

STATE OF ARKANSAS

ARKANSAS GEOLOGICAL COMMISSION

Norman F. Williams, State Geologist

INFORMATION CIRCULAR 20-L

INVENTORY OF SURFACE AND UNDERGROUND
COAL MINES IN THE ARKANSAS VALLEY COAL FIELD

By

William V. Bush and Lonnie B. Gilbreath
Arkansas Geological Commission
Little Rock, Arkansas



Prepared in cooperation with the

U. S. Geological Survey

1978

STATE OF ARKANSAS

ARKANSAS GEOLOGICAL COMMISSION

Norman F. Williams, State Geologist

INFORMATION CIRCULAR 20-L

INVENTORY OF SURFACE AND UNDERGROUND
COAL MINES IN THE ARKANSAS VALLEY COAL FIELD

By

William V. Bush and Lonnie B. Gilbreath
Arkansas Geological Commission
Little Rock, Arkansas

Prepared in cooperation with the

U. S. Geological Survey

1978

S T A T E O F A R K A N S A S

Bill Clinton, Governor

Arkansas Department of Commerce

Burl C. Rotenberry, Director

Arkansas Geological Commission

Norman F. Williams, State Geologist

COMMISSIONERS

C. S. Williams, Chairman

Mena

John Moritz

Bauxite

John Gray

El Dorado

Dorsey Ryan

Ft. Smith

David Baumgardner

Little Rock

Henry Peacock

Stuttgart

Dr. David L. Vosburg

State University

CONTENTS

Introduction	1
Acknowledgements	3
General Geology	3
Arkansas Coal Mining	3
History and Production	3
Underground Mines	5
Surface Mines	5
Current Mining and Reclamation Activities	8
Method of Investigation	9
Mine Categories	12
Results	13
Bibliography	15

FIGURES

1. Index map showing physiographic provinces of Arkansas	2
2. Description of Rock Units and Coal Beds in the Arkansas Coal Field	4
3. Coal Production in Arkansas 1880-1977 (Graph)	6
4. Districts and Fields in the Arkansas Coal Field	7

TABLES

1. Average Analysis of Coal Beds in the Arkansas Coal Field	4
2. Coal Production in Arkansas 1840-1977	7
3. Acreage Distributed and Reclaimed by Surface and Underground Coal Mining in the Arkansas Coal Field through December, 1977	14
4. Total Area Disturbed by Coal Mining in Arkansas	14

PLATES

I	Cross Section of Greenwood Syncline Showing Types of Surface and Underground Mines. . . .	8
II	Interior Workings of the Diamond Anthracite Coal Co. (1926)	10
III	Map of the Underground Mines in the Paris Coal Field (1951)	11
IV	Surface and Underground Mines in the Arkansas Coal Field	Folded

INVENTORY OF SURFACE AND UNDERGROUND
COAL MINES IN THE ARKANSAS VALLEY COAL FIELD

By

William V. Bush and Lonnie B. Gilbreath

INTRODUCTION

The Arkansas coal field lies in the western part of the Arkansas Valley Region of west central Arkansas. Reserves of low volatile bituminous and semianthracite coal are estimated at 2,120.5 million tons. The coal field covers an area of approximately 1900 square miles in parts of Crawford, Franklin, Johnson, Perry, Pope, Logan, Scott, Sebastian, and Yell Counties (Figure 1).

Mining of coal in the area has been in continual operation since 1870. From 1870 to 1918 underground mining was responsible for all significant production. In 1918 surface mining began with the development of power equipment to strip overburden economically. Since 1958 surface mine production has exceeded underground production. In 1974 and 1975 no coal was mined underground in Arkansas. One underground mine, opened in 1976, produced approximately 24,000 tons per year. To date over 100 million tons of coal have been produced in Arkansas.

The purpose of this report is to identify the land that has been disturbed and/or reclaimed by surface mining and delineate the area of underground mines in the Arkansas coal field. In doing this the following categories have been used to describe the areas affected:

1. Areas disturbed by surface mining
 - a. Unreclaimed land

- b. Reclaimed land
2. Areas in which underground mining has occurred
 - a. Underground areas mined
 - b. Surface areas affected by underground mining (mine dumps)
3. Overlap of surface and underground mining

The unreclaimed land of surface mining includes spoil banks, open cuts, high walls, stock piles, haul roads, and ponds. These areas include mines operated prior to 1971 and active mines during this investigation. Reclaimed land of surface mining is that area which has been graded and revegetated to a productive use. Areas of underground mining have been delineated from mine maps. Surface areas affected by underground mine tailings have been included with unreclaimed surface land.

About 90% of the reclaimed land has been restored since 1971 when the Arkansas Legislature passed Act 236, "The Arkansas Open Cut Land Reclamation Act of 1971". In 1977 Act 336 repealed Act 236 as the law which regulates present open cut mining. The Arkansas Department of Pollution Control and Ecology enforces regulations on reclamation activities in Arkansas. Federal Legislation (Public Law 95-87) "Surface Mining Control and Reclamation Act of 1977", currently being implemented in Arkansas, regulates the mining and reclama-

