., R. 5 E., Hamilton County), a coal lying

TABLE 5. Strippable resources of the Loudon Coal Member (in thousand tons).

	Class I resources at overburden thickness (ft)			Class II resources at overburden thickness (ft)			Total	Mined out
County	0-50	50-100	Total	0-50	50-100	Total	I & II	(sq mi)
Fayette	1,430		1,430				1,430	

TABLE 6. Strippable resources of the Belle Rive Coal Member (in thousand tons).

	Class I resources at overburden thickness (ft)			Class II resources at overburden thickness (ft)			Total	Mined out
County	0-50	50-100	Total	0-50	50-100	Total	I & II	(sq mi)
Franklin	1,542		1,542	1,506		1,506	3,048	
Jefferson	4,283		4,283	2,586		2,586	6,869	0.2
Total	5,825		5,825	4,092		4,092	9,917	0.2

approximately 390 feet above the Shoal Creek Limestone has been reported. This coal was penetrated by several coal tests in which it occurred as two benches, each 1.0 to 1.5 feet thick, separated by a claystone 1.5 to 2 feet thick. In an exposure in the same township (SE ¼ NE ¼ NE ¼, Sec. 4), the coal was reported to be 27 inches thick with only a ½- to ¾- inch claystone band 15 inches below the top.

Opdyke Coal Member. The Opdyke Coal Member (figs. 2, 7, 9) was named by Cady et al., 1952, for a 20- to 24-inch thick coal seam present in the vicinity of Opdyke in Jefferson County, Illinois (T. 3 S., R. 4 E.). The name is here further defined to apply to an exposure of the Mattoon Formation within a small east flowing stream in Jefferson County, approximately 3 miles southeast of Opdyke (SW ¼ SW ¼ NW ¼, Sec. 34, T. 3 S., R. 4 E.). The Opdyke Coal is 21 inches thick at the above type locality and is directly overlain by surficial deposits. However, this coal has been stripped in the SW ¼ of the above section, and has recently been stripped by Eads Coal Company throughout most of Sections 3 and 4, T. 4 S., R. 4 E. and the western part of Section 25, T. 3 S., R. 4 E., Jefferson County, where the coal was 18 to 24 inches thick. In this area the Opdyke Coal is overlain by a thin (less than 6 inches) black shale, and a pyritic limestone containing calcareous shell fragments. The black shale and limestone are lenticular and the coal is often overlain by a medium-gray silty shale. A thin coal less than 3 inches thick lies 20 to 25 feet above the Opdyke Coal and underlies a claystone containing limestone nodules. The Opdyke Coal is exposed and has been mined from several pits and drifts along Auxier Creek northeast of Opdyke in T. 3 S., R. 4 E., Jefferson County. The coal here averages 18 inches in thickness and is generally overlain by medium-gray shale. The Opdyke Coal is also 18 inches thick along a tributary to Seven Mile Creek in Jefferson County (Sec. 2, T. 3 S., R. 3 E.).

In the above mapped areas (plate 1-D) near Opdyke, a total of 22,344,000 tons of strippable resources (table 7 and appendices) have been estimated. Of this total 74 percent are in the Class I category and have an average thickness of 19 inches. Approximately 99 percent of these resources lie at depths of 50 feet or less.

In this area the Opdyke Coal (fig. 7) lies approximately 430 feet above the Shoal Creek Limestone and 35 to 40 feet above the Belle Rive Coal. The Opdyke Coal is tentatively correlated (plate 1-A) with the Oconee Coal Member exposed in southwestern Christian County and on the east and northwest flank of the Louden Anticline (fig. 4) in Fayette County.

North of Mt. Vernon, Jefferson County, the Opdyke Coal appears to average between 12 and 16 inches in thickness in reported exposures near the center SE ½, Section 22, T. 2 S., R. 3 E. and in several of the east tributaries to Casey Creek in T. 1 S., R. 3 E., Jefferson County. The coal was mined along the west bank of Casey Creek (southwest of Texico in Sec. 17, T. 1 S., R. 3 E.) and is exposed in a stream bank east of Dix (Sec. 18, same township).

TABLE 7. Strippable resources of the Opdyke Coal Member (in thousand tons).

	Class I resources at overburden thickness (ft)			Class II resources at overburden thickness (ft)			Total	Mined out
County	0-50	50-100	Total	0-50	50-100	Total	I & II	(sq mi)
Jefferson	16,227	250	16,477	5,868		5,868	22,344	3.7

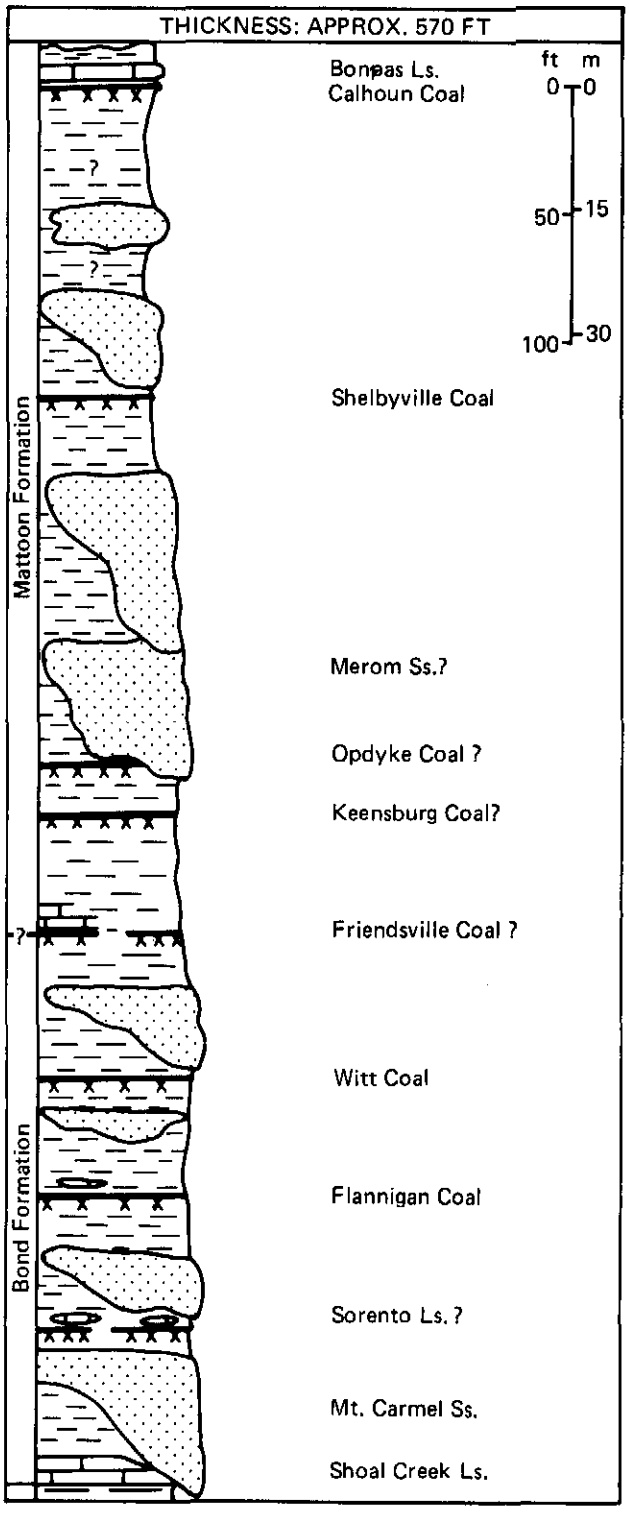


Figure 9. Generalized geologic section of the Bond and Mattoon Formations in the vicinity of Calhoun, Richland County, interpreted from drill hole data and surface exposures.

The presence of the Opdyke Coal has not been established northward into Marion County by surface exposures, although its position can be traced on electric logs. It is possible that the Opdyke Coal correlates with an 11- to 13-inch coal reported in Marion County (Sec. 27, T. 1 N., R. 2 E.) and a 10-inch coal exposed north of Alma in Marion County (Sec. 6, T. 3 N., R. 3 E.). The Opdyke Coal has not been traced in the subsurface east of the type area, and no coal exposures have been correlated with this coal along the southern and eastern margins of the Fairfield Basin.

