

The Pennsylvanian rocks of the eastern Kentucky coal field underlie an area of about 27,000 square kilometers (see index map). Largely because of the size and stratigraphic complexity of the area, Huddle and others (1962, p. 31) divided it into six coal reserve districts (unofficial), utilizing state and county lines as well as geologic features, drainage areas, and coal producing areas. This division is followed herein because, in general, each of these districts has a characteristic stratigraphic nomenclature, particularly as related to coal bed names. The six districts, shown on the index map, are the Princess, Licking River, Big Sandy, Hazard, Southwestern, and Upper Cumberland River; the Upper Cumberland River district has been divided into the Harlan and Middleboro subdistricts.

The Pennsylvanian rocks of eastern Kentucky are divided into four formations. In ascending order, they are the Lee and Breathitt Formations of Early and Middle Pennsylvanian age, and the Conemaugh and Monongahela Formations of Late Pennsylvanian age (table 1). The Lee Formation is largely quartzite sandstone that intertongues with and locally grades into the Breathitt Formation. The Breathitt, characterized by subgraywacke, gray shale, and gray siltstone, commonly grades into the overlying red and green shale and subgraywacke of the Conemaugh and Monongahela Formations. (The Breathitt Formation is recognized as a group in the Upper Cumberland River district and has been divided into five formations, the Hazen, Mingo, Catron, Higgin, and Bryson Formations. Because the stratigraphic relations of the rocks in these formations do not affect the correlation of coal beds and key beds, and because the Breathitt has been mapped as a formation in most of the area of this report for convenience in discussion all strata younger than the Lee Formation in the Upper Cumberland River district are assigned to the Breathitt Formation.) Although coal constitutes only a small percentage of the total Pennsylvanian rock sequence, it is of great economic importance. Coal is present in 25 major coal zones, mainly in the Breathitt Formation; it has been prospectively and mined extensively in all parts of the coal field since the early 1900's.

In general, correlation of coal beds in eastern Kentucky depends upon demonstrated continuity. However, because single beds do not persist across the entire coal field, the recognition of key beds and sequences of key beds is necessary to establish a stratigraphic framework to which coal beds can be referred for purposes of correlation. Key beds are commonly marine zones of wide extent—the most important are the Kendrick Shale, Magoffin, and Stoney Fork Members of the Breathitt Formation. These stratigraphic units are above stream level over much of the coal field, and their regional continuity has been demonstrated by mapping. Key beds may also be commercial coal beds that have wide extent, such as the Princess No. 3, and its correlatives, or the Fire Clay coal bed, which contains a distinctive flint-clay parting (table 1). Finally, sandstone members of the Lee and Breathitt Formations are important stratigraphic datums for local and regional correlation. In summary, key marine coal beds, and widely distributed sandstone members all constitute the stratigraphic framework by which locally-important commercial coal beds are correlated across the eastern Kentucky coal field.

Broad drainage divides between major rivers in eastern Kentucky make correlation of concealed coal beds below the Van Lear coal bed and its equivalents difficult; few detailed drill hole descriptions are available in those areas. However, two important datums have been demonstrated in the lower part of the section: the Zachariah and Gray Hawk coal beds and their equivalents. Correlation of the Zachariah and its equivalents is based in part upon comparison of measured sections and sparse drill hole data, and in part upon the correlation of an overlying unnamed marine zone found locally along the western margin of the coal field, with the Cannelton Limestone of White (1885) in the Big Sandy district. The correlation of the Gray Hawk coal bed and its equivalents is based upon the fact that these coal beds contain the stratigraphically highest observed occurrences in eastern Kentucky of the microfossil *Schizophoria* zone of Mississippian to Middle Pennsylvanian age (Robert Kosanke, oral commun., 1978).