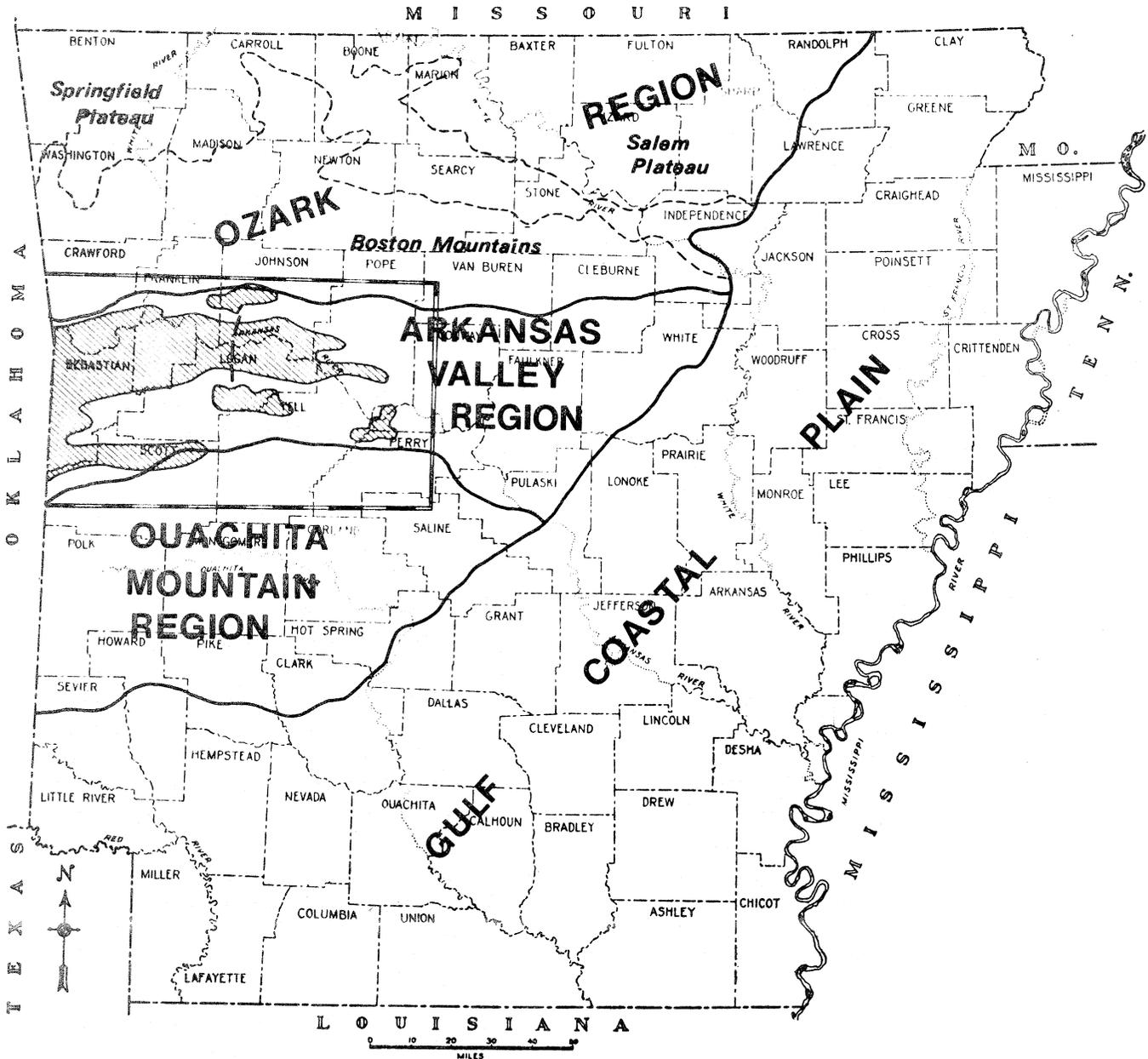


Figure 1. Index map showing physiographic provinces of Arkansas

-  Area of Investigation
-  Arkansas Valley Coal Field
-  Boundary Between Low-Volatile, Bituminous Coal to the West and Semianthracite to the East.

tion of coal in the state.

The information in this report was compiled on mining activities prior to January 1st, 1978. To this date 9910.6 acres have been affected by surface mining of which 2047 acres have been reclaimed and 26,545 acres have been affected by underground mines.

ACKNOWLEDGEMENTS

This project was financed under Federal Grant No. 14-08-0001-G-437 from the U. S. Geological Survey and by the Arkansas Geological Commission. Appreciation is extended to Norman F. Williams, State Geologist, for his support of the project. Most helpful in supplying coal maps and information were Boyd Haley, U. S. Geological Survey; Raymond Stroud, U. S. Bureau of Mines; Harl Griffith, State Mine Inspector; Milt Bonner, Arkansas Department of Pollution Control and Ecology; and Dr. Richard Cohoon, Arkansas Tech University.

The cooperation of the Arkansas Highway Department is appreciated for providing access to their aerial photographs. We especially thank all coal mining companies for their cooperation in supplying information on present mining and reclamation activities. Recognition is also extended to Mark McDonald, Donna Gilbreath, and Loretta Chase for their hard work in preparing maps and typing this report.

GENERAL GEOLOGY

The Arkansas coal field is located in the Arkansas Valley Region in west central Arkansas (Figure 1). The coal beds are in rock of Pennsylvanian (Atokan and Des Moinesian) Age and extend over an area of approximately 1900 square miles. The rocks consist mainly of sandstone and shale. The

Atoka Formation, Hartshorne Sandstone, McAlester Formation, Savanna Formation, and Boggy Formation outcrop in the area. A description of these units and the positions of major coal beds are shown in Figure 2. Coal mining is influenced by structural features in the Arkansas Valley Region. The structure is best described by Haley (1960): "The Arkansas Valley coal field is in a composite syncline containing a number of anticlines and smaller synclines and is cut by normal and reverse faults."

In past investigations 19 different coal beds have been described with four having the most economic significance. These four coal beds are the Lower Hartshorne, Upper Hartshorne, Charleston, and Paris. However, in recent years small amounts of Atoka coal have been mined by several companies. Analyses for the Lower Hartshorne, Charleston, Paris, and Atoka coals are shown in Table 1.

ARKANSAS COAL MINING

History and Production

The first significant production of coal in Arkansas was in 1870. The market expanded with the availability and increase of railroad transportation, and by 1880 production was recorded at 14,778 tons. Mining continued to expand and production reached 2 million tons per year in 1902. For the next 18 years production generally exceeded 2 million tons per year. Between 1921 and 1952 production averaged over 1 million tons per year. Production declined sharply from 1952 through 1967 when it reached a low of 189,000 tons. With greater demands for coal, production steadily increased from 1967 to 1976 when it reached 505,737 tons and then declined to 466,695 tons in 1977 due to the impact of a coal strike. Presently 14 coal companies are mining coal in the Arkansas coal field.

Figure 2

**DESCRIPTION OF THE ROCK UNITS AND COAL BEDS IN THE
ARKANSAS VALLEY COAL FIELD**

AGE		FORMATION	THICKNESS FEET	DESCRIPTION
CARBONIFEROUS SYSTEM	PENNSYLVANIAN	BOGGY FORMATION	0' to 200'	Shale, limy shale, siltstone and sandstone. No coal present in the Boggy in Arkansas.
		unconformity		
		<u>1.</u> SAVANNA FORMATION	750' to 1600'	Shale, siltstone, sandstone, coal and a few thin beds of limestone. Coal beds include the Charleston, Cavanal, Paris, and five unnamed coal beds.
		<u>2.</u> unconformity		
		<u>3.</u> MCALESTER FORMATION	500' to 1800'	Sandstone, siltstone, shale, and coal. Coal beds include the Lower Hartshorne, Upper Hartshorne, and six unnamed coal beds. The Lower Hartshorne is near the base of the McAlester and the Upper Hartshorne is 60-90' above it.
	<u>4.</u> unconformity			
		HARTSHORNE SANDSTONE	20' to 300'	Continuous sandstone below the Lower Hartshorne coal bed. Consists of sandstone or clayey sandstone or several quartzose sandstone beds interbedded with thin beds of shale. Lenticular coal beds may be present in the shale.
		unconformity		
	ATOKA	ATOKA FORMATION	1500' to 9000'	Sandstone, siltstone, shale, and thin beds of coal. The coal beds in the Atoka have not been mined on a large scale. This is the oldest formation containing coal in the Arkansas Valley.

