STATE OF ARKANSAS

Arkansas Geological Commission

Norman F. Williams, State Geologist

INFORMATION CIRCULAR 20-G

GEOLOGY OF THE SCRANTON AND NEW BLAINE QUADRANGLES LOGAN AND JOHNSON COUNTIES, ARKANSAS

by

Boyd R. Haley

U. S. GEOLOGICAL SURVEY

Prepared in cooperation with the U. S. Geological Survey

1968

(also published as U. S. Geological Survey Professional Paper 536-B)

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GEOLOGY OF THE SCRANTON AND NEW BLAINE QUADRANGLES, LOGAN AND JOHNSON COUNTIES, ARKANSAS

By Boyd R. Haley

ABSTRACT

The Scranton and New Blaine quadrangles, which comprise about 122 square miles, are in Logan and Johnson Counties in west-central Arkansas, between lats 35°15′00″ and 35°22′30″ N. and longs 93°22′30″ and 93°37′30″ W.

Sedimentary rocks of Devonian(?) to Middle Pennslyvianian age have been penetrated by wells drilled in the area; sedimentary rocks of Middle Pennsylvanian age and unconsolidated sediments of Quaternary age are exposed at the surface.

The rocks in the area are folded into eastward-trending synclines and anticlines and have been broken by eastward-trending normal faults. The structural relief, measured on the base of the Hartshorne Sandstone, is about 2,500 feet.

Coal beds are in the Atoka, McAlester, and Savanna Formations, but only the Lower Hartshorne coal bed, within the McAlester Formation and near its base, is economically important. This coal bed originally contained an estimated 83,099,000 short tons of coal.

Only a small amount of natural gas (88,000 cu ft per day from one well) is being produced from this area even though wells have penetrated most of the rocks that yield much larger quantities of gas elsewhere in Arkansas.

Building stone has been obtained from the Atoka Formation, the Hartshorne Sandstone, and the Savanna Formation. The Hartshorne Sandstone in this area has been the source of much of the building stone known as Arkansas Stone in Arkansas and the surrounding States. Road metal has been obtained from the Atoka and McAlester Formations and from gravel deposits in the upper river terrace.

INTRODUCTION

This report on the geology of the Scranton and New Blaine quadrangles is one of a series of geological reports being prepared by the U.S. Geological Survey in cooperation with the Arkansas Geological Commission. The purpose of these reports is to (1) provide a geologic map of the quadrangles; (2) show the extent and thickness of all coal beds; (3) give estimates of the coal reserves; (4) present stratigraphic and structural data and interpretations pertinent to the discovery of natural gas and petroleum deposits; and (5) provide information concerning the location of building stone, gravel, sand, and clay.

This report is also distributed as Arkansas Geological Commission Information Circular 20–G.

The Scranton quadrangle is bounded by lats 35°15′00″ and 35°22′30″ N. and by longs 93°30′00″ and 93°37′30″ W. The eastward adjoining New Blaine quadrangle is bounded by lats 35°15′00″ and 35°22′30″ N. and by longs 93°22′30″ and 93°30′00″ W. The two quadrangles comprise an area of approximately 118 square miles in Logan County and about 4 square miles in Johnson County (fig. 1).

The area of this report is included in the areas of a geologic report by Collier (1907) and generalized geologic reports by Croneis (1930) and Haley (1960).

The stratigraphic nomenclature and stratigraphic boundaries used in this report for the rocks of Middle Pennsylvanian age conform to those used by Merewether and Haley (1961). The nomenclature of Pennsylvanian and pre-Pennsylvanian rocks is, in general, that used elsewhere in Arkansas. Table 1 compares the geologic names and boundaries of the Devonian(?) to Middle Pennsylvanian rocks used in this report with those used elsewhere in northern Arkansas.

E. A. Merewether mapped the surface geology in that part of the New Blaine quadrangle north of the Arkansas River (pl. 1).

STRATIGRAPHY

Rocks of Devonian(?) to Middle Pennsylvanian age and unconsolidated sediments of Quaternary age either crop out or have been penetrated by wells in the mapped area. The areal extent of some of these rocks is shown on plate 1, and the north-to-south subsurface extent of some of them is indicated on plate 2. The lithology of most of these rocks is shown graphically on plate 3.

