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LAND DISTURBANCES FROM STRIP-MINING IN EASTERN KENTUCKY 5. HAZARD COAL RESERVE DISTRICT

Abstract. Results of an airphoto survey to determine the extent of land disturbance by coal mining and by coal-haul roads in one of the six coal-reserve districts of eastern Kentucky. Describes the district, forest cover, physiography and geology, and distribution and physical characteristics of the acres disturbed in this district.

Open-pit or strip-mining—primarily for coal—has expanded rapidly in eastern Kentucky during the past 15 years. Information about the amount, location, and general characteristics of the disturbed area is necessary for appraising the economic impacts and overall effects of strip-mining in that section of the state, for planning reclamation programs, and for determining research needs and priorities. To obtain reliable estimates of the acreage disturbed both by the mining itself and by the associated coal-haul roads, and to provide relevant information about the disturbed areas, the Northeastern Forest Experiment Station made a survey of eastern Kentucky. The survey was based on aerial photographs of all stripped areas as of October 1964.

The survey was broken down in accordance with the six subdivisions or coal-reserve districts delineated by the U. S. Geological survey¹. Thus there will be a series of six reports, of which this is the fifth.

The method used in our survey was a modification of forest-survey procedure. A 3-by-6-inch transparent template with 25 dots per square inch was positioned over the center of each photograph. Areas on the photographs that appeared to be stripped land or coal-haul roads were

¹Huddle, J. W., F. J. Lyons, H. L. Smith, and J. C. Ferm. COAL RESERVES OF EASTERN KENTUCKY. U. S. Geol. Survey Bull. 1120, 147 pp., 1963.

examined stereoscopically to determine important characteristics, and the amount of area in various categories was estimated by dot counts.

The Hazard Coal Reserve District

The Hazard Coal Reserve District lies in the heart of the eastern Kentucky coal fields. It includes all of Breathitt, Knott, Leslie, and Perry Counties and portions of Harlan and Letcher Counties north of Pine Mountain (fig. 1). Over three-fourths of the disturbance from strip-mining in the District occurs in Knott, Letcher, and Perry Counties.

Coal mining in the District began in 1837 in Breathitt County.¹ Production in the other counties began in the early 1900's. Through 1955, the Hazard District produced 454 million tons of coal. Forty-six percent

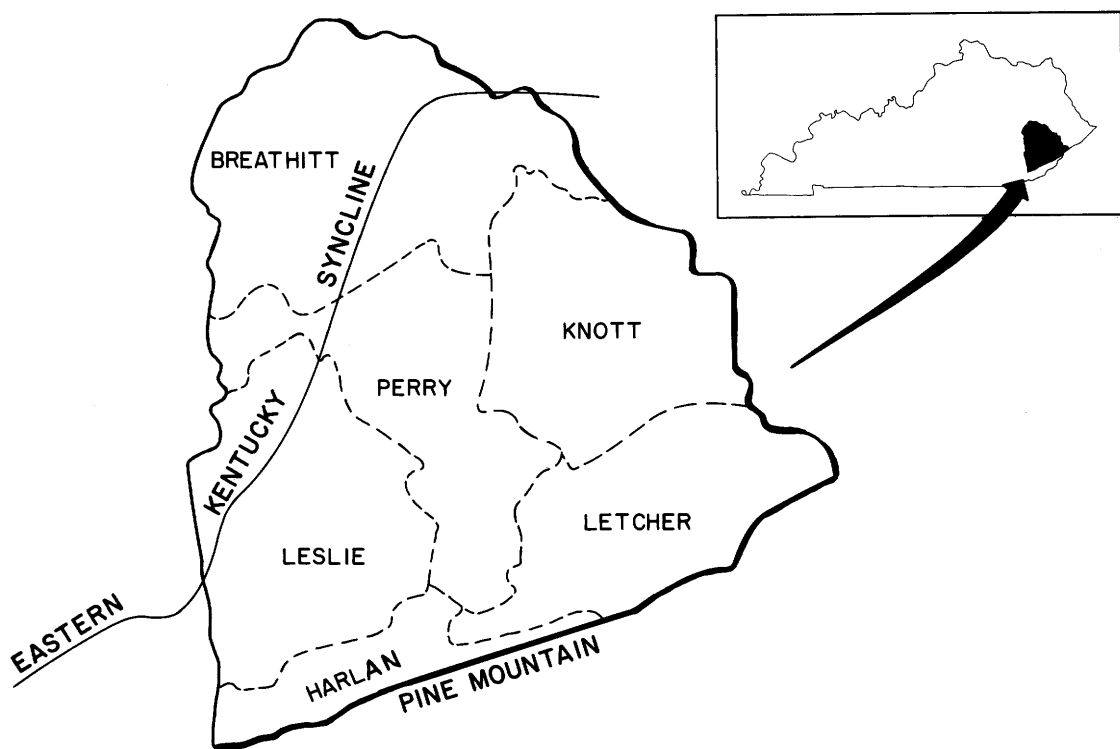


Figure 1.—Geologic and geographic features of the Hazard Coal Reserve District.

of this came from Letcher County, and 42 percent came from Perry County.