Oconee Coal Member (new). The Oconee Coal (figs. 2 and 8) is named in this report as a member of the Mattoon Formation, McLeansboro Group, following unpublished field notes by M. E. Hopkins (1966) on file at the Illinois State Geological Survey. The type locality was designated as an exposure in a west flowing tributary to Coal Creek approximately 300 feet north of the county line road in Christian County (SE ¼ SE ¼ SE ¼, Sec. 34, T. 11 N., R. 1 E.) about 4 miles north of the village of Oconee. Twelve inches of coal were observed; however, the base was not seen. The coal is overlain by 14 inches of calcareous and fossiliferous claystone lying below an 18-inch limestone. This limestone, dark gray, very argillaceous, and fossiliferous, is capped by a black shale about 2 feet thick.

The Oconee Coal (fig. 8) lies approximately 25 to 40 feet above the Loudon Coal Member, 60 to 70 feet above the Millersville Limestone and 60 to 110 feet below the Shelbyville Coal Member. A 60-foot interval between the Oconee and Shelbyville Coals is generally common except where a well-developed sandstone up to 100 feet thick occurs between these coals (as in areas of Cumberland County). At the type locality of the Oconee Coal the interval to the Shoal Creek Limestone is approximately 365 feet; however, in Shelby County south of Shelbyville and off the north flank of the Louden Anticline (fig. 4) the interval is only about 300 feet (fig. 8). The Oconee Coal is tentatively correlated with the Opdyke Coal Member (plate 1-A) in the southern part of the report area.

The Oconee Coal is exposed in several outcrops along Coal Creek in Christian County (Sec. 34, T. 11 N., R. 1 E.) and in Shelby County (Sec. 3, T. 10 N., R. 1 E.) near its type locality (plate 1-B). The total coal thickness varies from 15 to 24 inches in these exposures and may contain up to three thin shale bands. South of the type area the Oconee Coal was mined in Shelby County from small pits (NW ¼ SW ¼ SW ¼, Sec. 15, T. 9 N., R. 1 E.) and in Fayette County (NE ¼ NE ¼ NW ¼, Sec. 22, T. 9 N., R. 1 E.). Both of these mines were along Little Creek where the coal was reportedly 2 to 2.5 feet thick. East of the above area two exposures of what is thought to be the Oconee Coal occur along the east bank of the Kaskaskia River in Fayette

County (NE ¼ SW ¼ NE ¼ and NW ¼ NE ¼ NE ¼ , Sec. 28, T. 9 N., R. 3 E.). The coal here occurs along the northwest flank of the Louden Anticline and was reported to be 11½ inches in thickness. On the east flank of the Louden Anticline, the Oconee Coal is exposed in Fayette County (NW ¼ SE ¼ NW ¼, Sec. 25, T. 8 N., R. 3 E.) and is only about 9 inches thick (plate 2-E). Southwest of the above location a 10-inch coal thought to be the Oconee Coal is exposed in Fayette County, approximately one mile northwest of St. Elmo (SW ¼ NW ¼ NE ¼, Sec. 21, T. 7 N., R. 3 E.).

While the Oconee Coal appears to be fairly thin on the flanks of the Louden Anticline, it may average 2 feet in thickness west and northwest of the anticline. The position of the Oconee Coal can be traced in the subsurface on electric logs throughout Shelby, Cumberland, Effingham, and Jasper Counties, but its thickness in these areas is not known. The subcrop boundary of the coal lies under fairly thick drift north of Shelby and Cumberland Counties and no exposures of the Oconee Coal are known along the west flank of the LaSalle Anticlinal Belt (fig. 4) in eastern Cumberland and Jasper Counties. As mentioned previously, the Oconee Coal is tentatively correlated with the Opdyke Coal, which is thought to be fairly thin in Marion and northern Jefferson Counties and has not been traced into the southeastern part of the report area.

The Oconee Coal is mapped in the vicinity of its type locality in Christian County (plate 2-D) and in conjunction with the Loudon and Shelbyville Coals in a small area on the east flank of the Louden Anticline (plate 2-E). The coal is less than 18 inches in the latter area and varies between 15 and 24 inches near the type locality, so that no attempt was made to estimate strippable resources for the Oconee Coal.

Shelbyville Coal Member. The Shelbyville Coal Member (figs. 2, 8, 9, 10) was referred to as the "Shelby coal" by G. C. Broadhead in his discussion on the geology of Shelby County (Worthen, 1875, p. 171). Worthen (1875, p. 2) included the "Shelby coal" in his general lithologic section; however, he used the term "Shelbyville seam" in discussing probable coal correlations (Worthen, 1875, p. 49). Kay (1915, p. 217) made clear that the term "Shelbyville" was preferred over "Shelby."

The type section of the Shelbyville Coal Member is designated in this report as an exposure of the Mattoon Formation in a road ditch on the south side of Thompson Mill Bridge over the Kaskaskia River in Shelby County (near the center of the NE ¼ NW ¼, Sec. 1, T. 9 N., R. 3 E.). The above section is located approximately 10 miles south of the town of Shelbyville and about 2 miles southwest of the village of Fancher. The coal at the above locality is 26 inches thick and is overlain by a medium-gray limestone (weathered reddish brown) consisting dominantly of medium-grained crinoidal clasts and fairly abundant elongate coal detritus. Approximately 6 feet of limestone containing a 14-inch thick shale split 4 feet above the base are exposed at this locality. The caprock limestone is lenticular in this area, with the coal normally overlain by about 45 feet of silty shale or, occasionally, sandstone.

Cady (1952) expressed some doubt as to whether the coal exposed in the vicinity of Fancher correlates with the coal which was mined to the north near Shelbyville. However, the equivalence of these coals has been demonstrated by Bleuer (1967) as well as by the present study. In Shelby County, the Shelbyville Coal Member (fig. 8) normally lies between 125 and 150 feet above the Millersville Limestone Member, 60 feet above the Oconee Coal Member and about 75 feet below the Omega Limestone Member.

The Shelbyville Coal is exposed and has been mined from shallow shafts, drifts and small pits along the tributaries and northeast trending valleys of Mud and Robinson Creeks in an area between the towns of Shelbyville and Tower Hill. The coal is also exposed and has been mined along the Kaskaskia River and its tributaries from about 2 miles northeast of Shelbyville to approximately 1 mile north of the southern boundary of Shelby County where the coal subcrops along the northern flank of the Louden Anticline.

TABLE 8. Strippable resources of the Shelbyville Coal Member (in thousand tons).

	Class I resources at overburden thickness (ft)			Class II resources at overburden thickness (ft)			Total	Mined out
County	0-50	50-100	Total	0-50	50-100	Total	I & II	(sq mi)
Effingham	1,179		1,179				1,179	
Fayette	545		545				545	
Shelby	14,461	24,180	38,640	12,379	15,894	28,272	66,912	
Total	16,185	24,180	40,364	12,379	15,894	28,272	68,636	

