

# Structure and Overburden of the Springfield Coal Bed in Western Kentucky

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## Introduction

Historically, the Springfield (Western Kentucky No. 9) coal has been the most studied and most mined bed in the Western Kentucky Coal Field. It has the largest estimated original and remaining resource in western Kentucky (9.92 and 6.98 billion tons, respectively) (Andrews and others, 2000).

## Basin Overview

The Western Kentucky Coal Field is the southeastern extension of the Illinois Basin into western Kentucky (inset of Figure 1). The structural geology of the basin has been summarized in Greb and others (1992). The dominant structural features in western Kentucky are two structural grabens, the Webster and Moorman Synclines (Fig. 1). These synclines are roughly east-west trending, bounded on the north by the Rough Creek Fault System and on the south by the Pennyryle Fault System. The Moorman Syncline is shallower and more symmetrical than the Webster Syncline (Fig. 2). The two synclines are separated by the northeast-southwest-trending Central Faults (Fig. 3). The Webster Syncline is asymmetrical, with a gentle southern limb and a steep northern limb. Pennsylvanian strata reach thicknesses of 3,300 feet in the deepest parts of the structure (Fig. 4).

## Map Development

Because the Springfield is the most extensive and widely identifiable coal bed in this region, a large data set is available for development of a regional elevation model. The Springfield coal was used as a structural datum on many of the U.S. Geological Survey 7.5-minute geologic quadrangle maps for the Western Kentucky Coal Field. These data, along with a large repository of geophysical logs on file at the Kentucky Geological Survey, were used to develop a regional structure map of the Springfield coal. A generalized version of this map was included as Plate 1 in Greb and others (1992). The faults and contours from Greb and others (1992) were digitized, and a continuous-grid elevation model was interpolated from the digital vectors. An estimate of overburden for the Springfield coal was calculated by subtracting the elevation of the coal bed from the surface elevation, compiled from U.S. Geological Survey digital elevation models (DEM's) for the Western Kentucky Coal Field (Fig. 5).

## Discussion

The Springfield coal bed can be divided into three general structural areas: (1) north of the Rough Creek Fault System, (2) the Webster Syncline, and (3) the Moorman Syncline. In the area north of the Rough Creek Fault System, the Springfield coal is relatively shallow and dips very gently to the west. The surface-mineable belt of Springfield coal on the eastern side of this area is relatively wide, and significant surface mining has taken place there (Andrews and others, 2000). The central and western parts of this area are shallow enough to allow the development of large underground shaft mines. South of the Rough Creek Fault System, the Springfield coal is situated in an asymmetric graben, bounded by the Rough Creek and Pennyryle Fault Systems, and split by the northeast-trending Central Faults into the Moorman Syncline to the east and the Webster Syncline to the west. Overburden is thickest in the Webster Syncline, reaching over 2,500 feet in one fault-bounded block, which makes some of the Springfield in this region too deep to mine economically with current technology. Along the southern edge of the outcrop belt, the steep dip of the coal has led to a narrow belt of surface-mineable coal.

## Acknowledgments

Numerous colleagues have given significant assistance, without which this project would not have been possible. John Beard, Allen Williamson, and Dave Williams compiled the original draft of the structure map for the Springfield coal. Jerry Weisenfluh provided invaluable direction and suggestions during the course of this project. Special thanks are also due to Colin Treworthy of the Illinois State Geological Survey, who graciously interpolated the continuous-grid coal-bed elevation model from the original digitized vectors. This work was funded by the Coal Availability and National Coal Assessment Programs of the U.S. Geological Survey.

## References Cited

Andrews, W.M., Jr., Andrews, R.E., and Hiatt, J.K., 2000. Coal resources of the Springfield coal bed in western Kentucky. Kentucky Geological Survey, ser. 12, Map and Chart Series 10, 1 sheet.  
Greb, S.F., Williams, D.A., and Williamson, A.D., 1992. Geology and stratigraphy of the Western Kentucky Coal Field. Kentucky Geological Survey, ser. 11, Bulletin 2, 77 p.