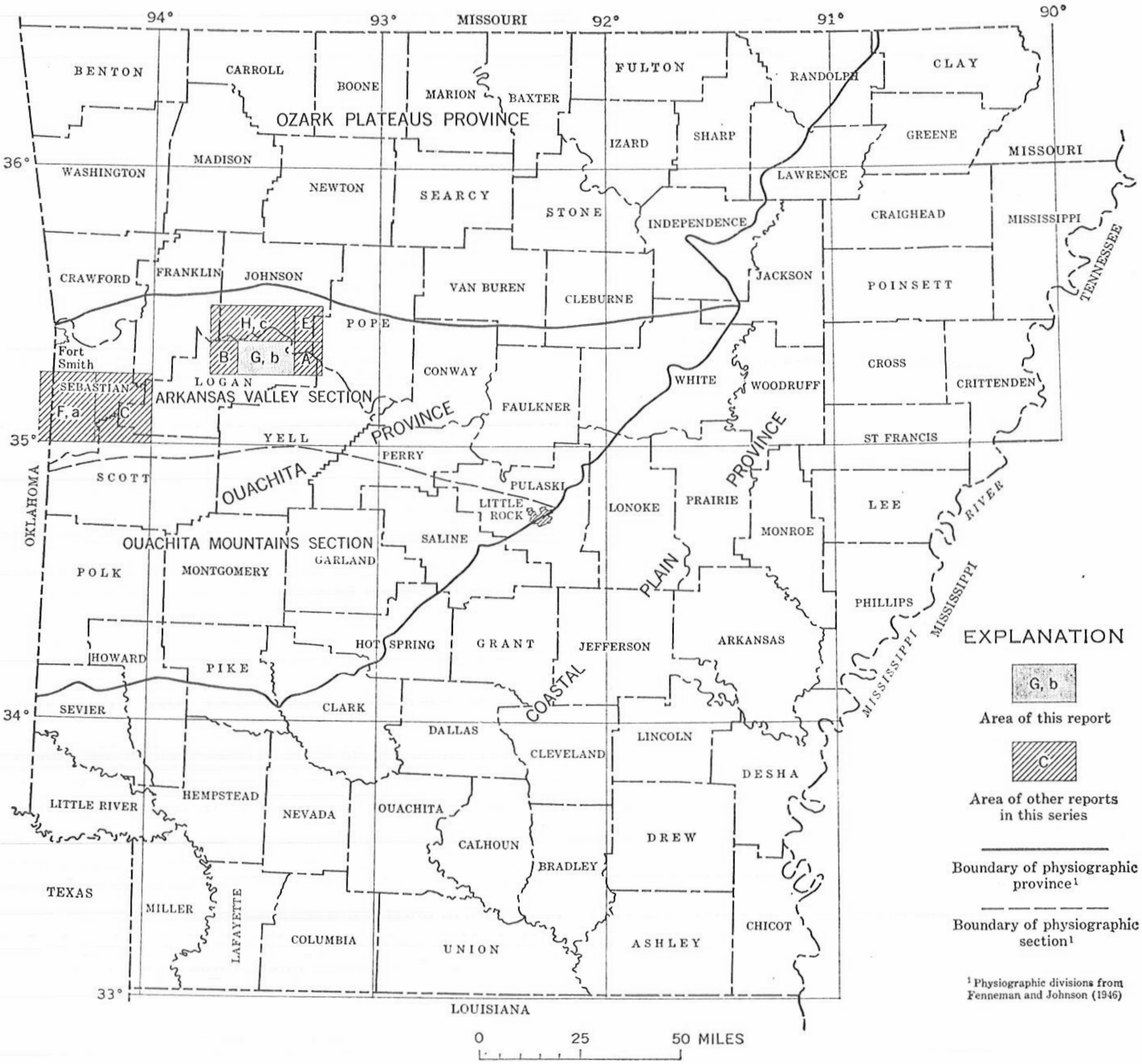

FIGURE 1.—Location of report area (G, b) and of areas of previously published chapters of Arkansas Geological Commission Information Circular 20 or of U.S. Geological Survey Professional Paper 536: A, Delaware quadrangle (Merewether and Haley, 1961); B, Paris quadrangle (Haley, 1961); C, Barber quadrangle (Haley, 1966); E, Knoxville quadrangle (Merewether, 1967); F and a, Greenwood quadrangle (Haley and Hendricks, 1968); and H and c, Coal Hill, Hartman, and Clarksville quadrangles (Merewether and Haley, 1968).

TABLE 1.—*Stratigraphic nomenclature of rocks in or near the Scranton and New Blaine quadrangles, Logan County, Ark.*

System		Series	Group	This report	Arkansas Valley and Ozark Mountains		System		Ouachita Mountains (Arkansas)	
CARBONIFEROUS	PENNSYLVANIAN	Des Moines	Krebs	Savanna Formation	Savanna Formation		CARBONIFEROUS	PENNSYLVANIAN	Atoka Formation	
				McAlester Formation	McAlester Formation					
				Hartshorne Sandstone	Hartshorne Sandstone					
		Atoka		Atoka Formation	Atoka Formation[1]	Zone W				
						Zone P				
						Greenland Sandstone Member				
		Morrow		Rocks of Morrow age	Bloyd Formation[1]	Trace Creek Shale Member			Johns Valley Shale	
						Kessler Limestone Member				
						Dye Shale Member				
						Woolsey Member				
						Brentwood Limestone Member				
					Hale Formation[1]	Prairie Grove Member				
						Cane Hill Member		?		
	MISSISSIPPIAN	Upper		Rocks of Mississippian age	Pitkin Limestone[1]			MISSISSIPPIAN	? ? Jackfork Sandstone and Stanley Shale	
					Fayetteville Shale[1]					
					Batesville Sandstone[2]					
					Ruddell Shale[2]					
					Moorefield Formation[2]					
		? Lower			Boone Formation[2]				Arkansas Novaculite	? ? Upper division
?				Chattanooga(?) Shale	Chattanooga Shale[2]			?		? Middle division
DEVONIAN		Upper					DEVONIAN			
		Lower or Middle		Rocks of Devonian(?) age	Penters Chert[2]					? Lower division

[1] Washington County
[2] Independence County

DEVONIAN(?) SYSTEM

Rocks probably belonging to the Devonian System were penetrated by the Humble Oil and Refining Co. Reinhart and Donovan 1 (well 3) in sec. 23, T. 8 N., R. 24 W. The lowermost 174 feet of rock penetrated by well 3 is chert containing scattered thin beds of medium- to dark-gray slightly silty shale. Some of the chert is light gray, but most is medium to dark gray and slightly limy. The chert in the upper 20 feet contains scattered very fine crystals of dolomite.

The rocks of Devonian(?) age are lithologically similar to the Penters Chert. They underlie a rock unit (28 ft. thick) of mostly dark-gray to grayish-black sooty pyritic shale that is lithologically similar to the Chattanooga Shale elsewhere in Arkansas. Thus these rocks are likely a part of the Penters Chert. If they are, they should correlate with rocks in the lower division of the Arkansas Novaculite (Hass, 1951, p. 2527, 2533). Miser and Purdue (1929, p. 51), however, did not mention dolomite in their description of the lower division.

The rocks considered to be of a Devonian(?) age in this report might be a part of the Boone Formation of Early and Late Mississippian age. They are lithologically similar. Generally, the Boone does not contain dolomite, but Maher (in Sheldon, 1954, p. 155) logged dolomite in the Boone in a well about 80 miles northeast of well 3, and Glick (in Sheldon, 1954, p. 21) logged dolomitic limestone in the Boone in a well about 90 miles north of well 3. Miser and Purdue (1929, p. 53) reported dolomite crystals in the upper division of the Arkansas Novaculite. According to a "summary of opinions" reported by Hass (1951, p. 2527, 2540), the upper division seems to be equivalent in age and stratigraphic position to the Boone.

If these rocks are a part of the Boone, the overlying rock unit of dark-gray to grayish-black sooty pyritic shale must be a part of the Moorefield Formation. This shale is much more lithologically similar to the Chattanooga than it is to the Moorefield.

Frezon and Glick (1959, pl. 27) estimated the thickness of the Boone Formation to be less than 150 feet in the subsurface north of well 3, and they showed a regional southward thinning of the formation. Miser and Purdue (1929, p. 52), in describing the Arkansas Novaculite, stated: "The upper part of the formation, though of considerable east-west extent in the Ouachita Mountains, is present, so far as known, only along their southern border, having been planed off on the north during the post-Devonian erosion cycle." The southward thinning trend of the Boone, combined with the presumed absence of the upper division of the Arkansas Novaculite, causes the author to believe that the rock unit penetrated in the lower 174 feet of well 3 is too thick to be Boone.

