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PETROLEUM GEOLOGY OF THE SMACKOVER FORMATION OF SOUTHERN ARKANSAS

By
Jack H. Vestal

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CONTENTS

Page

ABSTRACT 1
ACKNOWLEDGMENT 1
INTRODUCTION 3
Location 3
Topography and drainage 3
Purpose of investigation 3
Method of investigation 3
History of oil and gas development 3
STRATIGRAPHY 5
General 5
Surface formations 5
Subsurface formations 5
Quaternary 5
Tertiary 5
Upper Cretaceous 5
Lower Cretaceous 5
Jurassic 5
General statement 5
Cotton Valley group 6
Buckner formation 6
Smackover formation 6
Definition 6
Distribution and thickness 7
Lithologic and stratigraphic features 7
Porosity 9
Correlation 9
Norphlet formation 10
Permian 10
Undifferentiated Paleozoic 10
Igneous rocks 10
STRUCTURE 11
General 11
Tertiary 11
Upper Cretaceous 11
Lower Cretaceous 11
Jurassic 11
Permian 11
Undifferentiated Paleozoic 11

Page

OIL AND GAS-CONDENSATE FIELDS PRODUCING FROM THE SMACKOVER FORMATION . . 12
General . . . 12
Atlanta-West Atlanta field . . . 12
Bear Creek field . . . 12
Big Creek field . . . 12
Buckner field . . . 12
Cairo field . . . 13
Calhoun field . . . 13
College Hill field . . . 13
Columbia field . . . 13
Loutre Creek field . . . 13
Magnolia field . . . 13
McKamie-Patton field . . . 13
Mount Holly field . . . 13
Pine Tree field . . . 14
Salem Church field . . . 14
Schuler field . . . 14
Texarkana field . . . 14
Dorcheat-Macedonia field . . . 14
Midway field . . . 14
Village field . . . 14
Snow Hill pool, Smackover field . . . 15
Warnock Springs field . . . 15
Warnock Springs extension . . . 15
Mars Hill field . . . 15
Spottsville field . . . 15
Tubal field . . . 15
Wilks field . . . 15
Strong field . . . 15
Northeast Champagnolle field . . . 15
GEOLOGIC HISTORY . . . 16
Paleozoic . . . 16
Mesozoic . . . 16
Jurassic . . . 16
Lower Cretaceous . . . 17
Upper Cretaceous . . . 17
Cenozoic . . . 17
Tertiary . . . 17
Quaternary . . . 17
CONCLUSIONS . . . 18
BIBLIOGRAPHY . . . 19

ILLUSTRATIONS

		Page
Figure 1.	Index Map	2
Plate I .	Oil and gas-condensate fields—south Arkansas	Following text
Plate II .	Structural contour map on top of Smackover limestone formation in southern Arkansas	Following text
Plate III.	Isopachous map of Smackover limestone formation in southern Arkansas	Following text
Plate IV.	Electrical log cross-section from northern Louisiana to Clark Country, Arkansas	Following text

TABLES

Table		*Page*
1.	Cumulative production in barrels of crude oil and gas-condensate from the Smackover limestone in southern Arkansas to January 1, 1950	4
2.	Time relations of Upper Jurassic formations of the Gulf region of the United States	6
3.	Stratigraphic interpretation of stratigraphic sequence	6
4.	Lithology of Smackover formation in McKamie field, Lafayette County, Arkansas	7
5.	Lithology of Smackover formation in southeastern Nevada County, Arkansas	8
6.	Lithology of Smackover formation in southern Calhoun County, Arkansas	8
7.	Lithology of Smackover formation in southeastern Chicot County, Arkansas	8
8.	Lithology of Smackover formation near its northern limit in northeastern Bradley County, Arkansas	9
9.	Wildcat wells in southern Arkansas that penetrated the Smackover formation before January 1, 1948, (includes some field wells that were drilled through the Smackover)	Appendix
10.	Wildcat wells in southern Arkansas that penetrated the Smackover formation from January 1, 1948, to May 1, 1949	Appendix
11.	Wildcat wells in southern Arkansas that penetrated the Smackover formation from May 1, 1949, to May 1, 1950	Appendix

PETROLEUM GEOLOGY OF THE SMACKOVER FORMATION OF SOUTHERN ARKANSAS

By Jack H. Vestal

ABSTRACT

Much information has been published about the geology of the oil and gas producing formations of southern Arkansas, but the drilling of new wells makes necessary periodic revisions of the published facts. It is here intended to present and interpret all facts about the Jurassic Smackover formation available prior to May 1, 1950.

Chief sources of information include several hundred electrical well logs, drillers' logs of wells drilled in areas where electrical logs are not available, well cuttings of several of the approximately 52 wells drilled through the Smackover, published information, and personal discussions with geologists familiar with the area.

All well logs were referred to sea level as a datum in order to determine the regional Smackover structure. Correlations of well logs indicated the approximate northern limit of the Smackover and the regional thinning from south to north. Microscopic examination of bit cuttings from wells drilled through the Smackover and published core analysis data from producing fields revealed regional changes in lithology, porosity, and permeability.

Both the structure map, which shows all Smackover oil and gas-condensate wells and 284 wildcat wells, and the isopachous map have contour intervals of 100 feet and are the first of their kind known to be published. These maps are accompanied by tables that give the name, location, and other pertinent data about each wildcat well and the field wells drilled through the Smackover. Effective porosity and permeability favorable for oil and gas production were found to be present only in the southwest part of the state although recent drilling has shown that the Smackover underlies more of southeastern Arkansas than shown in previous publications.

ACKNOWLEDGMENT

Electrical well logs furnished by the Arkansas Division of Geology and other information available before May 1, 1950, and given by the Arkansas Division of Geology, the Arkansas Oil and Gas Commission, and many oil companies operating in southern Arkansas and northern Louisiana made possible this revision of the published facts about the Smackover formation of southern Arkansas.

Special credit is due to the geological staff of the Lion Oil Company, El Dorado, Arkansas, for many fruitful discussions and permission to obtain much needed data from its files.

The writer gratefully acknowledges C. H. Murphy and Company's permission to revise the original paper to include data to May 1, 1950.

Other contributors of pertinent information include Atlantic Refining Co., Barnsdall Oil Co., Carter Oil Co., Gulf Refining Co., McAlester Fuel Co., Macmillan Petroleum Co., C. H. Murphy & Co., Ohio Oil Co., Phillips Petroleum Co., Placid Oil Co., Shreveport Photo-Copy Co., and Trowbridge Sample Service.

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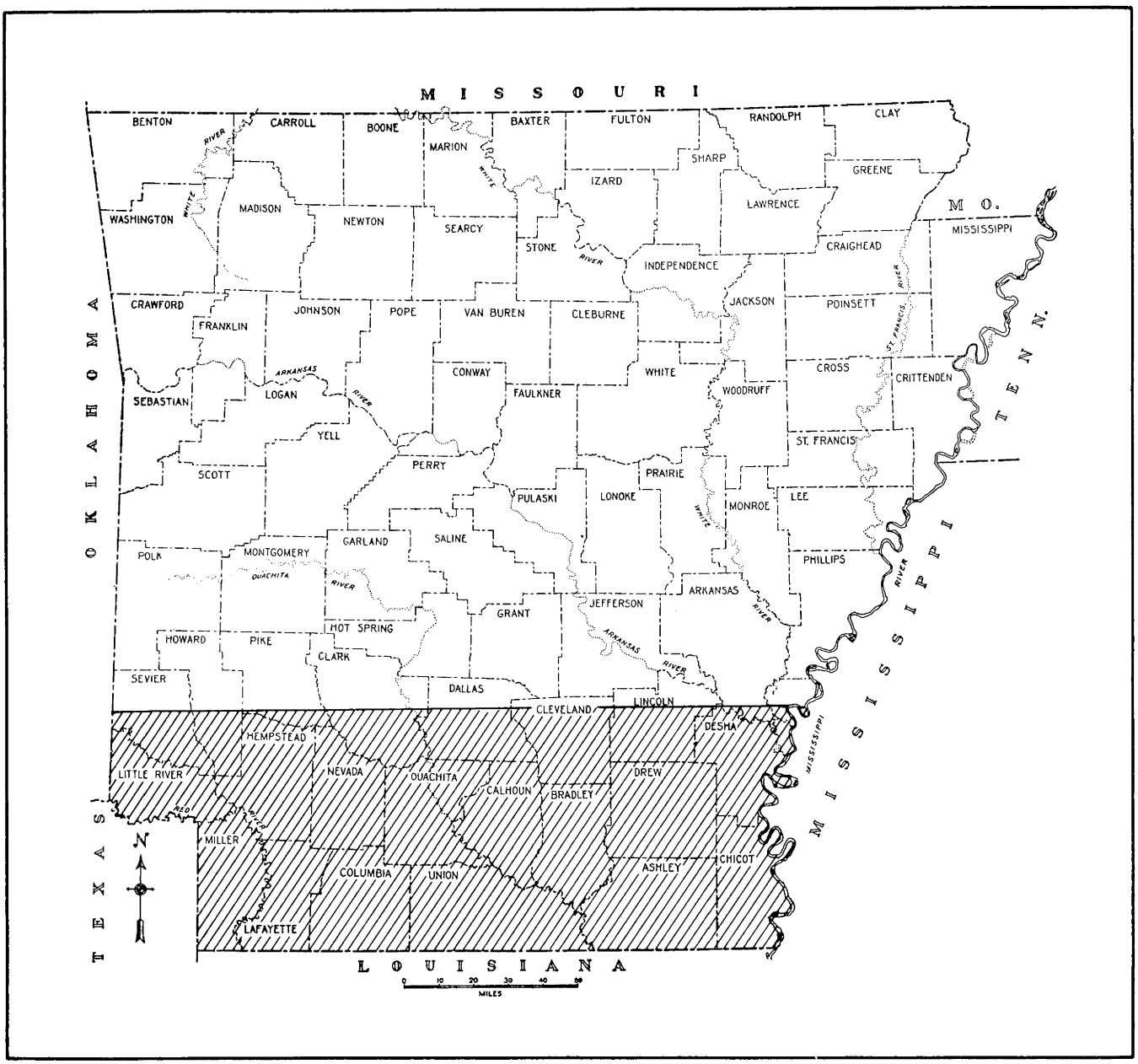


Figure 1.

Index map of Arkansas showing area covered in this report.

PETROLEUM GEOLOGY OF THE SMACKOVER FORMATION OF SOUTHERN ARKANSAS

INTRODUCTION

Location

The Smackover formation of Jurassic age underlies approximately 7,000 square miles of southern Arkansas, south of 34 degrees north latitude. Figure 1 shows the area studied.

Topography and Drainage

This area, which is included entirely in the Gulf Coastal Plain, ranges in elevation from 70 to 400 feet above sea level.

Although this part of Arkansas is relatively flat, most of it is well drained by the Red River, Ouachita River, Saline River, Mississippi River, and their tributaries.

Purpose of Investigation

Much has been written about the Smackover formation in southern Arkansas, but no detailed regional study including information based on all wells drilled to the Smackover in this area has been published. The principal purpose of this report is to present such a study, based on wells drilled in the area prior to May 1, 1950.

Method of Investigation

The material presented in this report was derived from (1) the examination and correlation of available electrical logs of all wildcat wells and a few producing wells in each oil and gas-condensate field; (2) the plotting and correlation of approximately 150 selected drillers' logs of wells drilled in areas where no electrical logs are available; (3) the detailed examination of the Smackover formation well cuttings in 14 of the approximately 52 wells that have been drilled through the Smackover; and (4) a detailed study of the geological literature of southern Arkansas with emphasis on the Smackover formation. From this information a structural contour map (Pl. II) and an isopachous map (Pl. III) were made. In order to show regional stratigraphic relationships, an electrical log cross-section (Pl. IV) was drawn from northern Louisiana to Clark County, Arkansas.

An electrical log has been run in almost every well drilled as deep as the Smackover in southern Arkansas since 1935, the year the first electrical log was run in this area. Whenever possible, electrical logs were used in compiling data for this paper, but information on wells drilled before 1935 was obtained entirely from drillers' logs.

History of Oil and Gas Development

Commercial production from the Smackover was first obtained in 1936 in the Snow Hill area of Ouachita County in the Phillips Petroleum Company No. 1 J. D. Reynolds, Sec. 27, T. 15 S., R. 15 W. (Table 9, well 166). By January 1, 1950, at least 284 wildcat wells had penetrated the Smackover formation in southern Arkansas (see Tables 9, 10, and 11). Twenty-six fields in Arkansas have produced a total of 134,610,902 barrels of oil and condensate from the Smackover (Table 1). Plate I shows all oil and gas-condensate fields in southern Arkansas.

TABLE 1

CUMULATIVE PRODUCTION IN BARRELS OF CRUDE OIL AND GAS-CONDENSATE FROM THE SMACKOVER IN SOUTHERN ARKANSAS TO JANUARY 1, 1950[1]

	Field	County	Year Discovered	Cumulative Production in Barrels
1.	Atlanta-West Atlanta	Columbia	1938	11,524,813
2.	Bear Creek	Union	1948	273,425
3.	Big Creek	Columbia	1939	168,327
4.	Buckner	Columbia and Lafayette	1937	7,165,603
5.	Cairo	Union	1948	728,392
6.	Calhoun	Columbia	1944	230,757
7.	College Hill	Columbia	1948	5,755
8.	NE Champagnolle	Union	1946	740
9.	Columbia	Columbia	1942	10,201
10.	Dorcheat-Macedonia	Columbia	1939	6,797,812
11.	Loutre Creek	Union	1949	31,137
12.	Magnolia	Columbia	1938	61,494,458
13.	Mars Hill	Lafayette	1947	79,682
14.	McKamie-Patton	Columbia and Lafayette	1940	9,458,016
15.	Midway	Lafayette	1942	19,286,998
16.	Mt. Holly	Union	1941	1,763,847
17.	Pine Tree	Columbia	1949	99,762
18.	Salem Church	Union	1944	117,932
19.	Schuler	Union	1937	7,180,058
20.	Snow Hill	Ouachita	1936	422,434
21.	Spottsville	Columbia	1949	3,675
22.	Strong	Union	1944	28,397
23.	Texarkana	Miller	1942	140,232
24.	Village	Columbia	1938	7,481,325
25.	Warnock Springs and Northeast Extension	Columbia	1947	107,049
26.	Wilks	Union	1944	10,075
				134,610,902

[1] Arkansas Oil and Gas Commission production data.

STRATIGRAPHY

GENERAL

Surface Formations

Recent, Quaternary, and Tertiary formations outcrop throughout most of the area studied; Upper and Lower Cretaceous formations are exposed in the northwest portion.

Subsurface Formations

Thick deposits of Jurassic age underlie much of southern Arkansas. Below these are thick deposits which are believed to be Permian in age (10). Igneous rocks and late Paleozoic formations of undetermined age compose the basement complex.

Quaternary

Recent thin alluvium deposits of unconsolidated gravel, sand, silt, and clay are found on the flood plains of all major streams and many minor ones.

Pleistocene terrace deposits of unconsolidated sand and gravel occupy much of the inter-stream surface areas (2). No attempt to subdivide either the Recent or Pleistocene deposits was made in this study.

Tertiary

The Tertiary system is represented only by the Eocene series which is commonly divided into four groups ranging from youngest to oldest: Jackson, Claiborne, Wilcox and Midway. These Eocene sediments, composed of sands, sandy clays, lignitic and carbonaceous clays, and glauconitic marls, with thin beds and lenses of limestone and chalk, thicken from approximately 1,500 feet in the southwestern part of the area to more than 4,000 feet in the eastern part. The series contains many siderite and ferruginous concretions, irregular thin lenses of bentonitic clay, and locally irregular lenses and boulders of quartzite (11, pp. 109-124).