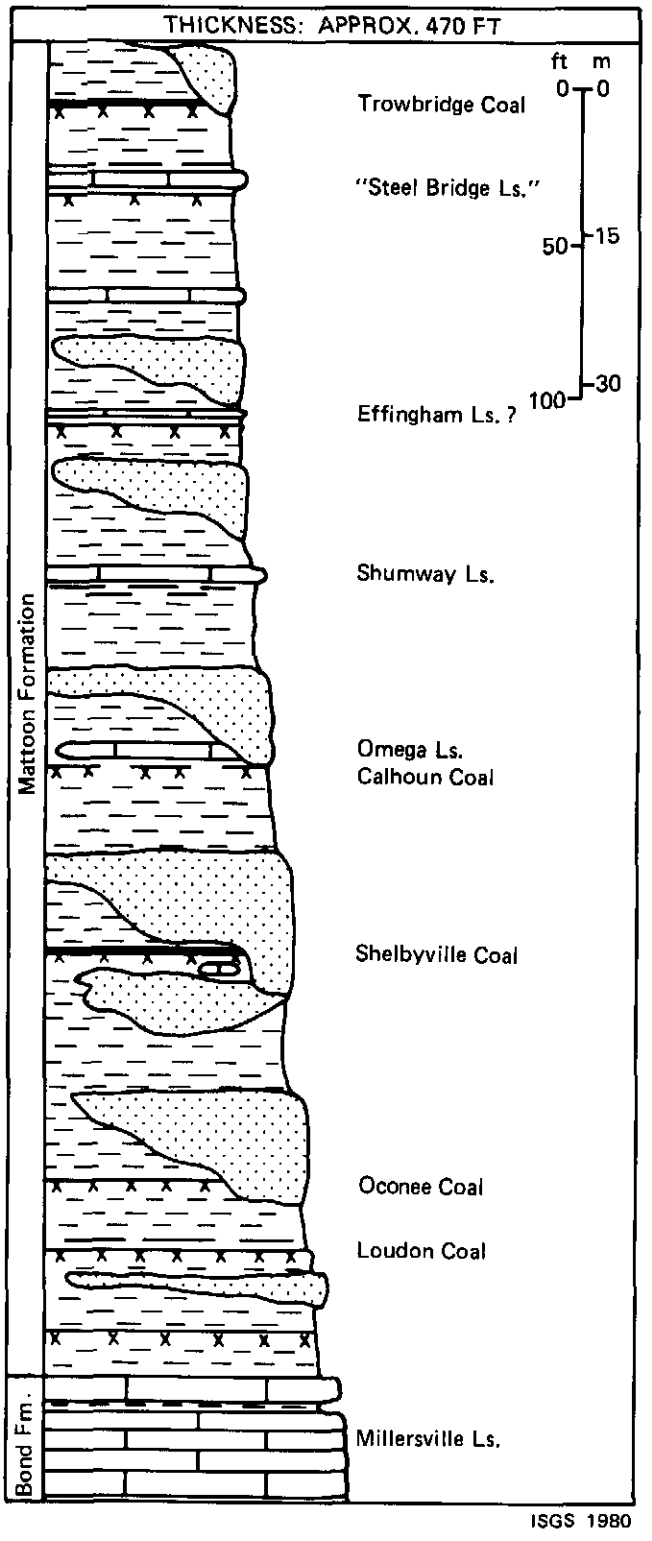


Figure 10. Generalized geologic section of the Mattoon Formation in the vicinity of Trowbridge, Shelby County, interpreted from drill hole data and surface exposures.

In Shelby County, the Shelbyville Coal dips generally to the east and lies under fairly thick surficial deposits (fig. 3) north of the Wisconsinan glacial boundary in the northern portion of the county. The coal is truncated to the west by a northwest-southeast trending drift-filled valley from the town of Tower Hill (8 miles west of Shelbyville) to the town of Cowden, approximately 2 miles west of the type section (plate 2-C).

The Shelbyville Coal varies in thickness from about 16 to 26 inches and averages about 20 inches in the areas where it is exposed and has been mined in Shelby County. The coal is normally overlain by 40 to 50 feet of silty shale and or sandstone, with the sandstone generally better developed to the north in the area of Shelbyville (Bleuer, 1967). Occasionally the Shelbyville Coal may be overlain by a black shale up to 3 feet thick which has been noted in a few exposures and mines along the east side of Mud Creek and in the southern portion of Robinson Creek. As at its type section, the Shelbyville Coal may be overlain by a lenticular crinoidal limestone up to 6 feet thick. This limestone was observed to have a maximum thickness of about 5 feet and a lateral continuity of approximately 100 feet in a northeast-southwest direction, in an excavation pit in Shelby County for the Lake Shelbyville Dam spillway (NE ¼ SE ¼ SW ¼, Sec. 8, T. 11 N., R. 4 E.).

In Shelby County, approximately 4 miles south of Shelbyville (along the northern boundary of Sec. 6, T. 10 N., R. 4 E.) and to the west (in the south half of Sec. 34 and 35, T. 11 N., R. 3 E.) a 25-foot limestone lying approximately 3 to 6 feet above the Shelbyville Coal is exposed. This limestone is apparently present in an east-west band probably no more than 1 mile wide and may, as suggested by Bleuer (1967), have been deposited in a topographic low, as the interval between the Millersville Limestone and the Shelbyville Coal decreases by about 25 feet in this area. The argillaceous, cherty limestone contains shale beds and has marine shell fragments in the basal 2 to 5 feet. Northwest of this area a similar limestone up to 30 feet thick is exposed west of Robinson Creek in the southwest portion of T. 11 N., R. 3 E., Shelby County, and between the town of Tower Hill and Mud Creek in the northeastern portion of T. 11 N., R. 2 E., Shelby County. This limestone crops out in a narrow band trending northwest-southeast and may be an extension of the previous east-west trend; however, in an area approximately 2 miles northeast of Tower Hill this limestone is underlain by up to 35 feet of sandstone, and it is not known whether the Shelbyville Coal is present below this sandstone or whether it has been eroded by channeling. This relatively thick limestone is thought to be older than the uppermost shale and sandstone present above the Shelbyville Coal in the vicinity of Shelbyville and, as suggested by Bleuer (1967), may, in part, be older than the crinoidal caprock limestone.

Approximately 6 miles northeast of the Shelbyville

Coal type locality in Shelby County, a 6- to 18-inch limestone containing abundant pelecypod (*Myalina*) shells is exposed (N ½ SE ¼, Sec. 23, T. 9 N., R. 4 E.). This limestone lies 40 to 45 feet above the Shelbyville Coal and 30 to 35 feet below the Omega Limestone Member (fig. 8). The Omega Limestone would generally be less than 5 feet thick in this area; however, it attains a thickness of 14 feet where it has been quarried along Brush Creek in Shelby County (NE ¼, Sec. 25, T. 9 N., R. 4 E.).

South of Shelby County, the Shelbyville Coal Member is exposed on the east flank of the Louden Anticline along Cedar Creek in Effingham County (SW ¼, Sec. 30, T. 8 N., R. 4 E.) (plate 2-E). At this locality the coal is 20 to 22 inches thick, dips approximately 50 feet per mile to the southeast and is overlain by 50 feet or more of fairly massive sandstone. It was mined in small drift pits at this location. On the southeast flank of the Louden Anticline, the Shelbyville Coal is exposed along the south cutbank of Hickory Creek in Fayette County (NE ¼ SE ¼ SW ¼, Sec. 34, T. 6 N., R. 3 E.) and has also been reported along a tributary to Hickory Creek approximately one-half mile north of the previous exposure. At the above localities the Shelbyville Coal varies from about 20 to 26 inches in thickness and appears canneloid in character. At the Hickory Creek exposure the coal contains small bivalved arthropods (*Estheria*) and is similar in appearance to a black, sheety shale. At both exposures the coal is overlain by about 1 foot of black shale which underlies, and may be cut out by, a sandstone.

No coal exposures in Marion County south of the Louden Anticline have as yet been correlated with the Shelbyville Coal. However, the Shelbyville Coal horizon has been recognized in the subsurface on electric logs in eastern Marion County (plate 1-A), northern Wayne County, and throughout the deep portion of the Illinois Basin northward to Coles County.

A total of 68,636,000 tons of strippable resources (table 8 and appendices) has been estimated within the mapped areas of the Shelbyville Coal in Effingham, Fayette, and Shelby Counties (plate 2-C,E). Approximately 57 percent of these resources is within the Class I reliability category with an average thickness of slightly over 22 inches. About 43 percent of the resources lie at depths of 50 feet or less. Coal resources amounting to 5,161,000 tons underlying 2.5 square miles of Lake Shelbyville were excluded.

