GEOLOGY OF THE CANE BRANCH AND HELTON BRANCH WATERSHED AREAS, McCREARY COUNTY, KENTUCKY

By Erwin J. Lyons

DEPARTMENT OF THE INTERIOR
U. S. GEOLOGICAL SURVEY.

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INTRODUCTION

Cane Branch and Helton Branch in McCreary County, Kentucky, are about 1.4 miles apart (fig. 1). Cane Branch, which is about 2.1 miles long, empties into Hughes Fork of Beaver Creek. Its watershed area of about 1.5 square miles lies largely in the Wiborg 7½-minute quadrangle (SW/4 Cumberland Falls 15-minute quadrangle), but the downstream part of the area extends northward into the Hail 7½-minute quadrangle (NW/4 Cumberland Falls 15-minute quadrangle). Helton Branch, which is about 1.1 miles long, has two tributaries and empties into Little Hurricane Fork of Beaver Creek. It drains an area of about 0.8 square mile of which about 0.5 square mile is in the Hail quadrangle and the remainder in the Wiborg quadrangle. The total relief in the Cane Branch area is about 500 feet and in the Helton Branch area about 400 feet. Narrow, steep-sided to canyon-like valleys and winding ridges, typical of the Pottsville escarpment region, are characteristic of both areas. Thick woods and dense undergrowth cover much of the two areas.

Field mapping was done on U. S. Geological Survey 7½-minute maps having a scale of 1:24,000 and a contour interval of 20 feet. Elevations of lithologic contacts were determined with a barometer and a hand level. Aerial photographs were used principally to trace the cliffs formed by sandstone and conglomerate ledges. Exposures, except for

those of the cliff- and ledge-forming sandstones and conglomerates, are not abundant. The most complete stratigraphic sections (secs. 3 and 4, fig. 2) in the two areas are exposed in cuts of newly completed Forest Service roads, but the rock in the upper parts of the exposures is weathered. To supplement these sections, additional sections were measured in cuts along the railroad and main highways in or near the watersheds

GEOLOGY

Rocks exposed in the Cane Branch and Helton Branch areas are in the upper part of the Lee formation of the Pennsylvanian system and consist of quartz conglomerate and sandstone, siltstone, claystone, and coal (fig. 3). The beds are essentially horizontal. For the purpose of this discussion, the stratigraphic section is divided into three parts: (1) the strata below the main cliff-forming sandstone, (2) the main cliff-forming sandstone, and (3) the strata above the main cliff-forming sandstone, this last including the main coal of the area.

Strata below the main cliff-forming sandstone.--About 35 to 45 feet of the rock below the main cliff-forming sandstone is exposed along the Forest Service roads. In the Cane Branch area the basal 15 to 20 feet consists of a very fine to fine-grained sandstone in beds less than 2 feet thick which contain a little mica and an occasional ironstone concretion, none of which is more than 1 inch in diameter (sec. 4, fig. 2). This sandstone is overlain by about 7 feet of sandy siltstone which is thin bedded to shaly in the lower part but without bedding in the upper part. Mica and plant fragments are present in the lower part of the siltstone,

and rootlet impressions are found throughout the siltstone. Above this siltstone is 6 inches of coal bloom, which is overlain by about 15 feet of silty, shaly claystone containing ironstone concretions as much as 3 inches in diameter. This claystone becomes sandy in the upper part.

In the Helton Branch area the sequence below the cliff-forming sandstone consists of very fine to fine-grained, cross-bedded and ripple-marked sandstone whose bedding planes occur at intervals of less than 6 inches and which contains mica and plant fragments (sec. 3, fig. 2). The upper 5 to 10 feet of this sandstone grades laterally into a dark, shaly siltstone or claystone which contains lenses of coaly material as much as 3 inches thick and 2 feet long.

Main cliff-forming sandstone.--The main cliff-forming sandstone consists of a sequence of sandstone and conglomerate which is correlated with the Rockcastle sandstone member of the Lee formation. At most places in the mapped area it appears to consist of two units of coarse-grained rock separated by a few feet of finer-grained clastic rock (secs. 3 and 4, fig. 2). Throughout most of the two areas this sequence is a cliff-former. In places the entire sequence forms a cliff, but in others only the lower or upper part does.