Upper Cretaceous

Upper Cretaceous sediments, known as the Gulf series, outcrop in the northwest part of the area in Little River, Sevier, Howard, Hempstead, Nevada, Pike, and Clark Counties. Formations of Upper Cretaceous age from youngest to oldest include the Arkadelphia, Nacatoch, Saratoga, Marlbrook, Annona, Ozan, Brownstown, Tokio, and Woodbine (2). These sediments consist of a series of clays, marls, shales, chalks, limestones, and sands, with some volcanic materials, especially in the basal beds. Although the series underlies all of the area, it thickens from approximately 200 feet in the southeastern part of the state to more than 2,000 feet in southwestern Arkansas (11, p. 63).

Most of the early oil and gas production in Arkansas was obtained from shallow wells drilled to sands of Upper Cretaceous age (Pl. I).

Lower Cretaceous

Ralph W. Imlay (6, p. vii) in 1940 gave the following summary of these formations:

> The Lower Cretaceous rocks of southern Arkansas range in thickness from about six hundred feet at the outcrop in Sevier, Howard, and Pike Counties to over 5,500 feet subsurface in the southwestern corner of the state. . . . The Lower Cretaceous—formations consist mainly of nearshore, shallow water deposits in Arkansas and of offshore, shallow water deposits in northern Louisiana. The nearshore deposits are characterized by conglomerates, sandstones, red beds, and reef limestones whose deposition was interrupted several times by withdrawals of the Gulf waters. The offshore deposits are characterized by dark shales and thin-bedded limestones the deposition of which was apparently nearly continuous. Anhydrite was formed both nearshore and offshore.
>
> . . . Formations of Lower Cretaceous age, from youngest to oldest, include the Kiamichi, Goodland, Walnut, Paluxy, Glen Rose equivalents (Mooringsport, Ferry Lake, Rodessa, Pine Island, and Sligo), and Hosston.

Extensive uplift and erosion at the end of Lower Cretaceous time removed much of these sediments so that from oldest to youngest they are progressively truncated from their northern limit toward the south. The subsurface northern limit extends from the outcrop in southeastern Pike County in a southeasterly direction through Clark, Ouachita, Calhoun, and Bradley Counties into Ashley County.

JURASSIC

General Statement

Rocks of Jurassic age do not outcrop in the Gulf Coastal Plain, and before the present era of deep oil well drilling nothing but philosophical

reasoning indicated their presence. These sediments have been found in wells in northeastern Texas, northern Louisiana, southern Arkansas, Mississippi, and Alabama (9, p. 1092).

Ralph W. Imlay (7, p. 1473), in his paper on the Jurassic formations of the Gulf region in 1943, presented a detailed correlation chart of the Jurassic formations in that area. Table 2 shows his interpretation of the time relations of the Upper Jurassic formations of the Gulf region of the United States.

TABLE 2
TIME RELATIONS OF UPPER JURASSIC FORMATIONS OF THE GULF REGION OF THE UNITED STATES
Imlay

	European Stages		Gulf Region of the United States
UPPER JURASSIC	Tithonian		Cotton Valley Formation
	Portlandian		
	Kimmeridgian	Bononian	
		Havrian	
		Sequanian	Buckner Formation
	Oxfordian	Argovian	Smackover Formation
		Divesian	Eagle Mills Formation (Red Beds and Salt)
	Callovian		

According to Hazzard, Blanpied, and Spooner, information obtained from the drilling of deep wells in south Arkansas, northeast Texas, and north Louisiana since the publication of Imlay's paper in 1943 indicates that the Louann Salt, Werner, Morehouse, and Eagle Mills are separate formations of probable Permian age (10, pp. 483-503). Their latest published interpretation of stratigraphic relations of the Jurassic and Permian sequence is presented in Table 3.

TABLE 3
INTERPRETATION OF STRATIGRAPHIC SEQUENCE
Hazzard, Blanpied, and Spooner

Jurassic	Cotton Valley Group
	Unconformity
	Buckner Formation
	Smackover Limestone
	Norphlet Formation Red Beds with or without Gravel
	Unconformity
Permian	Louann Salt
	Werner Formation Anhydrite Member and Red Bed and Gravel Member
	Unconformity
	Morehouse Formation
	Eagle Mills Formation

Cotton Valley Group

The youngest Jurassic beds belong to the Cotton Valley group (Table 3) and in Arkansas consist mainly of a near-shore redbed facies composed of interbedded variegated shales, sandstones, and generally a basal conglomerate; in northern Louisiana the beds consist of a normal marine offshore facies of fossiliferous, dark shales, limestones, and sandstones. Near the Arkansas-Louisiana boundary these two facies grade into each other. The approximate northern limit of the Cotton Valley, which is truncated by the Upper Cretaceous, extends through central Hempstead, Nevada, Ouachita, Calhoun, and Bradley Counties. The group thickens basinward to approximately 2,700 feet in southern Lafayette County and to approximately 4,000 feet in the North Lisbon field, Claiborne Parish, Louisiana.

Oil, gas, and gas-condensate are produced from Cotton Valley sands in several southern Arkansas fields. In most places these sands are very lenticular and often cannot be correlated from well to well in the same field. However, in the Schuler field the Jones sand at the base of Cotton Valley was found to underlie the entire field and has been the principal producing horizon for the field.

Buckner Formation

Underlying the Cotton Valley group is the Buckner formation which in Arkansas consists mainly of red shale and white to pink anhydrite but includes some green shale, some red and gray fine-grained sandstone, and thin beds of dolomitic limestone and argillaceous dolomite. Generally, red shale predominates in the upper part and anhydrite in the lower part, but the relative proportions of the two lithologic types vary from place to place. In northern Louisiana the Buckner changes into dark marine shales. The Buckner is locally absent, as in the Schuler field in southern Arkansas, and may vary in thickness up to several hundred feet. Since it grades downward through thin argillaceous dolomite streaks into the underlying Smackover limestone, this variation in thickness is probably due to post-Buckner and pre-Cotton Valley erosion.

Smackover Formation

Definition.—The Smackover formation was named after the Smackover field, Union County, Arkansas, where it first produced oil. In southern Arkansas it is divisible into two members of which the upper consists in most places of oolitic

to chalky limestone and the lower of dark, dense limestone with argillaceous bands. The porous oolitic zone, which produces oil and gas in all Smackover lime fields, is called the Reynolds oolite from the discovery well in the Snow Hill area of the Smackover field. The vertical change from one member to the other is gradational. In the northern part of the area the lower member is thinner than the upper and disappears near the northern boundary. Southward toward Louisiana the relationship is reversed and the lower member becomes more argillaceous. This relationship suggests that the upper member is in part the time equivalent of the lower member. In the southeastern part of the area the limestone becomes sandy and in southern Chicot County it is quite sandy. According to Imlay (7, p. 1440), "The limestone is in part dolomitic and in most sections contains small amounts of anhydrite as nodules or thin beds."

Distribution and thickness.—The areal extent and subsurface structure on top of the Smackover in southern Arkansas are shown on Plate II, and Plate III illustrates the thickness. Tables 9, 10, and 11 list 284 wildcat wells known to have penetrated the Smackover in southern Arkansas and include 52 wells that were drilled through it.

The thickest Smackover section encountered in Arkansas was 951 feet (Table 9, well 81). However, by considering the thicknesses found in northern Louisiana wells, the Smackover is probably more than 1,200 feet thick in southern Lafayette County (see Pl. III). Near the northern limit it thins rapidly due to erosion during post-Buckner and post-Lower Cretaceous time; but by considering facies changes and regional thinning in areas where it is not truncated, the Smackover probably never extended much farther north than it now does.

Lithologic and stratigraphic features.—At the present time the upper member of the Smackover is the deepest producing horizon in southern Arkansas; and, consequently, for economic reasons most wells that did not find production in the upper portion were not drilled through the entire Smackover formation. However, the distribution of wells drilled through the Smackover (Pl. III) in this area reveals regional changes in lithology and stratigraphy.

In order to illustrate the lithology of the entire section of the Smackover in the producing area, Smackover well cuttings from the Atlantic Refining Co. No. 3 Bodcaw Lumber Co., Sec. 29, T. 17 S., R. 23 W., Lafayette County (Table 9, well 111), are described in Table 4. In this well the top of the upper member, which grades into the Buckner anhydrite above, was picked at the first appearance of calcite streaks in the anhydrite. Below the calcite and anhydrite zone and above the oolitic zone in this well is 15 feet of gray, dense, non-porous limestone, generally called the "cap rock," which is found in most wells where the oolitic zone is encountered.

TABLE 4
LITHOLOGY OF SMACKOVER FORMATION IN McKAMIE FIELD, LAFAYETTE COUNTY, ARKANSAS

	Thickness (in feet)
Anhydrite, dark gray, dense, with streaks of calcite	2
Limestone, gray, dense, non-porous	15
Limestone, gray, oolitic, no porosity	10
Limestone, gray, oolitic, fair porosity	55
Limestone, gray, oolitic, good porosity	5
Limestone, gray, oolitic, excellent porosity and permeability	108
Limestone, gray, crystalline and oolitic, poor porosity	13
Limestone, gray, oolitic, oolites poorly preserved, no porosity	20
Limestone, gray, sucrosic, fine grained, no porosity with few poorly preserved oolites	45
Limestone, brown to gray, sucrosic, medium-grained, no porosity	20
Limestone, gray, dense, no porosity	55
Limestone, dark gray, dense, no porosity	30
Limestone, very dark gray, dense, no porosity	530
	908

The oolitic zone is the main producing zone in the McKamie and other Smackover formation fields. The porosity is derived from spaces between the oolites and is probably a primary feature rather than secondary solution of the cementing material. Below the oil-water contact the porosity and permeability greatly decrease, and the oolites are poorly preserved. "The porous zone thins toward the edges of the field, as evidenced by almost all edge wells. Thin streaks of reef-type limestone have been cored within the porous section in several wells" (10, p. 47).

In most fields the porosity and permeability decrease below the oil-water contact because of secondary cementation of the oolites. Some wildcat wells that were supposedly drilled "on structure" have found no porosity in the oolitic zone.

The portion of the upper member below the oolitic zone in the Atlantic No. 3 Bodcaw consists of gray to brown, non-porous, granular limestone which grades downward into gray, dense, non-porous limestone. The top of the lower member was picked at the top of the first very dark gray, dense limestone which was found to be 560 feet thick. The Smackover is described below in Table 5 from well cuttings from the Plymouth Oil Co. No. 1 C. H. Tompkins, Sec. 3, T. 14 S., R. 20 W., Nevada County (Table 9, well 132).

TABLE 5

LITHOLOGY OF SMACKOVER FORMATION IN SOUTHEASTERN NEVADA COUNTY, ARKANSAS

	Thickness (in feet)
Limestone, white, sucrosic, no porosity	12
Limestone, white, honeycomb, very porous, no permeability (looks as if oolitic limestone had been completely cemented and the oolites were later dissolved)	25
Limestone, light gray, sucrosic, no porosity	5
Limestone, light gray, dense, no porosity	349
	491

A complete section of the Smackover is described in Table 6 from well cuttings from the Placid Oil Co. No. 3 Freeman-Smith Lumber Co., Sec. 14, T. 16 S., R. 13 W., Calhoun County (Table 9, well 35).

TABLE 6

LITHOLOGY OF SMACKOVER FORMATION IN SOUTHERN CALHOUN COUNTY, ARKANSAS

	Thickness (in feet)
Limestone, light gray, dense, medium porosity due to solution channels	22
(Sample skip)	75
Limestone, light gray, dense, no porosity	210
Limestone, light gray with dark gray streaks, dense, no porosity	90
Limestone, dark gray, dense, no porosity	40
Limestone, light gray, dense, no porosity	30
Limestone, dark gray, dense, no porosity	241
	708

The entire section of the Smackover is described in Table 7 from well cuttings from the H. L. Hunt No. 1 Myers, Sec. 3, T. 19 S. R. 1 W., Chicot County (Table 9, well 42).

TABLE 7

LITHOLOGY OF SMACKOVER FORMATION IN SOUTHEASTERN CHICOT COUNTY, ARKANSAS

	Thickness (in feet)
Limestone, gray, sucrosic to dense, no porosity, very sandy (quartz grains, white, fine to medium)	69
Limestone, gray, sucrosic to dense, very sandy, trace poorly preserved oolitic structure, no porosity	10
Limestone, gray, sucrosic to dense, very sandy, no porosity	30
Limestone, gray, sucrosic to dense, trace porosity due to solution channels	10
Limestone, gray, sucrosic to dense, no porosity	60
Limestone, dark gray, dense, slightly sandy, no porosity	20
Limestone, very dark brownish gray, dense, very sandy, no porosity	80
Limestone, dark brownish gray, dense, slightly sandy, no porosity	100
Limestone, brownish gray, dense, no porosity	90
Limestone, very dark gray (almost black), dense, sandy, no porosity	205
	674

Well cuttings from other wells were examined, and descriptions of the Smackover section in several wells have been published, but the above four wells are considered to be representative from a regional point of view.

Until the discovery of the Midway field, all production in the Smackover formation had come from the porous Reynolds oolitic zone near the top. The discovery well of the Midway field, Barnsdall No. 1 Bond (Table 9, well 104), not only found the Reynolds zone to be saturated with oil but encountered an entirely new producing zone consisting of 118 feet of granular, almost completely non-oolitic, porous, and permeable limestone (8, p. 1290) below the Reynolds zone.

In the Texarkana field the oolites in the Reynolds zone are poorly developed, and much of the porosity is probably due to small solution channels in the limestone.

In the Magnolia field the Smackover formation (Columbia County) consists of non-porous dolomitic shale, oolitic limestone, and crystalline limestone. Production comes from the oolitic zone which has a maximum thickness of about 340 feet. It is both oolitic and pisolitic with hard, dense, firmly cemented streaks varying in thick-

ness to a maximum of 60 feet. Several streaks of cavernous, coral-reef material also occur, as well as layers of dense, crystalline limestone, with inclusions of anhydrite, gypsum, calcite, pyrite, and lignite. Styolites and sections with asphaltic matrix have been found. The oolitic member usually is found near the top but may be found as much as 60 feet below the base of the dolomitic shale. It is difficult or impossible to correlate the dense streaks and coral reefs within the oolitic zone because of their lenticular nature (16, p. 23).

In the Schuler field, the porous, permeable oolitic limestone has been found to occur as much as 80 feet below the oil-water contact (3, p. 91). Weeks and Alexander (15, p. 1512) have presented evidence that indicates the oil and gas in the upper member of the Smackover limestone came from the lower member:

> It is probable that the oil originated in the lower half of the Smackover limestone formation. This part of the formation consists of dark, banded limestone with thin partings of argillaceous, carbonaceous material. In practically all places where this zone has been penetrated, it was found to contain globules of oil in fractures and bedding planes. Dense limestone streaks below the producing oolite penetrated at Schuler contained globules of oil in the fractures.

A wildcat well, American Liberty Oil Co., No. 1 Bradley Lumber Co., Sec. 15, T. 13 S., R. 9 W. (Table 9, well 8), abandoned in 1946, extended the known northern limit of the Smackover approximately 16 miles northeast from the nearest well that had been drilled into the Smackover. In this well all of the Lower Cretaceous, the Cotton Valley and Buckner beds, and most of the Smackover were missing, with the Upper Cretaceous beds resting directly on the lower part of the Smackover. There has been some controversy as to whether this well actually encountered the Smackover. From the electrical well log it could be assumed that it did not, but an examination of the samples in view of regional structure and stratigraphy indicates that the 80 feet of limestone and 25 feet of very calcareous sandstone below the Upper Cretaceous is the lower part of the Smackover. The limestone and very calcareous sandstone, believed to be the lower part of the Smackover, is described in Table 8 from well cuttings.