DEVONIAN AND MISSISSIPPIAN SYSTEMS, CHATTANOOGA(?) SHALE

The unit identified as the Chattanooga(?) Shale in this report is 28 feet thick where penetrated by well 3. The formation is mostly dark-gray to grayish-black sooty pyritic shale containing some dark-gray slightly silty and limy shale. This unit could be a part of the Moorefield Formation if the underlying formation is the Boone.

MISSISSIPPIAN SYSTEM

The rock units in this interval in the Ozark Mountains include, in ascending order, the Boone Formation, the Moorefield Formation, the Ruddell Shale, the Batesville Sandstone, the Fayetteville Shale, and the Pitkin Limestone. This sequence of rocks is 493 feet thick where penetrated by well 3. The rocks consist of dark-gray and dark-gray to grayish-black slightly limy to very limy shale, a small amount of medium-dark-gray very slightly limy argillaceous siltstone, and one 10-foot-thick bed of medium-dark-gray argillaceous limestone. The base of the limestone is at a depth of 7,897 feet (well 3, pl. 3) and may be the base of the Pitkin Limestone.

PENNSYLVANIAN SYSTEM

MORROW SERIES

The sequence of rocks of Morrow age is 1,135 feet thick where penetrated by well 3. Well 4 (Western Natural Gas Co. R. Gray 1) penetrated the upper 540 feet of this sequence; well 11 (Gulf Oil Corp. and Ohio Oil Co. A. W. McElroy 1) penetrated the upper 890 feet; and well 13 (Sinclair Oil and Gas Co. Federal-Smith 1) penetrated the upper 652 feet. In other parts of Arkansas the Morrow Series is divided into the Hale Formation, which has two members, and the Bloyd Formation, which has five members (table 1). The Morrow Series in the area of this report cannot be divided with any certainty into the Hale and Bloyd Formations. The base of the sandstone, at a depth of 7,477 feet in well 3 and 8,695 feet in well 11 (pl. 3), may be the base of the Prairie Grove Member of the Hale Formation. The rocks in the Morrow Series of this report consist of about equal parts of dark-gray shale (silty and limy in part), light- to medium-gray siltstone (limy and sandy in part), and light- to medium-gray very fine to medium-grained sandstone (limy, argillaceous, silty, and coarse grained in part). Some partly silty partly very finely to medium-sandy medium-gray dense to granular limestone is present.

ATOKA SERIES, ATOKA FORMATION

The Atoka Formation is 6,190 feet thick where penetrated by well 3; however, about 1,210 feet of rock has been removed from this Atoka section by two normal faults (well 3, pl. 3). Well 4 started about 400 feet below the top of the Atoka and penetrated 7,340 feet of the formation; about 60 feet of the Atoka is missing because of a normal fault (well 4, pl. 3). The Atoka is 7,610 feet thick where penetrated by well 11. Well 13, which started about 640 feet below the top of the Atoka, penetrated the remaining 9,843 feet of the formation. The Atoka Formation thickens from an estimated 6,800 feet in the northern part of this area to an estimated 10,500 feet in the southern part. The upper four-fifths of the formation thickens southward and the lower two-fifths of this part seems to thicken by the greater amount.

The formation is about 50 percent dark-gray and dark-gray to grayish-black shale that is, in some places, slightly silty to very silty or slightly limy. About 35 percent of the formation is very light to dark-gray siltstone that is slightly limy, argillaceous, or very finely sandy in some places. About 15 percent of the formation is very light to medium-gray very fine to medium-grained sandstone that is, in some places, argillaceous, silty, slightly limy, and coarsely sandy. A very small percentage of the formation is coal, dark-gray limestone, and bentonitic(?) shale.

Where exposed at the surface, the shale in the Atoka is in beds 1/16–1/2 inch thick, the siltstone is in one or more beds as much as 2 feet thick, and the sandstone is in zones of one or more convolute, irregular, or regular beds as much as 3 feet thick. Generally the sandstone is coarser grained, more quartzose, and thicker bedded where it is thickest.

Well-preserved fragments of gastropods, brachiopods, crinoids, and bryozoans are in an iron-rich limy shale in the SW1/4SW1/4SE1/4 sec. 14, T. 7 N., R. 23 W.

Haley (1966, p. 4) reported that two units of the Atoka have lithologic characteristics tending to set them apart from the rest of the formation, and these units were designated, in ascending order, "zone P" and "zone W." These zones could not be identified with certainty in the area of this report. The Greenland Sandstone Member at the base of the Atoka (Henbest, 1953, p. 1946) could not be identified.

DES MOINES SERIES

The Hartshorne Sandstone, the McAlester Formation, the Savanna Formation, and the Boggy Formation, in ascending order constitute the Krebs Group. In the area of this report, the Boggy Formation and most of the Savanna Formation have been removed by erosion. The McAlester and Savanna Formations are lithologically similar to the upper part of the Atoka Formation; and if the rather distinctive Hartshorne Sandstone did not separate these two parts of the section, identification of either would be difficult. The lower contacts of the Hartshorne Sandstone, the McAlester Formation, and the Savanna Formation were traced on the surface and in the subsurface to the area of this report from the east boundary of the Paris quadrangle (Haley, 1961, pl. 1), to which they had previously been traced from the east boundary of the Fort Smith district (Hendricks and Parks, 1950, pl. 13).

Hartshorne Sandstone.—The Hartshorne Sandstone in the area of this report ranges in thickness from 20 feet (SW1/4SW1/4 sec. 23, T. 8 N., R. 24 W.) to 220 feet (sec. 13, T. 7 N., R. 23 W.). Where thinnest, the Hartshorne is an irregularly and thinly bedded very silty and argillaceous very fine grained sandstone. Where thickest, it is a thin to thick irregularly to regularly bedded or crossbedded partly silty very fine to medium-grained sandstone which in places contains lenses, pebbles, and cobbles of siltstone and shale. In secs. 29, 32, 33, 34, and 35, T. 8 N., R. 24 W., and secs. 2 and 3, T. 7 N., R. 24 W. (the west half of Prairie View Mountain), the upper two-thirds of the formation is a thin and regularly bedded very fine to fine-grained quartzose sandstone. In the east-central part of the mapped area the formation includes a lense 60 feet thick of shale and some siltstone. This lense is best exposed in the east side of Shoal Creek Narrows (secs. 27 and 34, T. 8 N., R. 23 W.).

Most sandstone in the formation is in the beds of the type deposited in stream channels. These beds have sharp upper and lower boundaries, most are crossbedded, and some are convoluted. The even-bedded sandstones in the west half of Prairie View Mountain are in zones of long (more than 20 ft) gently dipping (less than 5°) foreset beds.