*Descriptions from Haley, B. R., 1960, Coal Resources of Arkansas, U. S. Geological Survey Bulletin 1072—P

1. Paris, 2. Cavanal, 3. Charleston, 4. Upper Hartshorne, 5. Lower Hartshorne Coal beds

Table 1

**Average Analysis of Coal Beds in the Arkansas Coal Field
(As Received)**

Coal Bed	No. of Samples	County	% Moisture	% Volatile Matter	% Fixed Carbon	% Ash	% Sulfur	BTU
Charleston	(5)	Franklin Sebastian	2.4	18.2	74.0	5.5	2.6	14,363
Paris	(43)	Franklin Logan	1.8	17.9	70.6	9.8	4.4	13,765
Atoka	(3)	Johnson Pope	1.4	13.8	77.2	7.6	3.4	14,070
Lower Hartshorne	(125)	Scott Sebastian	2.9	17.4	72.1	7.7	1.3	13,771
Lower Hartshorne	(68)	Franklin Johnson	3.0	13.5	75.9	7.6	1.8	13,854
Lower Hartshorne	(14)	Logan Pope	2.8	12.0	75.7	9.6	1.7	13,499

Averages computed from analyses in Information Circular 20—K
Arkansas Geological Commission by Boyd R. Haley

Accumulative coal production in Arkansas from 1840 to 1977 is 104,162,458 tons (Table 2) of which 13% was produced by surface mining and 87% by underground mining. Figure 3 is a graph showing the relation of coal production by surface and underground methods.

All significant coal mining was by underground methods until late 1918 when 7200 tons were produced by surface mining. Production by surface mining increased to 750,000 tons in 1947 then declined through 1967. From 1968 production increased each year until 1977 (Figure 3, Table 2).

Production of coal by underground methods exceeded 1 million tons per year until 1948. After 1948 production by underground declined to only 3000 tons in 1973. Since 1958 surface production has exceeded underground production. In 1974 and 1975 no coal was mined underground. In 1976 an underground mine was opened in south Sebastian County by the Sugarloaf Mining Company which produced approximately 24,000 tons per year. Underground coal mining did not occur in 1978.

Arkansas coal has been used for domestic heating, steam production, fuel for smelters, manufacture of metallurgical coke, charcoal briquets, and dry-cell batteries.

The Arkansas coal field has been divided into two districts - the western part south of the Arkansas River and the eastern part north of the Arkansas River. In previous reports mines may be referred to as being located in one of these districts. Figure 4 delineates the fields within these two districts.

Underground Mines

Slope and shaft mines are the two basic types of underground coal mine openings found in the Arkansas coal field. The slope mine is characterized by a tunnel (slope) or tunnels (two slopes) 8 to 14 feet wide driven from a coal outcrop directly down

the dip of the coal bed. At intervals of approximately 300 feet passageways (entries) are driven into the coal on either side of the slope. After the entries have been driven a short distance from the slope, rooms are turned at 36 feet intervals along the updip side of the entry. The rooms from which most of the coal is extracted are about 8 feet wide at the entry, but they widen gradually as the room is pushed upslope. This leaves up to 12 feet of coal between the rooms as a pillar for roof support.

The shaft mine is characterized by sinking a vertical opening (shaft) through the overburden to the coal bed. From the bottom of the shaft main entries are driven along the strike of the coal bed. From these main entries various patterns are used in extracting the coal depending on the dip of the coal bed. If the bed has a steep dip, the coal downdip of the main entry is extracted by driving a slope into the coal and turning rooms from the slope entry as described for slope mines. The coal lying updip from the main entry is extracted by driving a set of passageways in the coal directly updip. Entries and rooms are turned off from these passageways in a similar fashion as for slope mines.

Another type of mine opening that is rarely seen in Arkansas is the drift mine. This is a mine on a hill above the level of surrounding valleys that is driven into a flat lying coal bed from the outcrop, similar in character to slope mines.

The last active underground coal mine in Arkansas was a slope mine operated by Sugarloaf Mining Company in south Sebastian County in 1976 and 1977.

Surface Mines

All of the active coal mines in Arkansas are surface mines. The typical surface mine is the strip mine which usually starts near the outcrop and continues downdip until

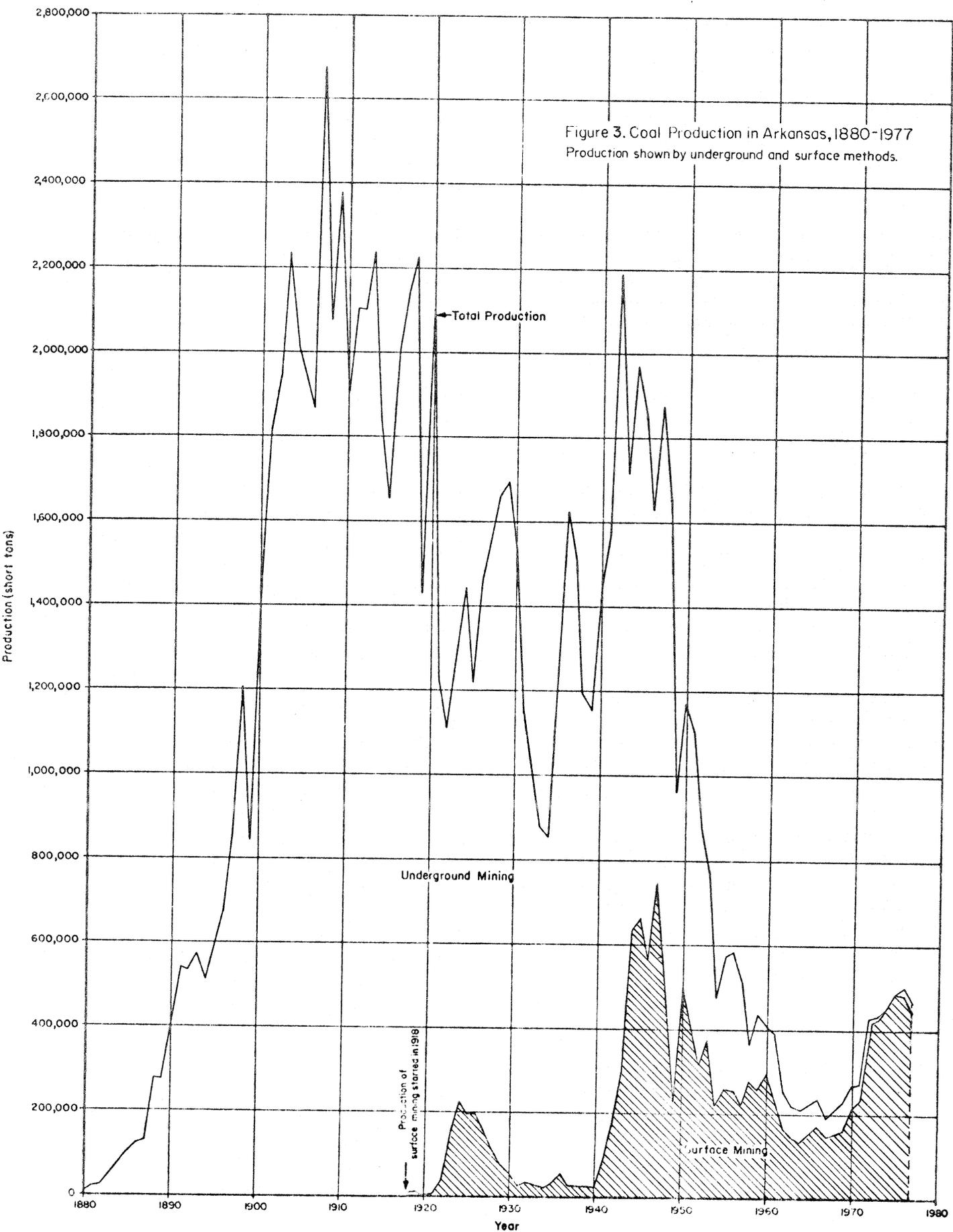


Figure 3. Coal Production in Arkansas, 1880-1977
Production shown by underground and surface methods.