TABLE 8

LITHOLOGY OF SMACKOVER FORMATION NEAR ITS NORTHERN LIMIT IN NORTHEASTERN BRADLEY COUNTY, ARKANSAS

	Thickness (in feet)
Limestone, light brownish-gray, granular, very fine-grained, sandy, no porosity	50
Limestone, light tan, fine-grained, granular to dense, few calcite crystals, no porosity	30
Sandstone, white to light gray, medium to coarse-grained, very calcareous, no porosity	25
	105

Porosity.—As previously discussed, at least six types of Smackover limestone porosity have been observed in well cuttings and cores, namely:

1. Porosity in the Reynolds zone of the upper member between the individual oolites.
2. Vuggy porosity in the upper member where oolites have been dissolved.
3. Solution channel porosity in the upper member.
4. Porosity in cavernous coral reef material in the upper member.
5. Interstitial porosity in granular limestone in the upper member.
6. Fracture and bedding plane porosity in the lower member.

The Reynolds oolitic zone of the upper member has produced most of the oil and gas from the Smackover formation in southern Arkansas. The Reynolds zone porosity extends across southern Arkansas in a belt that is approximately 25 miles wide and is defined in general by fields that produce from the Smackover. It does not extend much farther north than the producing fields and disappears in approximately eastern Union County. It has been found in the Haynesville and North Lisbon fields of northern Louisiana, but its southern limit is not known at the present time.

Correlation.—For several years Imlay (7, p. 1449) examined Smackover formation fossils in well cores from wells drilled in southern Arkansas and northern Louisiana and concluded the following:

> The upper part of the Smackover formation has yielded a fairly large fauna of Argovian age. The evidence is furnished mainly

by the mollusks, as the corals merely indicate a Middle or Upper Jurassic age. Most of the pelecypods and gastropods are comparable with Argovian or Kimmeridgian species, but a gastropod, apparently identical with **Xystrella,** suggests an age not younger than Argovian. The deciding evidence consists of several ammonites from depths of 8,741 feet in the Phillips Petroleum Company's Kendricks No. 1, Sec. 22, T. 19 N., R. 11 W., Bossier Parish, Louisiana. These ammonites are very similar to upper Argovian species of **Dichotomosphinctes** and **Discosphinctes** from eastern Durango, Mexico. An Argovian age is confirmed by the occurrence of lower Kimmeridgian ammonites in the same well at depths of 8,279 to 8,392 feet and of middle Kimmeridgian ammonites at depths of 8,048 to 8,063 feet. The lower Kimmeridgian ammonites occur in dark shale that apparently occupies the same stratigraphic position as the Buckner formation farther north. Whether the Smackover formation represents more than Argovian time is not known, but its thickness of only 450 to 1,650 feet and the presence of upper Argovian ammonites only 300 feet above its base suggests that it does not represent much more. Regional stratigraphic relationships indicate that the Smackover formation is equivalent to the La Gloria formation of northern Mexico, which contains ammonites of Argovian age in its upper part.

Table 2 (p. 6) shows the time relations between the Smackover and the Upper Jurassic stages of Europe.

Norphlet Formation

In nearly all of the wells drilled through the Smackover formation in southern Arkansas, northern Louisiana, and northeastern Texas a clastic section of red clays, with some gray clays, and reddish and gray sands, with or without gravel, has been encountered below the Smackover. This clastic section, ranging from several feet to 150 feet in thickness has been named the Norphlet formation. It has been found resting on the Louann salt, the Werner Anhydrite, the Eagle Mills formation, and undifferentiated Paleozoic rocks, some of which have steep dips. This stratigraphic relationship indicates that the Norphlet formation is Jurassic in age as is the Smackover formation (10, p. 488).

Permian

Below the Jurassic are several thousand feet of Permian formations. The youngest is the Louann salt, which in places is more than 1,300 feet thick. At the base of the Louann salt is the Werner formation, composed of as much as 200 feet of anhydrite, red clays and sands, and conglomeratic sands. Although the Morehouse formation has not been found in Arkansas, its thickness of over 1,100 feet of marine silty shales and siltstones in Morehouse Parish, Louisiana, only 8 miles from Arkansas, indicates that it probably underlies a portion of southern Arkansas. The Eagle Mills formation below the Morehouse consists of a series of dominantly red sands and shales. The maximum thickness of the Eagle Mills is not known, but in Ashley County in the Union Producing Co. No. E-1 Crossett Lumber Co. it is more than 4,500 feet thick (10, pp. 483-488).

Undifferentiated Paleozoic

Because of their extreme depth below the surface, little is known in the area of the Paleozoic rocks older than Permian. However, in the northern part of the area steeply dipping metamorphosed sandstones and shales have been found. In the Ouachita Mountains, which are north of the area, these rocks outcrop. Croneis has summarized the rocks of the Ouachita Mountains as follows:

> The rocks of the Ouachita Mountains consist of shale, sandstone, novaculite, chert, conglomerate, and minor amounts of limestone and volcanic tuff. They range in age from Cambrian to Carboniferous and have an aggregate thickness of at least 25,000 feet. They are intruded at some places by alkaline igneous rocks of mid-Cretaceous age, but the total area of igneous rocks is very small. The sedimentary rocks are essentially non-fossiliferous, but the Ordovician and Silurian beds have yielded a few graptolites, and the Carboniferous formations contain macerated remains of plants (4, p. XVIII).

Igneous Rocks

Little information is available about the igneous rocks in the area, but they have been encountered in a number of wells in the northern, eastern and southeastern sections. Several wells have been drilled through thin igneous sills into normal sedimentary rocks. Gravity surveys have shown that some of the wells that quit drilling in igneous rocks were in igneous plugs and sills, and in no case is an igneous mass of large areal extent indicated. These facts indicate that all igneous rocks encountered have been of an intrusive nature. In view of the location of these wells with respect to the Ouachita Mountains it is probable that most of these igneous intrusions are along the axes of buried extensions of these mountains.

STRUCTURE

General

The area studied lies within the Gulf Coastal Plain, and except for the folded Paleozoic beds older than Permian the regional dips of all formations are relatively gentle. The non-uniformity of the structural shifting in many of the oil fields of the area indicates the complex structural history of the area.

Tertiary

The Tertiary formations form a monocline which dips in a southeastward direction at a rate generally less than 75 feet and rarely more than 150 feet per mile. These formations reach their maximum thickness in the Desha Basin in the northeastern part of the area in the vicinity of Desha County. The deep structures of some of the oil fields which produce from older formations have slight structural indications at the surface in the Tertiary beds.

Upper Cretaceous

The Tertiary and Upper Cretaceous formations have essentially the same attitude in the area. Anticlines and domes of low relief, structural terraces, and fault line structures have produced large quantities of oil and gas in the southwest portion of the area.

Lower Cretaceous

A distinct angular relationship exists between the Lower and Upper Cretaceous formations. The Lower Cretaceous formations are tilted in a southwestward direction with dips that seldom exceed 150 feet per mile. Some anticlines with low structural relief and fault line fields produce oil in southwestern Arkansas.

Jurassic

The Jurassic and Lower Cretaceous formations have essentially the same regional dip. The only Jurassic horizon that can be satisfactorily mapped to show the true structure is the top of the Smackover formation. A westward plunging syncline separates the southwestern portion of the area from the Sabine dome in northwestern Louisiana. Little is known about the effect of the faults in the area on the Smackover formation. The anticlines on which all Smackover fields are located have east-west trending axes which are essentially parallel to the strike of the Smackover. The structural relief of these anticlines ranges up to more than 300 feet. L. C. Lamar (oral communication) stated that seismograph surveys indicate that the Louann salt below some of the Smackover fields is thicker than it is in adjacent areas. Whether the indicated salt flowage caused the folding of the anticlines or whether the flowage was a result of their folding is not known, but probably it was a combination of the two. In the extreme southeastern part of the area parts of two anticlines with structural closures of more than 2,000 feet on top of the Smackover extend into Arkansas. Plate II shows the areal extent and regional structure of the Smackover.

Permian

Little is known about the structure of the Permian formations, but the dips of the formations are not believed to be large.

Undifferentiated Paleozoic

Paleozoic rocks older than Permian, where encountered in wells in the area, are highly folded. The surface of these formations is known to dip steeply below the Permian and younger beds.

OIL AND GAS CONDENSATE FIELDS PRODUCING FROM THE SMACKOVER FORMATION

General

Most of the oil and gas produced from the Smackover formation in southern Arkansas has come from its porous, oolitic, upper member. Table 1 lists all fields that have produced from the Smackover, gives the county in which each is located, the year each was found, and the cumulative production of each to January 1, 1950. Plate I shows the location of all fields discovered in southern Arkansas. The discovery well in each field is listed in Tables 9, 10 and 11 in the appendix. Plate II shows, in general, the structure of each in relation to the regional structure of the Smackover.

All known Smackover fields produce from anticlinal structures. Before the use of the reflection seismograph, indications of structures at depth had been observed in the shallow Cretaceous beds and surface formations in the vicinity of several fields; in almost all cases the reflection seismograph was used to define the structures in the deeper beds.

In most fields the gas produced from the Smackover limestone, unlike that produced from the Cotton Valley and Cretaceous formations, contains appreciable quantities of hydrogen-sulphide gas with a maximum of approximately 7,000 grains per 100 standard cubic feet of gas (12, pp. 62-64).

The vertical permeability in the Reynolds oolitic zone in many cases is approximately equal to the horizontal permeability. Strict production control is required because of the high vertical permeability and a strong water drive in most of the Smackover limestone pools. Field rules and production rates are directed by the Arkansas Oil and Gas Commission in such a manner as to produce equitably the oil and gas in the most efficient manner.

Atlanta-West Atlanta Field

The Atlanta field in Columbia County is located on an east-west trending anticline approximately six miles long and approximately one-half to one mile wide with a maximum structural closure of 73 feet above the oil-water contact. The drilling which led to the discovery was based on seismograph surveys. Prior to May 1, 1950, sixty producing wells and seven dry holes had been completed with a spacing pattern of one well in the center of each 40 acres. The average effective producing section is 30 feet; the average porosity is 15 per cent with an average permeability of 1,275 millidarcys (10, pp. 2-6).

Bear Creek Field

The Bear Creek field, discovered in 1948, located on a small east-west trending anticline with low structural relief, produces from the oolitic Smackover limestone near the southwest side of the Smackover field. It has been developed on a 40-acre spacing pattern, and before May 1, 1950, three dry holes and nine producing wells had been drilled.

Big Creek Field

With a structural closure of approximately 60 feet the Big Creek field is in Columbia County on an east-west trending anticline approximately two miles long and approximately a mile and a half wide. The location of the discovery well was based on seismograph surveys. Two producing wells and one dry hole had been drilled before May 1, 1950, but both the producing wells have been plugged and abandoned. This field was a gas-condensate reservoir, and the well spacing was originally designated as 640 acres per well. The approximate effective thickness of the oolitic member is 30 feet; the average porosity is 12 per cent, while the average permeability is 250 millidarcys. An unusual feature of the gas is that it contains 31 percent nitrogen (10, pp. 8-10).

Buckner Field

The Buckner field, in Lafayette and Columbia Counties, is located on an east-west trending anticline about four miles long and three-fourths of a mile wide. The field has a maximum productive closure estimated to be 70 feet. The location of the discovery well was based on seismograph surveys. By May 1, 1950, twenty-nine producing wells and three dry holes had been completed with a spacing pattern of one well on each 40 acres. The effective thickness of the producing zone approximates 30 feet, with an average porosity of 20 percent and an average permeability of 50 millidarcys. The lithology of the producing zone differs from that in most Smackover fields in that the oolites have been replaced to a considerable extent by cementing material, which has reduced the effective permeability (10, pp. 12-14).

Cairo Field

During the summer of 1948 the Cairo field was discovered near the northeast flank of the Schuler field in Union County. Several years before the drilling of the discovery well, seismograph work had revealed an anomalous structural condition that was difficult to interpret. Later drilling has shown that the Buckner anhydrite and red shale which are not present at Schuler vary considerably in thickness over the anticlinal structure in the Cairo field. There are several different oil-water contact levels which are apparently due to different sedimentary conditions. Wells in the southwest part of the field produce gas and oil from a sub-sea level lower than the top of the Smackover porosity in dry holes to the northeast. Apparently, the field has been almost completely developed and consists of fifteen producing wells, four dry holes, and one drilling well.

Calhoun Field

The Calhoun field is a small, east-west trending anticline about three quarters of a mile wide and approximately one mile long. Seismograph surveys led to the location of the discovery well. The spacing pattern for the four producing wells and one dry hole completed before May 1, 1950, is one well on each 40 acres. The effective thickness of the producing zone approximates 41 feet, with an average porosity of 16 percent and an average permeability of 1,450 millidarcys (10, pp. 15-18).

College Hill Field

Drilling results on this seismograph prospect have been discouraging. Three dry holes in addition to the discovery well have been completed in the Smackover in the area.

Columbia Field

In the Columbia field only one producing well, abandoned since 1943, and one dry hole have been completed. Seismograph surveys led to the drilling of the discovery well (10, pp. 20-22).

Loutre Creek Field

Approximately 14 feet of oil saturated oolitic limestone were found above the oil-water contact in the discovery well of this field. Subsurface work led to the drilling of this well, and it is noteworthy that it is one of the few Smackover fields discovered without the aid of geophysics. Since completion of the first well, five dry holes have been drilled nearby, and it seems that the field will consist of only one producing well.

Magnolia Field

Early surface work in the area by John F. Magale and later seismograph work led to the drilling of the discovery well. The field is on an east-west trending symmetrical anticline approximately six miles long and a mile and a half wide with over 300 feet of structural closure above the oil-water contact. One hundred and fifteen producing wells and twelve dry holes had been completed before May 1, 1950, with a spacing pattern of one well on each 40 acres. Maximum productive thickness above the oil-water contact approximates 300 feet, with an average porosity of 17 percent and an average permeability of 1,500 millidarcys (10, pp. 35-41).

McKamie-Patton Field

Subsurface work, followed by seismograph surveys in the area, led to the drilling of the McKamie discovery well. When the Patton field was discovered west of the McKamie field producing area, it was believed that these two fields were on separate structures, but drilling since that time has proved that the two fields are on the same anticlinal structure. The structure is an east-west trending anticline about eight miles long and varies in width from one-half to one and one-half miles with a maximum structural closure of approximately 380 feet. The gas produced is extremely "sour" and contains approximately 4,000 to 7,000 grains of hydrogen-sulphide gas per 100 standard cubic feet. Thirty-five producing wells and seven dry holes had been completed by May 1, 1950. The average porosity is 17 percent, and the average permeability is 675 millidarcys (10, pp. 43-49).

Mount Holly Field

The Mount Holly field is located on a northwest-southeast trending anticline about one and one-half miles long and one mile wide with a structural closure of about 70 feet. Seismograph surveys in the area led to the drilling of the discovery well. Before May 1, 1950, fourteen producing wells and one dry hole had been completed with a spacing pattern of one well on each 40 acres. The average porosity is approximately 20 percent, and the permeabilities in the pay section range from 500 to 1,100 millidarcys (10, pp. 51-55).

Pine Tree Field

On the south flank of the Atlanta field in Columbia County is the Pine Tree field, a small anticlinal feature indicated by seismograph work. Drilling in the area has revealed that a steep structural trough separates the two fields. Three producing wells and one dry hole have been completed.

Salem Church Field

Subsurface indications of structure, confirmed by seismograph surveys, led to the drilling of the discovery well. The field is on a small northwest-southeast trending anticline with structural closure of more than 60 feet. Before May 1, 1950, three producing wells and one dry hole had been completed. The effective pay section was approximately 65 feet thick, with an average porosity of 20 percent and an average permeability of 700 millidarcys (10, pp. 63-66).

Schuler Field

Subsurface indications of structure in the Upper Cretaceous beds were recognized before seismograph surveys led to the drilling of the discovery well. The main producing section in the field is the Jones sand at the base of the Cotton Valley group and only several feet above the oolitic member of the Smackover. The structural closure above the oil-water contact is approximately 50 feet. Before May 1, 1950, sixteen producing wells had been completed in the Smackover limestone, but approximately 100 wells had been drilled into it because the Smackover limestone was the best formation in which to cement the well casing for completions in the Cotton Valley sands above. The average porosity in the Smackover is approximately 17 percent, and the permeability averages approximately 1,200 millidarcys (10, pp. 67-74).