The Hartshorne Sandstone unconformably overlies the Atoka Formation. The contact between the two formations is well exposed in the SE1/4SW1/4NW1/4 sec. 13, T. 7 N., R. 24 W.

McAlester Formation.—The McAlester Formation ranges in thickness from about 680 feet in the northeastern part of the report area to about 900 feet in the southwestern part of the area. The formation is mostly dark-gray to grayish-black shale that is slightly silty in some places and contains abundant ironstone concretions in some places. In the area of this report and elsewhere in Arkansas, some of the shale in the McAlester can be distinguished from the shale in the Atoka or in the Savanna by the lack of silt and by the darker color, whether fresh or weathered. A small part of the formation is about equally divided into thin irregularly bedded siltstone that is very finely sandy or argillaceous in places and thin-bedded irregularly bedded silty very fine grained sandstone. Three coal beds are in the McAlester Formation in the report area; the most important of these is the Lower Hartshorne coal bed, near the base of the formation. The McAlester Formation conformably overlies the Hartshorne Sandstone.

Savanna Formation.—The lower part of the Savanna Formation is present in the area of this report and is about 400 feet thick. Haley (1961, p. 8) estimated that the Savanna is 2,200 feet thick in the Paris quadrangle to the west; hence, as much as 1,800 feet of the formation may have been eroded from the area of the Scranton and New Blaine quadrangles. In the mapped area the Savanna consists of dark-gray slightly silty shale, thin and irregularly bedded light- to medium-gray siltstone that is partly argillaceous and very finely sandy in some places, thin and irregularly bedded light- to medium-gray very fine grained sandstone that is argillaceous and silty in places, and four coal beds. Ripple marks, crossbedding, and, in places, sedimentary flow features are common in the siltstone and sandstone. An excellent example of a large-scale sedimentary flow feature is exposed where the Paris syncline is cut by Pee Dee Creek in the W½ sec. 9, T. 7 N., R. 24 W. (pl. 1). The rock unit mapped here as a sandstone, 10–60 feet thick, is a sandstone on the limbs of the syncline, but it contains mixed sand, silt, and clay in the middle of the syncline. Preconsolidation sedimentary slump or flow mixed the sand with the underlying silt and clay in the area along the axis of the syncline. The position of this sedimentary flow feature relative to the axis of the syncline and the rather large size of the feature suggest that the Paris syncline was being formed during the time of Savanna deposition.

In general, the sandstone in the Savanna is finer grained, siltier, and more argillaceous than the sandstone in the McAlester, Hartshorne, or Atoka. In some places, the sandstone and siltstone weather yellowish brown, whereas the sandstone and siltstone in the other three formations generally weather light gray or grayish white.

The lower part of the Savanna Formation interfingers with the upper part of the McAlester Formation in the eastern part of the Paris quadrangle (Haley, 1961, p. 7). The same relation between the two formations exists in the Scranton and New Blaine quadrangles.

QUATERNARY SYSTEM

TERRACE DEPOSITS

Alluvium has been deposited by the Arkansas River at two terrace levels in the northern part of the report area and by local streams elsewhere. The terrace deposits of the Arkansas River consist of clay, silt, and sand; pebbles and cobbles of shale, siltstone, and sandstone, some of which are of local origin; and pebbles and cobbles of quartz and chert, which are of distant origin. The terrace deposits of the streams consist of clay, silt, and sand, and pebbles, cobbles, and boulders of rocks of local origin or from reworked river terraces. The alluvium in the uppermost river and stream terrace is considered equivalent to the Gerty Sand of Pleistocene age (Miser, 1954).

ALLUVIUM

Alluvium has been deposited along the Arkansas River and along the smaller streams. The river alluvium consists of clay, silt, sand, pebbles, cobbles, and boulders eroded from local rocks, reworked from local terraces, or transported from a distant source. The stream alluvium consists of clay, silt, sand, pebbles, cobbles, and boulders eroded from local rocks or reworked from terrace deposits.

STRUCTURE

The report area is in the Arkansas Valley section of the Ouachita province (fig. 1). The rocks have been folded into east-trending anticlines and synclines and have been broken by eastward-trending southward- and northward-dipping normal faults. (See pls. 1, 2, and 4.) The structural relief in the area is 2,500 feet, as measured on the base of the Hartshorne Sandstone from the trough of the Paris syncline to the crest of the Pine Ridge anticline.

SYNCLINES

The Paris syncline extends across the southern part of the report area. The Scranton syncline extends into the northern part of the report area from the northwest and presumably is terminated by the Dublin fault. The Ouita syncline extends across the northeastern part of the report area and probably dies out about 5 miles northwest of Scranton. The Ouita syncline was named the Scranton (Ouita) syncline by Merewether and Haley (1961, p. 10), because the information available suggested that the Scranton and Ouita synclines were the same structural feature.

ANTICLINES

The axis of the Pine Ridge anticline extends across the southwestern part of the report area and south of the southeastern part of the area. The Prairie View anticline extends across the central part of the area. Both anticlines are broken by northward-dipping normal faults. The Pine Ridge anticline is asymmetrical, the northern limb being steeper than the southern limb. The Prairie View anticline is nearly symmetrical.

FAULTS

Southward- and northward-dipping normal faults intersect the surface and have been penetrated by wells drilled in the area. In the Arkansas Valley, including the area of this report, the southward-dipping faults are believed to be the major faults, and the northward-dipping faults terminate against them (pl. 2). The planes of all faults are shown to be straight on plate 2, but they may curve and decrease in dip with depth. The fault planes are not shown as curved on plate 2 because the nature of the curve would be conjectural.

The Dublin fault is the only southward-dipping fault known in the report area. It is at a depth of 6,410 feet in well 3 (section *B–B′*, pl. 2, and log of well 3, pl. 3), where an estimated 1,100 feet of rock is missing. A maximum of 350 feet of rock is missing where the Hartshorne Sandstone is displaced by the Dublin fault (pls. 2 and 4). The maximum total amount of movement along the northward-dipping faults that presumably terminate against the Dublin fault is about 400 feet. This amount (400 ft) subtracted from the difference in displacements along the Dublin fault (1,100 ft in well 3 minus 350 ft at base of Hartshorne equals 750 ft) leaves a minimum displacement (350 ft) that can best be explained as movement along the Dublin fault during the deposition of the Atoka. It is also possible that unmapped northward-dipping faults, hidden by alluvium and terrace deposits, cause the discrepancy in displacement along the Dublin fault.