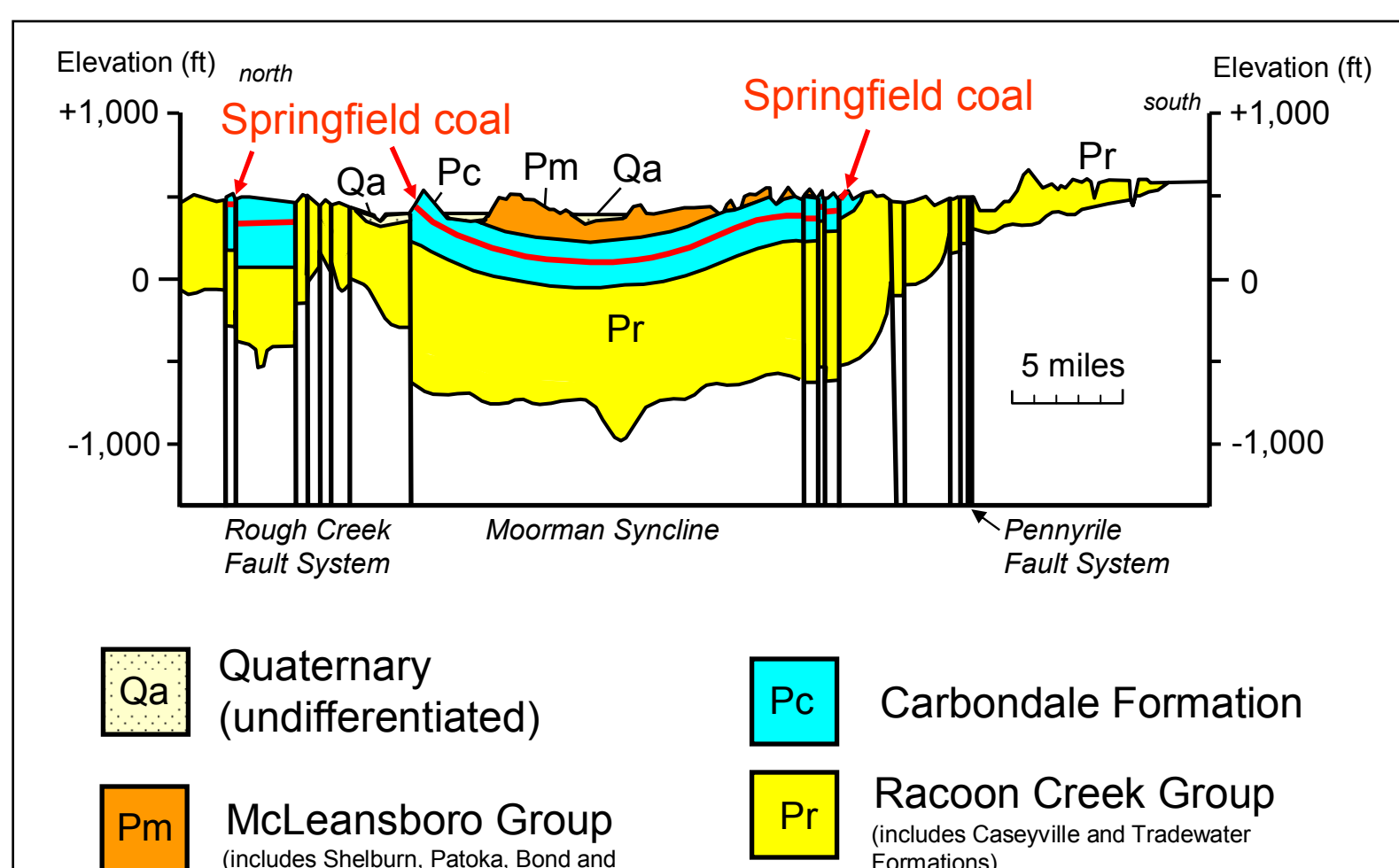


Figure 2. Generalized structural cross section of Pennsylvanian strata across the Moorman Syncline in western Kentucky. The Springfield coal is included in the Carbondale Formation. The position of the Springfield coal is shown by the red line. Approximate location of this cross section is shown in Figure 1.