Texarkana Field

Seismograph surveys and subsurface indications of structure led to the drilling of the discovery well in 1942. The field is located on a small anticline with structural closure of approximately 60 feet. Before May 1, 1950, two producing wells and one dry hole had been completed. The produced gas, unlike that from most of the other Smackover fields, contains no hydrogen-sulphide but does contain approximately 60 percent nitrogen (10, pp. 82-84).

Dorcheat-Macedonia Field

In the Dorcheat portion of the field the presence of a low flat structural nose or terrace in the Upper Cretaceous formations had been known for a number of years, but it remained for the reflection seismograph to define the structure in the deeper beds (13, p. 739). When the Macedonia portion of the field was discovered, it was believed to be a separate pool from the Dorcheat field; but later drilling has proved that the two fields are continuous on the same east-west trending anticline approximately eight miles long and one to two miles wide. Approximately 95 producing wells had been completed in the Reynolds oolitic zone before May 1, 1950, but many of these have since been recompleted in Cotton Valley sands above the Smackover. The gas produced from the Reynolds oolitic zone has a hydrogen-sulphide content of 1,800 grains per 100 standard cubic feet. The average porosity of the oolitic limestone is 15 percent with an average permeability of 200 millidarcys (10, pp. 331-337).

Midway Field

Subsurface correlation indicated a structural anomaly in the area before seismograph surveys led to the drilling of the discovery well. The field is on a northwest-southeast trending anticline approximately five miles long and one mile wide with a structural closure of approximately 200 feet. Forty-seven producing wells and fourteen dry holes had been completed by May 1, 1950. The spacing pattern in most cases is one well to each 40 acres. The porosity of the producing zone averages 26 per cent with an average permeability of 140 millidarcys. Unlike the oil and gas produced from most of the other Smackover fields, the oil produced at Midway contains a relatively small amount of sulfur compounds, and the gas contains no hydrogen-sulphide (10, pp. 345-349).

Village Field

The Village field is on a northwest-southeast trending anticline approximately two and one-half miles long and one to one-half miles wide. The location of the discovery well was based on seismograph surveys. Forty-five producing wells and ten dry holes had been completed in the Reynolds oolitic zone of the Smackover formation by May 1, 1950. The average porosity is 20 percent with a permeability of 2,000 millidarcys (10, pp. 371-374).

Snow Hill Pool, Smackover Field

Although the cumulative production from the Snow Hill pool has been relatively minor, its discovery in 1936 showed that the upper part of the Smackover formation was oil-bearing and the characteristics of the oolitic member were favorable for commercial production. The location of the discovery well in the Snow Hill area of the Smackover field was based on seismograph surveys. This pool, in which six producing wells and seven dry holes had been completed before May 1, 1950, is on a small northwest-southeast trending anticline that has a structural closure of approximately 50 feet above the oil-water contact. The porosity of the Reynolds oolitic zone is approximately 25 percent with permeability ranging as high as approximately 1,700 millidarcys (5, pp. 127-128).

Warnock Springs Field

The location of the discovery well was based on seismograph surveys. The field is on a northeast-southwest trending anticline approximately a mile and a half long and a mile wide. Before May 1, 1950, five producing wells and two dry holes had been completed.

Warnock Springs Extension

Subsurface studies led to the drilling of the first well, a gas distillate producer, in 1949, about a mile and a half northeast of the Warnock Springs field. Only one other well, a dry hole, has been drilled, but the new field is probably separated from the Warnock Springs field by a low structural saddle.

Mars Hill Field

The discovery well was drilled on a seismograph prospect approximately one mile north of the McKamie field. Before May 1, 1950, three producing wells and one dry hole had been completed in the field; and the structure seems to be an east-west trending anticline.

Spottsville Field

This field, discovered about three miles northeast of the Atlanta field in Columbia County in 1949, by drilling based on seismograph work, has one producing well and one dry hole, and the extent of the structure will not be known until more wells have been drilled.

Tubal Field

In this general area subsurface work indicated a structural nose in the Upper Cretaceous chalk. The reflection seismograph was used to locate the site for the drilling of the discovery well which was completed early in 1950 as an oil producer both from the Smackover formation and a sand in the Cotton Valley formation above. Unlike the Smackover crude oil produced from the Atlanta and Schuler fields to the north, the Tubal field Smackover oil contains no hydrogen-sulphide or "sour gas." Although only the discovery well has been drilled, a new location has been staked approximately three-fourths of a mile northwest of the discovery well.

Wilks Field

The discovery well, the only well in the field, was drilled on a seismograph prospect about two miles northwest of the Schuler field. This well was abandoned after producing approximately 10,000 barrels of oil.

Strong Field

In the Strong field only one producing well and two dry holes had been completed in the Smackover limestone before May 1, 1950, and the producing well was abandoned after producing only 28,000 barrels of oil. A seismograph survey led to the discovery of the field.

Northeast Champagnolle Field

The discovery well, drilled on a seismograph prospect, produced only 740 barrels of oil from the Smackover limestone before being abandoned. No other wells have been drilled to the Smackover in the immediate vicinity of this well. Although no official name has been given to this small reservoir in the Smackover limestone, the name Northeast Champagnolle field is used in this report because the discovery well was drilled near the northeast edge of the Champagnolle field which produces from both Upper and Lower Cretaceous sands.

GEOLOGIC HISTORY

PALEOZOIC

Little is known of the Paleozoic rocks older than Permian in the area studied, and the history must be inferred from conditions in the northern part of the area and in the Ouachita Mountains north of the area. The Paleozoic rocks in the Ouachita Mountains were deposited in a geosynclinal basin to the north of a land mass that probably occupied the present position of Louisiana and eastern Texas. Most of these sediments were laid down in shallow water, and the geosyncline gradually but continually subsided during their deposition. These rocks which range in age from Cambrian to Carboniferous have an aggregate thickness of at least 25,000 feet. These Paleozoic beds in the Ouachita Mountains were complexly folded into an anticlinorium during the mid-Pennsylvanian epoch of mountain building. The pressure that crumpled these Paleozoic beds was applied from the south, and the intensity of the folding and the amount of faulting diminish toward the north (4, p. XVIII-XIX). These folded rocks have been encountered in wells drilled in the northern part of the area studied for this report.

During Permian time the relationship that had existed during the earlier Paleozoic time between the basin in the present Ouachita Mountain area and the land mass to the south was reversed and thousands of feet of Eagle Mills red beds were deposited in southern Arkansas. The great magnitude of the downwarping south of the mountains is shown by the fact that more than 3,200 feet of Eagle Mills red beds were encountered in the Caddo Oil Co., Inc. No. 1 G. H. Christopher, SE SE SE, Sec. 9, T. 11 S., R. 22 W., Nevada County, Arkansas, and at the total depth of 5,250 feet the well was still in the Eagle Mills and had not reached the folded Paleozoic rocks which outcrop only 17 miles to the north. After Eagle Mills time Permian formations deposited were the marine silty shales and siltstones of the Morehouse formation, the red clays and sands, conglomeratic sands, and anhydrite of the Werner formation, and the Louann salt. This salt is believed to be a laterally continuous salt body which underlies parts of Texas, Arkansas, Mississippi, Alabama, and probably all of Louisiana. Uplift and erosion followed the deposition of the salt as shown by the fact that the Norphlet formation of Jurassic age is known to rest on the Louann salt, Werner anhydrite, Eagle Mills formation, or undifferentiated Paleozoic rocks (10, p. 488).

MESOZOIC

Jurassic

The oldest Mesozoic formations known in the area are of Upper Jurassic age. The Norphlet formation is a relatively thin, clastic section below the Smackover limestone formation. During Argovian time (Table 2) the seas advanced across southern Arkansas, and as much as 1,300 feet of Smackover limestone were deposited. The lower member of the Smackover is probably, in part, of chemical origin, as indicated by its extremely fine texture and by its interbedded anhydrite. The salinity of the sea during deposition of most of the lower member could not have been much above normal, as indicated by the presence of many brown to black argillaceous bands and the pelecypod **Posidonia,** a shallow water genus (7, pp. 1450-1451).

According to Imlay, the upper member of the Smackover formation in southern Arkansas was deposited mainly in shallow, normal marine water, as shown by the presence of oolites, chalky limestone, and shallow-water forms of corals, brachiopods, pelecypods, and gastropods. The oolitic limestone is considered to have been deposited in very shallow, agitated waters, and the chalky limestone in somewhat deeper water (7, pp. 1450-1451). The eastward increase in the amount of sand in the Smackover limestone in southern Arkansas indicates that there was some land mass in that vicinity during the deposition of the Smackover. The Smackover formation is gradational into the Buckner formation, and the variation in thickness of the Buckner indicates an unconformity above it.

Early in Kimmeridgian time (Table 2) highlands were elevated north of the area studied, as shown by the large amount of Cotton Valley sand and shale deposited. The basinward retreat of the marine waters in southern Arkansas at the beginning of the orogeny was probably not more than one hundred miles, judging from the distribution of conglomerate at the base of the Cotton Valley group (7, p. 1523).

Lower Cretaceous

A minor unconformity separates the Cotton Valley group from the basal Hosston beds of the Lower Cretaceous. During Lower Cretaceous time the sea, depositing gravels, sands, shales, limestones, and anhydrite, advanced and retreated several times across southern Arkansas. At the close of Lower Cretaceous time regional uplift was accompanied by extensive normal faulting along an east-west trending zone across southern Arkansas. This fault zone is generally considered to be a continuation of the Balcones fault zone in Texas. During the faulting, Lower Cretaceous and older rocks were displaced an estimated 2,700 feet (1, p. 1259). During this regional uplift the east-west trending anticlines that produce oil from the Smackover limestone were formed.

Weeks (15, p. 956) in describing the stratigraphy of southern Arkansas, states the following:

> The most pronounced subsurface feature of this area, and probably the most important from a stratigraphic standpoint, is the extensive pre-Gulf truncation of the older sedimentary rocks. Thus, ten thousand feet, plus or minus, of rocks in the southwest corner of the state are progressively truncated northeastward so that the entire section is missing within one hundred miles in the southern part of Dallas County.

Upper Cretaceous

Sedimentation of the Upper Cretaceous beds, except for minor breaks, was continuous throughout the epoch. These beds consist of clays, marls, shales, chalks, limestones, and sands, with some volcanic materials which are most abundant in the basal beds (11, p. 63). The thickening of formations toward the southwest corner of the state indicates that this area was influenced by the northeast Texas syncline that was forming during this epoch.

CENOZOIC

Tertiary

Only a slight unconformity separates the Cretaceous from the Tertiary. The Gulf of Mexico migration back and forth over this region during Eocene time reflects the crustal activities (11, p. 129). The resultant effect was the southeastward tilting of the strata and the deposition of over 4,000 feet of sediments in eastern Arkansas. Tertiary formations younger than Eocene are unknown in the area.

Quaternary

Terrace deposits of Pleistocene age and Recent alluvium are found in the area. The present surface of the ground is a result of differential erosion.

CONCLUSIONS

Except in southeastern Arkansas where the truncated edge of the Smackover formation is postulated to extend farther north than previously published, the northern limit is believed to be essentially the same as other investigators have concluded.

In view of the available information the southwest portion of the area studied seems to be the most promising for future oil development.

With respect to the Smackover little is known about the geology of the major fault zone across the southwestern portion of the area; therefore, there is a possibility of Smackover production along these faults.

From a regional point of view the area of effective porosity and permeability in the Smackover seems to extend neither much farther north than the present producing area nor much farther east than eastern Union County.

It is doubtful that stratigraphic type oil fields will be discovered along the northern limit of the Smackover because it is truncated by porous sands and gravels of basal Upper Cretaceous beds.