Table 2

Coal Production in Arkansas
1840 – 1977
(tons)

Year	Surface	Underground	Total
1840 – 1927	988,697*	58,272,124	59,260,821
1928 – 1966	8,926,905	32,025,000	40,951,905
1967	144,000	45,000	189,000
1968	152,000	59,000	211,000
1969	167,000	61,000	228,000
1970	217,000	51,000	268,000
1971	236,000	40,000	276,000
1972	420,000	8,000	428,000
1973	431,000	3,000	434,000
1974	455,000	---	455,000
1975	488,000	---	488,000
1976	481,737**	24,000**	505,737
1977	442,695**	24,000**	466,695
Total	13,550,034	90,612,124	104,162,158

* 1st recorded production in 1918
** Estimated

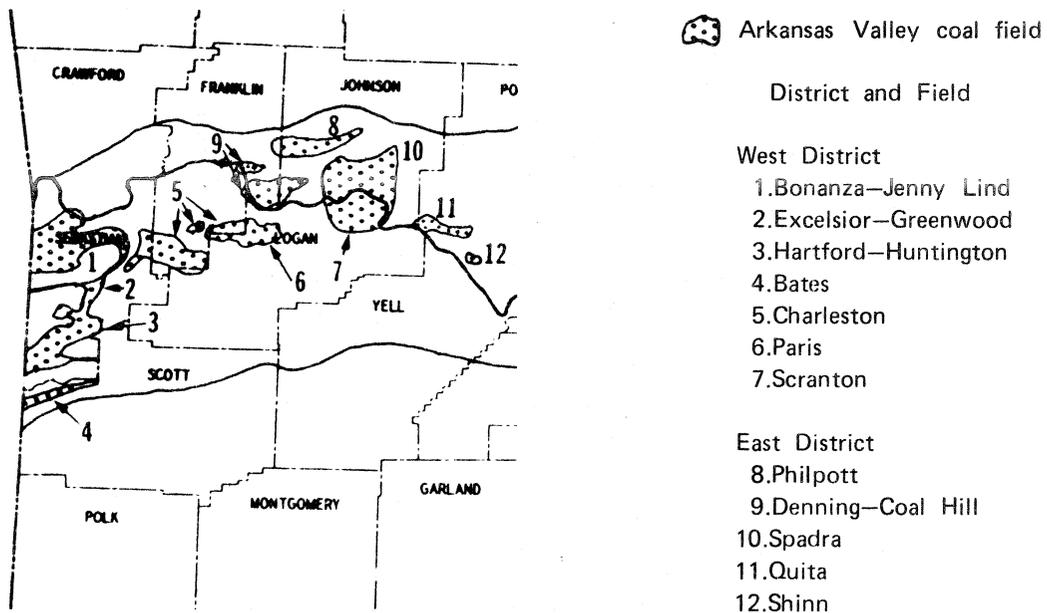


Figure 4. DISTRICTS AND FIELDS IN THE ARKANSAS VALLEY COAL FIELD

overburden becomes so thick that it is economically undesirable to continue mining. The overburden is removed from the coal in a relatively long strip, placing the spoils in the previous parallel cut. This procedure is continued to economic limits or property boundaries. Maximum overburden removed seldom exceeds 75 feet with an average overburden of approximately 40 feet. Prior to 1971 reclamation was not required and spoils were left in peaks forming parallel ridges. The final cut was left open usually filling with water forming a long narrow lake. Types of surface and underground mines in relation to the geology are shown in the cross section in Plate I.

Production occurred in Franklin, Sebastian, Johnson, and Logan Counties of which 95% was by strip mining and 5% by one underground mine. In 1978 all production was by surface mining.

Since 1971 all companies engaged in surface mining have been required to reclaim lands affected by the mining operation. Act 236 of 1971 entitled "The Arkansas Open Cut Land Reclamation Act of 1971" and was the first law in Arkansas requiring mining companies removing overburden from minerals to reclaim the land to a productive use. Companies were required to submit application for permit and post a bond of \$500 per acre. The application was to contain a reclamation plan requiring approval prior to mining. The Arkansas Department of Pollution Control and Ecology was designated in the law as the regulatory agency. General requirements of the law included grading and leveling of spoils, revegetation, and requirements for

Current Mining and Reclamation Activities

During the calendar year 1977 fourteen companies produced 466,695 tons of coal in Arkansas (Bush and Stroud, 1978).

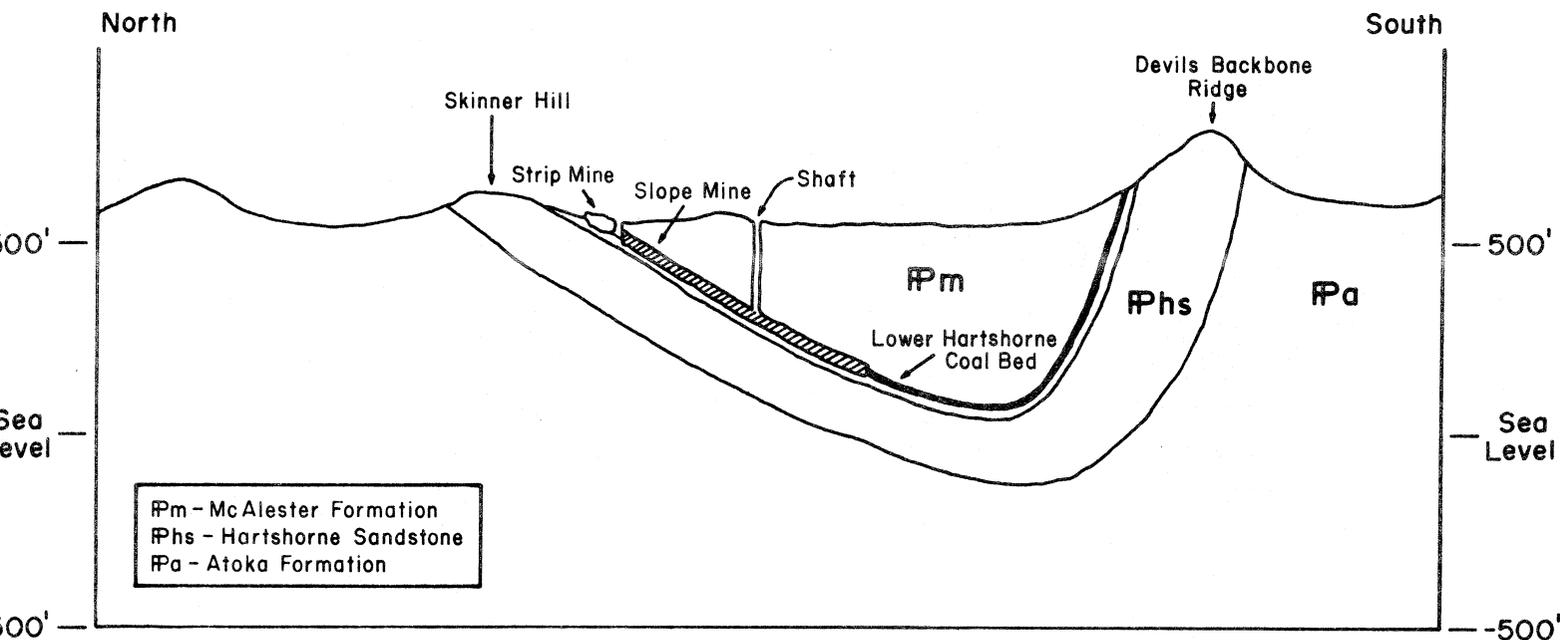


PLATE I CROSS SECTION OF GREENWOOD SYNCLINE SHOWING TYPES OF SURFACE AND UNDERGROUND MINES.

lakes and ponds. A high wall was allowed on the final cut. Bonds are released upon approval of reclamation.