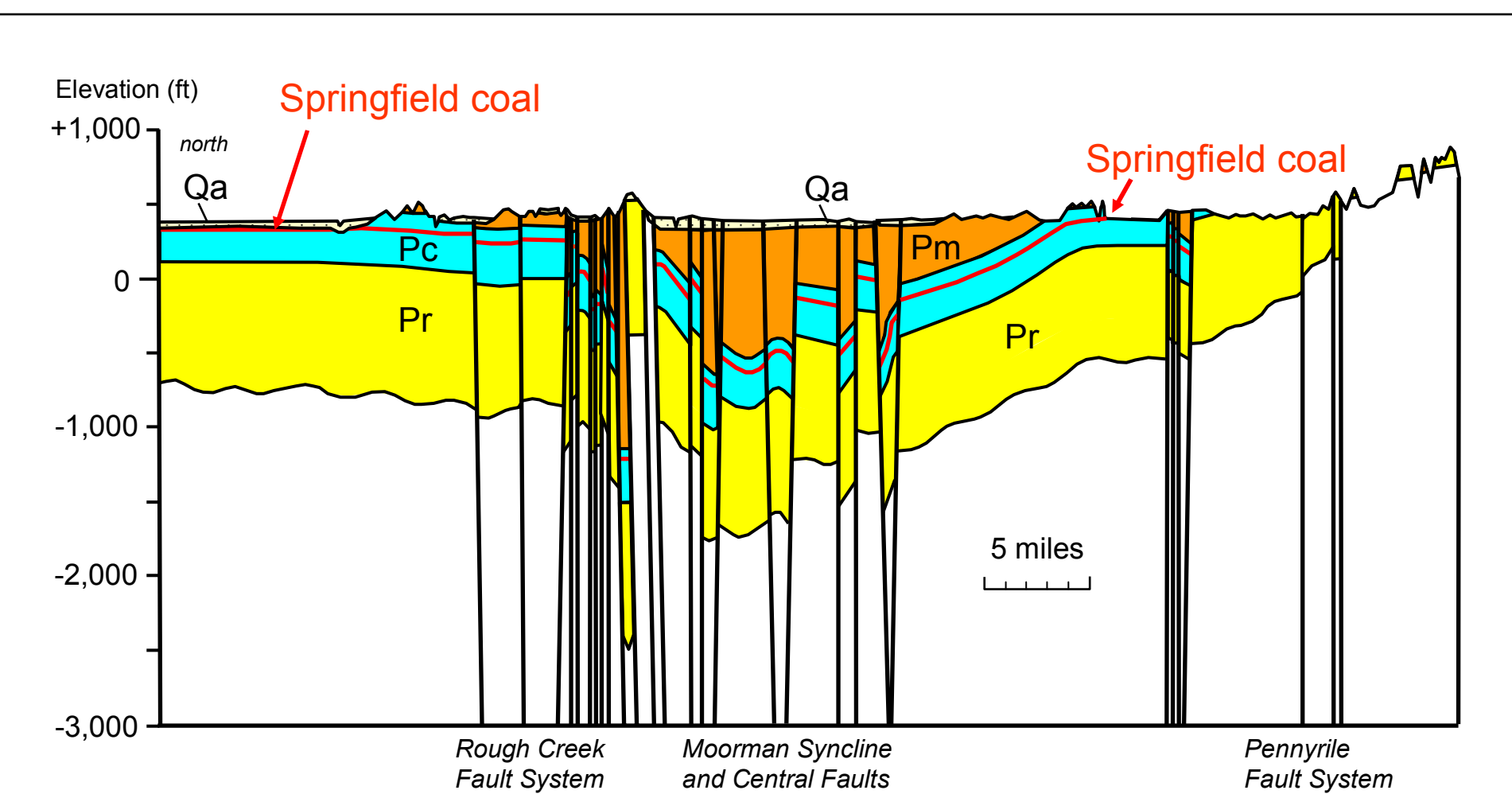


Figure 3. Generalized structural cross section of Pennsylvanian strata through the Central Faults in western Kentucky. The Springfield coal is included in the Carbondale Formation. The position of the Springfield coal is shown by the red line. The legend for this cross section is the same as Figure 2. Approximate location of this cross section is shown in Figure 1.