Calhoun Coal Member. The Calhoun Coal member (figs. 2, 8, 9, and 10) was named by Noe (1934) in a discussion of coal balls collected from a small surface mine near the town of Calhoun in Richland County, Illinois. Kosanke et al. (1960) designated the Calhoun Coal as a member of the Mattoon Formation in the McLeansboro Group and located its type section in Richland County (NE ¼ NE ¼ NE ¼ Sec. 6, T. 2 N., R. 14 W.). The type exposure occurs in a north-south road ditch south of an east-flowing tributary to Bonpas Creek and approximately 2 miles east of Calhoun. At the above locality the Calhoun Coal Member is 16 inches thick and is overlain by the Bonpas Limestone Member. This limestone is 3 feet thick and medium-gray (weathering with a reddish cast), containing abundant brachiopod fragments (many *Chonetes*) and crinoidal debris. The Bonpas Limestone is medium to thick bedded in the upper part and tends to be very argillaceous and thin bedded near the base. It is present over nearly all the mapped area in Richland and Lawrence Counties and normally varies from 2 to 4 feet in thickness.

Near its type area, the Calhoun Coal (fig. 9) lies 750 feet above the West Franklin Limestone Member, 560 feet above the Shoal Creek Limestone Member, and approximately 110 feet above the estimated position of the Shelbyville Coal. The coal is exposed and has been mined from several small pits along the tributaries to Bonpas Creek in T. 2 and 3 N., R. 14 W., Richland County, for about 6 miles north of the county line. Approximately 6 miles to the east, along the east-flowing tributaries to Little Bonpas Creek in Lawrence County, the Calhoun Coal subcrops near the base of the relatively steep (70-100 feet/mile) west flank of the LaSalle Anticlinal Belt (fig. 4). West of Parkersburg (T. 2 N., R. 10 E., Richland County) the Calhoun Coal subcrop is overlain by thick drift.

The Calhoun Coal dips mainly to the north at about 30 feet/mile where it is exposed along Bonpas Creek in Richland County, and it varies in thickness from about 12 inches to 30 inches. While the Calhoun Coal attained a maximum thickness of 30 inches at a small abandoned limestone quarry and strip mine in Richland County (NE ¼ SW ¼, Sec. 5, T. 2 N., R. 14 W.), it averages only about 18 inches in thickness and is thought to be variable in thickness throughout the area of mapped resources (plate 2-B). Along the mapped subcrop west of Little Bonpas Creek in Lawrence County, the Calhoun Coal appears to average only about 14 inches in thickness where data are available. In Lawrence County (Sec. 7, T. 2 N., R. 13 W.), the Calhoun Coal reportedly contains abundant coal balls (calcareous nodules of petrified plant material) which may dominate the entire thickness of the coal seam.

In the mapped area of the Calhoun Coal (plate 2-B) in Richland and Lawrence Counties, 6,282,000 tons of strippable resources (table 9, and appendices) have been mapped, all lying within Richland County. All these resources are within the Class I reliability category, lie at depths of 50 feet or less, and have an average thickness of approximately 22 inches.

The Calhoun Coal is reported to be 24 inches thick in an abandoned quarry of the overlying Bonpas Limestone in Wayne County approximately 3 miles north of Fairfield (NE ½ NE ¼ Sec. 20, T. 1 S., R. 8 E.). In another quarry 2

TABLE 9. Strippable resources of the Calhoun Coal Member (in thousand tons).

	Class I resources at overburden thickness (ft)			Class II resources at overburden thickness (ft)			Total	Mined out
County	0-50	50-100	Total	0-50	50-100	Total	I & II	(sq mi)
Richland	6,282		6,282				6,282	

miles to the southwest, 12 to 15 inches of coal reportedly underlie 4 feet 2 inches of limestone. In this area the Calhoun Coal is preserved in a small elongate outlier probably no more than 1.5 miles wide extending from the town of Fairfield to about 3.5 miles north.

On the basis of its stratigraphic position above the Shelbyville Coal Member, the Calhoun Coal is considered to be equivalent to the coal underlying the Omega Limestone Member (Bonpas Limestone equivalent) which is exposed in portions of Marion, Clay, Effingham, and Shelby Counties (plate 1-B). According to Weller and Bell (1936), the type section of the Omega Limestone is located in an abandoned quarry in Marion County (N½ NW¼ NE¼, Sec. 30, T. 3 N., R. 4 E.). In this area the Omega Limestone varies from about 2 to 10 feet in thickness and lies approximately 100 feet above the Shelbyville Coal position.

In the type area of the Omega Limestone the Calhoun Coal is lenticular and varies up to about 10 inches in thickness. However, the Calhoun Coal was mined from several abandoned shafts less than 40 feet in depth along the south side of the east-flowing creek near the center of Section 20, T. 6 N., R. 4 E., Effingham County. In these mines the coal varied from 18 to 48 inches in thickness and was overlain by 3 to 7 feet of Omega Limestone. Approximately 4 miles east of this area in Effingham County (Sec. 11 and 12, T. 6 N., R. 4 E., and Sec. 7, 17, and 18, T. 6 N., R. 5 E.), are several outcrops and exposures of the Calhoun Coal in abandoned limestone quarries along Fulfer and Limestone Creeks. The thickness of the coal at these localities varies between 10 and 18 inches. Approximately 6 to 12 inches of the Calhoun Coal is exposed in an abandoned limestone quarry located in Clay County (NW ¼ SE ¼ Sec. 11, T. 4 N., R. 5 E.); however, in one locality the coal is reportedly 50 inches thick. In Shelby County (SE ¼ Sec. 23, T. 10 N., R. 4 E.) the Calhoun Coal lies 1.5 feet below the Omega Limestone and attains a thickness of 13 inches. However, a 9-inch lower bench of coal is reported to occur locally 1 to 14 inches below the main seam. The Calhoun Coal is present only locally in this area.

Trowbridge Coal Member. Cady (1948) named the Trowbridge Coal Member (figs. 2, 10) for the village of Trowbridge in southeastern Shelby County, near which the coal cropped out along the south side of the road about ¼ mile west of the SE corner of Section 11, T. 10 N., R. 6 E. This coal is reported to be 2.5 feet thick, overlain by brownish-gray silty shale, and underlain by poorly-bedded silty shale with limestone concretions containing a few *Spirorbis* fragments. In the vicinity of its type area the Trowbridge Coal (fig. 10) is estimated to lie 180 to 200 feet above the Omega Limestone Member, 250 feet above the Shelbyville Coal Member, and 380 to 400 feet above the Millersville Limestone Member.

Cady (1937, plate XIV) mapped the subcrop of the Trowbridge Coal along Copperas Creek and the Little Wabash River in eastern Shelby County between Trowbridge and Neoga; he referred to this coal as the Shelbyville Coal, erroneously correlating it with the stratigraphically lower coal exposed to the west near the town of Shelbyville. In 1952 Cady calculated a total of 16,269,000 tons of resources of the Trowbridge Coal with an average thickness of 28 inches in portions of Shelby and Cumberland Counties. The mapped area of the Trowbridge Coal (plate 2-F) and the resources (table 10) within this report are only slightly modified from Cady (1937 and 1952).

The Trowbridge Coal crops out and has been mined both from small strip mines and shallow shafts where it averages 28 inches in thickness along the Little Wabash River and Copperas Creek in the eastern portion of T. 10 N., R. 6 E., Shelby County. The coal subcrops approximately 2.5 miles west of Neoga and may be eroded east of the mapped area in the vicinity of Neoga in Cumberland County. A channel sandstone overlies theTrowbridge Coal in a northwest flowing tributary to the Little Wabash River (near the center of the W ½ Sec. 12, T. 10 N., R. 6 E.) and may locally cut out the coal.

A 2.5- to 6- foot limestone (locally referred to as the "Steel Bridge Limestone") containing ostracods and *Spirorbis* occurs 15 to 25 feet below the Trowbridge Coal and is exposed in Shelby County (near the center of Sec. 22, T. 10 N., R. 6 E.). At this exposure a black sheety shale up to 2 feet thick lies about 2 feet above this limestone. These beds probably occupy a position between the Trowbridge Coal and the Effingham Limestone Member (fig. 10).