In 1977 Act 336 repealed Act 236. The new law included the addition of sand and gravel operations and rock quarries. Other points specified in the new law are: maximum slope requirements (3:1); pH values of surface water (6 to 8); safety features around high-walls; and, the value of the bond would be determined by the estimated cost of reclamation. This law regulated coal mining for a short period until federal legislation took over. All open cut mining in Arkansas, except coal, is still regulated by Act 336.

Presently coal mining is regulated by Public Law 95-87 "Surface Mining Control and Reclamation Act of 1977" passed by the 95th Congress. The State of Arkansas is currently up-grading state statutes to conform with the federal law. By late 1979 the state program should be in compliance with federal regulations.

METHOD OF INVESTIGATION

Initial stages of the investigation consisted of base map selection, literature search, and selection of aerial photographs of the Arkansas coal field. U. S. Geological Survey topographic quadrangles 1:24,000 and 1:62,500 scale were selected as base maps for field compilation. Sixty-two maps were used in covering the study area. The literature search included: all published reports; open-file reports; county, state, and federal records; and maps dealing with coal in Arkansas. Over 1000 low altitude aerial photographs provided by the Arkansas Highway Department were used for stereoscopic study to delineate surface areas disturbed by mining.

Separate field sheets were used for compilation of surface and underground mines. Surface mine maps were completed in Phase 1 of the project. Data compiled

from aerial photography and plots of all recorded mine locations from the literature were transferred to the quadrangles. Verification of all coal mines along with adjustments of the boundaries, if needed, was done in the field over a three month period. Original field sheets are on file at the Arkansas Geological Commission and available for public examination.

Phase II of the project involved the locations and extent of underground mines in the Arkansas coal field. All information had to be acquired from literature and old mine maps. The exact number and extent of underground mining is not known, but it is believed that most mines have been delineated in this investigation. Some 406 maps were examined in compiling information on underground coal mines. Most of these maps were the result of work conducted for companies by the late R. E. Welch, an engineer from Ft. Smith, Arkansas during a period 1900 through 1950. The U. S. Bureau of Mines microfilmed 154 mine maps or coal field maps from which boundaries were transferred to base maps. All the coal mine maps observed were drawn in great detail, showing the mines' interior features such as location and dimensions of entries, rooms, pillars, air shafts, etc. Maps of coal fields showed boundaries and general interior features of existing mines. Other maps were obtained from files of the Arkansas Geological Commission; Boyd Haley, U. S. Geological Survey; State Mine Inspectors Office in Ft. Smith; Arkansas Tech University; and the Arkansas Department of Pollution Control and Ecology. Copies of mine maps on the U. S. Bureau of Mines' microfilm may be obtained from the Arkansas Geological Commission. Plates II and III are examples of maps on the microfilm. The interior of the Diamond Anthracite Coal Company at Clarksville is shown on Plate II and the Paris coal field with several mines is shown on Plate III.

Information compiled on the two sets of field sheets was transferred to one set of quadrangles and acreages were calculated

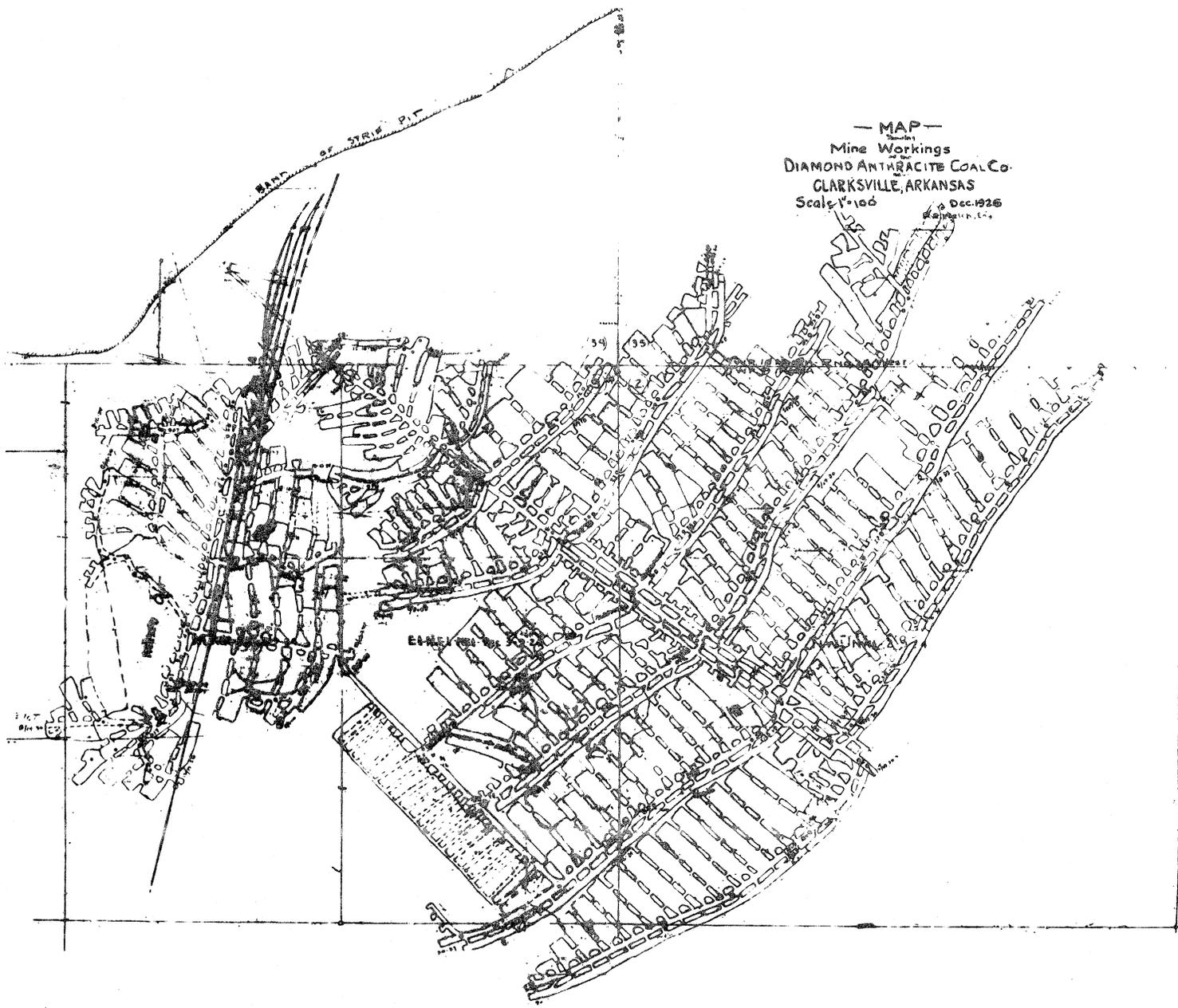


Plate II. Interior Workings of the Diamond Anthracite Coal Co. (1926)

