

THE RACCOON CREEK GROUP (PENNSYLVANIAN) IN THE SUBSURFACE OF THE ILLINOIS BASIN

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ABSTRACT: Examination of more than 5,000 subsurface wireline logs in the southern half of the Illinois Basin indicates that the Colchester Coal is much easier to recognize basin-wide than the Seelyville Coal. Consequently, the bottom of the Colchester Coal should be used to mark the top of the Raccoon Creek Group in subsurface studies. The Group is more than 1,200 feet thick in Union County, Kentucky. In the lowest formation of the Raccoon Creek Group, the Mansfield Formation, seven units are recognizable in the subsurface.

KEYWORDS: Colchester Coal, Mansfield Formation, Pennsylvanian, Raccoon Creek Group, Seelyville Coal.

INTRODUCTION

The Raccoon Creek Group in the Illinois Basin contains the oldest rocks of the Pennsylvanian System that range in age from Morrowan to Desmoinesian. The Group is best known from studies along the outcrop belt where various coal-producing members and a few limestone members or beds have been mapped. Unlike the younger, basin-extensive, and important commercial coals, the coals of the Raccoon Creek Group are not commercially important basin-wide because they are of limited areal extent. An earlier report (Droste and Horowitz, 1995) illustrated the subsurface distribution of part of the Group in Indiana, and our current report represents an extension of the earlier study farther into the subsurface of the Illinois Basin.

In Indiana and Illinois, the study area (Figure 1) is south of Township 19 North and between the Second (Indiana) and Third (Illinois) Principle Meridians. In Kentucky, the study area lies north of the eroded Pennsylvanian outcrop belt. The control for subsurface data is limited to available well logs on file at the Indiana Geological Survey. Although approximately 5,000 wells provided the control for this report, no more than one well per square mile was used in constructing the thickness maps.

STRATIGRAPHY

The Tri-State Committee on Correlation in the Pennsylvanian System recommended (Jacobson, *et al.*, 1985) that the top of the Raccoon Creek Group be