Total production from all mining methods in 1962 was 13.2 million tons. Of this, 25 percent or 3.3 million tons were produced by strip mines and auger mines.² Nine percent of the total came from strip-mining, and 16 percent came from auger mines or from strip and auger mines.

Merz, in 1947, found 416 acres of strip-mining disturbance in the District.³ There were 199 acres disturbed near Jenkins in Letcher County and 217 acres disturbed west of Hazard in Perry County. All of this disturbance was less than 5 years old when this early survey was made.

District coal reserves (measured, indicated, and inferred) are estimated to be 11.1 billion tons. About 3 billion tons are in beds more than 42 inches thick, and 4 billion tons are in beds 28 to 42 inches thick. The actual reserves may be much greater since there are many areas in the District where there has been little or no core drilling. The possibility of finding commercially important coal beds in these areas is high because of their geologic similarity with adjoining coal-producing areas.

Forest Cover

About 87 percent of the District's land area is covered by forests.^{4,5} The non-forest land generally occurs in the valley bottoms. About 71 percent of the strip and auger mines are located on the upper slopes and ridges. Ninety-six percent of these (strip and auger) mines have forests immediately below and adjoining the disturbed area.

Fifty-seven percent of the commercial forest stands are sawtimber sized with oak-hickory and central mixed hardwood types predominating. Pine and oak-pine types occur on 4 percent of the forest land.

Physiography and Geology

The District lies in a sharply dissected area of the Appalachian Plateau characterized by narrow ridges and deep V-shaped valleys. Local relief in excess of 1,000 feet is not uncommon.

²Mandt, A. H. ANNUAL REPORT. Ky. Dep. Mines and Minerals, 166 pp., 1963.

³Merz, Robert W. CHARACTER AND EXTENT OF LAND STRIPPED FOR COAL IN KENTUCKY. Kentucky Agr. Exp. Sta. Circ. 66, 27 pp., 1949.

⁴United States Forest Service and Kentucky Department of Natural Resources. BASIC FOREST RESOURCE STATISTICS, EASTERN UNIT, KENTUCKY, 1963. 1965. (Unpublished preliminary report on file at Kentucky Division of Forestry and the Northeastern Forest Experiment Station, Upper Darby, Pa.)

⁵United States Forest Service and Kentucky Department of Natural Resources. BASIC FOREST RESOURCE STATISTICS, SOUTHERN CUMBERLAND UNIT, KENTUCKY, 1963. 1965. (Unpublished preliminary report on file at Kentucky Division of Forestry and the Northeastern Forest Experiment Station, Upper Darby, Pa.)

The Middle and North Forks of the Kentucky River drain a major part of the District. Eastern Knott and Letcher Counties are drained by tributaries to the Big Sandy River.

Structural geology in the District is controlled by the eastern Kentucky syncline, which passes through western Leslie County and central Breathitt County. The syncline causes a gentle regional dip of generally less than one-half degree to the northwest. The Pine Mountain overthrust block marks the southern boundary of the District and influences a very small area in its immediate vicinity.

The Breathitt formation of the Pennsylvania Age dominates the surface geology of the District. This formation thickens from north to south and ranges from about 1,300 feet thick in eastern Breathitt County to about 2,500 feet thick in southern Leslie County.

The U. S. Geological Survey recognizes 23 principal coal beds in the District of which 21 contain estimated reserves.¹ Of these, seven have been strip-or auger-mined (fig. 2).

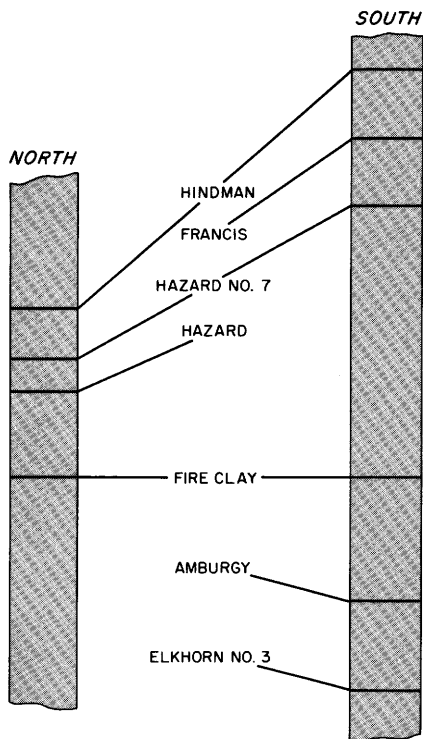


Figure 2.—Relative position of the coal beds mined by the open pit method in the Hazard Coal Reserve District.