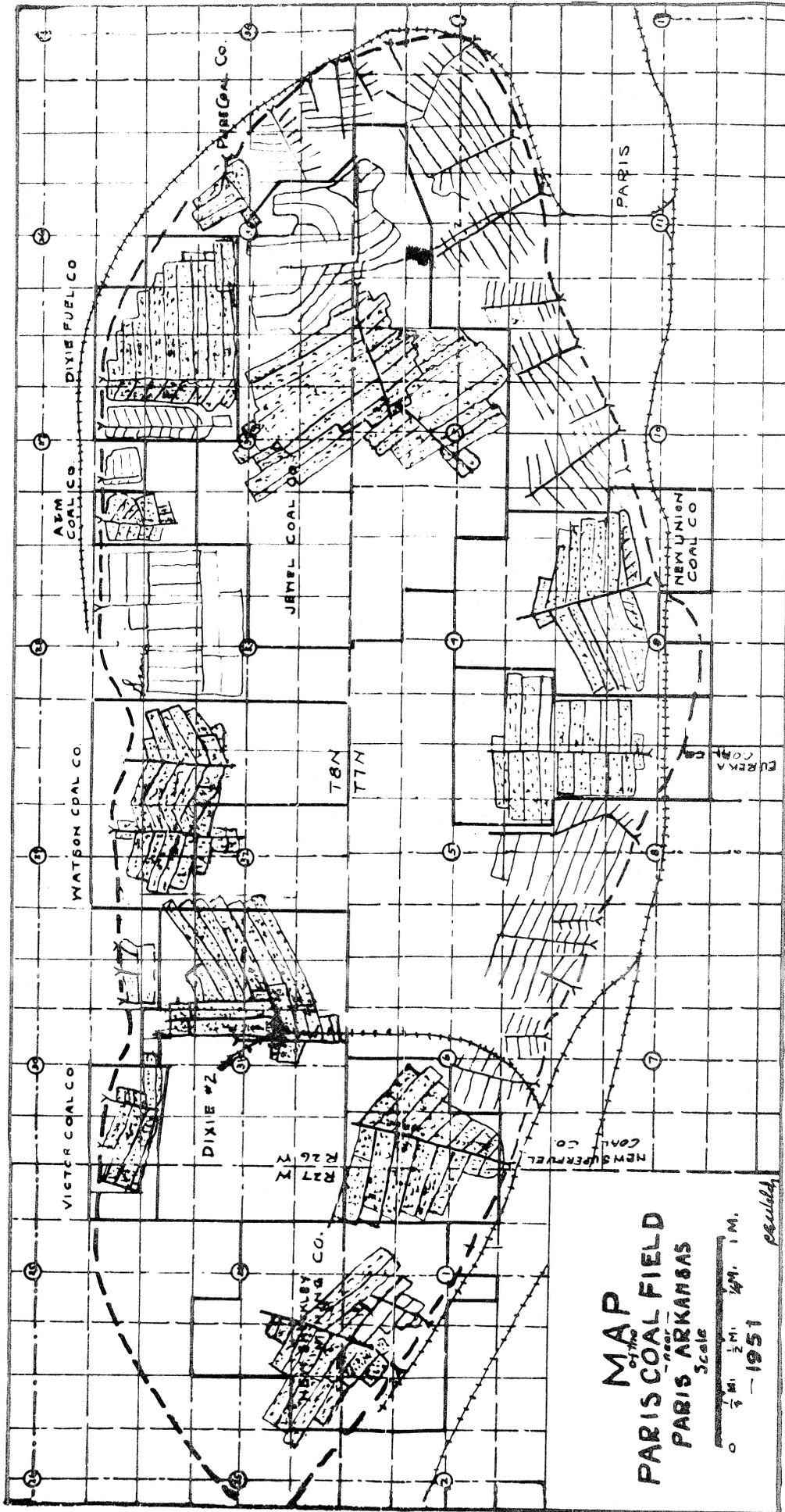


Plate III. Map of the Underground Mines in the Paris Coal Field

for described categories. These quadrangles were reduced to 1:100,000 scale and transferred to the base map of the Arkansas coal field (Plate IV). Compiled field sheets of surface and underground mines were reduced to 1:50,000 scale and photo copies are available from the Arkansas Geological Commission.

Verification was not possible for some locations of surface and underground mines noted in the literature. In this instance a mine symbol was placed on the map indicating the reported type of mine.

The areal extent of all coal mines was determined after they had been outlined on the compiled base maps. A planimeter was used in determining mine areas in both acres and square miles. Totals were computed for the various categories. Computation sheets have been retained by the Arkansas Geological Commission for public examination.

COAL MINE CATEGORIES

Land affected by coal mining has been separated into three major categories; 1) areas disturbed by surface mining, 2) areas delineated as underground mines, and 3) those areas of overlap of surface and underground mining.

1. Areas disturbed by surface mining - include all land that has been physically disturbed in the process of surface mining. Two divisions have been made to define these lands. These categories and divisions refer to all lands disturbed by surface mining; spoils, open cuts, stockpiles, high walls, haul roads, ponds, and areas adjacent to mined land that was affected during mining.

(a) Unreclaimed land - lands disturbed by surface mining where no attempt has been made to restore it to a productive use. These lands include almost the entire area mined prior to 1971 and the active mining. Land mined prior to the Reclama-

tion Act of 1971 is often referred to as "orphan spoils" or "pre-law spoils". Also included in this category are spoil piles and tailings from underground mines. These piles of rock debris are usually found at openings of old underground mines and reach a maximum size of two to three acres and 30 to 40 feet in height.

(b) Reclaimed land - refers to the lands disturbed by surface mining and restored to a useable condition. Since the purpose of this study is not an attempt to judge the quality or legality of reclamation activities carried on the the mining companies, a liberal standard was used in defining reclaimed lands. If an attempt was made to level spoil piles or waste dumps to some gentle slope so the land could be used, even though it may or may not have been completely revegetated, these areas were delineated as reclaimed land. Approximately 90% of the reclaimed land was mined and reclaimed since 1971 under state reclamation laws. The remaining 10% was reclaimed voluntarily by property owners or companies reclaiming orphan spoils adjacent to active mines regulated by state law.

2. Areas affected by underground coal mines.

The boundaries of underground coal mines were plotted on field maps from actual field maps. The total number of underground mines is not known, but it is believed that most mines have been located in this study. Underground mines underlie 76 percent of the land area affected by coal mining.

