

COAL IN NORTHEASTERN CARROLL COUNTY AND SOUTHEASTERN LIVINGSTON COUNTY, MISSOURI

**WALLACE B. HOWE
and WALTER V. SEARIGHT**



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EDWARD L. CLARK, STATE GEOLOGIST

Rolla, Missouri



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Wallace B. Howe and Walter V. Searight

ABSTRACT

Northeastern Carroll and southeastern Livingston counties are underlain by Pennsylvanian strata which contain two coal beds of minable thickness, the Croweburg and Bevier coals. A tonnage of 1,693,950 tons of Croweburg coal under 30 feet or less of cover is estimated to be present. The Croweburg and Bevier coal beds, 40 feet apart vertically, offer the possibility of tandem operation.

INTRODUCTION

History of coal mining.—Residents report that underground mining in northeastern Carroll County began as early as the 1850's. Coal "banks" in the area were described in 1872 (Broadhead, 1873, pp. 308-311). Coal was mined from drifts, slopes and strip pits before 1891 (Winslow, 1891, pp. 107-108). At that time several acres of coal had been stripped and mined in the vicinity of Little Compton, a community in the NW $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 20, T. 55 N., R. 21 W., a half mile north of the present site of Compton School. In 1911, a drift mine in the SW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 8, a slope mine in the NW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 16, and a strip mine in the NW $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 17, were operating; and an abandoned shaft was in the SE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 17, all in T. 55 N., R. 21 W., (Greene, 1911). These and other small, long-abandoned operations can still be seen.

At present a strip mine operates seasonally in the NW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 18, T. 55 N., R. 21 W. A bulldozer has been used in this pit to uncover the coal.

All mining in northeastern Carroll County was in the bed now called Croweburg.

Topography.—The area under consideration in this report is portrayed on the Hale 7 $\frac{1}{2}$ ' topographic quadrangle which shows most of the locations which have been stripped for coal. Copies of this quadrangle are available at the office of the Missouri Geological Survey.

Strata associated with coal beds.—The general succession of strata in the area is shown on Plate I (in pocket). The names are those adopted at an interstate conference of geologists at Nevada, Missouri, March 31, 1953. The succession consists of shales, sand-

stones, limestones, underclay, and coal as indicated in the columnar section (Plate I).

Five coal beds are present in northeastern Carroll County and southeastern Livingston County. All are in the Desmoinesian Stage of the Middle Pennsylvanian Series. Four of them, the Croweburg, Wheeler, Bevier and Mulky are in the Cabaniss group and one, the Summit, is in the Marmaton group. Three of the coal beds are not of minable thickness: the Wheeler, four to five inches thick, the Mulky, only a smut streak, and the Summit, four to six inches thick. The Croweburg and Bevier are thick enough to offer stripping possibilities. The interval between them is about 40 feet. The possibility of stripping the Bevier and Croweburg in tandem operation increases possible tonnage per acre and extends the area of possible operation. They are not thick enough for extensive underground mining in the foreseeable future.

CROWEBURG COAL BED

Distribution.—The map, Plate I, indicates the outcrop of the Croweburg coal bed. Control from pits, drifts and slopes in section 17 and in the NE $\frac{1}{4}$ sec. 20, T. 55 N., R. 21 W., is adequate to determine the coal boundary with considerable accuracy. The area southwest of a northwest-trending line through Compton School, at the center of section 20, is entirely drift covered and the boundary is therefore conjectural. The Lagonda sandstone, normally present above the Bevier coal, crops out a few feet above the flood plain at the common section corners of sections 4, 5, 8, and 9, T. 55 N., R. 21 W. Coal does not crop out in this immediate vicinity, nor has it been reported except along the southern edge of the SE $\frac{1}{4}$ sec. 8. Whether the Croweburg coal bed, as well as the Bevier, has been cut out and the position occupied by the Lagonda sandstone or whether the coal lies below the sandstone at depth is not known. Structural evidence indicates that all beds are warped downward and that the coal is present at depth. Two miles north of the outcrop of the Croweburg coal in SE $\frac{1}{4}$ sec. 8, the coal was mined before 1872 and has been reported to dip sharply to the southeast (Broadhead, 1873, pp. 310-311).

Persistence and thickness.—The Croweburg is presumed to be persistent in Carroll County and to the north in Livingston County except where it has been removed by erosion. In most areas it is uniform in thickness, but in this area information suggests that considerable variations in thickness are common. The coal was completely exposed in but one place in 1952. This was a strip mine in the SW $\frac{1}{4}$ NE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 17, T. 55 N., R. 21 W., where it was 20

inches thick. The bed was measured in 1911 by Frank C. Greene (1911) as follows: 22 to 26 inches thick in the SW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 8; 18 to 23 inches thick in the NW $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 17; 23 inches thick in the NW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 16; and 23 inches thick in the SE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 17.

Quality.—The Croweburg coal is hard, bright, and blocky. It has been reported to be generally free from pyrite; however, on the dumps, pyrite in fairly large masses has been observed. Samples of this coal satisfactory for analysis were not available during this investigation.

BEVIER COAL BED

Distribution.—The Bevier coal bed crops out in the NE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 12, T. 55 N., R. 21 W., along a northward draining tributary which bends eastward into Lick Creek. It has been uncovered in the borrow cut both north and south of the Chicago, Burlington, and Quincy Railroad in the S $\frac{1}{2}$ SE $\frac{1}{4}$ sec. 36, T. 56 N., R. 21 W. In 1911 it was exposed in Mowhee Bluff, the high bluff of Grand River, in the western part of sec. 16, T. 55 N., R. 21 W., (Greene, 1911). It also crops out in several places along Towstring Creek and at and near Bedford.