The Trowbridge Coal is not known outside the mapped area shown on plate 2-F and its position has not as yet been

traced on electric logs to the east and southeast. The stratigraphic position of the Trowbridge Coal must be considered as somewhat uncertain. Hopkins and Simon (1975) placed the Trowbridge Coal between the Bogata Limestone and Effingham Limestone Members (fig. 2) on the basis of the estimated intervals of these units above the Millersville Limestone at their respective type localitites. However, as this interval is thought to be somewhat variable, it is possible that the Trowbridge Coal is equivalent to a 2-foot coal which has been mined in the vicinity of Newton and lies above the Bogata Limestone and below the Reisner Limestone Member (fig. 11). In this case the "Steel Bridge Limestone" may be equivalent to the upper bench of the Bogata Limestone.

In this study, approximately 17,002,000 tons of strippable resources (table 10 and appendices) were mapped for the Trowbridge Coal with an average coal thickness of 28 inches. About 87% of these resources occur in Shelby County, with approximately 50 percent of the total resources classified as Class I and about 97% of the resources lying at depths of 50 feet or less. Strippable resources of the Trowbridge Coal underlying Lake Mattoon (plate 2-F) were excluded.

Unnamed Coal Member. An unnamed coal (fig. 11) lying between the Reisner Limestone Member and the Bogata Limestone Member is reported to be 28 to 32 inches thick in three small abandoned drift or slope mines located approximately a half-mile east and southeast of the town of Newton, Wade Township, Jasper County. The reported locations of these mines are: (1) NW ¼ NE ¼ SW ¼ Sec. 6, T. 6 N., R. 10 E., Jasper County; (2) SW ¼ SW ¼ SE ¼ Sec. 6, T. 6 N., R. 10 E., Jasper County; (3) NW ¼ NW ¼ NE ¼ Sec. 7, T. 6 N., R. 10 E., Jasper County. No exposures of this coal have been identified; but this same coal was probably mined from a shaft reported to be 136 feet deep located in Jasper County, approximately 2.5 miles northwest of Newton (NW ¼ NE ¼ SE ¼ Sec. 27, T. 7 N., R. 9 E.). The coal was indicated to be 3 to 4 feet thick in this mine.

The U.S. Corps of Engineers drilled approximately 12 holes about 8 miles northwest of Newton (Sec. 26, 27, 28, T. 8 N., R. 9 E.) which encountered 2 to 2.4 feet of what is thought to be this same coal at elevations between 410 an 425 feet above mean sea level. The coal encountered in these holes was 40 feet below the Reisner Limestone Member and about 10 to 15 feet above the upper bench of the Bogata Limestone Member.

Although this coal is estimated to lie approximately 450 feet above the Millersville Limestone, it is possible that it may be equivalent to the Trowbridge Coal Member. The Trowbridge Coal, exposed in northwestern Cumberland County and adjacent Shelby County, lies approximately 400 feet above the Millersville Limestone (fig. 10).

Greenup Limestone Member. The Greenup Limestone Member (fig. 2) was named (Newton and Weller, 1937) for the town of Greenup, Cumberland County, Illinois. The type section (Kosanke et al., 1960) consists of exposures along the valley wall of the Embarras River just west of Greenup (C W ½ NE ¼ Sec. 3, T. 9 N., R. 9 E.). The Greenup Limestone is the youngest known relatively thick marine limestone within the Mattoon Formation in Illinois. It is known from several outcrops in Jasper, Cumberland, and Coles Counties, where it is up to 8 feet thick and has been locally quarried.

The Greenup Limestone, often relatively pure with abundant open-marine fauna, is dominated by brachiopods, crinoids and occasional corals, and may contain abundant fusulinids. The Greenup Limestone may grade laterally into nodular limestone with a claystone or shale matrix.

Near its type section the Greenup Limestone is estimated to lie approximately 500 feet above the Millersville Limestone. Further south, what is considered to be the Greenup Limestone (Newton and Weller, 1937) crops out in Jasper County along a tributary to the Embarras River (Sec. 28 and 29, T. 8 N., R. 9 E.), along Mint and Slate Creeks (Sec. 7, T. 7 N., R. 9 E.). The Greenup Limestone in the latter two areas is estimated to lie 575 feet to almost 600 feet above the Millersville Limestone. This increase in interval is thought to result partly from an increase in

TABLE 10. Strippable resources of the Trowbridge Coal (in thousand tons).

	Class I resources at overburden thickness (ft)			Class II resources at overburden thickness (ft)			Total	Mined out
County	0-50	50-100	Total	0-50	50-100	Total	I & II	(sq mi)
Cumberland	172		172	1,987		1,987	2,159	
Shelby	8,174	69	8,243	6,298	303	6,601	14,843	
Total	8,346	69	8,415	8,285	303	8,588	17,002	

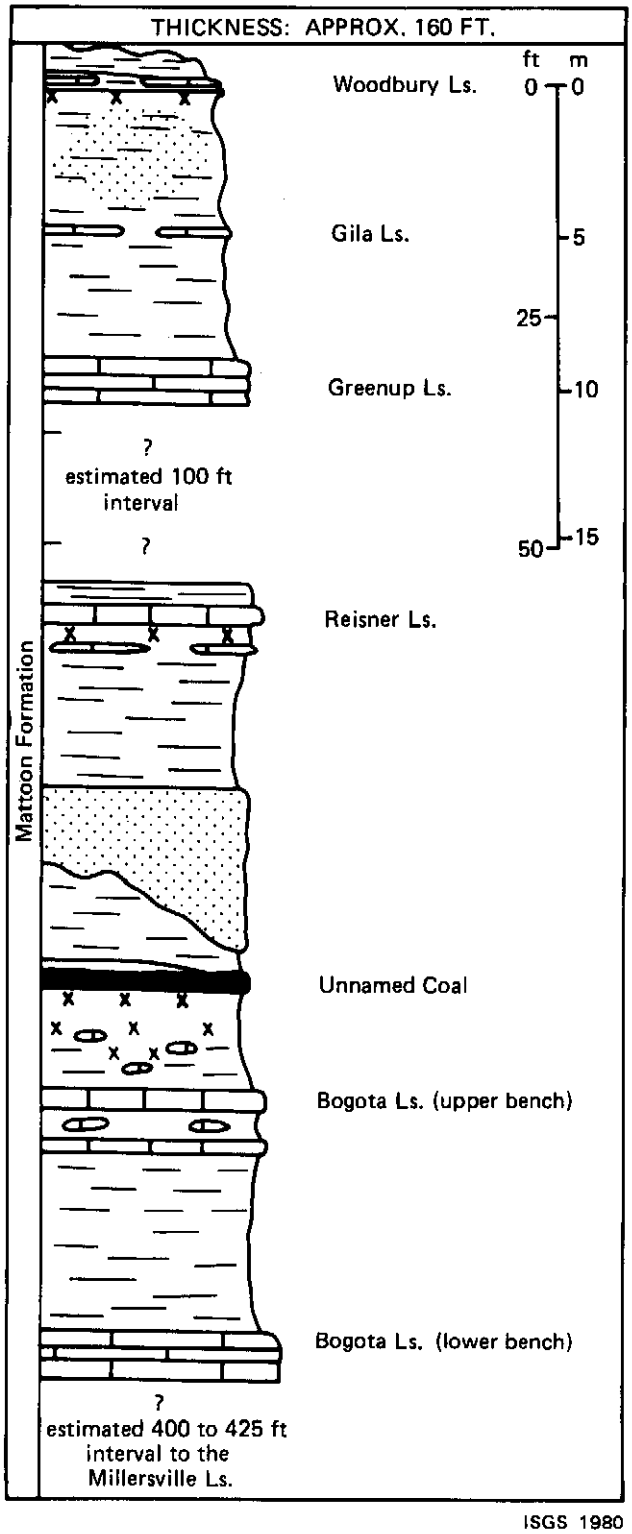


Figure 11. Generalized geologic section of the uppermost Mattoon Formation in the vicinity of Gila, Jasper County, interpreted from drill hole data and surface exposures.

thickness of sandstone between the Millersville Limestone and Shelbyville Coal. A hole drilled by the U.S. Corps of Engineers, probably located in Section 28, T. 8 N., R. 9 E., Jasper County encountered 5.5 feet of limestone at a depth of 24 feet. This limestone is considered to be the Greenup and lies at an elevation approximately 100 feet above the Reisner Limestone Member (fig. 11) encountered in adjacent holes. The type section of the Reisner Limestone is located in Jasper County (NE ¼ NE ¼ Sec. 16, T. 7 N., R. 10 E.) and consists of a 9-inch marine limestone with abundant small brachiopods overlain by a 1.5-foot black shale. The Reisner Limestone is estimated to lie 475 to 500 feet above the Millersville Limestone.