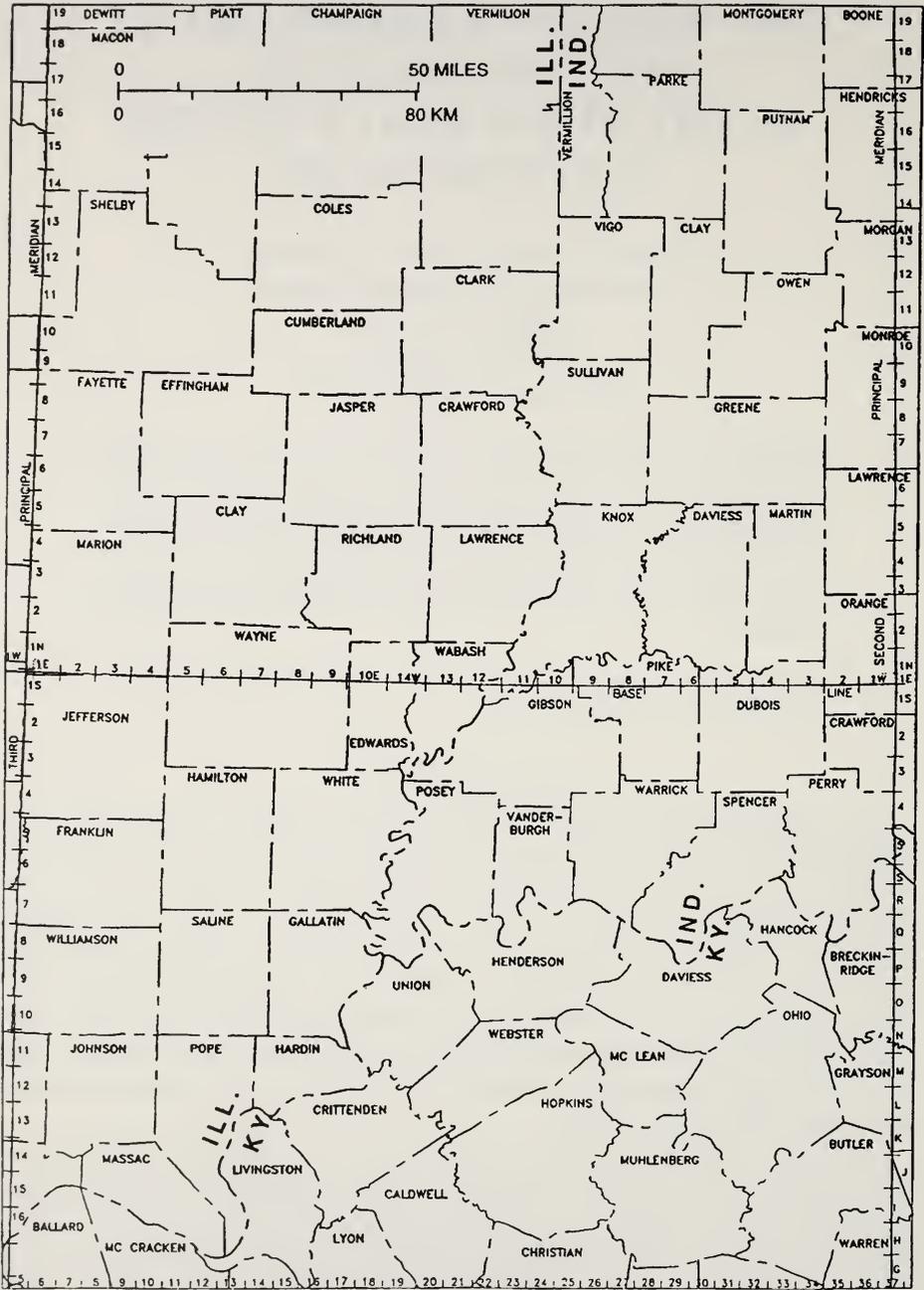


Figure 1. Map showing the study area.

placed at the top of the Seelyville Coal. We have not been able to identify unequivocally the stratigraphic position of the Seelyville on geophysical logs from numerous places in Indiana or in neighboring counties in Kentucky and Illinois. Jacobson (1987) has shown correlations of splits of Seelyville coal beds in Indiana and

Illinois with splits of Dekoven and Davis coal beds in Kentucky. We believe the top of the Raccoon Group should not have to depend upon the uncertainty of correlations among several split coal beds through a stratigraphic interval of several tens of feet. Greb, Williams, and Williamson (1992) used the base of the Davis Coal as the top of the Raccoon Creek Group in Kentucky. Our correlations clearly indicate that the Seelyville in both its type area and throughout the subsurface in Indiana is stratigraphically above the top of the Davis Coal of Kentucky. Consequently, we herein place the top of the Raccoon Creek Group at the base of the Colchester Coal. This redefinition of the Group concurs with the recommendation of Hassenmueller and Ault (1991), who noted that the stratigraphic position of the Colchester rather than the Seelyville can be made basin-wide with more certainty. The Colchester generally lies several tens of feet above the Seelyville (Figure 2). Below the base of the Colchester, the Raccoon Creek Group in Indiana contains, in descending order, the Staunton, Brazil, and Mansfield Formations (Figure 2). The thickness of the Group (Figure 3) ranges from less than 300 feet in Illinois and Indiana to more than 1,200 feet in Kentucky.

The stratigraphic position of a number of members mapped in outcrop areas is helpful in subsurface correlations (Figure 2). The base of the Perth Limestone, or the sandstone that replaces it, marks the bottom of the Staunton Formation, and the Buffaloville Coal is in the uppermost part of the Brazil Formation. The base of the Lower Block Coal separates the Brazil Formation above from the Mansfield Formation below.

Previously, the Mansfield was divided (Droste and Horowitz, 1995) into three informal units, the upper, middle, and lower divisions. In this study, the Mansfield has been divided into seven intervals (Figure 3) using an alphabetical designation from base to top. Maps currently under construction will show the interval-by-interval depositional limits that document the onlap that occurred during early Pennsylvanian transgression in the Illinois Basin. Each of the seven intervals contains a dark gray shale facies, usually at the top of the interval, which is of regional significance. The upper Mansfield of Droste and Horowitz (1995) is identical to Mansfield-G of this report. The middle Mansfield is divided into Mansfield-F (above) and Mansfield-E (below) at the stratigraphic position of the Pinnick Coal. The base of Mansfield-E is as much as 30 feet below the stratigraphic position of the French Lick Coal at its type locality. The top of Mansfield-D is suspected to be close to the stratigraphic position of the Bell Coal of Kentucky.