Table 1 lists most of the stratigraphic names of Pennsylvanian age used in eastern Kentucky, and is concerned principally with coal names used in publications since about 1950, especially all of the coal names that identify delineated resources and reserves. In general, coal names listed in this table represent coal beds that have been mined either commercially or for local use by residents of the area. Not every coal bed listed under a district in table 1 is found in all parts of that district, nor has every coal bed been given a name. The main source of names used in the construction of table 1 is the almost 200 geologic reports of the Geologic Quadrangle (GQ) Map Series of the U.S. Geological Survey (USGS), published as a result of the cooperative geological mapping program of the USGS and the Kentucky Geological Survey. (This endeavor was begun in 1960 and completed in 1978.) The GQs, at a scale of 1:24,000, present limited descriptions of the local stratigraphy and identify many coal beds by both local and regional names. Additional sources of stratigraphic information and coal bed names used in the construction of table 1 include USGS quadrangles (England, 1955; Adickson, 1957; Welch, 1958; Bergin, 1962) and the coal resources of eastern Kentucky as a whole (Huddle and others, 1963); and USGS professional papers (Huddle and England, 1966; England, 1968) that are comprehensive reports on the stratigraphy and coal resources of significant areas in eastern Kentucky. Members of both the USGS and Kentucky Geological Survey contributed valuable information and suggestions used in compiling this report; in particular, Gary Harmed of the Kentucky Geological Survey made many helpful suggestions with respect to the coal names in the Harlan subdistrict.

Table 2 lists coal bed names that are used in relatively small areas within the coal districts. These local names are from a variety of sources, including field notes utilized in preparation of USGS Bulletin 1120 (Huddle and others, 1963), and field reports of the Kentucky Geological Survey Coal Section. The names have been used mainly in oral communication between coal specialists; their usage in published reports has been very limited.

Figure 1 illustrates representative generalized sections in different parts of the coal field that were selected to show the continuity of some coal beds as well as the thickening of Pennsylvanian strata from the northern part of the area southeastward. Because the Pennsylvanian rocks of eastern Kentucky are characterized by rapid lateral changes in lithology, single sections are representative of only small areas; descriptions of stratigraphy in given areas are published in the relevant reports of the GQ Map Series.

Sandstone members of the Lee Formation provide important stratigraphic datums for correlations. These include the Bee Rock, Nease, Rockcastle, and Corbin Sandstone Members. The continuity of the Corbin Sandstone Member of the Lee Formation has been demonstrated by mapping in the Southwestern, Licking River, Princess, and Big Sandy districts; however, it pinches out to the southeast and is present only in sections 1 and 2 of figure 1. The upper sandstone member of the Lee Formation in the Big Sandy district is partly or wholly equivalent to the Nease and Bee Rock Sandstone Members of the Upper Cumberland district. England (1968, p. 31) has shown by subsurface data that the Nease Sandstone Member is in part equivalent to the Rockcastle Sandstone Member of the Lee Formation. The Rockcastle Sandstone Member pinches out to the northwest, and analyses of available data suggest that it or its equivalents do not extend into the areas of sections 1 and 2 of figure 1.