The two unnamed northward-dipping faults extending across the extreme northwest corner of the mapped area have an estimated combined displacement of 90 feet. Neither of the fault planes is exposed, but the surface traces of both can be accurately located. The Scranton fault extends eastward into the mapped area and, though the fault plane is not exposed, its surface trace can be located in sec. 11, T. 8 N., R. 25 W. Displacement along the fault ranges from 0 to about 200 feet. The Prairie View fault dips northward and extends across the west-central part of the report area. The maximum displacement along the fault is 350 feet in sec. 28, T. 8 N., R. 24 W. The Shoal Creek fault, a northward-dipping fault, extends across the east-central part of the report area and dies out in sec. 25, T. 8 N., R. 24 W., about a mile southwest of the east end of the Prairie View fault. The maximum amount of displacement along the fault is estimated to be 300 feet.

The Hickory Grove fault, which dips northward, extends almost across the southern part of the report area. The fault plane dips 80° N. where exposed in the SE¼SW¼ sec. 16, T. 7 N., R 24 W. The surface trace of the fault plane can be accurately located throughout much of its western extent and very accurately located on the south side of the road between Hickory Grove Cemetery and Shoal Creek (sec. 23, T. 7 N., R. 24 W.). The northward-dipping faults in the northern part of the report area are probably related to the southward-dipping Dublin fault, and perhaps the Hickory Grove fault is also related. It seems more probable, however, that the Hickory Grove fault is related to the asymmetrical Pine Ridge anticline (sections *A–A′*, *B–B′*, and *C–C′*, pl. 2). The maximum displacement along the fault is about 200 feet.

ECONOMIC GEOLOGY

COAL

Coal beds are in the Atoka, McAlester, and Savanna Formations. The exposures, extent, thickness, and mined areas of all coal beds are shown on plate 4. All coal in the Scranton and New Blaine quadrangles is classified as semianthracite (Haley, 1960, pl. 62), on the basis of the percentage of dry mineral-matter-free fixed carbon in the coal in accordance with the specifications of the American Society for Testing and Materials (1939).

The estimated reserves of Lower Hartshorne coal listed in table 2 are tabulated in categories of amount of overburden, thickness of coal, and abundance of reliable thickness data, in accordance with the standards and procedures adopted by the U.S. Geological Survey (Averitt, 1961, p. 14–26).

TABLE 2.—*Estimated original reserves of coal in the Lower Hartshorne coal bed, Scranton and New Blaine quadrangles*

[In millions of short tons]

Overburden (feet)	Thickness of coal (inches)			
	14–28	28–42	>42	Total
Measured and indicated reserves				
0–1,000	7.097	11.702	0.651	19.456
1,000–2,000	.393			.393
Total	7.490	11.702	.657	19.849
Inferred reserves				
0–1,000	47.806	15.338		63.144
1,000–2,000	.106			.106
Total	47.912	15.338		63.250
Total reserves				
0–1,000	54.903	27.040	0.657	82.600
1,000–2,000	.499			.499
Total	55.402	27.040	.657	83.099

Coal beds in the Atoka Formation

The coal beds in the Atoka Formation were not found at the surface but were penetrated by wells 3, 4, and 13 (pl. 3), by two drill holes in sec. 9, T. 8 N., R. 24 W., and by drill holes in secs. 4 and 6, T. 7 N., R. 23 W. (Collier, 1907, p. 143, 146.) In other parts of the Arkansas Valley the coal in the Atoka is thin and of poor quality, and there is no reason to believe that the coal beds penetrated in this area are different.

Coal beds in the McAlester Formation

Three coal beds are in the McAlester Formation in the report area. They are the Lower Hartshorne coal bed, near the base of the formation, an unnamed coal bed about 45 feet above the Lower Hartshorne coal, and an unnamed coal bed about 150 feet above the base of the formation.

The Lower Hartshorne coal bed is the thickest, the most widespread, and economically the most important coal bed in the area of this report. It seems to terminate in the Paris syncline east of secs. 3 and 10, T. 7 N., R. 23 W. (pl. 4). The coal bed was not found and none of the local residents knew of its existence east of these sections; nor was any evidence for the coal bed found by Merewether and Haley (1961) in mapping the Paris syncline in the Delaware quadrangle to the east.

The original reserves of coal in the Lower Hartshorne coal bed in the report area are estimated to be 83,099,000 short tons (table 2). Surface and underground mining have removed an estimated 108,000 short tons of coal; thus an estimated 82,991,000 short tons of coal remains in the report area. Averitt (1961, p. 24) estimated that underground mining recovers, on the average, about 50 percent of the coal in the ground. In accordance with this estimated recovery of 50 percent, the report area is considered to contain a recoverable reserve of 41,495,000 short tons.

The unnamed coal bed about 45 feet above the Lower Hartshorne coal bed was penetrated by a drill hole in the NW¼NW¼ sec. 20, T. 8 N., R. 23 W. (Collier, 1907, p. 145). The thickness of this coal bed was not reported.

The unnamed coal bed about 150 feet above the base of the McAlester Formation is exposed in an exploratory opening in the SW¼SE¼ sec. 9, T. 7 N., R. 24 W. In this opening, the coal bed is 17 inches thick and contains layers and lenses of shale, some of which is carbonaceous.

Coal beds in the Savanna Formation

Four coal beds are in the Savanna Formation (pls. 1, 4), but they all are too thin (12 in. or less) to mine, even for small local demand.

OIL AND GAS

Oil has not been discovered in the Scranton and New Blaine quadrangles, and only one of the 13 wells drilled in this area is a producing gas well (Western Natural Gas Co. R. Gray 1, well 4, pl. 3). All the wells are described in table 3. Well 3 penetrated all of the Atoka Formation (1,210 ft. is absent because of faulting) and all of the Morrow Series, and no show of gas was reported. Well 4 penetrated all of the Atoka (60 ft. is absent because of faulting) and the upper 540 feet of the Morrow and is reported to produce 88,000 cubic feet of gas per day from the upper part of the Atoka. Well 11 penetrated all of the Atoka and the upper 890 feet of the Morrow and had a reported show of 564,000 cubic feet of gas per day from the lower part of the Atoka. Well 13 penetrated all of the Atoka and the upper 652 feet of the Morrow, and no show of gas was reported. The failure of these wells to produce more gas is difficult to explain because elsewhere in Arkansas gas has been discovered in many parts of the Atoka Formation and in the upper part (Bloyd Formation and Prairie Grove Member of the Hale Formation) of the Morrow Series. In many of the gas fields in the Arkansas Valley gas is trapped by lithologically changed reservoir rock. If gas is similarly trapped in the Scranton and New Blaine quadrangles, wells 3, 4, 11, and 13 missed most of the traps. Perhaps the gas escaped along the fault planes, but this seems unlikely because some lithologic traps must not be faulted, and there are many fault-trapped gas fields elsewhere in Arkansas. Possibly, Commercial quantities of gas were never present in the area of this report.