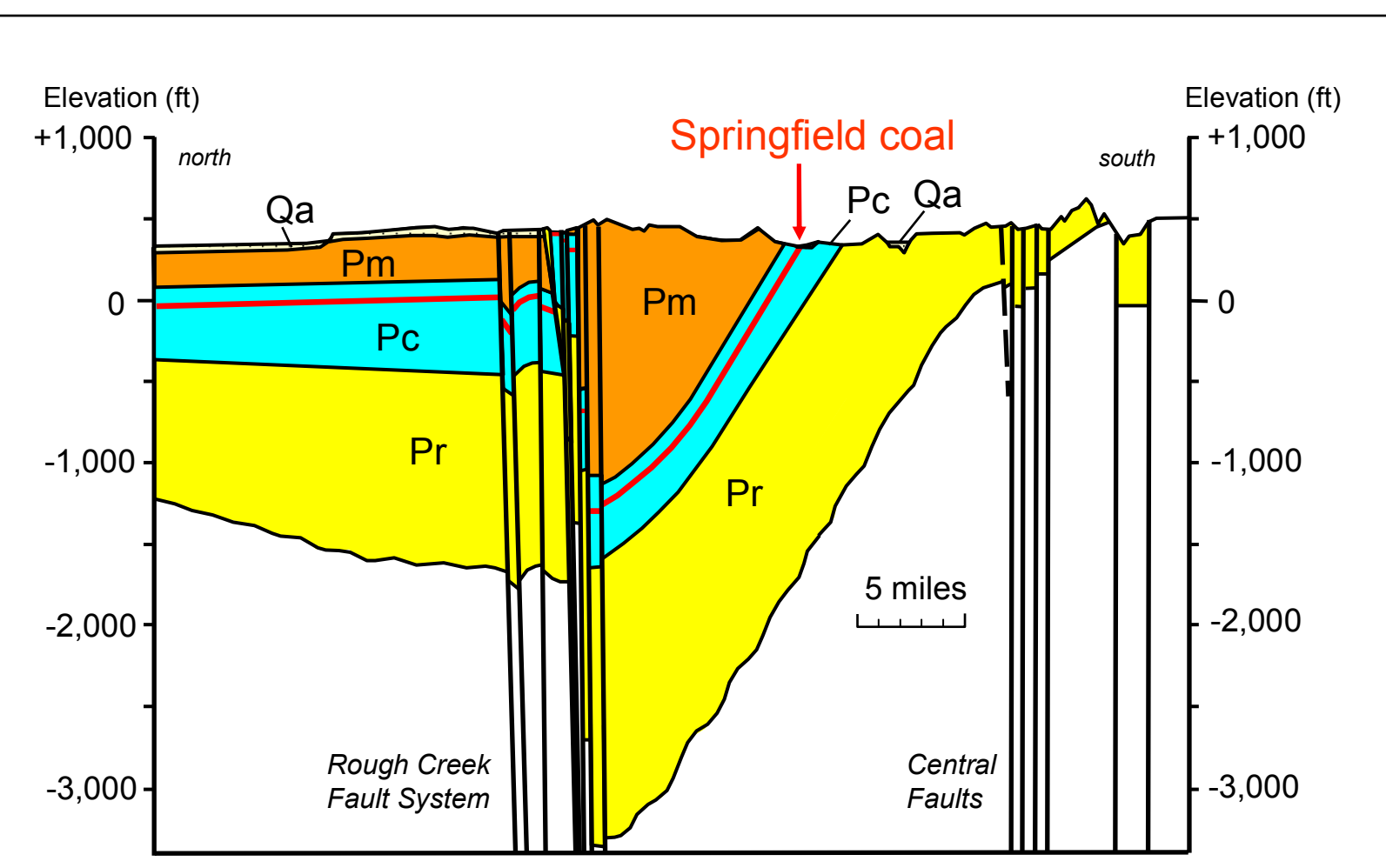


Figure 4. Generalized structural cross section of Pennsylvanian strata across the Webster Syncline in western Kentucky. The Springfield coal is included in the Carbondale Formation. The position of the Springfield coal is shown by the red line. The legend for this cross section is the same as Figure 2. Approximate location of this cross section is shown in Figure 1.