Gila Limestone Member. Field relationships in northwestern Jasper County (Newton and Weller, 1937) indicate that the Greenup Limestone lies approximately 10 to 15 feet below the Gila Limestone Member (fig. 11). The Gila Limestone consists of a 3.5-inch lenticular limestone containing a few fish scales and teeth, and its type section is located along Mint Creek in Jasper County (NE ¼ SW ¼ Sec. 31, T. 8 N., R. 9 E.).

Woodbury Limestone Member. Newton and Weller (1937) indicate that the Gila Limestone lies about 20 to 30 feet below the Woodbury Limestone Member (fig. 11) a lenticular bed 3 to 6 inches thick at its type locality in Cumberland County (S ½ SE ¼ Sec. 32, T. 9 N., R. 8 E., Cumberland County). The Woodbury Limestone is reddish brown, contains abundant marine shell fragments, and overlies a 5-inch coal bed. The exact stratigraphic position of the Woodbury Limestone is not clear and is based primarily on the presence of a 4- to 5- inch coal lying above the Gila Limestone at its type locality along Mint Creek in Jasper County.

REFERENCES

Andresen, M. J., 1956, Subsurface stratigraphy and sedimentation of the West Franklin-Cutler Limestone zones of southern Illinois: unpublished Masters thesis, University of Illinois, 32 p.

Bleuer, N. K., 1967, Geology of the southeast quarter of the Shelbyville, Illinois, Quadrangle: unpublished Masters thesis, University of Illinois, 140 p.

Bristol, H. M., and J. D. Treworgy, 1979, The Wabash Valley fault system in Illinois: Illinois State Geological Survey Circular 509, 19p.

Cady, G. H., 1935, Classification and selection of Illinois coals: Illinois State Geological Survey Bulletin 62, 354 p.

Cady, G. H., 1937, Summary list of areas in western, northern, and central Illinois recommended for special investigation as possibly suitable for strip mining: Illinois State Geological Survey *Circular* 19, 6 p.

Cady, G. H., 1948, Analyses of Illinois coals: Illinois State Geological Survey Supplement Bulletin 62, 77 p.

Cady, G. H., 1952, Minable coal reserves of Illinois: Illinois State Geological Survey Bulletin 78, 138 p.

Cady, G. H., M. B. Rolley, Adabell Karstrom, M. A. Parker, and M. E. Hopkins, 1955, Subsurface geology and coal resources of the Pennsylvanian System in Wabash County, Illinois: Illinois State Geological Survey Report of Investigations 183, 24p.

Clegg, K. E., 1961, Subsurface geology and coal resources of the Pennsylvanian System—Sangamon, Macon, Menard, and parts of Christian and Logan Counties, Illinois: Illinois State Geological Survey Circular 312, 28 p.

Culver, H. E., 1925, Preliminary report on coal-stripping possibilities in Illinois: Illinois State Geological Survey Illinois Cooperative Coal Mining Investigations Bulletin 28, 61 p.

Damberger, H. H., 1970, Clastic dikes and related impurities in Herrin (No. 6) and Springfield (No. 5) Coals of the Illinois Basin, *in* Depositional environments in parts of the Carbondale Formation—western and northern Illinois: Illinois State Geological Survey Guidebook 8, p. 111-119.

Damberger, H. H., 1973, Physical properties of the Illinois Herrin (No. 6) Coal before burial, as inferred from earthquake-induced disturbances: *in* Seventh International Congress of Carboniferous Stratigraphy and Geology, Compte Rendu, v. 2, p. 341-350.

Fuller, M. L., and F. G. Clapp, 1904, Description of the Patoka, Indiana-Illinois Quadrangle: U. S. Geological Survey Atlas Folio 105, 12 p.

Hopkins, M. E., 1966, Unpublished field notes on file at Illinois State Geological Survey.

Hopkins, M. E., and J. A. Simon, 1975, Pennsylvanian System *in* Handbook of Illinois stratigraphy: Illinois State Geological Survey Bulletin 95, p. 163-200.

Horberg, C. L., 1950, Bedrock topography of Illinois: Illinois State Geological Survey Bulletin 73, 111 p.

Horne, J. C., 1968, Detailed correlation and environmental study of some late Pennsylvanian units of the Illinois Basin: Unpublished Ph.D. thesis, University of Illinois, 49 p.

Jacobson, R. J., and L. E. Bengal, forthcoming, Strippable coal resources of Illinois. Part 7, Vermilion and Edgar Counties: Illinois State Geological Survey Circular.

Kay, F. H., 1915, Coal resources of District VIII (Danville): Illinois State Geological Survey Illinois Cooperative Mining Investigation Bulletin 14, 68 p.

Kosanke, R. M., J. A. Simon, H. R. Wanless, and H. B. Willman, 1960, Classification of the Pennsylvanian strata of Illinois: Illinois State Geological Survey Report of Investigations 214, 84 p.

Newton, W. A., and J. M. Weller, 1937, Stratigraphic studies of Pennsylvanian outcrops in part of southeastern Illinois: Illinois State Geological Survey Report of Investigations 45, 31 p.

Noe, A. C., 1934, New research in *Illinois coal balls*: *Illinois* Academy of Science Transactions (1933), v. 25, no. 4, p. 151.

Piskin, K., and R. E. Bergstrom, 1975, Glacial drift in Illinois: thickness and character: Illinois State Geological Survey Circular 490, 35 p.

Reinertsen, D. L., 1964, Strippable coal reserves of Illinois. Part 4—Adams, Brown, Calhoun, Hancock, McDonough, Pike, Schuyler, and the southern parts of Henderson and Warren Counties: Illinois State Geological Survey Circular 374, 32 p.

Searight, T. C., and W. H. Smith, 1969, Strippable coal reserves of Illinois. Part 5B—Mercer, Rock Island, Warren, and parts of Henderson and Henry Counties: Illinois State Geological Survey Circular 439, 24 p.

Shaver, R. H., et al., 1970, Compendium of rock-unit stratigraphy in Indiana: Indiana Geological Survey Bulletin 43, 229 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.

Smith, W. H., 1958, Strippable coal reserves of Illinois. Part 2—Jackson, Monroe, Perry, Randolph, and St. Clair Counties: Illinois State Geological Survey Circular 260, 35 p.

Smith, W. H., 1961, Strippable coal reserves of Illinois. Part 3—Madison, Macoupin, Jersey, Greene, Scott, Morgan, and Cass Counties: Illinois State Geological Survey Circular 311, 40 p.

Smith, W. H., 1968, Strippable coal reserves of Illinois. Part 6—LaSalle, Livingston, Grundy, Kankakee, Will, Putnam, and parts of Bureau and Marshall Counties: Illinois State Geological Survey Circular 419, 29 p.

Smith, W. H., and D. J. Berggren, 1963, Strippable coal reserves of Illinois. Part 5A—Fulton, Henry, Knox, Peoria, Stark, Tazewell, and parts of Bureau, Marshall, Mercer, and Warren Counties: Illinois State Geological Survey Circular 348, 59 p.

Smith, W. H., and J. B. Stall, 1975, Coal and water resources for coal conversion in Illinois: Illinois State Geological Survey *Cooperative Resources Report* 4, 79 p.

Treworgy, C. G., L. E. Bengal, and A. G. Dingwell, 1978, Reserves and resources of surface-minable coal in Illinois: Illinois State Geological Survey Circular 504, 44 p.

United States Geological Survey Bulletin 1450-B, 1976, Coal resource classification system of the U. S. Bureau of Mines and U. S. Geological Survey, 7 p.

Van Den Berg, J., 1956, Pennsylvanian stratigraphy above the Shoal Creek Limestone in Illinois: unpublished Masters thesis, University of Illinois, 53 p.