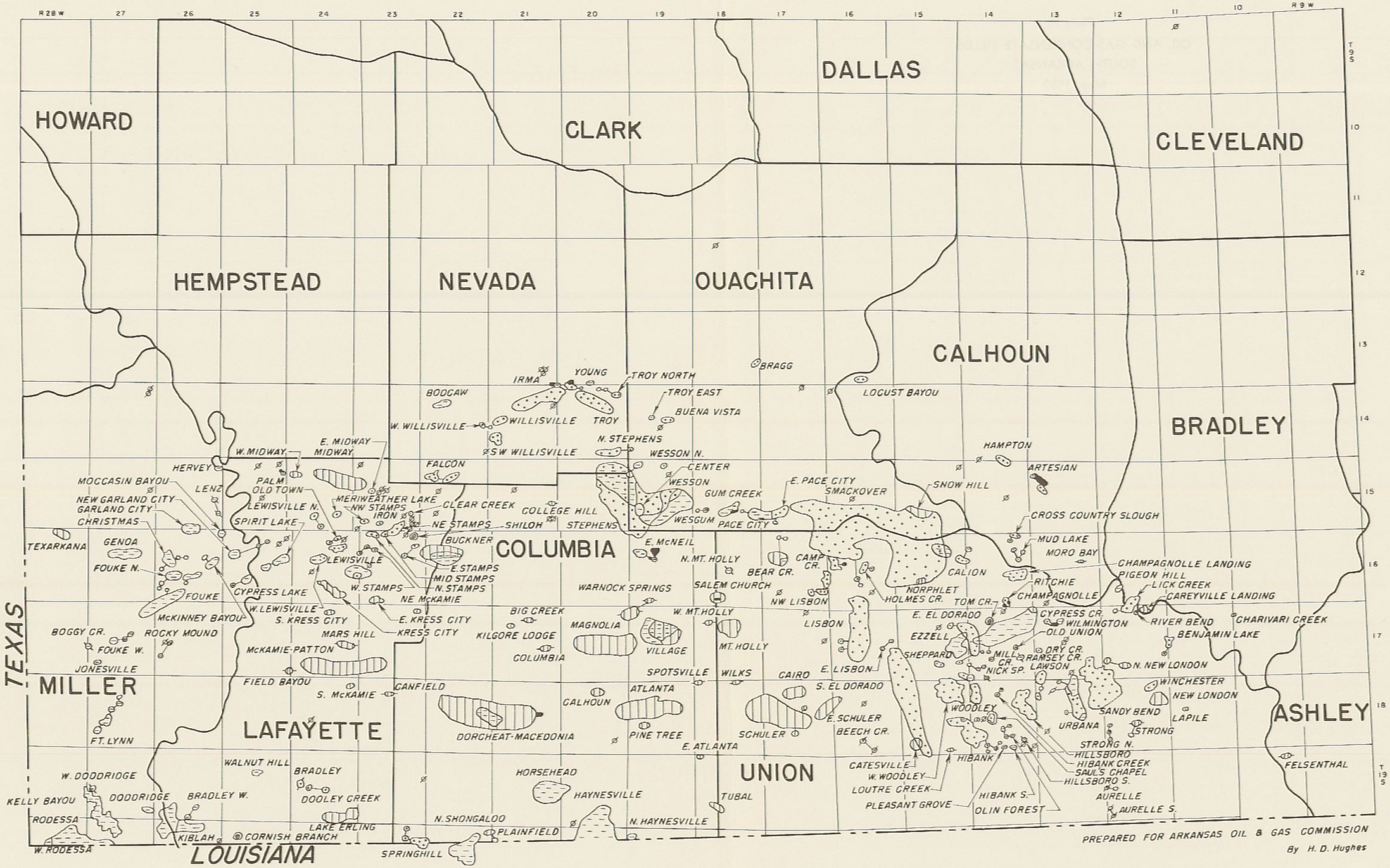
SELECTED BIBLIOGRAPHY

1. Blanpied, B. W. and Hazzard, Roy T. "Developments in North Louisiana and South Arkansas in 1941," *American Association of Petroleum Geologists, Bulletin,* Vol. XXVI (July 1942), Part II, pp. 1250-1276.
2. Branner, George C. *et al. Geologic Map of Arkansas.* Washington: United States Geological Survey, 1929.
3. Bruce, W. A., "A Study of the Smackover Limestone Formation and the Reservoir Behavior of its Oil Condensate Pools," *Petroleum Development and Technology,* Vol. CLV (1944), pp. 88-119.
4. Croneis, Carey. *Geology of the Arkansas Paleozoic Area,* Bulletin 3 of the Arkansas Geological Survey. Little Rock: Parke-Harper Printing Co., 1930.
5. Fancher, George H. with Mackay, Donald K. *Secondary Recovery of Petroleum in Arkansas—A Survey.* El Dorado: Arkansas Oil and Gas Commission, 1946.
6. Imlay, Ralph W. *Lower Cretaceous and Jurassic Formations of Southern Arkansas and Their Oil and Gas Possibilities.* Little Rock: Arkansas Geological Survey, 1940.
7. Imlay, Ralph W. "Jurassic Formations of Gulf Region," *American Association of Petroleum Geologists, Bulletin,* Vol. XXVII (November 1943), Part II, pp. 1407-1533.
8. Markley, E. A. and Valerius, Claude N. "Midway Field Discovery, Lafayette County, Arkansas," *American Association of Petroleum Geologists, Bulletin,* Vol. XXVI (July 1942) Part II, p. 1290.
9. Sandidge, John R. "Expanding Activities of Paleontologists," *American Association of Petroleum Geologists, Bulletin,* Vol. XXX.
10. Shreveport Geological Society. *1945 Reference Report on Certain Oil and Gas Fields of North Louisiana, South Arkansas, Mississippi, and Alabama,* Vol. I (pp. 1-328), Vol. II (pp. 317-503). Shreveport: Shreveport Geological Society, 1947.
11. Spooner, W. C. *Oil and Gas Geology of the Gulf Coastal Plain in Arkansas.* Little Rock: Parke-Harper Printing Co., 1935.
12. Thigpen, C. H. "The Cotton Valley Series and Smackover Lime Offer the Best Possibilities for Untapped Future Reserves of Oil and Gas in Arkansas," *Oil and Gas Journal,* Vol. 41 (February 1943), pp. 62-64.
13. Trager, H. Harold. Dorcheat Pool, Columbia County, Deepest in Arkansas," *American Association of Petroleum Geologists, Bulletin,* Vol. XXIV (April 1940), Part I, pp. 738-740.
14. Weeks, Warren B. "South Arkansas Stratigraphy with Emphasis on the Older Coastal Plain Beds," *American Association of Petroleum Geologists, Bulletin,* Vol. XXII (August 1939), Part II, pp. 953-983.
15. Weeks, Warren B. and Alexander, Clyde W. "Schuler Field, Union County, Arkansas," *American Association of Petroleum Geologists, Bulletin,* Vol. XXVI (September, 1942), Part II, pp. 1467-1516.
16. Winham, H. F. "An Engineering Study of the Magnolia Field in Arkansas," *Petroleum Development and Technology,* Vol. CLI (1943), pp. 15-34.

DIVISION OF GEOLOGY

Arkansas Resources and Development Commission

Plate I



PREPARED FOR ARKANSAS OIL & GAS COMMISSION

By H. D. Hughes

OIL AND GAS-CONDENSATE FIELDS-SOUTH ARKANSAS

UPPER CRETACEOUS

UPPER CRETACEOUS (Abandoned)

NEW FIELDS DISCOVERED - 1964

LOWER CRETACEOUS

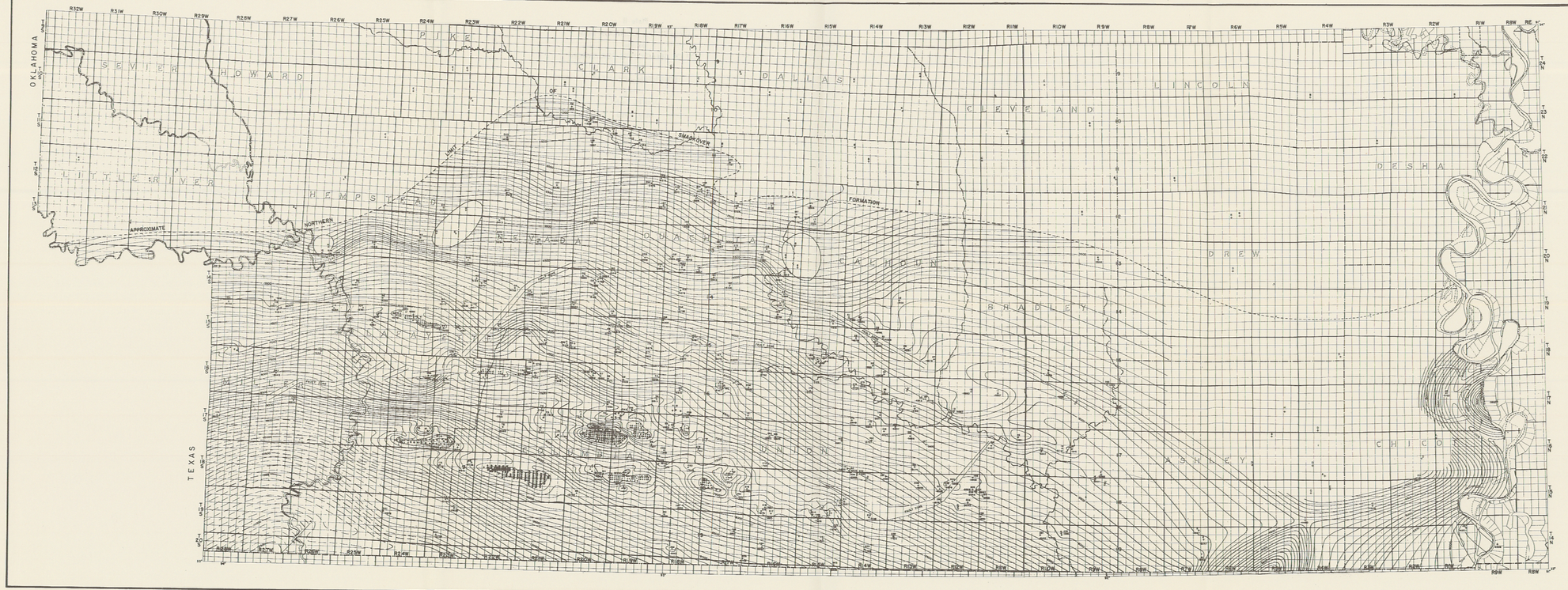
LOWER CRETACEOUS (Abandoned)

EXTENSIONS TO FIELDS - 1964

JURASSIC

JURASSIC (Abandoned)

UNPRODUCTIVE WILDCAT WELLS - 1964



STRUCTURAL CONTOUR MAP

ON

TOP OF SMACKOVER FORMATION

IN

SOUTHERN ARKANSAS

CONTOUR INTERVAL 100 FEET

SCALE

0 5 10 MILES

DATUM PLANE MEAN SEA LEVEL

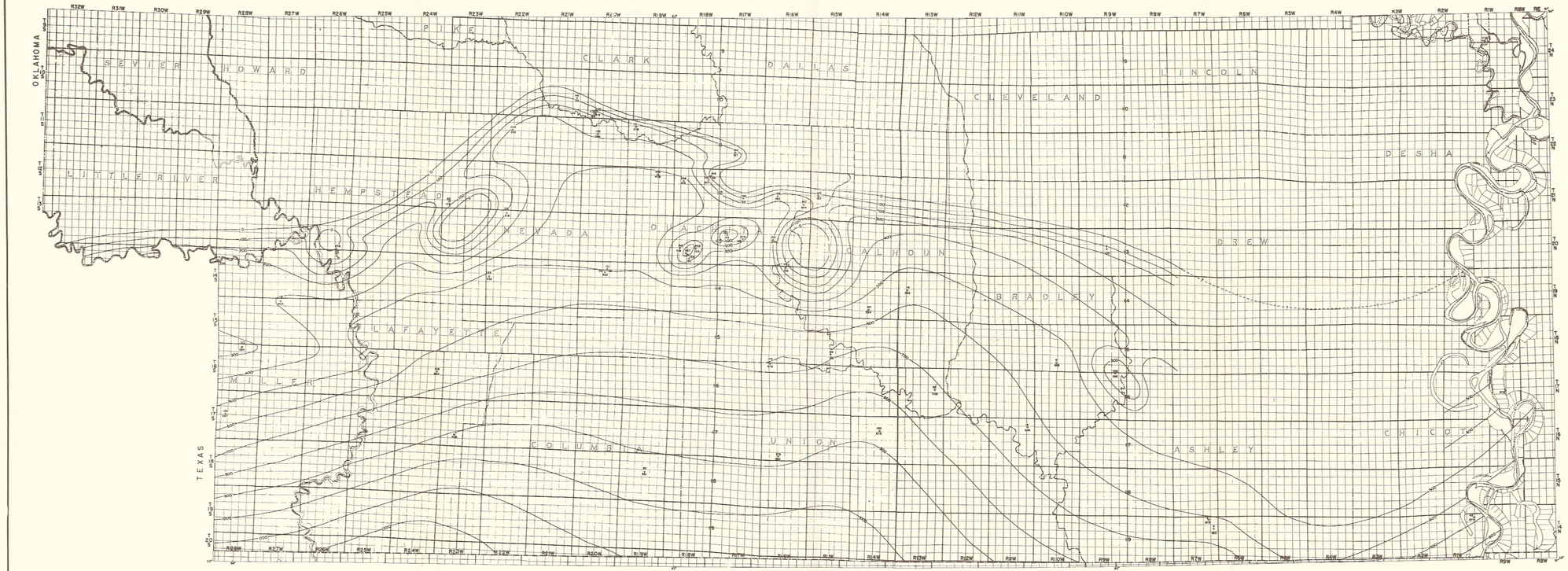
LEGEND

- • OIL WELL IN SMACKOVER FORMATION
- ✗ ABANDONED OIL WELL IN SMACKOVER FORMATION
- ✱ GAS-CONDENSATE WELL IN SMACKOVER FORMATION
- ✱ ABANDONED GAS-CONDENSATE WELL IN SMACKOVER FORMATION
- ✣ DRY HOLE IN SMACKOVER FORMATION
- 223 REFERENCE NUMBER, TABLE 9, 9, 10 & 11
- -7729 TOP OF SMACKOVER FORMATION, FEET BELOW SEA LEVEL

- AE EOCENE ON IGNEOUS ROCK
- KEU UPPER CRETACEOUS ON EAGLE MILLS
- KU UPPER CRETACEOUS ON PALEOZOIC
- KUI UPPER CRETACEOUS ON IGNEOUS ROCK
- KEL LOWER CRETACEOUS ON EAGLE MILLS
- KL LOWER CRETACEOUS ON PALEOZOIC
- KCV COTTON VALLEY ON EAGLE MILLS
- KCVI COTTON VALLEY ON IGNEOUS ROCK
- PZ BUCKNER ON PALEOZOIC
- PZ NO SMACKOVER, PALEOZOIC AT TOTAL DEPTH
- KLI LOWER CRETACEOUS ON IGNEOUS

JACK H VESTAL

MAY, 1950



ISOPACHOUS MAP OF SMACKOVER FORMATION IN SOUTHERN ARKANSAS

CONTOUR INTERVAL 100 FEET

SCALE

0 1 5 10 MILES

LEGEND

- ● OIL WELL IN SMACKOVER FORMATION
- ◉ GAS-CONDENSATE WELL IN SMACKOVER FORMATION
- ◇ DRY HOLE IN SMACKOVER FORMATION
- 80 REFERENCE NUMBER, TABLE 9 & 10 & 11
- ◇ 951 SMACKOVER FORMATION THICKNESS IN FEET

JACK H. VESTAL
MAY, 1950

BARNSDALL & SOHIO
NO. 1 CARTER BURTON
26 - 23N - 13W
BOSSIER PARISH, LA.

McALESTER
NO. 1 JEFFUS
4 - 19S - 23W
LAFAYETTE CO., ARK.

ATLANTIC
NO. 3 BODCAW
29 - 17S - 23W
LAFAYETTE CO., ARK.

OHIO
NO. 1 GARNER
13 - 16S - 24W
LAFAYETTE CO., ARK.

BARNSDALL
NO. 1 BOND
11 - 15S - 24W
LAFAYETTE CO., ARK.

PLACID
NO. 1 BODCAW
18 - 14S - 22W
NEVADA CO., ARK.

DUNLAP
NO. 1 HART
17 - 13S - 21W
NEVADA CO., ARK.

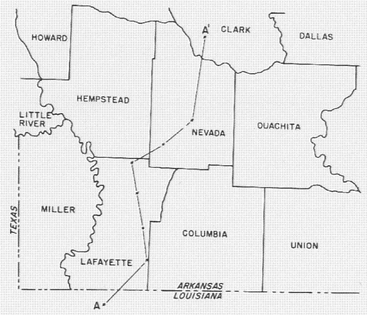
GRIEVES
NO. 1 ROSS
3 - 10S - 21W
CLARK CO., ARK.

A

A'

CENOZOIC
TERTIARY
EOCENE SERIES
UNCONFORMITY
MESOZOIC
CRETACEOUS
UPPER
GULF SERIES
UNCONFORMITY
LOWER
COMANCHE SERIES
UNCONFORMITY
JURASSIC
COTTON VALLEY GROUP
SMACKOVER FORMATION
UNCONFORMITY
PALEOZOIC
PERMIAN
LOUANN SALT
WERNER FORMATION
UNCONFORMITY
EAGLE MILLS FORMATION
UNCONFORMITY

BASE UPPER CRETACEOUS
EAGLE MILLS
SMACKOVER FORMATION
LOUANN SALT
WERNER ANHYDRITE
EAGLE MILLS FORMATION
UNCONFORMITY
SMACKOVER FORMATION



STRATIGRAPHIC AND STRUCTURAL CROSS-SECTION NO. 1

IN

SOUTHERN ARKANSAS

HORIZONTAL SCALE
0 10 20 MILES

JACK H. VESTAL

MAY 1950

VERTICAL SCALE IN FEET BELOW SEA-LEVEL
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
10000
11000
12000

TABLE 9

WILDCAT WELLS IN SOUTHERN ARKANSAS THAT PENETRATED THE SMACKOVER FORMATION BEFORE JANUARY 1, 1948 (INCLUDES SOME FIELD WELLS THAT WERE DRILLED THROUGH THE SMACKOVER)