The lower unit, which is 80 to 90 feet thick, consists in both watersheds of a sandstone, conglomeratic sandstone, or conglomerate. The matrix is made up of grains ranging in size from very fine to coarse in which lenses and irregular masses of subrounded white quartz pebbles most of which are less than 2 inches in diameter are abundant locally. Most beds are at least 1 foot thick, many are wedge-shaped, and in places they have

been scoured and the channels refilled with ~~distinctively different~~ sandstone or conglomerate. Cross-bedding is common.

The bed of finer grained ~~sediment~~ rock that separates the two units of coarse-grained rock throughout much of the area is as much as 5 feet thick and ranges from a sandy thin-bedded to shaly siltstone with interbedded very fine grained sandstone lentils to a silty claystone with interbedded siltstone layers. The bed may be missing locally, however. Coaly plant fragments are found in some exposures.

The upper unit of coarse-grained rocks ranges from 35 to 80 feet in thickness. In the Helton Branch area this upper unit consists of about 35 feet of fine- to medium-grained cross-bedded sandstone in beds as thick as 3 feet and containing quartz pebbles in the upper 10 feet (secs. 2 and 3, fig. 2). Along the Forest Service road in the Cane Branch area the upper unit consists of a very fine to fine-grained sandstone containing mica flakes, plant fragments, and interbedded siltstone (sec. 4, fig. 2). The beds are less than 3 feet thick, many are wedge-shaped, and there is evidence of scouring and refilling of the channels. Along the east side of Cane Branch this unit is thicker, being approximately 80 feet thick, and is more conglomeratic, containing white quarts pebbles in all but the uppermost 20 feet.

Strata above the main cliff-forming sandstone.--About 150 to 200 feet of rock is exposed above the main cliff-forming sandstone in the Cane Branch and Helton Branch areas. Most exposures are poor and in many places the rocks are deeply weathered. In much of the area this rock sequence consists of interbedded very fine to fine-grained sandstone, sandy siltstone, and sandy and silty claystone which in places contain plant frag-

ments and coaly lenses, but in some parts of the area the section is predominantly sandstone. At the head of Helton Branch is an almost continuous vertical section of sandstone and conglomerate about 100 feet thick, the lower 30 feet of which is part of the main cliff-forming sandstone (sec. 2, fig. 2). The upper 70 feet is a fine- to coarse-grained sandstone containing white quartz pebbles. Along Middle Ridge bordering Helton Branch on the east (fig. 1) a sandstone bed forms a series of ledges about 40 feet high, the base of the bottom ledge being about 40 feet above the top of the main cliff-forming sandstone. The sandstone is fine- to coarse-grained, is in beds as much as 2.5 feet thick, is cross-bedded, and contains white quartz pebbles.

In the southwestern part of the Helton Branch area and also in the Cane Branch area the highest sandstone exposed is very fine to medium-grained and friable, and weathers into rounded forms having a pinkish cast (secs. 1, 2, and 7, fig. 2). This sandstone closely resembles the Corbin sandstone, which is widely exposed along U. S. Highway 27 to the south where it is one of the uppermost units of the upper part of the Lee formation above the Rockcastle sandstone member.

COAL

A coal that has been stripped at the head of Cane Branch overlies the main cliff-forming sandstone and correlates with the Barren Fork coal of other areas. This coal was exposed only in the strip pit, where neither it nor the rocks in the highwall could be examined carefully because of water and slump. The coal bed can be seen in a number of small

mines and in exposures outside of the area shown in fig. 1. The nearest and most accessible occurrences are at the northern end of the railroad tunnel south of Parkers Lake, in several mines on and south of Dry Ridge and west of U. S. Highway 27, and in several small mines southeast and east of the Cane Branch area on Kilburn Fork, Laurel Fork, and Eagle Creek. In these last localities the coal ranges from 23 to 27 inches in thickness and is bright attrital, thinly banded in some parts of the bed, with interlaminated shale and coal in the upper part and, locally, masses and lenses of iron sulfide. The roof of the coal is a siltstone overlain by a sandstone or conglomeratic sandstone, which at places forms a cliff. Where the siltstone was removed by erosion or scouring prior to the deposition of the sandstone, the sandstone rests directly on the coal.

The Barren Fork coal was not found in the Helton Branch area, and it is possible that it may not be present but is represented by the dark claystone that overlies the main cliff-forming sandstone (sec. 3, fig. 2).