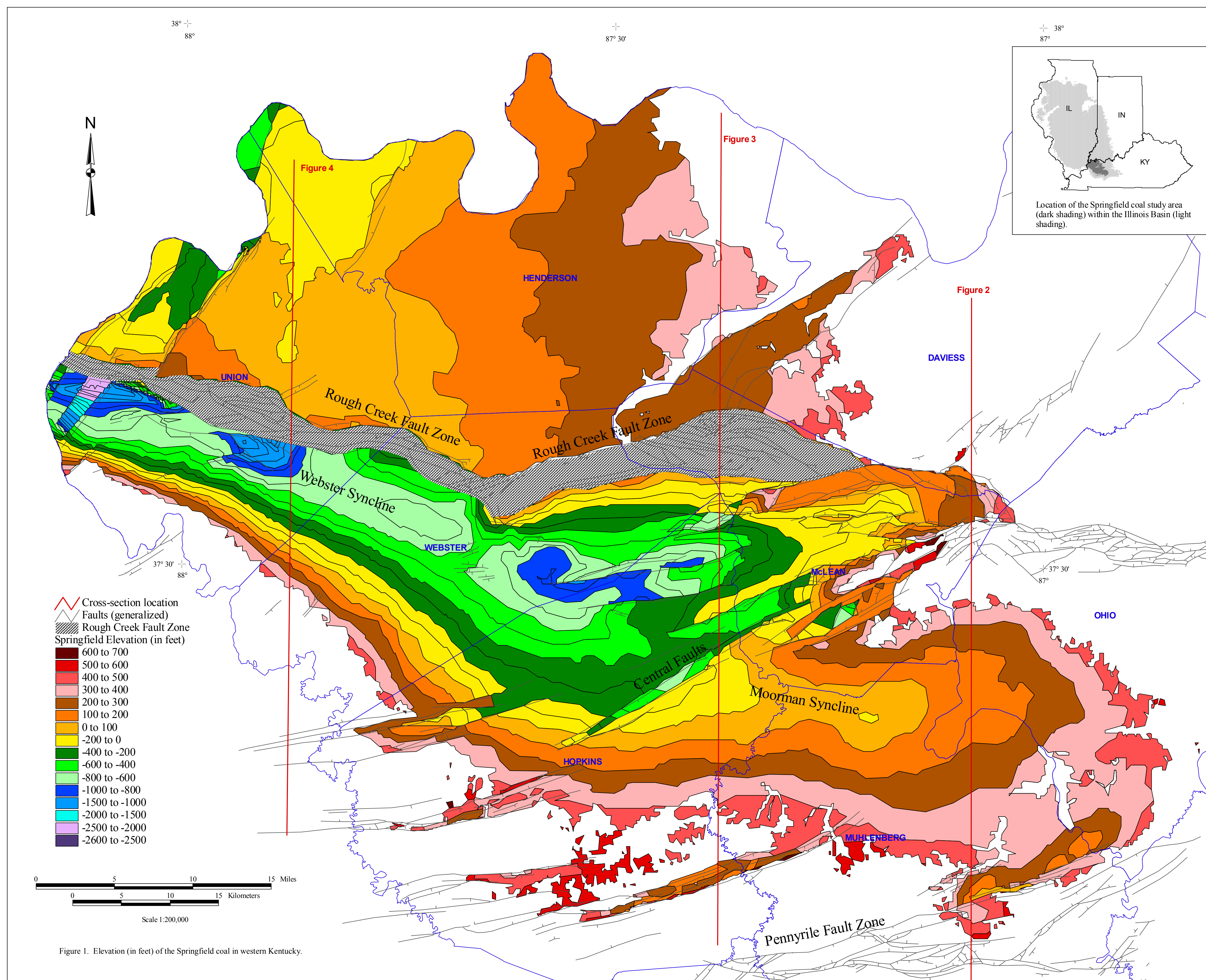


Figure 1. Elevation (in feet) of the Springfield coal in western Kentucky.