BUILDING STONE

Slabs and blocks of weathered sandstone from the Atoka Formation and the Hartshorne Sandstone have been used in constructing the exteriors of some of the buildings in the area.

The Hartshorne Sandstone in the central part of the report area is a major source of the building stone known as Arkansas Stone and used in Arkansas and the surrounding States. The stone is quarried, as slabs 1–6 inches thick, mostly in secs. 29, 32, 33, 34, and 35, T. 8 N., R. 24 W., and secs. 2 and 3, T. 7 N., R. 24 W. Some of the slabs are trimmed and used for exterior finish or flagstone, but most are cut into blocks 3–4 inches wide and 6 inches to 3 feet long which are used for decorative building purposes in much the same way as brick is used. The best quality building stone is where the sandstone is in long (more than 20 ft.) low-dipping (less than 5°) foreset beds near the crests of ridges underlain by Hartshorne Sandstone.

Slabs of sandstone taken from a quarry in the Savanna Formation (NW¼NE¼ sec. 2, T. 7 N., R. 25 W.) were used for sidewalks in the nearby communities and towns.

TABLE 3.—*Description of wells drilled in the Scranton and New Blaine quadrangles, Logan County, Ark., as of July 1, 1964*

Well No. (pls. 1-4)	Company name	Lease name	Location	Total depth (ft)	Reported ground elevation (ft)	Electric log	Stratigraphic zone of production	Reported depth of production (ft)	Reported production (cu ft per day)	Completion date	Remarks
1	Prall and Hickey.	Graves 1	Center SE¼S W¼ sec. 14, T. 8 N., R. 25 W.	1,430	[1]495	No			Dry	1922	
2	W. M. Greerson.	C. S. Parks 1	Near center SE¼SE¼ sec. 21, T. 8 N., R. 24 W.	1,672	[1]380	No	Upper part of Atoka Formation.	1,665	1,000		
3	Humble Oil and Refining Co.	Reinhart and Donovan 1.	660 ft from north line and 1,470 ft from east line sec. 23, T. 8 N., R. 24 W.	8,317	380	Yes			Dry	Nov. 1961	Rock samples examined and logged by E. A. Merewether.
4	Western Natural Gas Co.	R. Gray 1	Center S W¼NE¼ sec. 25, T. 8 N., R. 24 W.	7,870	[1]470	Yes	Upper part of Atoka Formation.	1,370–1,400	88,000	Mar. 1954	Rock samples examined and logged by E. E. Glick.
5			Near N W cor. S W¼ NE¼ sec. 26, T. 8 N., R. 24 W.	3,450	[1]437				Dry		
6	Arkansas-Louisiana Pipe Line Co.	W. Parks 1	Near N W cor. NE¼ SE¼ sec. 26, T. 8 N., R. 24 W.	4,619	[1]470				Dry		
7			Near center S W¼ SE¼ sec. 26, T. 8 N., R. 24 W.	2,650	[1]445	No	Upper part of Atoka Formation.	717, 1,100, and 1,256.	Show of gas	1916	
	J. H. Flowers		Sec. 27, T. 8 N., R. 24 W.	1,890		No				1920	Location in section unknown.
8	Choctaw Oil and Gas Co.	Pitts Brothers	Near SE cor. NE¼ N W¼ sec. 27, T. 8 N., R. 24 W.	810	[1]420	No			Dry	1921	
9	do	do	Near SE cor. N W¼ sec. 27, T. 8 N., R. 24 W.	1,654	[1]418	No			Dry	1921	
10	M. W. Greerson.	Hatweg 1	Near center S W¼ S W¼ sec. 27, T. 8 N., R. 24 W.	1,295	[1]415	No			Dry		
11	Gulf Oil Corp. and Ohio Oil Co.	A. W. McElroy 1.	330 ft N. and 330 ft E. from S W cor. NE¼ sec. 32, T. 8 N., R. 24 W.	8,736	585	Yes	Lower part of Atoka Formation.	6,544	564,000	Mar. 1962	Gas flow diminished to noncommercial rate; well abandoned. Rock samples examined and logged by B. R. Haley.
12	Arkansas-Louisiana Pipe Line Co.	J. Jenson 1	455 ft E. and 350 ft S. of N W cor. NE¼ NE¼ sec. 35, T. 8 N., R. 24 W.	2,405	[1]470		Upper part of Atoka Formation.	1,365, 1,605, 1,690, and 2,332.	Show of gas		
13	Sinclair Oil and Gas Co.	Federal-Smith 1.	Center SE¼N W¼ sec. 24, T. 7 N., R. 24 W.	10,495	690	Yes				Aug. 1962	Rock samples examined and logged by B. R. Haley.

[1] Elevation estimated from plate 1.

ROAD METAL

Shale and interbedded shale and siltstone have been quarried for road metal in some parts of the area. The gravel in the lower part of the upper river terrace is used, unprocessed (not crushed, sorted, or washed), for road metal and makes an excellent surface on unpaved roads.

GRAVEL, SAND, AND CLAY

Well-sorted gravel is in the upper river terrace, the river alluvium, some places in the lower river terrace, and some of the stream terraces. Sand is in the river terraces and river alluvium and in some places in the stream alluvium. Clay is in the lower river terrace and the river alluvium.