SUMMARY

Quartz sandstone, some of which is mica-bearing, is the predominant rock type in outcrops of the upper part of the Lee formation in the Cane Branch and Helton Branch watershed areas. All of the beds vary laterally in lithology and thickness over short distances, and because of this, construction of a cross section across the two areas in sufficient detail to be of value was not deemed feasible. To obtain enough information for such a cross section and to determine the presence or absence of the Barren Fork coal equivalent in the Helton Branch area, a drilling or trenching program would be necessary.

No analyses of the Barren Fork coal are known to be available although it is possible that the former operators of the strip pit had analyses made. To obtain a sufficiently fresh sample of the coal from the strip pit for analyses at the present time would require excavation by a bulldoser or a crew of men.

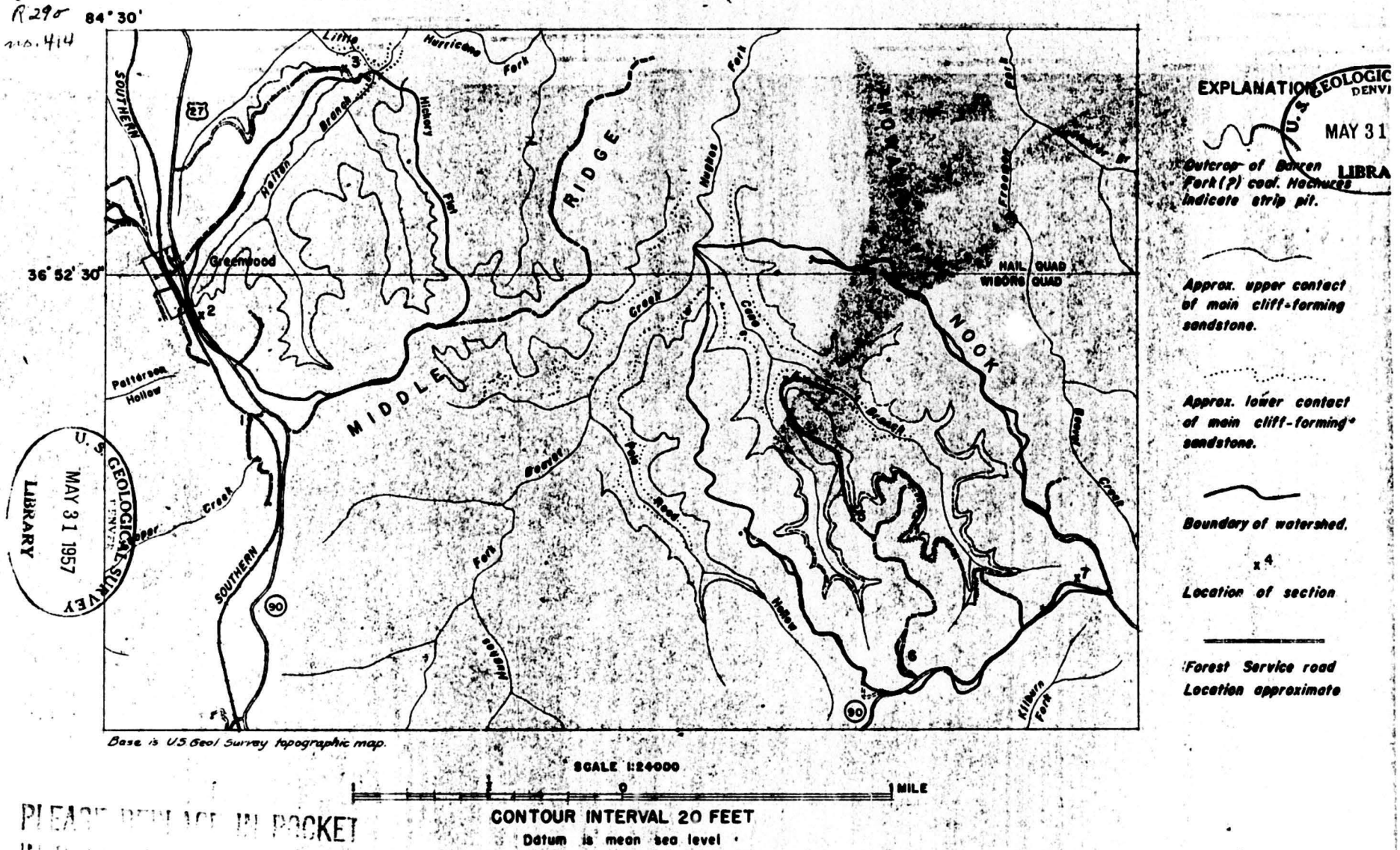

Figure 1.- Extent of coal and cliff-forming sandstone of Pennsylvanian age in and near the Helton Branch and Cane Branch watersheds McCreary County, Kentucky