Wanless, H. R., 1956, Classification of Pennsylvanian rocks of Illinois as of 1956: Illinois State Geological Survey Circular 217, 14 p.

Weller, J. M., and A. H. Bell, 1936, The geology and oil and gas possibilities of parts of Marion and Clay Counties, with discussion of the central portion of the Illinois Basin: Illinois State Geological Survey, Report of Investigations 40, 54 p.

Willman, H. B., et al., 1975, Handbook of Illinois stratigraphy: Illinois State Geological Survey Bulletin 95, 261 p.

Worthen, A. H., 1866, Geology: Geological Survey of Illinois, v. 1, 504 p.

Worthen, A. H., 1875, Geology and Paleontology: Geological Survey of Illinois, v. 6, 532 p.

APPENDIX 1. Strippable coal resources in Area 8 by county, coal seam, and reliability category (in thousand tons).

Coal	Class I resources at overburden thickness (ft)				Class II resources at overburden thickness (ft)				Total	Mined out
	0-50	50-100	100-150*	Total	0-50	50-100	100-150*	Total	I & II	(sq mi)
CRAWFORD COUNTY										
Bristol Hill	15,370	2,957		18,326	11,448	12,383		23,830	42,157	0.1
Total	15,370	2,957		18,326	11,448	12,383		23,830	42,157	0.1
CUMBERLAND COUNTY										
Trowbridge	172			172	1,987			1,987	2,159	
Total	172			172	1,987			1,987	2,159	
EFFINGHAM COUNTY										
Shelbyville	1,179			1,179					1,179	
Total	1,179			1,179					1,179	
FAYETTE COUNTY										
Loudon	1,430			1,430					1,430	
Shelbyville	545			545					545	
Total	1,975			1,975					1,975	
FRANKLIN COUNTY										
Belle Rive	1,542			1,542	1,506			1,506	3,048	
Total	1,542			1,542	1,506			1,506	3,048	
JEFFERSON COUNTY										
Belle Rive	4,283			4,283	2,586			2,586	6,869	0.2
Opdyke	16,227	250		16,477	5,868			5,868	22,344	3.7
Total	20,510	250		20,760	8,454			8,454	29,213	3.9
MENARD COUNTY										
Springfield	2,306	60,237	309,221	371,764		22,207	141,111	163,318	535,082	0.03
Total	2,306	60,237	309,221	371,764		22,207	141,111	163,318	535,082	0.03
RICHLAND COUNTY										
Calhoun	6,282			6,282					6,282	
Total	6,282			6,282					6,282	
SANGAMON COUNTY										
Springfield		32,808	233,575	266,383		11,530	140,120	151,649	418,031	3.6
Total		32,808	233,575	266,383		11,530	140,120	151,649	418,031	3.6
SHELBY COUNTY										
Shelbyville	14,461	24,180		38,640	12,379	15,894		28,272	66,912	
Trowbridge	8,174	69		8,243	6,298	303		6,601	14,843	
Total	22,635	24,249		46,883	18,677	16,197		34,873	81,755	
WABASH COUNTY										
Friendsville	34,531	12,422		46,953	64,009	40,758		104,767	151,720	0.14
Total	34,531	12,422		46,953	64,009	40,758		104,767	151,720	0.14

*100-150 ft overburden category used only for Springfield (No. 5) Coal in Sangamon and Menard Counties

APPENDIX 2. Strippable coal resources in Area 8 by township, county, coal seam, seam and overburden thickness, and reliability category (in thousand tons).

Coal township, thickness (in.)	Class I resources at overburden thickness (ft)				Class II resources at overburden thickness (ft)				Total	Mined out
	0-50	50-100	100-150*	Total	0-50	50-100	100-150*	Total	I & II	(sq mi)
CRAWFORD COUNTY										
Bristol Hill										
5N-11W										
18		83		83	1,082	1,671		2,752	2,835	
20	278			278					278	
Total	278	83		361	1,082	1,671		2,752	3,113	
5N-12W										
18					8,190	3,573		11,763	11,763	0.1
20	13,493	1,888		15,381					15,381	
Total	13,493	1,888		15,381	8,190	3,573		11,763	27,144	0.1
6N-11W										
18	647	611		1,258	1,160	709		1,869	3,127	
20	27			27					27	
Total	675	611		1,285	1,160	709		1,869	3,154	
6N-12W										
18					1,016	6,430		7,446	7,446	
20	925	375		1,300					1,300	
Total	925	375		1,300	1,016	6,430		7,446	8,746	
Coal	15,370	2,957		18,326	11,448	12,383		23,830	42,157	0.1
County	15,370	2,957		18,326	11,448	12,383		23,830	42,157	0.1
CUMBERLAND COUNTY										
Trowbridge										
10N-7E										
28	172			172	1,987			1,987	2,159	
Total	172			172	1,987			1,987	2,159	
EFFINGHAM COUNTY										
Shelbyville										
8N-4E										
20	1,179			1,179					1,179	
Total	1,179			1,179					1,179	
FAYETTE COUNTY										
Loudon										
8N-3E										
18	1,430			1,430					1,430	
Total	1.430			1,430					1,430	
Shelbyville										
8N-3E										
20	545			545					545	
Total	545			545					545	
County	1.975			1.975					1.975	

*100-150 ft overburden category used only for Springfield (No. 5) Coal in Sangamon and Menard Counties.

APPENDIX 2 (*continued*)

Coal township, thickness (in.)	Class I resources at overburden thickness (ft)				Class II resources at overburden thickness (ft)				Total	Mined out
	0-50	50-100	100-150	Total	0-50	50-100	100-150	Total	I & II	(sq mi)
FRANKLIN COUNTY										
Belle Rive										
5S-4E										
20					1,506			1,506	1,506	
24	1,542			1,542					1,542	
Total	1,542			1,542	1,506			1,506	3,048	
JEFFERSON COUNTY										
Belle Rive										
3S-4E										
18	1,284			1,284					1,284	
Total	1,284			1,284					1,284	
4S-4E										
18	1,048			1,048					1,048	0.2
20					2,586			2,586	2,586	
24	1,951			1,951					1,951	
Total	2,999			2,999	2,586			2,586	5,585	0.2
Coal	4,283			4,283	2,586			2,586	6,869	0.2
Opdyke										
2S-3E										
18	102			102					102	
Total	102			102					102	
3S-3E										
18	721			721					721	
Total	721			721					721	
3S-4E										
18	6,267	250		6,517					6,517	1.8
20	2,986			2,986					2,986	
Total	9,253	250		9,503					9,503	1.8
4S-4E										
18					5,868			5,868	5,868	1.9
20	6,151			6,151					6,151	
Total	6,151			6,151	5,868			5,868	12,018	1.9
Coal	16,227	250		16,477	5,868			5,868	22,344	3.7
County	20,510	250		20,760	8,454			8,454	29,213	3.9
MENARD COUNTY										
Springfield (No. 5)										
17N-6W										
60						13,639	16,005	29,644	29,644	
68			2,014	2,014					2,014	
72		10,213	16,489	26,702					26,702	
Total		10,213	18,503	28,716		13,639	16,005	29,644	58,360	
17N-7W										
60							6,054	6,054	6,054	
68			26,811	26,811					26,811	
72		99	26,552	26,651					26,651	
Total		99	53,363	53,461			6,054	6,054	59,515	
17N-8W										
60							14,869	14,869	14,869	
68			11,019	11,019					11,019	
72			49,095	49,095					49,095	
Total			60,114	60,114			14,869	14,869	74,983	

APPENDIX 2 (*continued*)