Owing to scarcity of outcrops of the Bevier coal, the area underlain by the coal cannot be determined precisely. The area shown on the map (Plate I) was determined from outcrops of the coal, outcrops of the Lagonda sandstone, the elevation of the Croweburg coal as indicated by structure contours (Plate I), and the assumption that the glacial deposits are not more than 20 feet thick. Whether or not the coal is actually present under the inferred area can be ascertained only by drilling.

Attention is again directed to the possibility that the Bevier coal has been removed locally and its position occupied by the Lagonda sandstone. This possibility is important in sec. 8, T. 55 N., R. 21 W., where the Bevier has not been reported, although its presence is inferred. If the surface deposits are locally thicker than 20 feet, the area underlain by minable coal is smaller.

Thickness.—The Bevier coal bed is 15 inches thick where it crops out in the NE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 12, T. 55 N., R. 21 W. At Mowhee Bluff the Bevier coal was reported to be 13 to 20 inches thick (Greene, 1911). South of the area of this report, in the NE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 8, T. 54 N., R. 21 W., where the coal was formerly stripped, it was 28 inches thick (Hinds, 1912, p. 127). In southeastern Livingston County, to the north of the area of this report, the Bevier is

14 to 24 inches thick (Hinds, 1912, pp. 265-267) but it is locally absent owing to erosion of the coal and the deposition of the Lagonda sandstone.

Quality.—Little is known of the quality of the Bevier coal other than that in the old reports on Livingston County, it is said to be good. Satisfactory samples were not available for analysis.

STRUCTURE

Structure contours drawn on the Croweburg coal bed (Plate I) show the general variations in attitude of the coal below the surface. Control is based on estimates of the elevation of the coal bed from contour lines on the topographic map of the Hale quadrangle and from estimates of the elevation of the coal bed from the outcrops of other identifiable strata.

The structure contour map shows gentle dips of 40 to 50 feet per mile into a syncline. The lowest point in this structural depression is at the common corner of sections 4, 5, 8, and 9, T. 55 N., R. 21 W. The axis of the syncline trends from about the center of sec. 31, T. 56 N., R. 21 W., southeastward across the NW $\frac{1}{4}$ sec. 6, to the SE corner sec. 5, T. 55 N., R. 21 W. South and west of the axis, the coal generally dips east in sec. 6, east of northeast in sec. 7, and north and northeast in sections 8 and 17. In sec. 5, the dip is generally west of south. Structural and topographic conditions have exposed the Croweburg coal near the bottoms of the valleys in the N $\frac{1}{2}$ sec. 17, and, also, along the south line of sec. 8. The coal gradually rises to the south along Grand River and its eastward draining tributaries. From the structure contours it appears that the Croweburg coal bed is below drainage along Lick Creek in sec. 8, except along the southeastern edge of the section. The bed is 30 feet or more below the level of the flood plain of Grand River at the southeastern corner of sec. 5, and the northeastern corner of sec. 8. Evidence indicates that the dip of the Bevier coal bed is similar to that of the Croweburg coal.

POTENTIAL STRIPPING AREAS

Stripping areas in the Croweburg Coal.—The inferred area in northeastern Carroll County in which the Croweburg coal is covered by 30 feet or less of overburden is indicated on the map (Plate I). This area measured by a planimeter is 491 acres. Assuming that the Croweburg coal bed averages 23 inches thick and that an acre-inch contains 150 tons of coal (1800 tons per acre-foot), the area contains 1,693,950 tons of coal under 30 feet or less of

cover. No allowance has been made for the relatively small unknown amount of coal mined in previous operations. Adequate exploration by drilling before development is necessary to determine the presence and character of the coal and the extent, thickness, and character of the overburden.

Overburden on the Croweburg coal consists of black fissile shale, thin limestone beds, and surficial materials consisting of glacial drift and loess or silt. As a rule where the cover includes less than 10 to 15 feet of shale and limestone the coal is likely to be soft. Where glacial and younger unindurated deposits rest on the coal, the bed may be weathered. The surficial deposits above the coal are probably 15 to 20 feet thick in most places. Glacial drift will stand vertically for a short time only. Where water accumulates at the contact between drift and bedrock, the drift is very unstable and it slides readily.

Stripping areas in the Bevier coal.—Areas of the Bevier coal under shallow cover are presumed to be present. Such areas are most likely to be found by drilling in a belt immediately inside the borders of the area assumed to be underlain by Bevier coal as indicated on the map (Plate I). Most likely localities for exploration are those where the coal is structurally high and the topographic surface is low.

Available information suggests that the Bevier bed does not average more than 16 inches thick. Therefore, it does not average more than 2400 tons of coal per acre.

Possible areas of tandem operation on both the Croweburg and Bevier coal beds.—The Croweburg and Bevier coal beds together probably average 39 inches, which at 150 tons per acre-inch is 5850 tons of coal per acre. Where the Bevier is present under a cover of less than 20 feet thick, the total overburden on both coal beds is estimated to be less than 60 feet. With 60 feet of overburden and 39 inches of coal the ratio of overburden to coal is 18.5 feet to 1.

Exploratory drilling to establish the presence of both coal beds, the thickness of each, the interval between the beds, and the amount of overburden on the Bevier should precede a systematic drilling program to outline areas favorable for tandem strip mining.

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