Correlation from outcrop exposures into the subsurface show that at numerous locations a coal bed on the outcrop is replaced in the subsurface by a limestone bed. In an area of southern Vanderburgh County, an unusual net thickness of limestone occurs in the Brazil and Mansfield-G intervals (Droste and Horowitz, 1995). In this location, approximately 100 feet of the 200 feet of Brazil and Mansfield-G interval is limestone. In some wells, the interval from Upper to Lower Block Coal is continuous limestone. In a nearby well, continuous limestone beds occur from the Mariah Hill Coal to the Lower Block Coal positions.

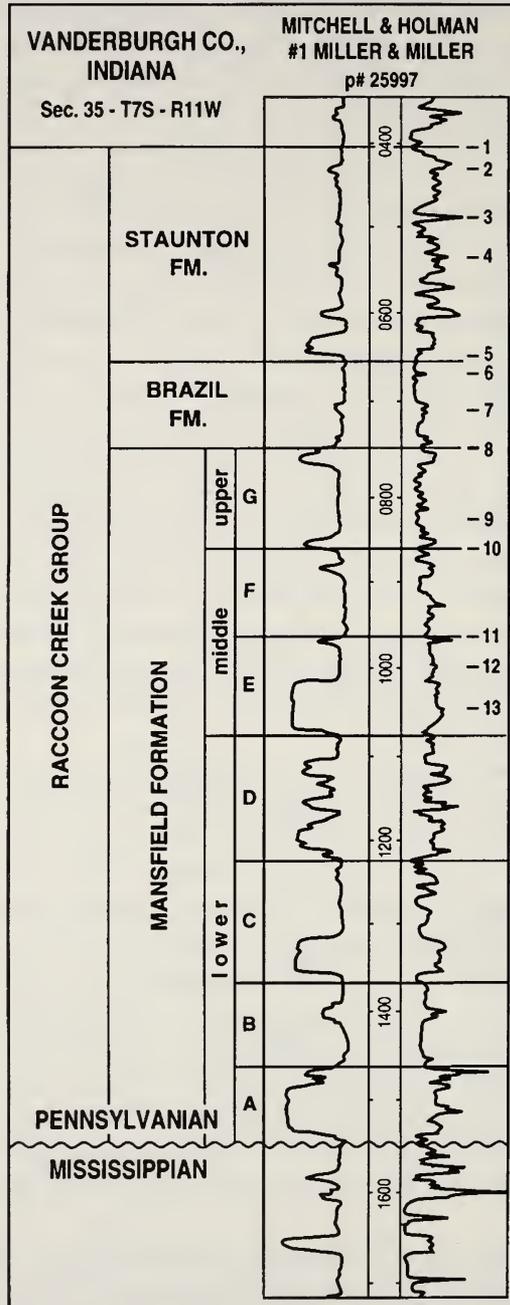


Figure 2. Electric log from a well in Vanderburgh County, Indiana, and stratigraphic nomenclature used in this report. Numbers at the right show the stratigraphic positions of the following strata: 1 = Colchester Coal; 2 = Seelyville Coal; 3 = Davis Coal; 4 = Holland Limestone; 5 = Perth Limestone; 6 = Buffaloville Coal; 7 = Upper Block Coal; 8 = Lower Block Coal; 9 = Mariah Hill Coal; 10 = Blue Creek Coal; 11 = Pinnick Coal; 12 = St. Meinrad Coal; and 13 = French Lick Coal.