REFERENCES CITED

- Adickson, W. L., 1957, Coal geology of the White Oak quadrangle, Magoffin and Morgan Counties, Kentucky: U.S. Geological Survey Bulletin 1047-A, 23 p.
- Bergin, W. L., 1962, Coal geology of the Seitz quadrangle, Breathitt, Magoffin, Morgan, and Wolfe Counties, Kentucky: U.S. Geological Survey Bulletin 1122-C, 39 p.
- Cavarero, V. V., Jr., and Fern, J. C., 1968, Siliceous spicules as shoreline indicators in deltaic sequences: Geological Society of America Bulletin, v. 79, p. 283-275.
- Crider, A. F., 1915, The fine clays and fire clay industries of the Olive Hill and Ashland districts of northeastern Kentucky: Kentucky Geological Survey, ser. 4, v. 1, pt. 2, p. 592-711.
- England, R. J., 1955, Geology and coal resources of the Cannel City quadrangle, Kentucky: U.S. Geological Survey Bulletin 1020-A, 21 p.
- England, R. J., 1958, Geology and coal resources of the Elk Valley area, Tennessee and Kentucky: U.S. Geological Survey Professional Paper 572, 58 p.
- Hennen, R. V., and Reger, D. B., 1914, Logan and Mingo Counties: County Reports of the West Virginia Geological Survey, 774 p.
- Huddle, J. W., and England, R. J., 1966, Geology and coal reserves of the Kermitt and Varney area, Kentucky: U.S. Geological Survey Professional Paper 507, 93 p.
- Huddle, J. W., Lyons, E. J., Smith, H. L., and Fern, J. C., 1963, Coal reserves of eastern Kentucky: U.S. Geological Survey Bulletin 1120, 247 p.
- Jillison, W. R., 1920, The Kendrick Shale—a new calcareous fossil horizon in the coal measures of eastern Kentucky: Kentucky Department of Geology and Forestry, ser. 5, bull. IV, p. 56-69.
- Johnston, J. E., 1962, Geology of the Lenox quadrangle, Kentucky: U.S. Geological Survey Geologic Quadrangle Map GQ-181.
- Lyons, E. J., 1963, Coal beds of the Southwestern reserve district, in Huddle, J. W., Lyons, E. J., Smith, H. L., and Fern, J. C., 1963, Coal reserves of eastern Kentucky: U.S. Geological Survey Bulletin 1120, p. 124-147.
- Morse, W. C., 1931, Pennsylvanian invertebrate fauna of Kentucky: Kentucky Geological Survey, ser. 6, v. 36, p. 293-348.
- Phalen, W. C., 1912, Description of the Kenova 30' quadrangle Kentucky-West Virginia-Ohio: U.S. Geological Survey Geologic Atlas of the United States, Folio 184.
- Puffett, W. P., 1963, Geology of the Vox quadrangle, Kentucky: U.S. Geological Survey Geologic Quadrangle Map GQ-224.
- Welch, S. W., 1958, Geology and coal resources of the Tiptop quadrangle, Kentucky: U.S. Geological Survey Bulletin 1042-P, p. 385-612.
- White, I. C., 1885, Nomenclature of Appalachian coal beds: The Virginian, v. 6, p. 7-16.
- , 1891, Stratigraphy of the bituminous coal field of Pennsylvania, Ohio, and West Virginia: U.S. Geological Survey Bulletin 65, 212 p.