Ref. No.	Company	Well No.	Lease	Description	Sec.	Twp.	Rge.	Year Completed	Elevation	Top of Smackover, Ft. below Sea Level	Total Depth, Ft.	Smackover Thickness, Ft.	Formation at Total Depth	Ref. No.	Remarks
	Ashley County														
1	Phillips Pet. Co.	1	Godfrey	C S½ SW NW	18	17S	9W	1937	85	-5115	5611	-	Smackover	1	Dry and abandoned
2	Placid Oil Co.	1	Crossett Lbr. Co.	C NE SE	34	17S	9W	1945	136	-5262	5508	-	Smackover	2	Dry and abandoned
3	Chicago Corp. & Southern Prod. Co.	1	M. R. Morris	C NE NE	31	18S	4W	1947	120	-4480	4630	-	Smackover	3	Dry and abandoned
4	Union Prod. Co.	D-2	Crossett Lbr. Co.	753.3'S, 657.7'E of NW Cor	3	18S	9W	1944	119	-5221	5708	-	Smackover	4	Dry and abandoned
5	Union Prod. Co.	B-1	Crossett Lbr. Co.	150'E of C S½ NE	2	19S	7W	1943	127	-4967	6865	603	Eagle Mills	5	Dry and abandoned
6	Union Prod. Co.	E-1	Crossett Lbr. Co.	3370.6'S, 1258.3'E of NW Cor	12	19S	7W	1944	137	-5057	11136	653	Eagle Mills	6	Dry and abandoned
7	Union Prod. Co.	F-1	Crossett Lbr. Co.	668'E, 576'N of SW Cor	24	19S	7W	1944	113	-5153	5775	-	Smackover	7	Dry and abandoned
	Bradley County														
8	American Liberty Oil Co.	1	Bradley Lbr. Co.	C NE NE SW	15	13S	9W	1946	116	-3544	5010	105	Eagle Mills	8	Dry and abandoned
9	Placid Oil Co.	2	C. H. Murphy	C SE SE	28	15S	10W	1943	149	-4666	6301	528	Eagle Mills	9	Dry and abandoned
10	Placid Oil Co.	2	Southern Lbr. Co.	C NW SW	12	16S	10W	1943	154	-4895	5300	-	Smackover	10	Dry and abandoned
11	Phillips Pet. Co.	1	Marsden	330'S, 662'W of NE Cor SW	9	16S	11W	1938	137	-4637	5143	-	Smackover	11	Dry and abandoned
12	Placid Oil Co.	1	Southern Lbr. Co.	C NE SE	11	16S	12W	1942	106	-4660	5045	-	Smackover	12	Dry and abandoned
13	Modisette	1	Brown	330'S, 660'W of NE Cor NW NE	28	16S	12W	1936	90	-4697	5195	-	Smackover	13	Dry and abandoned
14	Amerada Pet. Corp.	1	Bradley Lbr. Co.	460'E, 660'N of SW Cor SE NE	14	17S	10W	1939	82	-5012	5310	-	Smackover	14	Dry and abandoned
15	Placid Oil Co.	3	C. H. Murphy	C SW SW	16	17S	10W	1942	80	-5312	5610	-	Smackover	15	Dry and abandoned
16	Phillips Pet. Co.	1	C. H. Murphy	C NW NW	12	17S	11W	1936	91	-4811	5627	636	Louann Salt	16	Dry and abandoned
	Calhoun County														
17	C. E. Murdock	1	Eagle Mills Lbr. Co.	200'N, 200'W SE Cor SW SE	29	12S	15W	1925	168	-2324	2551	-	Smackover	17	Dry and abandoned
18	B. E. Davis	1	Gaughan	C NE SE	34	13S	16W	1947	103	-3313	3434	-	Smackover	18	Dry and abandoned
19	J. R. Lockhart	1	Southern Kraft	C SE NW NW	17	14S	13W	1939	171	-4191	5010	562	Eagle Mills	19	Dry and abandoned
20	Placid Oil Co.	1	Furlow-Abbot	C SW SW	28	14S	14W	1942	108	-4324	4992	534	Eagle Mills	20	Dry and abandoned
21	Placid Oil Co.	1	Southern Lbr. Co. and International Paper	C NW SE	30	14S	14W	1943	120	-4160	4450	-	Smackover	21	Dry and abandoned
22	Placid oil Co.	1	Gorth et al.	C NE SW	35	14S	15W	1943	101	-4516	4719	-	Smackover	22	Dry and abandoned
23	Skelly Oil Co.	1	Helen B. Gaughn	818'S, 671'E of NW Cor	3	14S	16W	1944	106	-3484	3682	132	Eagle Mills	23	Dry and abandoned
24	J. T. O'Neil	1	Gaughn	C NE NE	15	14S	16W	1944	103	-3925	4343	-	Smackover	24	Dry and abandoned
25	J. T. O'Neil et al.	2	Gaughan	C SE NW	22	14S	16W	1945	105	-4259	4510	-	Smackover	25	Dry and abandoned
26	British-American Oil Prod. Co.	1	Freeman-Smith Lbr. Co.	C SE NE	17	15S	13W	1940	117	-4297	4790	-	Smackover	26	Dry and abandoned
27	Placid Oil Co.	1	Freeman-Smith Lbr. Co.	C NE SE	24	15S	13W	1942	109	-4573	5206	-	Smackover	27	Dry and abandoned
28	Placid Oil Co.	4	Freeman-Smith Lbr. Co.	C NE NW	2	15S	14W	1943	120	-4296	4423	-	Smackover	28	Dry and abandoned
29	Placid Oil Co.	8	Freeman-Smith Lbr. Co.	C NW NE	8	15S	14W	1943	92	-4578	4699	-	Smackover	29	Dry and abandoned
30	Placid Oil Co.	6	Freeman-Smith Lbr. Co.	C SE SW	11	15S	14W	1943	115	-4395	4591	-	Smackover	30	Dry and abandoned
31	Placid Oil Co.	2	Freeman-Smith Lbr. Co.	C NW NW	12	15S	14W	1943	114	-4226	4615	-	Smackover	31	Dry and abandoned
32	Skelly Oil Co.	1	Calion Lbr. Co.	C NE SE	27	15S	14W	1942	92	-4831	4980	-	Smackover	32	Dry and abandoned
33	Barnett	1	Freeman-Smith Lbr. Co.	132'E, 145'N of SW Cor NE SW	36	15S	14W	1936	87	-4809	5519	-	Smackover	33	Dry and abandoned
34	Proetz and Brown	1	Calion Lbr. Co.	610'E, 300'N of SW Cor SE SW	22	15S	15W	1936	100	-4848	4958	-	Smackover	34	Dry and abandoned
35	Placid Oil Co.	3	Freeman-Smith Lbr. Co.	C NE SE	14	16S	13W	1943	103	-4779	6927	708	Eagle Mills	35	Dry and abandoned
36	Placid Oil Co.	5	Freeman-Smith Lbr. Co.	C NW SE	14	16S	13W	1943	97	-4913	5082	-	Smackover	36	Dry and abandoned
37	Placid Oil Co.	1	Southern Lbr. Co.	C SE SW	22	16S	13W	1943	85	-5155	5303	-	Smackover	37	Dry and abandoned
38	Placid Oil Co.	1	Morgan	C SE SW	12	16S	14W	1943	89	-4999	5150	-	Smackover	38	Dry and abandoned
	Chicot County														
39	W. O. White et al.	1	George Hudson	C NE NW	8	16S	1W	1946	128	-5722	6123	-	Smackover	39	Dry and abandoned
40	Placid Oil Co.	1	Cox and Wilson	C SE SE	34	17S	2W	1944	126	-3907	4487	-	Smackover	40	Dry and abandoned

TABLE 9--Continued

Ref. No.	Company	Well No.	Lease	Description	Sec.	Twp.	Rge.	Year Completed	Elevation	Top of Smackover, Ft. below Sea Level	Total Depth, Ft.	Smackover Thickness, Ft.	Formation at Total Depth	Ref. No.	Remarks
	Chicot County--Continued														
41	Placid Oil Co.	1	Parish Coleman	1980'W, 960'S of NE Cor	22	18S	3W	1944	105	-4345	4802	-	Smackover	41	Dry and abandoned
42	H. L. Hunt	1	Myers	C NW SE NE	3	19S	1W	1943	120	-6201	7210	674	Eagle Mills	42	Dry and abandoned
	Clark County														
43	W. P. Wilson	1	Hamilton and Mathews	50'W of C SE NE	31	10S	20W	1940	175	-1229	1622	164	Eagle Mills	43	Dry and abandoned
44	Roy L. Fisher	1	Hugh Ross	C of Sec	23	10S	21W	1943	186	- 826	2166	95	Paleozoic[1]	44	Dry and abandoned
45	McKenzie Oil Co.	1	Sid Eakin	325'N, 325'E of SW Cor SW SW	9	11S	19W	1929	147	-1333	1700	-	Smackover	45	Dry and abandoned
46	Coker and Grieves	1	Williams	C NE NE NE	7	11S	19W	1941	168	-1212	1776	278	Eagle Mills	46	Dry and abandoned
47	Coker and Grieves	1	Sullivan	150'S and 150'W of NE Cor NW SE	2	11S	20W	1942	250	-1253	1800	?	?	47	Dry and abandoned
	Columbia County														
48	Crow	1	J. W. Smart	C SW SW	12	15S	20W	1941	239	-5710	6030	-	Smackover	48	Dry and abandoned
49	Crow	D-2	J. F. Smart	C NE NE SE	12	15S	20W	1943	310	-5618	5998	-	Smackover	49	Dry and abandoned
50	McAlester Fuel Co.	A-1	W. N. Paschal	C SW SW	19	15S	20W	1947	402	-6118	6597	-	Smackover	50	Dry and abandoned
51	L. L. Prock	1	C. E. Young	C NE SE	21	15S	21W	1942	375	-6249	6717	-	Smackover	51	Dry and abandoned
52	Atlas Refg. Co.	1	Wynn	C SW SW	8	16S	19W	1946	242	-6308	6625	-	Smackover	52	Discovery well, McNeal field. Dry in Smackover
53	Southwood Oil Co.	1	J. M. Medlock	C SE NE	12	16S	19W	1942	235	-6295	6666	-	Smackover	53	Dry and abandoned
54	Northern Ordnance, Inc.	1	J. B. Wells	C NW NE	25	16S	19W	1944	287	-6913	7286	-	Smackover	54	Dry and abandoned
55	McAlester Fuel Co.	1	J. C. Luck	C NE NE	9	16S	20W	1944	347	-6553	6950	-	Smackover	55	Dry and abandoned
56	McAlester Fuel Co.	1	Ross Staggs	C NW SW	10	16S	20W	1943	299	-6542	6935	-	Smackover	56	Dry and abandoned
57	McAlester Fuel Co.	1	Couch-Staggs	C NW SW	11	16S	20W	1945	258	-6492	6787	-	Smackover	57	Dry and abandoned
58	McAlester Fuel Co.	1	W. H. Russ	C SW SW	12	16S	20W	1946	359	-6471	6848	-	Smackover	58	Dry and abandoned
59	Standard Oil Co. of La.	1	R. S. Warnock	C NW NW	36	16S	20W	1939	376	-7296	7778	-	Smackover	59	Dry and abandoned
60	G. H. Vaughn	1	Jackson	C SE SW	8	16S	21W	1944	344	-7052	7502	-	Smackover	60	Dry and abandoned
61	J. R. Hayden, Trustee	1	I. O. Runyan et al.	C NW NW	14	16S	21W	1943	292	-7208	7659	-	Smackover	61	Dry and abandoned
62	G. H. Vaughn Prod. Co.	1	McKissack	C SE SE	18	16S	21W	1945	340	-7266	7848	-	Smackover	62	Dry and abandoned
63	Carter Oil Co.	1	J. P. McKean	C SW SW	8	16S	22W	1937	257	-6933	7309	-	Smackover	63	Discovery well, Buckner field
64	Crescent Drlg. Co.	1	Edna Hawkins	C SW NW	8	17S	18W	1945	309	-6953	7300	-	Smackover	64	Dry and abandoned
65	Phillips Pet. Co. and Crescent Drlg. Co.	1	W. J. Cox	C NE SE	8	17S	18W	1943	338	-6968	7410	-	Smackover	65	Discovery well, West Mt. Holly field. Dry in Smackover
66	Twin City Syndicate	1	Hollingsworth	C NW SW	31	17S	18W	1939	271	-7539	7850	-	Smackover	66	Dry and abandoned
67	McAlester Fuel Co.	1	Warnock	C NW NE	6	17S	19W	1945	309	-7069	7415	-	Smackover	67	Discovery well, Warnock Springs field
68	Carter Oil Co.	1	W. P. Phillips	C SE NW	15	17S	19W	1938	311	-7055	7603	-	Smackover	68	Discovery well, Village field
69	J. M. Forgotson	1	L. M. Denby	C SW SW	24	17S	19W	1940	249	-7327	7768	-	Smackover	69	Dry and abandoned
70	Phillips Pet. Co. and Crescent Drlg. Co.	1	R. S. Warnock	C SW NW	1	17S	20W	1941	299	-7111	7525	-	Smackover	70	Dry and abandoned
71	Crescent Drlg. Co.	1	Cooley	C NW SE	5	17S	20W	1944	315	-7315	7750	-	Smackover	71	Dry and abandoned
72	Kerlyn Oil Co.	A-1	Barnett	C SE SW NE	14	17S	20W	1938	321	-7285	7740	-	Smackover	72	Discovery well, Magnolia field
73	Standard Oil Co. of La.	1	Petty Stave Co.	660'N, 735'W of SE Cor	4	17S	21W	1939	265	-7678	7999	-	Smackover	73	Discovery well, Big Creek field
74	Phillips Pet. Co.	1	Askew	C NE NW	4	17S	21W	1939	287	-7756	8510	-	Smackover	74	Dry and abandoned
75	Frank and George Frankel	1	Ulma Edwards	C SE SW	16	17S	21W	1944	259	-7843	8168	-	Smackover	75	Dry and abandoned
76	Roy Lee, Trustee	1	L. Pickler	C SW NE	23	17S	21W	1942	272	-7730	8125	-	Smackover	76	Discovery well, Columbia field
77	Lion Oil Refg. Co.	1	J. C. Robertson	C NW NW	10	17S	22W	1943	291	-7921	8306	-	Smackover	77	Dry and abandoned
78	Sinclair Prairie Oil Co.	1	F. W. Souter	C NE SW	15	17S	22W	1942	327	-8055	8590	-	Smackover	78	Dry and abandoned
79	Atlas Oil and Refg. Co.	1	Longino et al.	C NW NW SE	34	17S	23W	1946	280	-9014	9379	-	Smackover	79	Dry and abandoned
80	Tidewater Asso. Oil Co.	1	J. T. Beene	C SE NW	15	18S	19W	1938	232	-7954	9173	951	Louann Salt	80	Discovery well Atlanta field
81	Tidewater Asso. Oil Co.	1	A. O. Young	C NE SE	18	18S	19W	1943	311	-7935	8356	-	Smackover	81	Discovery well W. Atlanta field

[1]Undifferentiated Paleozoic formations older than the Eagle Mills formation.