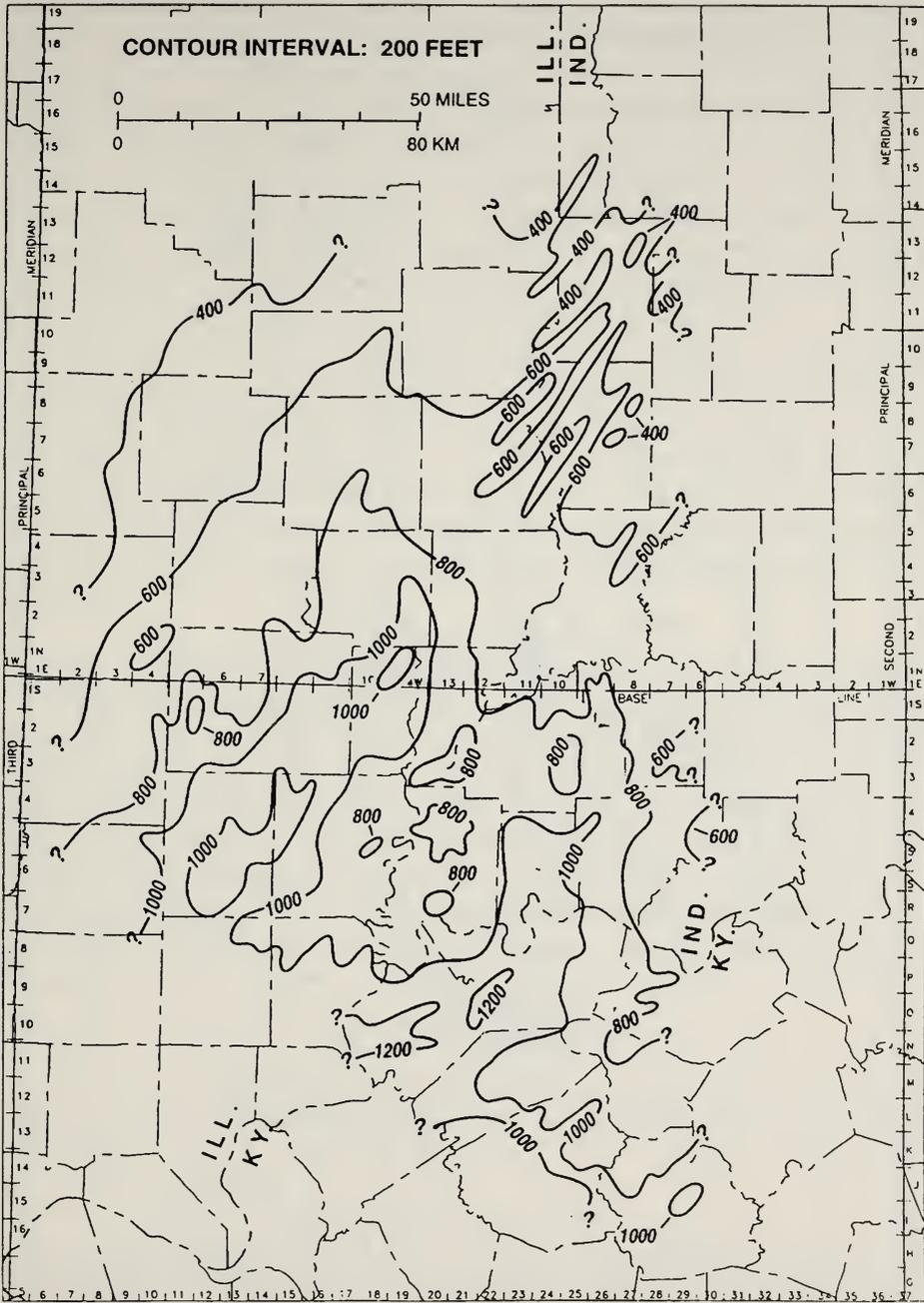


Figure 3. Map showing the thickness of the Raccoon Creek Group (contour interval = 200 feet).