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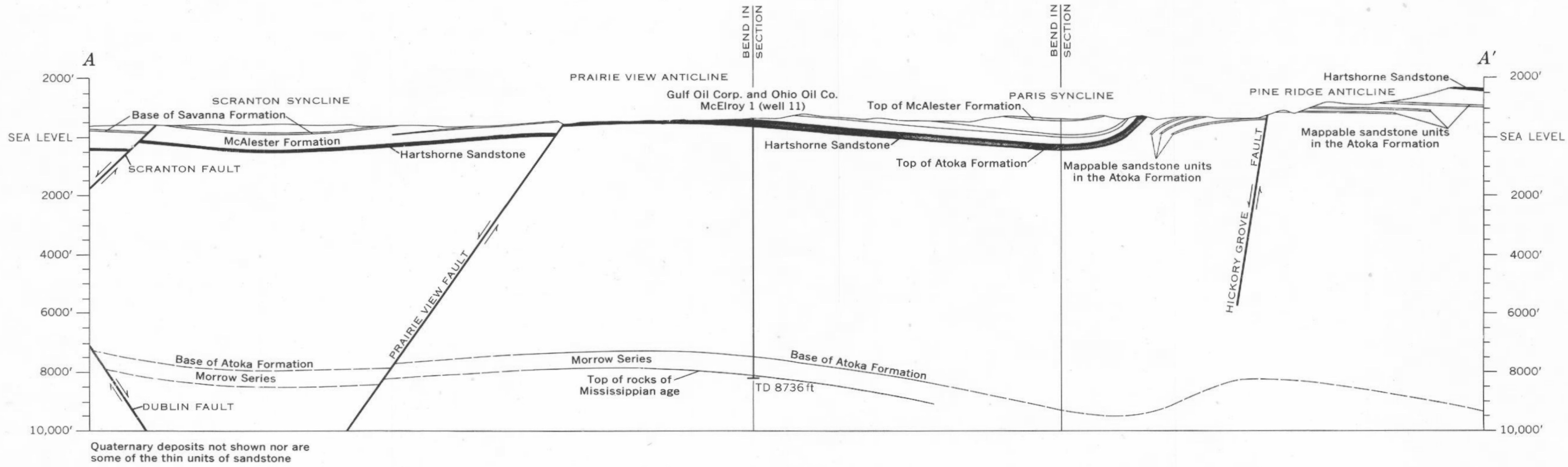
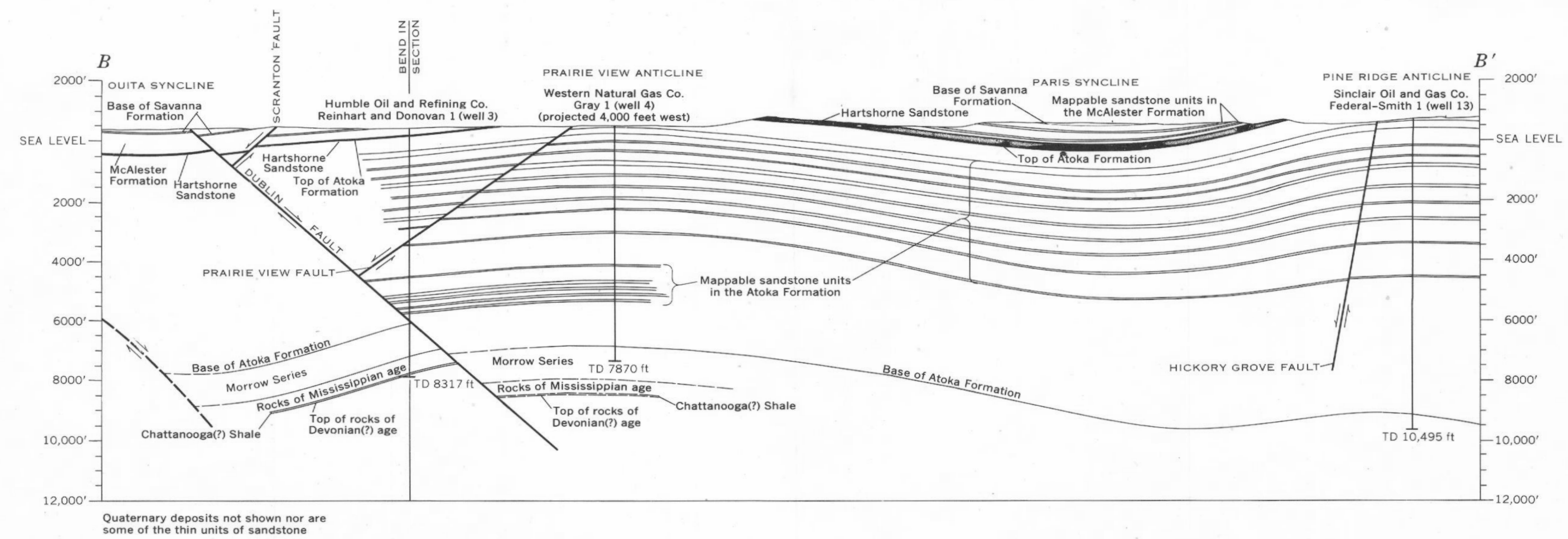
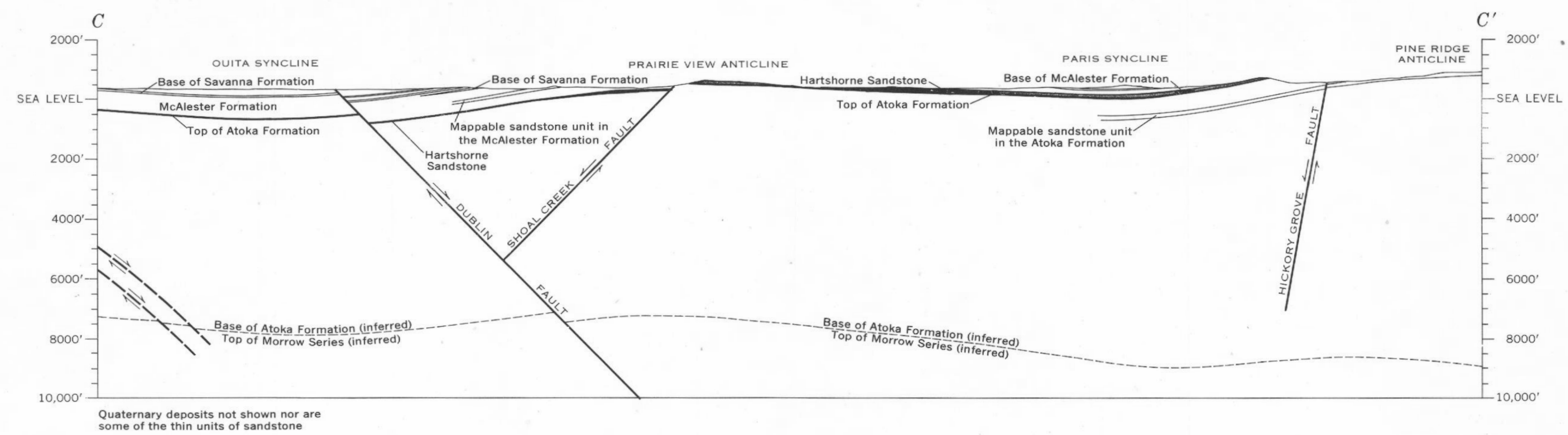
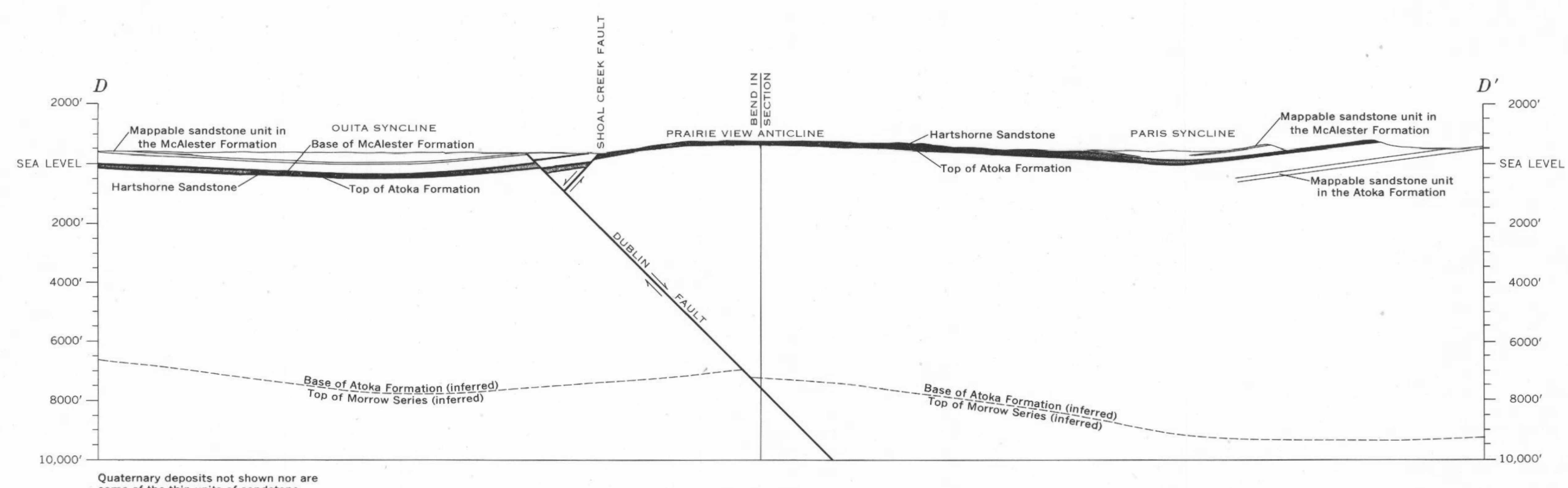