TABLE 9--Continued

Ref. No.	Company	Well No.	Lease	Description	Sec.	Twp.	Rge.	Year Completed	Elevation	Top of Smackover, Ft. below Sea Level	Total Depth, Ft.	Smackover Thickness, Ft.	Formation at Total Depth	Ref. No.	Remarks
	Columbia County--Continued														
82	Tidewater Asso. Oil Co.	1	L. H. Pearce Estate	C NE NW	10	18S	20W	1944	292	-7965	8298	-	Smackover	82	Discovery well,Calhoun field
83	Harry Bass Drlg. Co.	1	W. D. Baker	C SW SW	12	18S	20W	1946	360	-8000	8365	-	Smackover	83	Dry and abandoned
84	B. G. Byars	1	Longion-Goode	C SE NE	14	18S	20W	1947	340	-8040	8431	-	Smackover	84	Dry and abandoned
85	Chicago Corp.	1	T. H. Chaffin Estate	600'W, 660'N of SE Cor NW SE	29	18S	20W	1947	258	-8742	9160	-	Smackover	85	Dry and abandoned
86	McAlester Fuel Co.	A-1	Lizzie Franks	C SE SE	16	18S	21W	1941	265	-8556	8690	-	Smackover	86	Discovery well, Macedonia field
87	Atlantic Refg. Co.	A-1	Pinewood Lbr. Co.	C NE NE	16	18S	22W	1939	220	-8578	8998	-	Smackover	87	Discovery well, Dorcheat field
88	Gulf Refg. Co.	1	Nancy Lewis et al.	2030'S, 1980'W of NE Cor	12	18S	23W	1940	275	-8735	9045	-	Smackover	88	Dry and abandoned
89	G. H. Vaughn	1	Bodcaw Oil Co.	C NW NE	14	18S	23W	1944	267	-8941	9253	-	Smackover	89	Dry and abandoned
90	Barnsdall Oil Co.	1	El Dorado and Wesson Railroad	669.5'E, 660'N of SW Cor NW SW	5	19S	18W	1940	181	-8499	8760	-	Smackover	90	Dry and abandoned
91	Northern Ordnance, Inc.	1	Dora B. Waggoner	C NW NE	10	19S	23W	1943	250	-10222	10600	-	Smackover	91	Dry and abandoned
	Hempstead County														
92	Stewart	1	Stewart	350'N, 400'W of SE Cor NE NE	31	12S	23W	1937	400	-3250	3931	133	Eagle Mills	92	Dry and abandoned
93	Royal Oil and Gas Corp.	1	McWilliams-Stanford Unit	1931.5'W, 660'N of SE Cor NE NW	23	13S	24W	1944	379	-4033	4524	-	Smackover	93	Dry and abandoned
94	Hygrade Prod. Co.	1	Z. A. Copeland	C NW NW	32	14S	23W	1942	276	-6072	6403	-	Smackover	94	Dry and abandoned
95	Barnsdall Oil Co.	1	J. B. Shults	C SW NE	20	14S	25W	1942	256	-5692	6101	-	Smackover	95	Dry and abandoned
96	Barnsdall Oil Co. and Tidewater Asso. Oil Co.	1	Brunson	C NW NW	36	14S	25W	1944	337	-6059	6545	-	Smackover	96	Dry and abandoned
97	Barnsdall Oil Co.	1	Monroe Cox	660'S, 333.5'E of NW Cor NESW	2	14S	26W	1944	259	-4938	5412	51	Eagle Mills	97	Dry and abandoned
98	Placid Oil Co.	1	N. D. Munday	C NW NW	2	14S	26W	1947	265	-4638	5300	-	Smackover	98	Dry and abandoned
	Lafayette County														
99	Frank and George Frankel	1	Stamps Land Co.	C SE NW	17	15S	23W	1942	267	-6283	6598	-	Smackover	99	Dry and abandoned
100	Lion Oil Refg. Co.	1	Ladie	C NE SW	4	15S	24W	1945	296	-6282	6632	-	Smackover	100	Dry and abandoned
101	Barnsdall Oil Co.	1	Spencer-Gunter	100'E of C SW SE	5	15S	24W	1942	275	-6279	6561	-	Smackover	101	Dry and abandoned
102	Wheless Oil Co.	1	Knighton	700'S, 700'E of NW Cor	8	15S	24W	1947	299	-6276	6590	-	Smackover	102	Dry and abandoned
103	Barnsdall Oil Co.	1	Edgar Bond	C NW SW	11	15S	24W	1942	272	-6034	6536	-	Smackover	103	Discovery well, Midway field
104	Tidewater Asso. Oil Co.	1	J. M. Landis	C SW NE	4	15S	25W	1944	249	-6361	6634	-	Smackover	104	Dry and abandoned
105	Mid-Continent Pet. Corp.	1	James B. Russell	C NE NE	15	15S	25W	1942	247	-6661	7274	-	Smackover	105	Dry and abandoned
106	Erwin and Leach	3	Bodcaw Lbr. Co.	C NW NW NW	20	16S	23W	1936	250	-7400	7720	-	Smackover	106	Dry and abandoned
107	Shell Oil Co. and Ohio Oil Co.	1	Warren	C SE SE	13	16S	24W	1938	252	-6903	7284	-	Smackover	107	Dry and abandoned
108	Ohio Oil Co.	1	Garner	C NW SW	13	16S	24W	1939	270	-6660	7573	623	Louann Salt	108	Dry and abandoned
109	Atlantic Refg. Co.	1	Bodcaw Lbr. Co.	C NE SW	29	17S	23W	1940	273	-8765	9221	-	Smackover	109	Discovery well, McKamie field
110	Atlantic Refg. Co.	3	Bodcaw Lbr. Co.	C NE SE	29	17S	23W	1941	271	-8793	9979	908	Red beds[1]	110	McKamie field well
111	McAlester Fuel Co.	A-1	Cap Lee	C NE SW	24	17S	24W	1947	267	-8750	9086	-	Smackover	111	Discovery well, Mars Hill field
112	Tidewater Asso. Oil Co.	1	Moore	C SW SE	29	17S	24W	1941	267	-8996	9492	-	Smackover	112	Discovery well, Patton field
113	Barnsdall Oil Co.	1	Bodcaw Lbr. Co.	C SE SW	8	18S	23W	1947	262	-9175	9964	-	Smackover	113	Dry and abandoned
114	McAlester Fuel Co.	1	Cora Jeffus	C NE NW	4	19S	23W	1942	260	-10164	10477	-	Smackover	260	Dry and abandoned
	Little River County														
115	Robert W. O'Meara	1	Ed Wood Heirs	3934'W 3318'S of NE Cor	7	14S	28W	1946	285	-4975	5678	334	Eagle Mills	115	Dry and abandoned

[1]Eight feet of red beds were drilled below the base of the Smackover limestone. Several wells drilled into the Louann salt in southern Arkansas have encountered the Norphlet formation, a red bed section up to thirty feet in thickness, between the base of the Smackover and the top of the salt. Approximately eight miles north of this well salt was found below the Smackover in the Ohio No. 1 Garner (well 108). The Eagle Mills red beds are stratigraphically below the salt; therefore, it seems probable that the red beds in this well are part of the Norphlet formation and that salt would have been found if the well had been drilled deeper.

TABLE 9--Continued

Ref. No.	Company	Well No.	Lease	Description	Sec.	Twp.	Rge.	Year Completed	Elevation	Top of Smackover, Ft. below Sea Level	Total Depth, Ft.	Smackover Thickness, Ft.	Formation at Total Depth	Ref. No.	Remarks
	Miller County														
116	Tidewater Asso. Oil Co.	1	L. L. Sutton	380'W, 328.4'S of NE Cor NW SW	2	15S	26W	1942	256	-6334	6685	-	Smackover	116	Dry and abandoned
117	E. H. Moore, Inc.	2	Dale	691'N, 455'W of C	24	15S	26W	1937	250	-7010	7310	-	Smackover	117	Dry and abandoned
118	Barnsdall Oil Co.	1	Grace Unit	C SE NW	4	15S	27W	1943	268	-5907	6695	403	Eagle Mills	118	Dry and abandoned
119	Waldo	1	Grace	C NE NE	9	15S	27W	1944	265	-6124	6465	-	Smackover	119	Dry and abandoned
120	S. R. Sylvestre and Wadley	1	S. E. Mann	C SE NW	4	15S	28W	1942	324	-6036	6510	-	Smackover	120	Dry and abandoned
121	Magnolia Pet. Co.	9	E. V. Olivett	C NE NE	4	16S	26W	1943	238	-7552	7906	-	Smackover	121	Dry and abandoned
122	Carter Oil Co.	1	Lena E. Orr	C SE NW	3	16S	28W	1942	358	-6982	7700	284	Eagle Mills	122	Discovery well, Texarkana field
123	Carter Oil Co.	1	Sturgis	C NW SE	1	17S	27W	1940	346	-8954	9550	-	Smackover	123	Discovery well, Fouke field. Dry in Smackover
124	Atlantic Refg. Co.	1	Montana Realty Co.	660'N, 1980'W of SE Cor	17	17S	28W	1945	218	-8945	10006	547	Igneous rock	124	Dry and abandoned
	Nevada County														
125	Lokey and Shepard	1	Purifoy	C NE NE NE	17	11S	20W	1937	188	-1557	2220	285	Eagle Mills	125	Dry and abandoned
126	H. L. Hunt and Arkansas Fuel Oil Co.	1	Kirk	C SW SE	33	12S	20W	1942	318	-3494	4037	-	Smackover	126	Dry and abandoned
127	Moorefield and Tanner	1	Westmoreland	200'S, 200'W of C	10	12S	21W	1923	250	-2230	2519	-	Smackover	127	Dry and abandoned
128	Barney Dunlap	1	Ervin Hart	C SE SW	17	13S	21W	1943	323	-4070	4463	-	Smackover	128	Dry and abandoned
129	Wakefield	1	Sanders, Rouse Unit	100'S of C SE NW	4	13S	22W	1942	394	-3413	4050	218	Eagle Mills	129	Dry and abandoned
130	Big West Drlg. Co.	1	Pauline Mendenhall	330'S, 330'E of NW Cor	1	14S	20W	1945	304	-4416	4795	-	Smackover	130	Dry and abandoned
131	Plymouth Oil Co.	1	C. H. Tompkins	660'N, 1970'W of SE Cor	3	14S	20W	1944	344	-4654	5500	491	Eagle Mills	131	Dry and abandoned
132	Plymouth Oil Co.	1	Grove Land and Tbr. Co.	C SE SW	5	14S	20W	1943	305	-4883	5268	-	Smackover	132	Dry and abandoned
133	Benedum and Trees	1	L. C. Block	C NE SE SE	9	14S	20W	1937	287	-4858	5394	-	Smackover	133	Dry and abandoned
134	Benedum and Trees	1	Groves	170'N of C N½ SE NW	10	14S	20W	1936	354	-4788	6144	533	Louann Salt	134	Dry and abandoned
135	Plymouth Oil Co.	2	Grove	C SE NE	21	14S	20W	1943	361	-5185	5577	-	Smackover	135	Dry and abandoned
136	Magnolia Pet. Co.	A-1	Lester	C NE SW	36	14S	20W	1944	308	-5058	5475	-	Smackover	136	Dry and abandoned
137	Placid Oil Co.	1	Mrs. Levi West et al.	330'S, 330'E of NW Cor SE NE	19	14S	21W	1946	341	-4985	5440	-	Smackover	137	Dry and abandoned
138	Placid Oil Co.	1	Silvey	C SW SE	14	14S	22W	1944	300	-5033	5610	-	Smackover	138	Dry and abandoned
139	Placid Oil Co.	1	Bodcaw Lbr. Co.	C SE NW	18	14S	22W	1943	309	-5270	7180	536	Eagle Mills	139	Dry and abandoned
140	Barnsdall Oil Co.	1	Flora Stuart	100'E of C SW SE	12	14S	23W	1946	295	-5183	5590	-	Smackover	140	Dry and abandoned
141	H. L. Hunt et al.	1	Stamps Land Co.	C NW NW	35	14S	23W	1943	342	-5633	6162	-	Smackover	141	Dry and abandoned
142	Hunt Oil Co.	1	Bodcaw Oil Co.	C SW NW	36	14S	23W	1947	352	-5617	6077	-	Smackover	142	Dry and abandoned
143	Texas Canadian Corp.	1	J. M. Stocks	330'S, 380'W of NE Cor SW SE	9	15S	22W	1940	310	-5712	6068	-	Smackover	143	Dry and abandoned
	Ouachita County														
144	Pure Oil Co.	1	Moline Lbr. Co.	660'E, 300'N of SW Cor	21	11S	17W	1924	130	-1797	2885	127	Eagle Mills	144	Dry and abandoned
145	El Dorado Union Oil Co.	1	Eagle Lbr. Co.	150'E, 400'N of SW Cor	17	12S	15W	1925	160	-2269	2832	123	Eagle Mills	145	Dry and abandoned
146	O. F. Whitaker, Trustee	1	Simon Howard	600'E, 150'N of SW Cor NW NE	20	12S	16W	1937	128	-2122	2600	262	Eagle Mills	146	Dry and abandoned
147	N. F. Small et al.	2	Eagle Mills Lbr. Co.	1000'S, 250'E of NW Cor	25	12S	16W	1924	139	-2272	2693	244	Eagle Mills	147	Dry and abandoned
148	Standard Oil Co. of La.	1	Moline Timber Co.	120'N, 300'E of SW Cor NE SW	22	12S	17W	1914	109	-2306	2597	133	Eagle Mills	148	Dry and abandoned
149	Stockholders Service Bureau	1	W. H. Garnett	150'N, 150'W of SE Cor	2	12S	18W	1923	135	-1970	2700	35	Eagle Mills	149	Dry and abandoned
150	S. J. Carnes	1	Camden Coal and Clay Co.	430'E, 480'N of SW Cor SW NE	11	12S	18W	1943	252	-2031	3200	207	Eagle Mills	150	Dry and abandoned
151	Skelly Oil Co.	1	Camden Coal and Clay Co.	C SE SW	12	12S	18W	1944	228	-2112	2406	-	Smackover	151	Dry and abandoned
152	Straughan Pet. Co.	1	Garnett	200'S, 200'W of NE Cor SE	15	12S	18W	1921	242	-2518	3270	?	?	152	Dry and abandoned
153	Garland Anthony	1	Turner-Anthony	C SW SE SE	33	12S	18W	1944	199	-3001	3280	-	Smackover	153	Dry and abandoned
154	Dickson	1	Benton	660'S, 660'E of NW Cor SE	24	12S	19W	1923	237	-2973	3350	-	Smackover	154	Dry and abandoned
155	Sohio Prod. Co.	1	Parker and Daniels	C NE SW	17	13S	16W	1942	102	-3140	3601	334	Eagle Mills	155	Dry and abandoned
156	Danciger Oil and Refg. Co.	1	Nolan Huddleston	C NE SE	19	13S	16W	1943	102	-3380	3515	-	Smackover	156	Dry and abandoned
157	DeKalb Agriculture Association	1	Berg	C SW NW	31	13S	16W	1943	107	-3937	4073	-	Smackover	157	Dry and abandoned