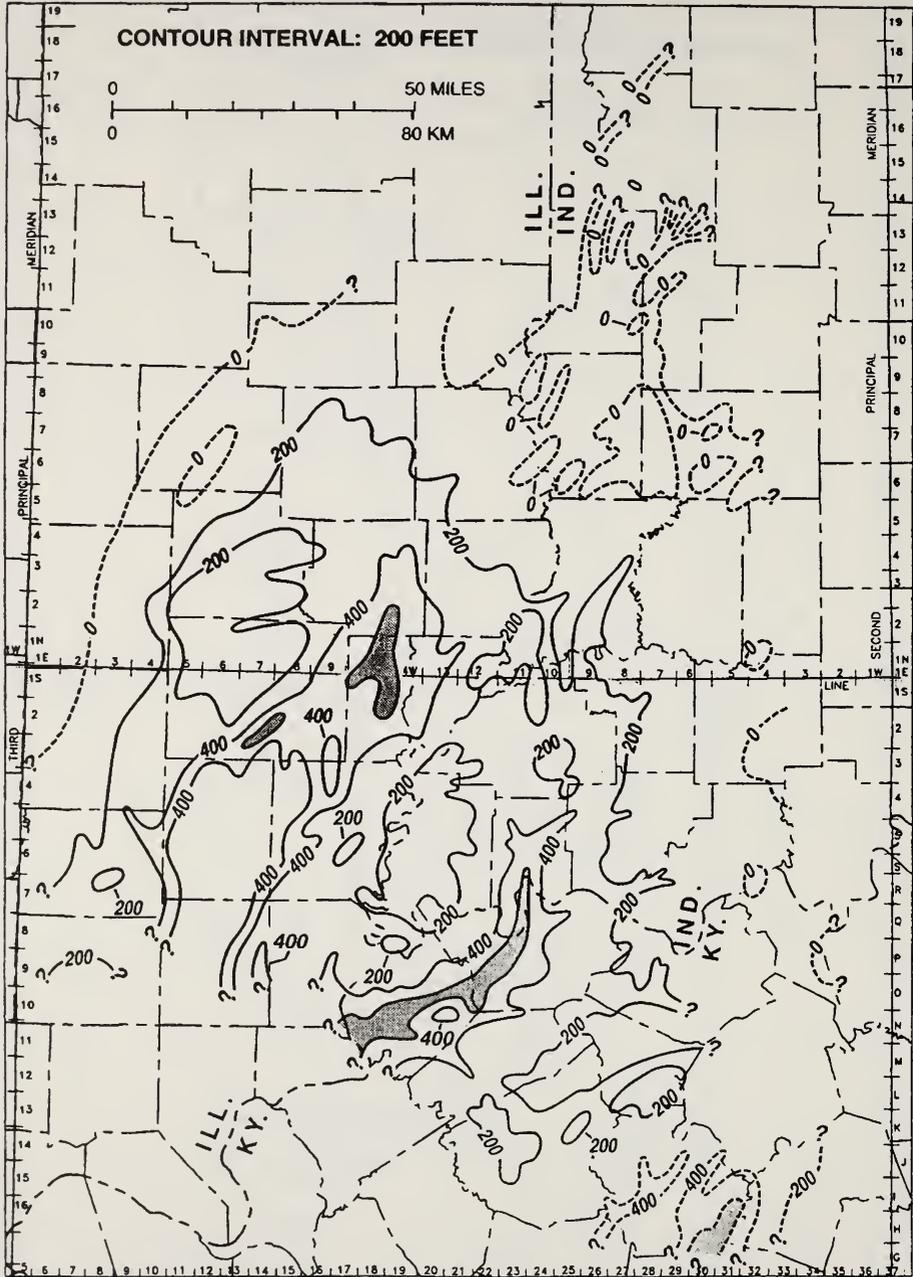


Figure 4. Map showing the thickness of Mansfield-A through Mansfield-D (contour interval = 200 feet). Areas where the thickness is greater than 500 feet are shaded (see text for explanation).

The lower Mansfield, approximately equivalent to the Caseyville Formation of Kentucky and Illinois, is divided into four units whose definition is not based on stratigraphic nomenclature defined on outcrop because only the upper several tens of feet of the lower Mansfield reach the outcrop in Indiana. The Mansfield-A through Mansfield-D, the lower Mansfield of Droste and Furer (1995), will be discussed in the future based on subsequently gathered subsurface data. The details of the Mansfield-A through Mansfield-D ranges in thickness from zero at depositional limits to almost 600 feet in Union County, Kentucky. Areas where the lower Mansfield is greater than 500 feet thick are shaded in Figure 4 to illustrate the location of earliest Pennsylvanian deposition.

The area of thick lower Mansfield, extending from Illinois and Kentucky and a few miles into Indiana, overlies the position of the Evansville Paleovalley. Another thick area in the southeastern part of the study area is related to the infilling of a paleovalley, but the map pattern shown is tentative. Structural complexities and limited well control have made correlations more uncertain. The area of greatest thickness in eastern Illinois may be the result of the development of an early Pennsylvanian depocenter in the central part of the Fairfield Basin.

SUMMARY

The stratigraphic position of the Colchester Coal has much better basin-wide recognition than the Seelyville Coal, and the base of the Colchester should be used to mark the top of the Raccoon Creek Group in subsurface studies. The large variation in thickness of Mansfield-A through Mansfield-D is at least in part related to the topography of the sub-Pennsylvanian surface. Variation in the overall rate of subsidence may have resulted in early generation of a distinct depocenter in eastern Illinois. More detailed surface studies, particularly of Mansfield rocks, may facilitate the mapping of marine, transition, and non-marine facies.

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