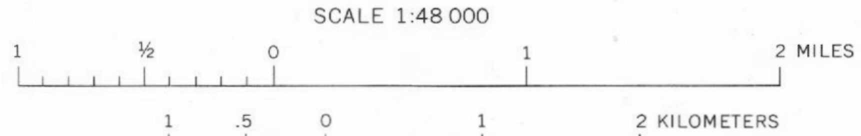






STRUCTURAL SECTIONS IN SCRANTON AND NEW BLAINE QUADRANGLES LOGAN AND JOHNSON COUNTIES, ARKANSAS

SCALE 1:48 000



DATUM IS MEAN SEA LEVEL

STRATIGRAPHIC SECTIONS IN SCRANTON AND NEW BLAINE QUADRANGLES
LOGAN AND JOHNSON COUNTIES, ARKANSAS

311-629 O - 68 (In pocket)

UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

PREPARED IN COOPERATION WITH THE
ARKANSAS GEOLOGICAL COMMISSION

PROFESSIONAL PAPER 536-B
PLATE 4

(COAL HILL) 1:24 000

(KNOXVILLE) 1:24 000

93°37'30" R. 25 W. R. 24 W. A 35' (HARTMAN 1:24 000) 32'30" B 30' R. 24 W. R. 23 W. 27'30" C (CLARKSVILLE 1:24 000) 25' R. 23 W. R. 22 W. D 93°22'30"

35°22'30" 35°22'30"

20' 20'

T. 8 N.
T. 7 N.

(PARIS 1:24 000)

(DELAWARE 1:24 000)

17'30" 17'30"

35°15' 93°37'30" R. 25 W. R. 24 W. A' 35' (MAGAZINE MOUNTAIN NE 1:24 000) 32'30" B' 30' R. 24 W. R. 23 W. 27'30" C' (DARDANELLE 1:125 000) 25' D' R. 23 W. R. 22 W. 93°22'30" 35°15'

(BLUE MOUNTAIN) 1:24 000

(DARDANELLE) 1:125 000

EXPLANATION

Symbols in red indicate data on contoured horizon

500

Structure contours

Drawn on base of Hartshorne Sandstone. Dashed where datum is eroded. Contour interval 100 feet

Anticline Syncline

Folds

Showing trace of axial plane

U D

Fault

U, *upthrown side;* D, *downthrown side; dashed on downthrown block*

IPh IPa

Surface trace of contact between Hartshorne Sandstone (IPh) and Atoka Formation (IPa)

A A'

Structural section shown on plate 3

Unnamed coal bed in Savanna Formation

Unnamed coal bed in McAlester Formation

Lower Hartshorne coal bed

X5

Exposure of coal

Number is thickness of coal, in inches

17

Surface opening on coal bed

Number is thickness of coal, in inches

Mine shaft

Quarry

Gravel pit

18

Drill hole in Lower Hartshorne coal bed

Number is thickness of coal, in inches; the words "thin coal" are as reported in drill records

Mined area in Lower Hartshorne coal bed

14

Lower Hartshorne coal thickness line

Number is thickness of coal, in inches

1000

Lower Hartshorne coal bed overburden thickness line

Number is thickness of overburden, in feet

Boundary between measured and indicated reserves and inferred reserves of coal

Square on side of area of measured and indicated reserves of coal

3 Gas producing 4 Show of gas 7 No show of gas

Wells

Number designates well listed in table 3 in text

Gas field

Base from U.S. Geological Survey, 1:24,000

TRUE NORTH MAGNETIC NORTH 7°
APPROXIMATE MEAN DECLINATION, 1968

STRUCTURE CONTOUR, COAL BED, AND GAS FIELD MAP OF SCRANTON AND NEW BLAINE QUADRANGLES, LOGAN AND JOHNSON COUNTIES, ARKANSAS

SCALE 1:48 000

1 ½ 0 1 2 3 MILES

1 .5 0 1 2 3 KILOMETERS

CONTOUR INTERVAL 10 AND 20 FEET
DOTTED LINES ON EAST HALF REPRESENT 10-FOOT CONTOURS
DATUM IS MEAN SEA LEVEL

INTERIOR—GEOLOGICAL SURVEY, WASHINGTON, D.C.—1968—G68092

Geology by Boyd R. Haley, 1957–58

93°37'30" 30' 93°22'30"
35°22'30"
SCRANTON 1961 | NEW BLAINE 1962
35°15'

INDEX SHOWING LOCATION OF QUADRANGLES