Coal township, thickness (in.)	Class I resources at overburden thickness (ft)				Class II resources at overburden thickness (ft)				Total	Mined out
	0-50	50-100	100-150	Total	0-50	50-100	100-150	Total	I & II	(sq mi)
MENARD COUNTY										
Springfield (No. 5)—*continued*										
18N-5W										
60							61	61	61	
72			619	619					619	
Total			619	619			61	61	680	
18N-6W										
60							5,143	5,143	5,143	
72		16,700	29,920	46,620					46,620	
Total		16,700	29,920	46,620			5,143	5,143	51,763	
18N-7W										
60						1,331	41,275	42,606	42,607	0.01
66		522	7,412	7,934					7,934	
72		19,742	50,788	70,530					70,530	
Total		20,264	58,200	78,464		1,331	41,275	42,606	121,071	0.01
18N-8W										
60						101	15,332	15,433	15,433	0.02
66	2,306	7,229	44,897	54,432					54,432	
72		206	11,473	11,679					11,679	
Total	2,306	7,435	56,369	66,110		101	15,332	15,433	81,543	0.02
19N-5W										
60						618	7,280	7,898	7,898	
72		501	6,735	7,236					7,236	
Total		501	6,735	7,236		618	7,280	7,898	15,134	
19N-6W										
60						635	9,236	9,871	9,871	
72		4,422	23,352	27,775					27,775	
Total		4,422	23,352	27,775		635	9,236	9,871	37,646	
19N-7W										
60						5,883	25,381	31,264	31,264	
72		603	2,046	2,649					2,649	
Total		603	2,046	2,649		5,883	25,381	31,264	33,912	
19N-8W										
60							475	475	475	
Total							475	475	475	
Coal	2,306	60,237	309,221	371,764		22,207	141,111	163,318	535,082	0.03
County	2,306	60,237	309,221	371,764		22,207	141,111	163,318	535,082	0.03
RICHLAND COUNTY										
Calhoun										
2N-14W										
18	2,060			2,060					2,060	
24	3,431			3,431					3,431	
Total	5,491			5,491					5,491	
3N-14W										
18	435			435					435	
24	357			357					357	
Total	792			792					792	
Coal	6,282			6,282					6,282	
County	6,282			6,282					6,282	

APPENDIX 2 (*continued*)

Coal township, thickness (in.)	Class I resources at overburden thickness (ft)				Class II resources at overburden thickness (ft)				Total	Mined out
	0-50	50-100	100-150	Total	0-50	50-100	100-150	Total	I & II	(sq mi)
SANGAMON COUNTY										
Springfield (No. 5)										
15N-6W										
60							65	65	65	
66			1,629	1,629					1,629	
Total			1,629	1,629			65	65	1,693	
15N-7W										
60							83	83	83	0.03
66			6,338	6,338					6,338	
Total			6,338	6,338			83	83	6,421	0.03
15N-8W										
60							3,393	3,393	3,393	
Total							3,393	3,393	3,393	
16N-5W										
72			18,340	18,340					18,340	1.4
Total			18,340	18,340					18,340	1.4
16N-6W										
60							21,544	21,544	21,544	0.9
66			10,291	10,291					10,291	
72			16,258	16,258					16,258	
Total			26,549	26,549			21,544	21,544	48,093	0.9
16N-7W										
60							30,924	30,924	30,924	0.04
66			5,795	5,795					5,795	
68		3,668	47,491	51,158					51,158	
Total		3,668	53,285	56,953			30,924	30,924	87,877	0.04
16N-8W										
60						1,035	73,135	74,169	74,169	
68		2,308	7,349	9,657					9,657	
Total		2,308	7,349	9,657		1,035	73,135	74,169	83,826	
17N-5W										
72			12,351	12,351					12,351	0.7
Total			12,351	12,351					12,351	0.7
17N-6W										
60						5,435	10,112	15,547	15,547	
72		5,409	32,965	38,374					38,374	0.1
Total		5,409	32,965	38,374		5,435	10,112	15,547	53,921	0.1
17N-7W										
68		11,235	49,466	60,701					60,701	0.3
72		326	1,740	2,066					2,066	
Total		11,560	51,206	62,767					62,767	0.3
17N-8W										
60						5,060	864	5,924	5,924	0.1
72		9,863	23,563	33,425					33,425	
Total		9,863	23,563	33,425		5,060	864	5,924	39,349	0.1
Coal County		32,808	233,575	266,383		11,530	140,120	151,649	418,031	3.6
		32,808	233,575	266,383		11,530	140,120	151,649	418,031	3.6

APPENDIX 2 (*continued*)

Coal township, thickness (in.)	Class I resources at overburden thickness (ft) 0-50	50-100	100-150	Total	Class II resources at overburden thickness (ft) 0-50	50-100	100-150	Total	Total I & II	Mined out (sq mi)
SHELBY COUNTY										
Shelbyville										
9N-3E										
24	1,037	622		1,660					1,660	
Total	1,037	622		1,660					1,660	
9N-4E										
24	966	2,196		3,162					3,162	
Total	966	2,196		3,162					3,162	
10N-3E										
18	423	974		1,398					1,398	
24	328	137		466					466	
Total	752	1,112		1,864					1,864	
10N-4E										
24	2,545	8,193		10,738					10,738	
Total	2,545	8,193		10,738					10,738	
11N-3E										
18	3,060	1,514		4,574	526	2,403		2,928	7,502	
24	2,954	6,850		9,805	122	6,327		6,449	16,254	
Total	6,014	8,365		14,379	648	8,730		9,377	23,756	
11N-4E										
18					1,852	4,278		6,130	6,130	
24	647	3,563		4,237					4,237	
Total	647	3,563		4,237	1,852	4,273		6,130	10,367	
12N-2E										
18	2,243			2,243	7,824	387		8,211	10,453	
Total	2,243			2,243	7,824	387		8,211	10,453	
12N-3E										
18	230			230	2,055	2,499		4,554	4,784	
Total	230			230	2,055	2,499		4,554	4,784	
12N-4E										
24		128		128					128	
Total		128		128					128	
Coal	14,461	24,180		38,640	12,379	15,894		28,272	66,912	
Trowbridge										
10N-6E										
28	8,174	69		8,243	6,298	303		6,601	14,843	
Total	8,174	69		8,243	6,298	303		6,601	14,843	
County	22,635	24,249		46,883	18,677	16,197		34,873	81,755	
WABASH COUNTY										
Friendsville										
1N-12W										
30					4,949	1,861		6,810	6,810	0.04
36	6,108	15		6,124					6,124	
Total	6,108	15		6,124	4,949	1,861		6,810	12,933	0.04
1N-13W										
30					14,531	13,989		28,520	28,520	
36	4,198	4,059		8,257					8,257	
45	192	3,681		3,873					3,873	
Total	4,390	7,741		12,130	14,531	13,989		28,520	40,650	

APPENDIX 2 *(continued)*

Coal township, thickness (in.)	Class I resources at overburden thickness (ft) 0-50	50-100	100-150	Total	Class II resources at overburden thickness (ft) 0-50	50-100	100-150	Total	Total I & II	Mined out (sq mi)
WABASH COUNTY										
Friendsville—*continued*										
2N-12W										
30					3,744	392		4,136	4,136	
36	3,194			3,194					3,194	
Total	3,194			3,194	3,744	392		4,136	7,330	
2N-13W										
30						137		137	137	
Total						137		137	137	
1S-12W										
30					61			61	61	
Total					61			61	61	
1S-13W										
30	5,444	1,328		6,772	21,554	10,750		32,304	39,076	
36	1,238	135		1,372					1,372	
38						1,206		1,206	1,206	
45	3,868			3,868	5,509			5,509	9,377	
48	916			916					916	
Total	11,466	1,463		12,929	27,063	11,956		39,019	51,948	
1S-14W										
38						814		814	814	
Total						814		814	814	
2S-13W										
30					3,703			3,703	3,703	0.1
33	1,187			1,187					1,187	
38					4,108	6,844		10,952	10,952	
42	4,386	2,255		6,641	2,042	572		2,614	9,255	
45					890			890	890	
48	3,800	949		4,749					4,749	
Total	9,373	3,204		12,577	10,743	7,416		18,159	30,736	0.1
2S-14W										
38					2,918	4,193		7,111	7,111	
Total					2,918	4,193		7,111	7,111	0.04
Coal	34,531	12,422		46,953	64,009	40,758		104,767	151,720	0.14
County	34,531	12,422		46,953	64,009	40,758		104,767	151,720	0.14