SERIES FORMATION	PRINCESS DISTRICT		LICKING RIVER DISTRICT		HAZARD DISTRICT		SOUTHWESTERN DISTRICT		BIG SANDY DISTRICT		UPPER CUMBERLAND DISTRICT	
											Harlan Subdistrict	Middleboro Subdistrict
UPPER PENNSYLVANIAN CONEMAUGH AND MONONGAHELA	(Eroded)		(Eroded)		(Eroded)		(Eroded)		(Eroded)		(Eroded)	
	Annes Limestone Member											
	Brush Creek Limestone Member											
	Princess No. 10 or Brush Creek coal bed											
	Princess No. 9 coal zone											
	Princess No. 8 or Upper Kittanning 1 coal bed											
	Princess No. 7 or Middle Kittanning 1 coal bed		Princess No. 7 coal bed									
	Princess No. 6 or Lower Kittanning (?) coal bed		Princess No. 5 coal bed									
	Hindins clay bed		Flint clay bed		Lima/Lin Limestone 5							
	Laurel coal bed		Vangor Limestone 2									
BREATHITT	Vangor Limestone 1											
	Princess Nos. 5A and 5B coal beds											
	Kilgore Flint 3											
	Princess No. 5, Richardson, or No. 5 Black 1 coal zone		Skyline, Princess No. 5, or Richardson coal zone									
	Princess No. 4, Bros, or Torchlight coal zone		Main Black one 1 coal zone		Bross coal zone		Tiptop coal bed		Bross coal zone			
	Princess No. 3, Mudsum, or Nickall coal bed		Peach Orchard coal zone		Peach Orchard coal zone		Hazard No. 7 coal zone		Hazard No. 8 coal bed		Peach Orchard coal zone	
	Hazard coal bed		Hazard or Prater coal zone		Hazard or Prater coal zone		Hazard No. 5A 1, Hazard No. 6, Prater, Adelaide, or Leatherwood coal bed		Hazard coal zone		Hazard coal zone	
	Haddix coal zone		Haddix coal zone		Haddix coal zone		Haddix coal zone		Haddix coal zone		Haddix coal zone	
	Magoffin Member		Magoffin Member		Magoffin Member		Magoffin Member		Magoffin Member		Magoffin Member	
	Taylor coal bed		Taylor coal bed		Taylor coal bed		Taylor coal bed		Taylor coal zone		Taylor coal zone	
LOWER AND MIDDLE PENNSYLVANIAN	Hamlin coal zone		Hamlin coal zone		Hamlin coal zone		Hamlin coal zone		Hamlin coal zone		Hamlin coal zone	
	Fire Clay - Whitesburg coal zone		Fire Clay rider coal bed		Fire Clay rider coal bed		Fire Clay or Hazard No. 4 coal zone		Fire Clay rider or Big Mary 1 coal bed		Fire Clay, Hazard No. 4, Dean, or Windock 1 coal bed	
	Whitesburg coal zone		Whitesburg coal zone		Whitesburg coal zone		Whitesburg coal zone		Whitesburg coal zone		Whitesburg coal zone	
	Kendrick Shale Member 1		Kendrick Shale Member 1		Kendrick Shale Member 1		Kendrick Shale Member 1		Kendrick Shale Member 1		Kendrick Shale Member 1	
	Williamson, Gun Creek, or Cannel City coal bed		Cannel City, Gun Creek, or Williamson coal bed		Amburg or Cannel City coal zone		Amburg rider coal bed		Lower Pioneer 1 coal bed		Amburg coal zone	
	Van Lear, Tom Cooper, or Little Coney coal bed		Little Coney, Tom Cooper, Van Lear, or Upper Elkhorn No. 3 coal zone		Upper Elkhorn No. 3 coal zone		Elk Gap 1 coal bed		Elk Gap 1 coal bed		Elk Gap 1 coal bed	
	Grassy or Hopewell coal bed		Grassy, Lacey Creek, or Upper Elkhorn No. 2 coal bed		Upper Elkhorn No. 2 or Grassy coal bed		Upper Elkhorn No. 1 coal bed		Upper Elkhorn No. 2 or Lacey Creek coal bed		Upper Elkhorn No. 1 coal bed	
	Brain or Wolf Creek coal bed		Marine zone (fossiliferous shale and siltstone)		Marine zone (fossiliferous shale and siltstone)		Marine zone (fossiliferous shale and siltstone)		Marine zone (fossiliferous shale and siltstone)		Marine zone (fossiliferous shale and siltstone)	
	Grayson sandstone bed		Whitesburg coal bed		Whitesburg coal bed		Whitesburg coal bed		Whitesburg coal bed		Whitesburg coal bed	
	Marine zone (fossiliferous ferugineous sandstone)		Zachariah coal bed		Zachariah coal bed		Zachariah coal bed		Zachariah coal bed		Zachariah coal bed	
LEE AND BREATHITT	Sandstone Member		Corbin Sandstone Member		Sandstone member		Corbin Sandstone Member		Corbin Sandstone Member		Corbin Sandstone Member	
	Gray Hawk or Mine Fork coal bed		Gray Hawk coal bed		Gray Hawk coal bed		Gray Hawk coal bed		Gray Hawk coal bed		Gray Hawk coal bed	
	Beattyville or Warm Fork coal bed		Beattyville, Halsey Rough, Carley Hollow, or Tarter coal bed		Beattyville, Halsey Rough, Carley Hollow, or Tarter coal bed		Beattyville, Halsey Rough, Carley Hollow, or Tarter coal bed		Beattyville, Halsey Rough, Carley Hollow, or Tarter coal bed		Beattyville, Halsey Rough, Carley Hollow, or Tarter coal bed	
			Barnes Fork or Bryant Farm coal bed		Barnes Fork or Bryant Farm coal bed		Barnes Fork or Bryant Farm coal bed		Barnes Fork or Bryant Farm coal bed		Barnes Fork or Bryant Farm coal bed	
			Rockcastle Sandstone Member		Rockcastle Sandstone Member		Rockcastle Sandstone Member		Rockcastle Sandstone Member		Rockcastle Sandstone Member	
			Beaver Creek, Streams No. 3, or Conroy coal bed		Beaver Creek, Streams No. 3, or Conroy coal bed		Beaver Creek, Streams No. 3, or Conroy coal bed		Beaver Creek, Streams No. 3, or Conroy coal bed		Beaver Creek, Streams No. 3, or Conroy coal bed	
			Streams No. 2 or New Livingston coal bed		Streams No. 2 or New Livingston coal bed		Streams No. 2 or New Livingston coal bed		Streams No. 2 or New Livingston coal bed		Streams No. 2 or New Livingston coal bed	
			Streams No. 1 1/2 coal bed		Streams No. 1 1/2 coal bed		Streams No. 1 1/2 coal bed		Streams No. 1 1/2 coal bed		Streams No. 1 1/2 coal bed	
			Streams No. 1, Livingston, Hudson, or Lee No. 1 coal bed		Streams No. 1, Livingston, Hudson, or Lee No. 1 coal bed		Streams No. 1, Livingston, Hudson, or Lee No. 1 coal bed		Streams No. 1, Livingston, Hudson, or Lee No. 1 coal bed		Streams No. 1, Livingston, Hudson, or Lee No. 1 coal bed	
			Livingston Conglomerate Member		Livingston Conglomerate Member		Livingston Conglomerate Member		Livingston Conglomerate Member		Livingston Conglomerate Member	
UPPER MISSISSIPPIAN OR LOWER PENNSYLVANIAN LEE OR OLDER ROCKS	Anthony 1 coal bed		Anthony 1 coal bed		Anthony 1 coal bed		Anthony 1 coal bed		Anthony 1 coal bed		Anthony 1 coal bed	
	Olive Hill clay bed 2		Olive Hill clay bed 2		Olive Hill clay bed 2		Olive Hill clay bed 2		Olive Hill clay bed 2		Olive Hill clay bed 2	