3. Areas of overlap of surface and underground mines.

In compiling the surface and underground mine boundaries there were occasions of encroachment of surface mines into and/or over underground mines. The overlap areas represent those areas where mining has occurred both on the surface and underground.

On Plate IV symbols S (surface mine) and U (underground mine) were used to note unconfirmed locations of reported coal mines. The principal publication supplying these locations was "The Arkansas Coal Field" by A. J. Collier, U. S. Geological Survey Bulletin 326, 1907. The symbol S designates a reported surface mine, most likely very small along the outcrop, that has been covered by vegetation. The U designates a location description of an of an underground mine for which a mine map was not available. It should also be noted here that the sites of the reported locations could be incorrect. In some instances small mine dumps were located but the disturbed areas were so small they could not be illustrated on Plate IV, but the areal extent of the mine dumps was included in the acreage calculations.

RESULTS

A total of 34,856 acres (54.5 square miles) was delineated as surface and underground coal mines in the Arkansas coal field. This is 0.10 percent of the state's total land area. Of this total, 9910.6 acres (15.5 square miles) were affected by surface mining (.03 percent of the state's total land area). A detailed account by county of acreage disturbed and/or reclaimed, by category, and with the percentage of land affected by coal mines in each county is

shown in Table 3. The total area of coal mine lands by categories along with the percent of the state disturbed by surface mining and percent disturbed by underground mining is shown in Table 4.

An interesting analogy can be made to illustrate the similarity of area between the total land disturbed by surface coal mining and a prominent Arkansas feature. Interstate Highway 40 which traverses the state between Fort Smith and West Memphis is closely comparable in land area that it encompasses to that area which is affected by all the surface coal mining in the state.

No attempt was made to determine environmental problems associated with surface or underground mines, but during the inventory process we did note that many of the old surface mines have revegetated voluntarily and provide excellent wildlife habitat. In these cases grading and leveling mine spoils would destroy vegetation and possibly expose pyrite bearing shales creating acid conditions. Many of the associated ponds and lakes contain fish, so acid water does not appear to be a major problem at the present time. No attempt was made to enter or evaluate conditions of underground mines. It can be assumed that the mines are filled with water or collapsed. The most obvious problem with underground mines would be open shafts (which seem to be few) and possible communication of mine water with ground water.

Table 3

**Acreage Disturbed and Reclaimed by Surface and Underground Coal Mining
in the Arkansas Coal Field through December, 1977**

County	Total Area of County (acres)	Area Disturbed by Surface Mining (acres)	Surface Area Reclaimed (acres)	Surface Area Not Reclaimed (acres)	Area Disturbed by Underground Mining (acres)	Overlap of Surface and Underground Mining (acres)	Total Area Disturbed (acres) ²	% of County Disturbed by Coal Mining ³
Crawford	388,480	2.75	0	2.75	0	0	2.75	.0007%
Franklin	398,720	2580	812	1768	3346	19	5907	1.45%
Johnson	515,200	3745	688	3057	4299	80	7964	1.55%
Logan	468,480	264	63	201	4247	116	4395	.94%
Perry	359,040	1.84	0	1.84	0	0	1.84	.0005%
Pope	529,920	369	135	234	846	12	1203	.23%
Scott	574,720	286	11	275	190	49	427	.07%
Sebastian	343,680	2645	338	2307	13,617	1323	14,939	4.35%
Yell	606,720	17	0	17	0	0	17	.0023%
Total	4,184,960	9,910.59	2047¹	7863.59	26,545	1599	34,856.59	.83%

- 1. 1854 acres reclaimed under reclamation law, 193 acres voluntarily reclaimed.
- 2. Surface plus Underground Area Disturbed minus overlap.
- 3. Total Area Disturbed divided by County Area.