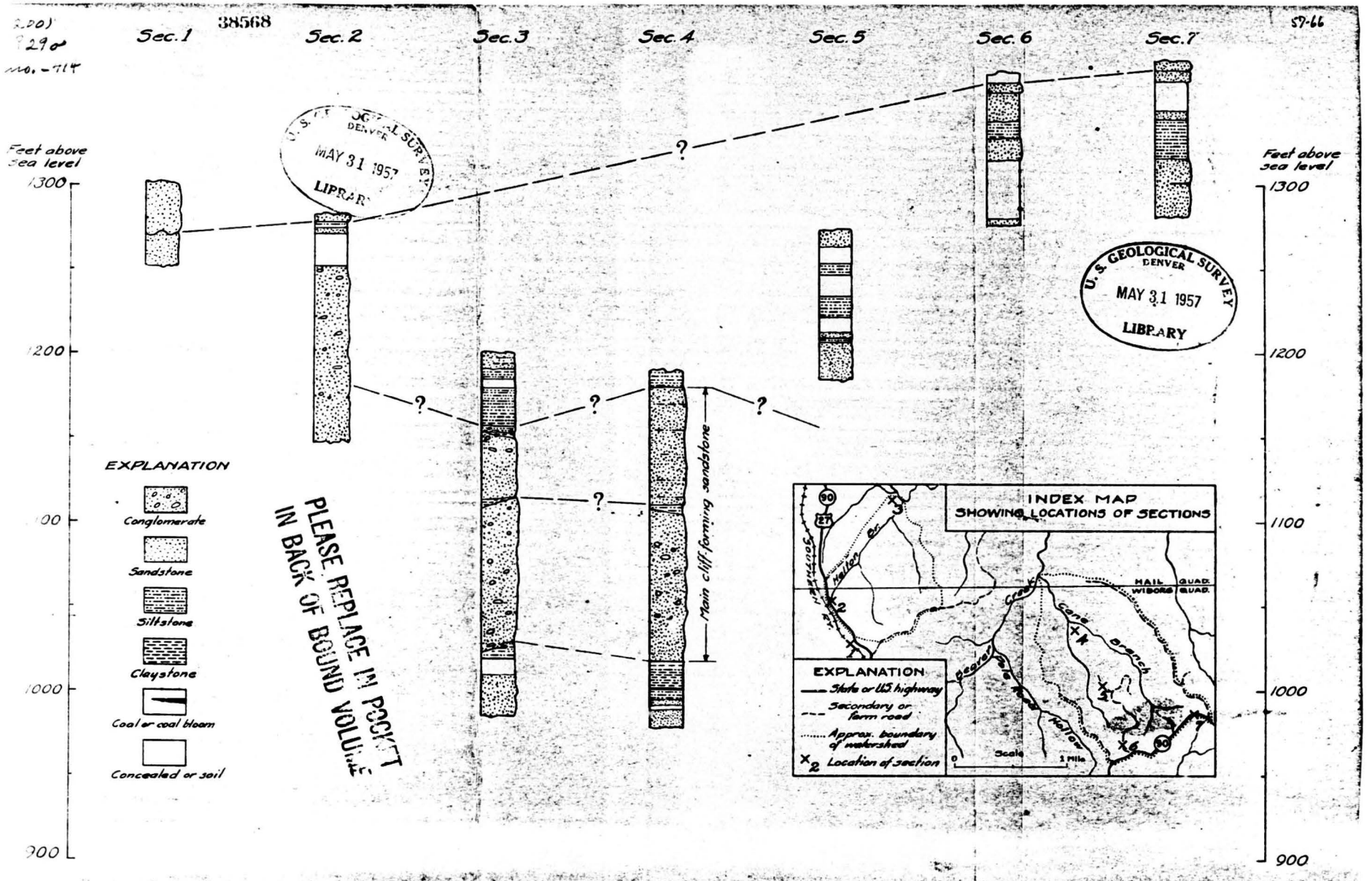

Figure 2.- Columnar sections of rocks of Pennsylvanian age exposed in or near the Helton Branch and Cane Branch watersheds, McCreary County, Kentucky