- 1Name used for coal bed in adjacent areas
2As used by Phalen (1912)
3Of Cavarero and Fern (1968)
4Formerly Kendrick Shale of Jillison (1920)

- 5Of Crider (1913)
6Of local usage (Johnston, 1962)
7Formerly Lost Creek Limestone of Morse (1931)
8Of Morse (1931)

- 9The name Hazard No. 5A was originally applied to a coal bed in the Haddix coal zone; it is generally used in most parts of the Hazard coal reserve district to indicate the lowermost coal bed of the Hazard coal zone.
10Includes the Salt Lick Beds of Morse (1931).
11The name Moss has been used locally (Puffett, 1963) and regionally (Lyons, 1963) as a correlative of the Upper Elkhorn No. 3 coal bed.

- 12Of White (1885)
13Of Hennen and Reger (1914)
14Of White (1891)
15The Limestone and Pardoe coal beds locally come together to form a single coal bed where the Jesse Sandstone is not present.

- 16The name Low Splint is used for a coal bed in the lower part of the Creech coal zone in the Harlan subdistrict as well as for a coal bed above the Magoffin Member in the Middleboro subdistrict.
17The name Mason is commonly used to identify the coal beds of the Mingo coal zone in the Middleboro subdistrict.
18The Higgin coal bed has locally been called the Pewee coal bed in Tennessee; however, the Pewee is probably equivalent to the Red Springs coal bed of the Middleboro subdistrict.

Table 1.--Correlation of named coal beds, coal zones, key beds, and other selected rock stratigraphic units of Pennsylvanian age by coal reserve district and subdistrict. Sandstone members are shown in their general stratigraphic positions and may not be equivalent in age to adjacent stratigraphic units. Unnumbered strata are left blank. Members of the Lee Formation are stippled. Key marine zones are marked by alveol-d-d pattern.