Both maps universal transverse Mercator, zone 16; 1927 North American datum

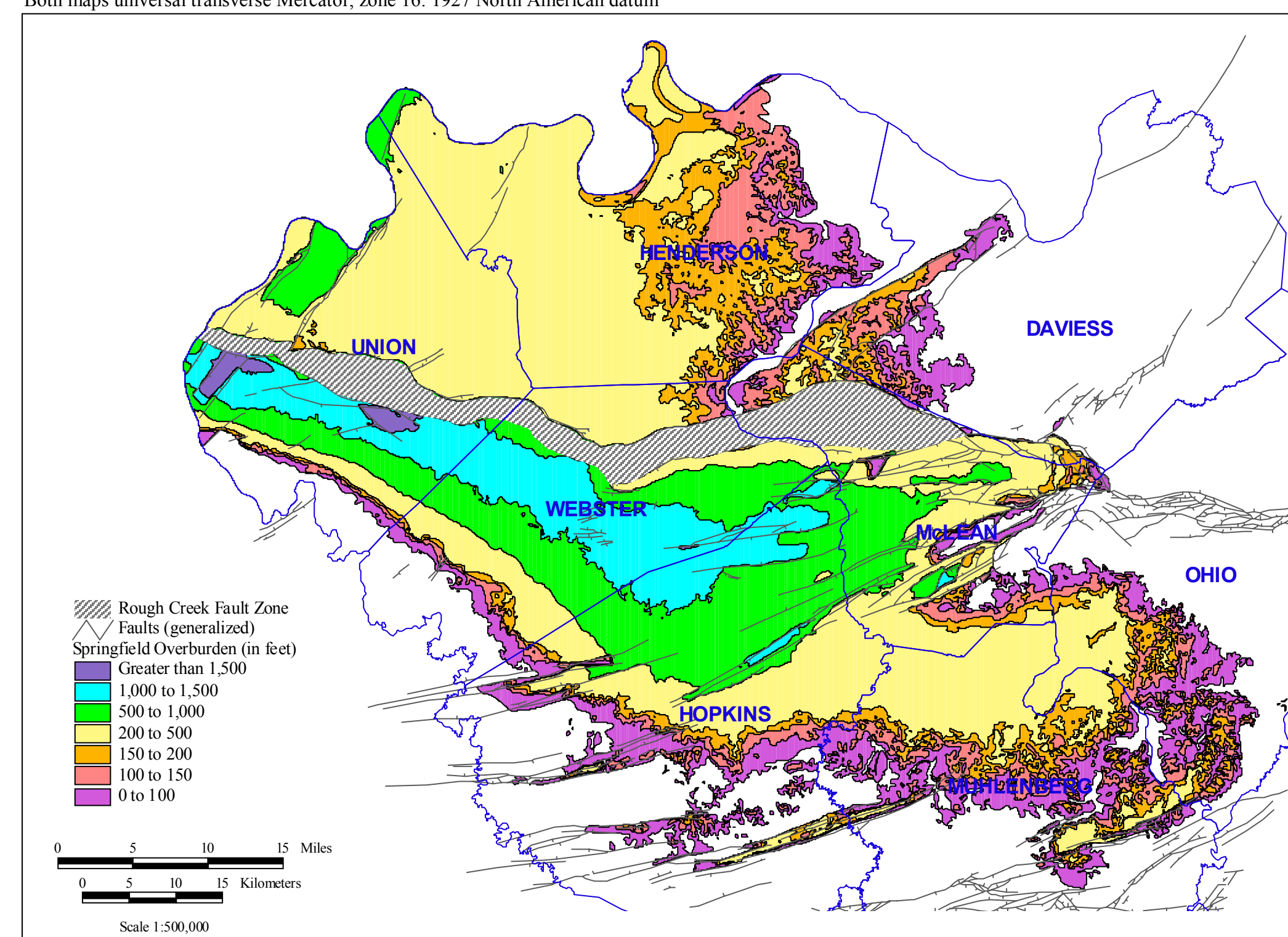


Figure 5. Estimated overburden (in feet) of the Springfield coal in western Kentucky.

For information on obtaining copies of this map and other Kentucky Geological Survey maps and publications call:  
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