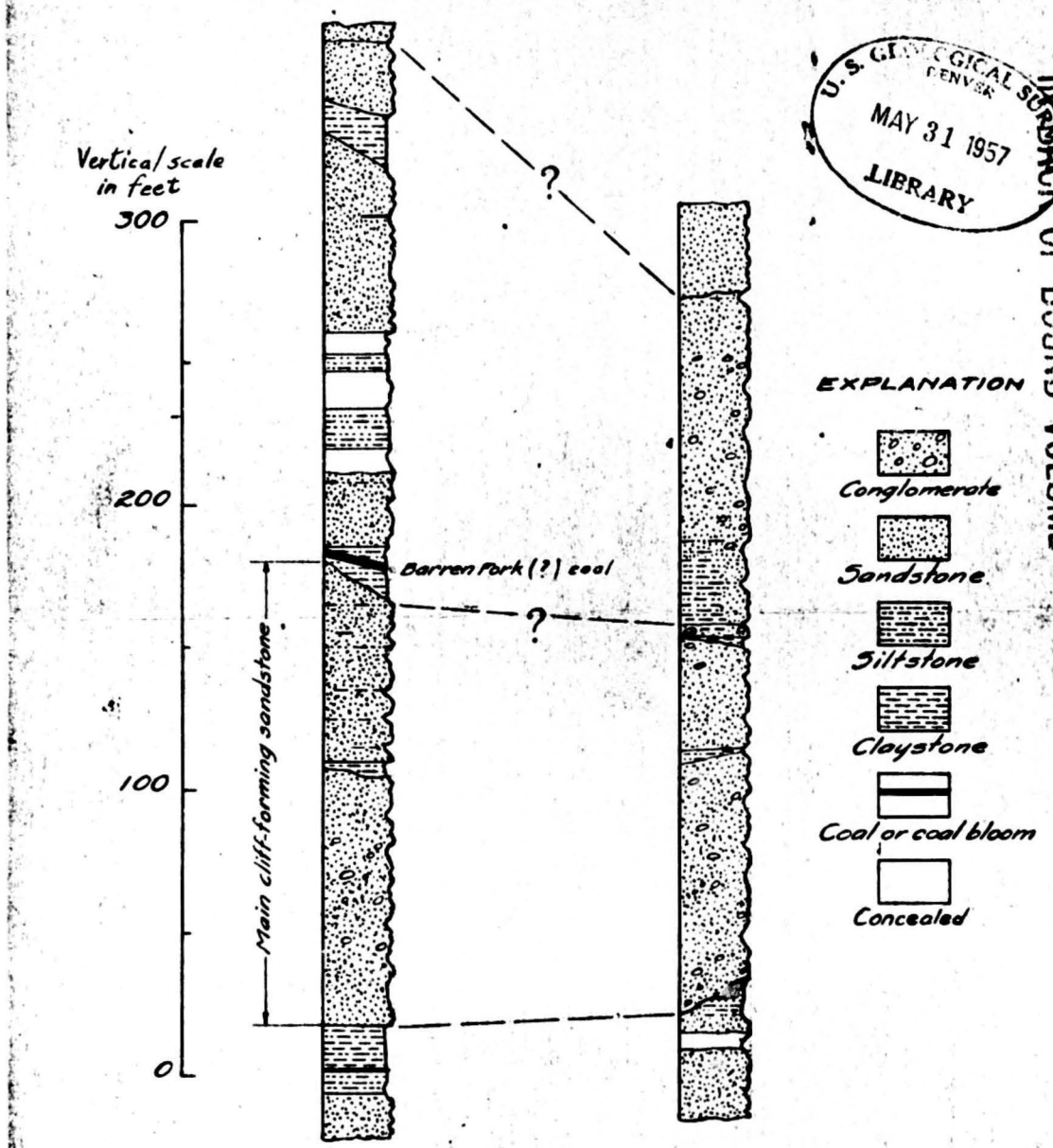

Figure 3.- Generalized sections of rocks of Pennsylvanian age present in the Helton Branch and Cane Branch watersheds, McCreary County, Kentucky