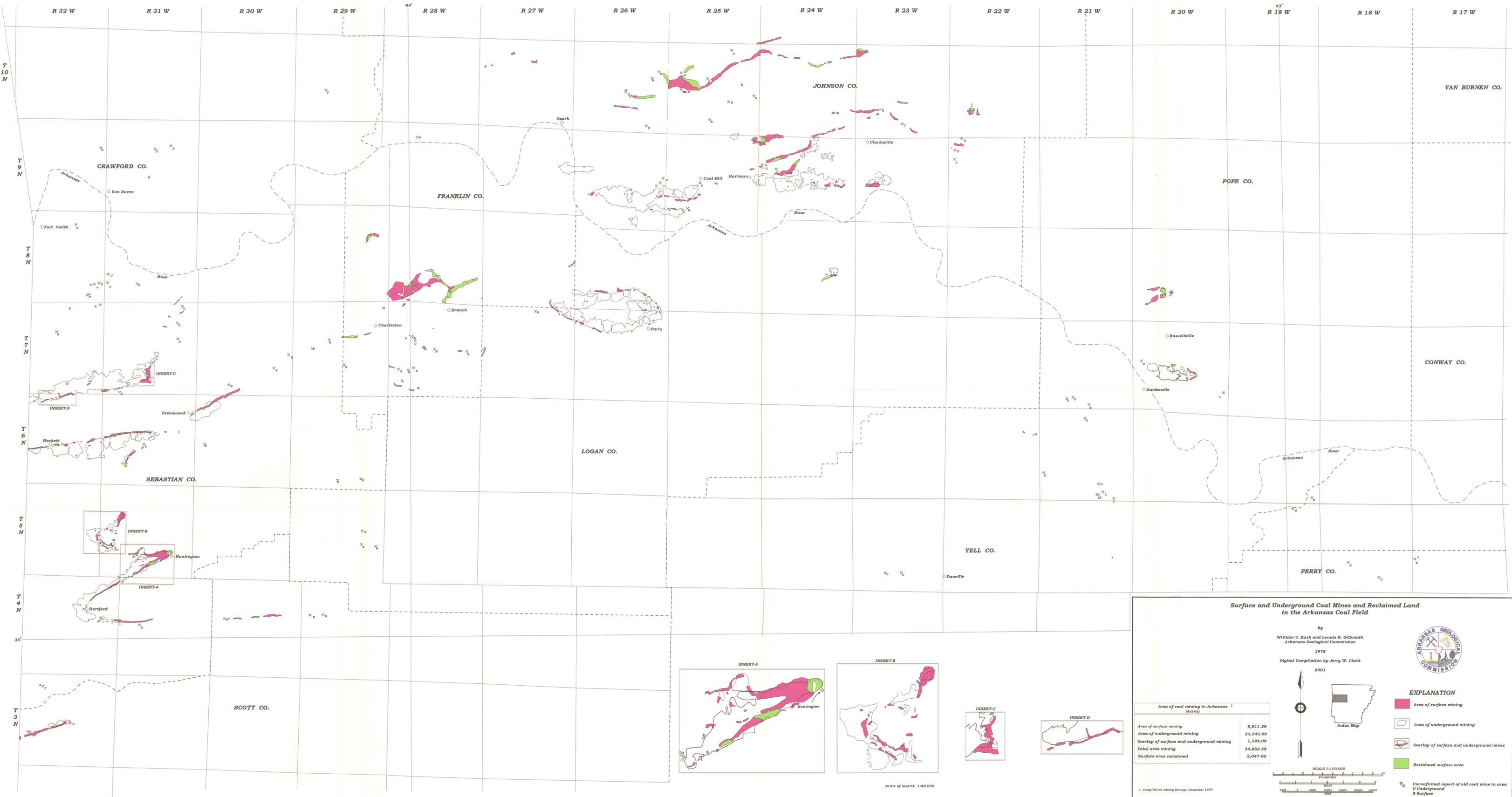
Table 4

Total Area Disturbed by Coal Mining in Arkansas

Area of Arkansas	Area Disturbed by Surface Mining	Area Reclaimed	Area Disturbed by Underground Mining	Overlap of Surface and Underground Mining	Total Area Disturbed	% of State Disturbed	% of State Disturbed by Surface Mining	% of State Disturbed by Underground Mining
Square Miles								
53,104	15.49	3.20	41.48	2.50	54.47	.1%	.029%	.078%
Acres								
33,986,560	9910.59	2047	26,545	1599	34,856.59	.1%	.029%	0.78%

SELECTED BIBLIOGRAPHY

- Branner, George C., A. C. Fieldner, A. M. Cooper, F. D. Osgood, J. N. Geyer, and H. N. Sunder; 1928, *Analyses of Arkansas Coals*, Bureau of Mines, Technical Paper 416.
- Branner, George C., 1942, *Mineral Resources of Arkansas*, Arkansas Geological Survey, Bulletin 6.
- Bush, William V. and Raymond B. Stroud, 1977, *Arkansas Geological Commission, Arkansas Mineral Producers and Production*, Arkansas Geological Commission, Special Report.
- Collier, A. J., 1907, *The Arkansas Coal Field*, U. S. Geological Survey, Bulletin 326.
- DeWolf, F. W. and A. J. Collier, 1906, *Investigations of the Coal Fields of Illinois and Arkansas*, U. S. Geological Survey extract from Bulletin 316, contributions to the Economic Geology.
- Haley, B. R., 1960, *Coal Resources of Arkansas*, U. S. Geological Survey, Bulletin 1072-P.
- , 1961, *Geology of Paris Quadrangle, Logan County, Arkansas*, Arkansas Geological and Conservation Commission, Information Circular 20-B.
- , 1966, *Geology of the Barber Quadrangle, Sebastian County and Vicinity, Arkansas*, Arkansas Geological Commission, Information Circular 20-C.
- Haley, B. R. and Thomas A. Hendricks, 1968, *Geology of the Greenwood Quadrangle, Arkansas-Oklahoma*, Arkansas Geological Commission, Information Circular 20-F.
- Haley, B. R. 1968, *Geology of the Scranton and New Blaine Quadrangles, Logan and Johnson Counties, Arkansas*, Arkansas Geological Commission, Information Circular 20-G.
- Haley, B. R. and Thomas A. Hendricks, 1972, *Geology of the Van Buren and Lavaca Quadrangles, Arkansas-Oklahoma*, Arkansas Geological Commission, Information Circular 20-I.
- Hendricks, T. A., and Bryan Parks, 1937, *Geology and Mineral Resources of the Western Part of the Arkansas Coal Field*, U. S. Geological Survey, Bulletin 847-E.
- , 1949, *Geology of the Fort Smith District, Arkansas*, U. S. Geological Survey, Professional Paper 221-E.
- Merewether, E. A. and B. R. Haley, 1961, *Geology of Delaware Quadrangle, Logan County, and Vicinity, Arkansas*, Arkansas Geological and Conservation Commission, Information Circular 20-A.
- Merewether, E. A., 1967, *Geology of Knoxville Quadrangle, Johnson and Pope Counties, Arkansas*, Arkansas Geological Commission, Information Circular 20-E.
- , 1972, *Geology of the Knoxville and Delaware Quadrangles, Johnson and Logan Counties and Vicinity, Arkansas*, Arkansas Geological Commission, Information Circular 20-J.
- Merewether, E. A. and B. R. Haley, 1969, *Geology of the Coal Hill, Hartman, and Clarksville Quadrangles, Johnson County and Vicinity, Arkansas*, Arkansas Geological Commission, Information Circular 20-H.
- Riley, E. A., 1935, *Report of Reconnaissance made of Philpot Valley Coal Basin, Johnson County, Arkansas*, Arkansas Geological Commission, unpublished report.
- Steel, A. A., 1910, *Coal Mining In Arkansas, Part I*, Arkansas Geological Survey.
- Stroud, Raymond B. and others, 1969, *Mineral Resources and Industries of Arkansas*, U. S. Bureau of Mines, Bulletin 645.
- Toenges, A. L. and E. L. Fish, 1949, *Coal-Mining Methods and Practices in Western Arkansas*, U. S. Bureau of Mines, Report of Investigations 4448.
- U. S. Bureau of Mines, 1924-31, *Coal, production by states: Mineral resources of the United States*.
- , 1932-74, *Bituminous Coal - Detailed statistics by States and Counties: Minerals Yearbook*.
- U. S. Geological Survey, 1885, 1888-1918, and 1921-23, *Coal production States: Mineral resources of the United States*.
- Winslow, Arthur, 1888, *The Geology of the Coal Regions, A Preliminary Report upon a Portion of the Coal Regions of Arkansas*, Arkansas Geological Survey, Annual Report for 1888.



Surface and Underground Coal Mines and Reclaimed Land in the Arkansas Coal Field

By
William V. Bush and Lonnie B. Gilbreath
Arkansas Geological Commission
1978
Digital Compilation by Jerry W. Clark
2001

Area of coal mining in Arkansas ¹ (Acres)	
Area of surface mining	9,911.59
Area of underground mining	25,545.00
Overlap of surface and underground mining	1,599.00
Total area mining	34,856.59
Surface area reclaimed	2,047.00

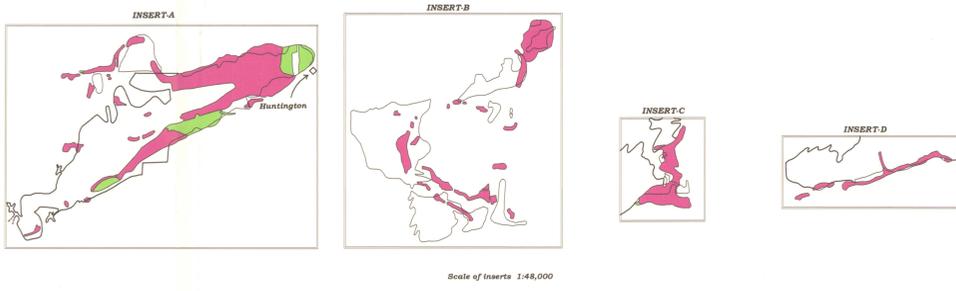
EXPLANATION

- Area of surface mining
- Area of underground mining
- Overlap of surface and underground mines
- Reclaimed surface area

Unconfirmed report of old coal mine in area
U-Underground
S-Surface

SCALE 1:100,000

Index Map



¹ Compiled on mining through December 1977