**Table 1.—Disturbed area by counties and coal seams
in the Hazard Coal Reserve District, in acres**

Coal seam	Breathitt County	Harlan County	Leslie County	Letcher County	Knott County	Perry County	Total
Elkhorn No. 3	—	—	—	974	—	—	974
Amburgy	—	—	—	381	—	—	381
Fireclay	38	—	215	677	175	—	1,105
Hazard	—	—	108	—	—	223	331
Hazard No. 7	219	—	—	367	662	1,470	2,718
Francis	—	310	92	—	—	—	402
Hazard No. 9	1,554	338	77	—	2,226	2,958	7,153
Total	1,811	648	492	2,399	3,063	4,651	13,064
Percent of land area disturbed	0.6	1.4	0.2	1.2	1.3	2.1	1.0

Distribution of Stripped Area

By 1964, a total of 13,064 acres or 1 percent of the total land area had been disturbed (excluding coal-haul roads) by strip-and auger-mining (table 1). Perry County had the largest acreage disturbed (4,651 acres) and the highest percent of area disturbed (2.1 percent), Letcher and Knott Counties also had large acreages disturbed.

For the seven seams mined, the Hazard No. 9 and Hazard No. 7 accounted for 76 percent of the disturbance. The Hazard No. 9 contributed 55 percent, and the Hazard No. 7 contributed 21 percent. Other coal seams strip-mined in the District were the Fireclay, Hazard, Francis, Amburgy, and the Elkhorn No. 3.

Physical Characteristics of the Disturbed Areas

There are two basic types of strip-mining in the eastern Kentucky coal field: contour-or rim-stripping, and area-stripping. Auger-mining usually is employed as a supplement to contour-mining; it is a means for working a seam beyond the point where removal of the overburden by stripping is economically feasible. In this District 94 percent of the disturbance has resulted from contour-mining. All of the area-stripping occurred on the ridge tops.

In the contour-stripping, 10 percent of the disturbed area was on or above the highwall; 47 percent was in pits, inslopes, and leveled or un-leveled benches above the out slopes; and 43 percent was in out slopes. Of the 5,280 acres in out slopes, 11 percent was in slides or slumps.

Table 2.—Coal-haul road disturbed acreage and mileage by county
and road classes in the Hazard Coal Reserve District

Class of haul road	County												Total	
	Breathitt		Harlan		Knott		Leslie		Letcher		Perry			
	Acres	Miles	Acres	Miles	Acres	Miles	Acres	Miles	Acres	Miles	Acres	Miles	Acres	Miles
I	46	8.1	26	4.6	102	17.9	13	2.3	102	17.8	137	24.0	426	74.7
II	18	3.2	46	8.1	56	9.8	—	—	48	8.4	66	11.6	234	41.1
III	13	2.3	8	1.4	3	.5	—	—	10	1.8	—	—	34	6.0
Total	77	13.6	80	14.1	161	28.2	13	2.3	160	28.0	203	35.6	694	121.8

On 85 percent of the contour-stripping operations, there had been some grading of the spoil between the outslope and the highwall or pit. About 45 percent of the contour-stripping operations was graded to nearly level benches. Much of this leveling has been done since 1954 when the State enacted legislation requiring reclamation of disturbed areas.

All the area-stripping—784 acres—was done on the ridge tops where the overburden was relatively shallow. The proportional distribution of the disturbed area by bank position was as follows: on or above the highwalls, 1 percent; leveled or unleveled benches above the outslope, 49 percent; and outsoles, 50 percent. Slides and slumps occurred on 46 percent or on 180 of the 392 acres in outsoles.

Sixty-eight percent of the area-stripping has not been leveled. Much of this disturbance occurred before enactment of a state reclamation law. Twenty-eight percent has been graded to a nearly level bench, and 4 percent has been partially leveled.

In all stripping operations, the operator must build and maintain a network of roads for hauling coal from the mines. In this survey we classified haul roads as: primary (running from a public road to the mine); secondary (joining two pits or serving as spurs for primary roads); or third class (service roads and temporary haul roads).

We estimate 696 acres had been disturbed by coal-haul roads in this District. This figure was computed directly from dot counts on the aerial photographs. By field measurement we determined that the average width of disturbance for the District's coal-haul roads was 47 feet. Therefore, there were 5.7 acres disturbed per mile of road; and we estimate there are about 122 miles of coal-haul roads in the District. This mileage was distributed among the three classes as follows: primary, 75 miles; secondary, 41 miles; and third class, 6 miles (table 2). On the average there are 107 acres of strip-mine disturbance for each mile of coal-haul road.

Ninety-two percent of these roads run through forested country. Over two-thirds are built along mountain slopes away from tributary streams. Thirty-one percent of the primary roads and 6 percent of the secondary roads were built in the valley bottoms. All of the third class roads were built on the slopes or ridges.

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