TABLE 9--Continued

Ref. No.	Company	Well No.	Lease	Description	Sec.	Twp.	Rge.	Year Completed	Elevation	Top of Smackover, Ft. below Sea Level	Total Depth, Ft.	Smackover Thickness, Ft.	Formation at Total Depth	Ref. No.	Remarks
	Ouachita County--Continued														
158	Skelly Oil Co.	1	C. O. Adams	C NW NW NW	29	13S	18W	1945	162	-3583	4010	218	Eagle Mills	158	Dry and abandoned
159	Tidewater Asso. Oil Co.	1	S. A. Graves Estate	C NW SE NW	33	13S	18W	1937	190	-3735	4501	125	Eagle Mills	159	Dry and abandoned
160	Jack Carnes	1	Rath and Cartier	C NW SE	35	13S	18W	1943	185	-3857	4210	-	Smackover	160	Dry and abandoned
161	L. J. Peters and S. J. Carnes	1	H. L. Berg	C SW NE	6	14S	17W	1943	141	-3943	4215	-	Smackover	161	Dry and abandoned
162	Skelly Oil Co.	1	L. T. Pate	C SW NE	9	14S	17W	1944	188	-4104	4351	-	Smackover	162	Dry and abandoned
163	McAlester Fuel Co. and Marine Oil Co.	1	W. G. Walker	C NE SW NW	16	14S	18W	1943	194	-4278	4573	-	Smackover	163	Dry and abandoned
164	Lion Oil Refg. Co.	1	Blanche Levey	660'N, 330'E of SW Cor	21	15S	15W	1937	168	-4767	5350	-	Smackover	164	Dry and abandoned
165	Phillips Pet. Co.	1	J. D. Reynolds	330'N of S line, 330'W of E line of NW	27	15S	15W	1936	174	-4724	4926	-	Smackover	165	Discovery well. Snow Hill pool, Smackover field
166	Phillips Pet. Co.	1	J. T. Arnold	660'S, 330'E of NW Cor NE SW	27	15S	15W	1936	208	-4704	5717	698	Louann Salt	166	Snow Hill pool, Smackover field
167	Lion Oil Refg. Co.	1	Annie	C SE NE	29	15S	17W	1939	168	-5472	6093	-	Smackover	167	Dry and abandoned
168	Arkansas Fuel Oil Co.	A-1	McGaughey	C NW NW	6	15S	18W	1941	240	-5069	5311	-	Smackover	168	Dry and abandoned
169	Hunt Oil Co.	1	J. H. Dawson	C NW NW	14	15S	18W	1946	223	-5487	5784	-	Smackover	169	Dry and abandoned
170	G. H. Vaughn	1	Haltom	C NE NE SE	28	15S	18W	1944	155	-5977	6264	-	Smackover	170	Dry and abandoned
171	G. H. Vaughn	1	Reynolds-Berg	C SE SW	6	15S	19W	1943	307	-5368	6017	-	Smackover	171	Dry and abandoned
172	Deep Rock Oil Corp.	1	Wesson	510'S, 660'W of NE Cor SE NE	23	15S	19W	1939	253	-5679	6053	-	Smackover	172	Dry and abandoned
173	Crow Drlg. Co.	1	Yarbrough	C NW NW	30	15S	19W	1944	200	-6032	6387	-	Smackover	173	Dry and abandoned
	Union County														
174	Bruce Anthony	1	Giles	C NE SE	26	16S	14W	1942	153	-5471	5785	-	Smackover	174	Dry and abandoned
175	J. R. Lockhart	1	Armer	550'N, 330'W of SE Cor SW NW	32	16S	14W	1944	205	-5649	5868	-	Smackover	175	Dry and abandoned
176	Curtis Kinard	1	Anthony Lbr. Co.	C SW SE	34	16S	14W	1947	175	-5645	5954	-	Smackover	176	Dry and abandoned
177	Lion Oil Refg. Co.	A-9	Hayes	242'S, 246'W of NE Cor SW NE	4	16S	15W	1932	94	-5125	7255	710	Louann Salt	177	Dry and abandoned
178	Murphy and Head	1	Jessie Murphy	C SE SW SE	8	16S	15W	1944	238	-5372	5728	-	Smackover	178	Dry and abandoned
179	Gulf Refg. Co.	49	Lewis Werner	4620'N, 60'E of SW Cor	5	16S	16W	1935	128	-5792	7973	676	Igneous rock	179	Dry and abandoned
180	National Asso. Pet. Co.	1	Annie Smith	C NE NE NE	17	16S	17W	1945	187	-6167	6395	-	Smackover	180	Dry and abandoned
181	Lion Oil Refg. Co.	1	G. M. LeCroy	C SE NW	36	16S	17W	1942	168	-6226	6500	-	Smackover	181	Dry and abandoned
182	Root Pet. Co.	1	McRae	C SW SE	16	16S	18W	1944	270	-6610	6950	-	Smackover	182	Dry and abandoned
183	Carter Oil Co.	1	G. F. Wilson	660'N, 665'E of SW Cor SW NW	33	16S	18W	1944	219	-6677	7091	-	Smackover	183	Discovery well, Salem Church field
184	Kerlyn Oil Co.	1	Union Sawmill	C NW SW NE	17	17S	11W	1944	93	-5357	5560	-	Smackover	184	Dry and abandoned
185	Placid Oil Co.	1	Goode	560' from N line and 660' from E line N½ NW	6	17S	13W	1946	93	-5547	5667	-	Smackover	185	Discovery well, Northeast Champagnolle field
186	Kerlyn Oil Co.	1	Frost	C NW SE NE	9	17S	13W	1943	172	-5626	5836	-	Smackover	186	Discovery well, Wilmington field. Dry in Smackover
187	Lion Oil Refg. Co.	1	Union Sawmill	C NE SE NE	14	17S	13W	1943	185	-5600	5900	-	Smackover	187	Dry and abandoned
188	Marine Oil Co.	1	L. O. McGough	C NE NW	34	17S	13W	1945	196	-6074	6331	-	Smackover	188	Dry and abandoned
189	Curtis Kinard	B-1	W. R. Crain	C SW NE SW	1	17S	14W	1947	137	-5577	5742	-	Smackover	189	Dry and abandoned
190	H. L. Hunt	15	E. F. Gregory	C SW SE SE	10	17S	14W	1935	180	-5757	6911	873	Louann Salt	190	Dry and abandoned
191	Fohs, Pilgrim, and Root	1	C. T. Grace	667.7'E, 562.4'N of SW Cor NW SE	31	17S	14W	1943	254	-6422	6710	-	Smackover	191	Dry and abandoned
192	Delta Drlg. Co.	1	Grace	C SE SE	31	17S	14W	1940	206	-6475	6819	-	Smackover	192	Discovery well, Nick Springs field. Dry in Smackover
193	Marine Oil Co.	1	Ezzell	665'S, 110'E of NW Cor NE NE	13	17S	15W	1944	226	-5957	6253	-	Smackover	193	Dry and abandoned
194	Lion Oil Refg. Co.	1	Dumas	100'W of C NE SW SW	9	17S	16W	1945	177	-6523	6728	-	Smackover	194	Dry and abandoned
195	E. G. Bradham	1	A. E. Slaughter	430'N, 430'W of SE Cor	9	17S	16W	1940	187	-6523	6821	-	Smackover	195	Dry and abandoned
196	Atlantic Refg. Co.	1	Mary E. Davis	600'S, 640'W of NE Cor NW	15	17S	18W	1941	247	-6877	7373	-	Smackover	196	Discovery well, Mt. Holly field

TABLE 9--Continued

Ref. No.	Company	Well No.	Lease	Description	Sec.	Twp.	Rge.	Year Completed	Elevation	Top of Smackover, Ft. below Sea Level	Total Depth, Ft.	Smackover Thickness Ft.	Formation at Total Depth	Ref. No.	Remarks
	Union County--Continued														
197	Marine Oil Co.	1	Eudy	C NE SW	18	18S	11W	1943	141	-5935	6112	-	Smackover	197	Dry and abandoned
198	Guy Mabee et al.	1	Union Sawmill	330'S, 330'W of NE Cor SW NW	31	18S	11W	1946	106	-6281	6414	-	Smackover	198	Dry and abandoned
199	N. H. Wheless Drlg. Co.	1	Union Sawmill	C SW NW	1	18S	12W	1942	161	-5903	6286	-	Smackover	199	Dry and abandoned
200	Amerada Pet. Corp.	1	Turbeville	C SE SW	4	18S	12W	1942	160	-5898	6290	-	Smackover	200	Dry and abandoned
201	Plymouth Oil Co.	1	Leora Trammell	C W½ SE SE	7	18S	12W	1947	167	-6042	6230	-	Smackover	201	Dry and abandoned
202	Joe Modisett	2	Union Sawmill	C SW NE	8	18S	12W	1938	184	-5876	6533	-	Smackover	202	Dry and abandoned
203	C. H. Lyons	A-1	Agerton	C SW SW	12	18S	12W	1942	178	-5926	6131	-	Smackover	203	Dry and abandoned
204	Joe Modisett et al.	3	Union Sawmill	C NW NE	13	18S	12W	1939	159	-5897	6291	-	Smackover	204	Discovery well, New London field. Dry in Smackover
205	Marine Oil Co.	2	P. M. Walton	C SE NW	13	18S	12W	1942	180	-5944	6170	-	Smackover	205	New London field. Dry in Smackover
206	Lion Oil Refg. Co.	1	Union Sawmill	C NE NE SW	23	18S	12W	1944	133	-6095	6275	-	Smackover	206	Dry and abandoned
207	Root Pet. Co.	1	Union Sawmill	C NW NW	27	18S	12W	1944	136	-6174	6382	-	Smackover	207	Discovery well, Strong field
208	Marine Oil Co.	B-1	Thompson	C SE SE NE	10	18S	13W	1944	231	-6225	6520	-	Smackover	208	Dry and abandoned
209	Fohs Oil Co.	1	Craig	C SE NE	5	18S	14W	1938	251	-6569	6905	-	Smackover	209	Dry and abandoned
210	Lion Oil Refg. Co.	1	Nick	C NE NE	5	18S	14W	1944	248	-6530	6860	-	Smackover	210	Dry and abandoned
211	McAlester Fuel Co.	A-1	Patterson	C SE SW	19	18S	14W	1947	215	-7041	7302	-	Smackover	211	Dry and abandoned
212	Lion Oil Refg. Co.	1	Union Sawmill	C NW SE	34	18S	14W	1944	206	-7138	7410	-	Smackover	212	Dry and abandoned
213	Crescent Drlg. Co.	1	Root	C NE NE	25	18S	15W	1942	165	-7199	7465	-	Smackover	213	Dry and abandoned
214	C. H. Murphy, Jr.	C-1	Cates	670'E, 765'N of SW Cor NW SW	33	18S	15W	1940	227	-7491	7718	-	Smackover	214	Dry and abandoned
215	Carter Oil Co.	1	D. A. Zimmerman	C SE SE	29	18S	16W	1940	233	-7657	8020	-	Smackover	215	Dry and abandoned
216	Delta Drlg. Co. et al.	1	Pickering	664'S, 659'W of NE Cor SE NW	32	18S	16W	1941	177	-7679	7970	-	Smackover	216	Dry and abandoned
217	Tidewater Asso. Oil Co.	1	Grace Griffin	C NW SE	33	18S	16W	1945	230	-7660	7919	-	Smackover	217	Dry and abandoned
218	Crescent Drlg. Co.	1	W. A. Burns	100'E of C NE SW	13	18S	17W	1941	211	-7385	7701	-	Smackover	218	Discovery well, East Schuler field. Dry in Smackover
219	Lion Oil Refg. Co.	A-1	Morgan	330'S, 330'W of NE Cor NW NE	18	18S	17W	1937	228	-7378	7683	-	Smackover	219	Discovery well, Schuler field
220	Atlantic Refg. Co.	1	Murphy	C NW SW	2	18S	18W	1944	288	-7549	7943	-	Smackover	220	Discovery well, Wilks field
221	Kerlyn Oil Co.	1	Crossett Lbr. Co.	C SW SW NW	9	19S	10W	1946	69	-6145	6283	-	Smackover	221	Dry and abandoned
222	Marine Oil Co.	1	Bank	C SE SE	7	19S	13W	1944	268	-7412	7765	-	Smackover	222	Dry and abandoned
223	Oliphant Oil Corp.	1	Union Sawmill	668'E, 658'S of NW Cor NW SW	22	19S	14W	1939	158	-7729	7950	-	Smackover	223	Dry and abandoned
224	C. H. Murphy, Jr.	1	C. H. Murphy	660'W, 531'S of NE Cor	4	19S	15W	1945	249	-7505	7870	-	Smackover	224	Dry and abandoned
225	Carter Oil Co.	1	V. Foyil	790'S, 660'E of NW Cor NW NW	12	19S	15W	1943	187	-7579	7909	-	Smackover	225	Dry and abandoned
226	Barnsdall Oil Co.	1	Cameron	C SW NW	36	19S	17W	1940	218	-8799	9069	-	Smackover	226	Dry and abandoned
	Addition, Ouachita County														
227	Skelly Oil Co.	1	Sallie Russell	C NE SE	29	13S	18W	1944	220	-3624	3990	14	Eagle Mills	227	Dry and abandoned

TABLE 10

WILDCAT WELLS IN SOUTHERN ARKANSAS THAT PENETRATED THE SMACKOVER FORMATION FROM JANUARY 1, 1948, TO MAY 1, 1949

Ref. No.	Company	Well No.	Lease	Description	Sec.	Twp.	Rge.	Year Completed	Elevation	Top of Smackover Ft. Below Sea Level	Total Depth Feet	Smackover Thickness Feet	Formation at Total Depth	Ref. No.	Remarks
	Ashley County														
228	Superior Oil Company	1	Bradley Lumber Co.	660'S,400'W of NE cor	11	19S	10W	1948	74	-5965	6170	--	Smackover	228	Discovery well, Felsenthal Field, Dry in Smackover
	Clark County														
229	H. T. Ross et al	1	H. T. Ross et al	318'E, 182'N of SWc NW NW	32	10S	20W	1948	175	-1229	1659	219	Eagle Mills	229	Dry and abandoned
	Columbia County														
230	H. L. Hunt et al	1	D. W. Elledge	1980'S, 1980'E of NWc	15	15S	21W	1948	357	-6027	6470	--	Smackover	230	Dry and abandoned
231	H. L. Hunt Oil Co.	1	D. H. Kitchens	C NW NW	18	15S	21W	1948	342	-6422	6783	--	Smackover	231	Dry and abandoned
232	McAlester Fuel Co.	A-1	W. D. Black	C NW SE	24	15S	21W	1948	425	-6105	6541	--	Smackover	232	Discovery well, College Hill field
233	G. H. Vaughn	1	Mary A. Dennis	C SW SW NW	7	16S	21W	1948	312	-6888	7234	--	Smackover	233	Dry and abandoned
234	R. W. O'Meara	1	T. F. Moody	C NE SE	12	16S	22W	1948	305	-6916	7243	--	Smackover	234	Dry and abandoned
235	G. H. Vaughn	1	W. L. McCall Est.	C NW NE SE	30	17S	18W	1948	267	-7358	7712	--	Smackover	235	Dry and abandoned
236	Lion Oil Co.	1	Story	C NE SE	20	18S	19W	1949	269	-8143	8476	--	Smackover	236	Discovery well, Pine Tree field
	Hempstead County														
237	Lee & Burnett	A-1	Ollar	C SE SE NE	27	13S	25W	1948	331	-4914	5463	--	Smackover	237	Dry and abandoned
238	Placid Oil Co.	1	M. Modest Estate	100'N, 20'E of C SW SW	35	13S	26W	1948	262	-4499	4935	62	Eagle Mills	238	Dry and abandoned
	Lafayette County														
239	McAlester Fuel Co.	A-1	C. F. Tatom	97'N of C NE SE	33	15S	23W	1949	322	-7010	7430	--	Smackover	239	Dry and abandoned
240	Stanolind Oil & Gas Co.	1	Bodcaw Lumber Co.	C NE SW	29	19S	23W	1948	237	-10755	11430	--	Smackover	240	Dry and abandoned
241	Stanolind Oil & Gas Co.	1	Union Sawmill	C NW NW	18	19S	24W	1948	266	-10573	11441	--	Smackover	241	Dry and abandoned
	Miller County														
242	Carter Oil Co.	1	H. H. Gildon	590'N, 590'E of SWc NW NW	22	16S	27W	1948	307	-8043	8461	--	Smackover	242	Dry and abandoned
	Nevada County														
243	Caddo Oil Co., Inc.	1	G. H. Christopher	C SW SE SE	9	11S	22W	1948	295	-1405	5258	310	Eagle Mills	243	Dry and abandoned
244	McAlester Fuel Co.	A-1	Ira Kiser	C SW SW	15	12S	22W	1948	305	-2945	3616	--	Smackover	244	Dry and abandoned
245	W. L. Pickens et al	1	C. T. Almond	300'N, 300'E of SWc SE NW	16	13S	22W	1948	338	-3994	4355	--	Smackover	245	Dry and abandoned
246	N. A. Hardin	1	L. L. Mitchel	730'S, 617'W of NEc SW	35	13S	23W	1949	351	-4647	5200	--	Smackover	246	Dry and abandoned
247	Hassie Hunt Trust et al	1	Nels Danielson	C NE SW	30	14S	20W	1948	352	-5424	6113	--	Smackover	247	Dry and abandoned
	Ouachita County														
248	Garland Anthony	1	Henry Hirsch	330'S, 660'W of NEc NE SW	8	12S	18W	1948	281	-2441	3330	419	Eagle Mills	248	Dry and abandoned
249	S. J. Carnes et al	1	Joe Epperson	C NW NW	1	12S	19W	1948	345	-2215	2741	--	Smackover	249	Dry and abandoned
250	Hunt Oil Co.	1	Mollie Purifoy	C SE SE	3	12S	19W	1948	289	-2478	3202	409	Werner Anhydrite	250	Dry and abandoned
251	Houston Oil Co.	1	James Boyd	C SW NE NW	17	13S	17W	1948	219	-3087	3401	44	Eagle Mills	251	Dry and abandoned
252	Bert Fields	1	D. Loda et al	466'S, 466'E of NWc	27	13S	18W	1948	142	-3548	3853	123	Eagle Mills	252	Dry and abandoned
253	S. J. Carnes	1	H. L. Berg	NE SE NW	27	13S	19W	1948	285	-3928	4227	--	Smackover	253	Dry and abandoned
254	S. J. Carnes	1	J. Roberson Heirs	C SE NW	36	13S	19W	1948	222	-3941	4262	--	Smackover	254	Dry and abandoned
255	Federal Royalty Co.	1	Southern Co.	C NW SW SW	27	14S	16W	1948	117	-4436	4568	--	Smackover	255	Dry and abandoned
256	Carter Oil Co.	1	Frank Landers	589'N, 727'E of SWc NW SW	28	14S	18W	1949	314	-4738	5401	--	Smackover	256	Dry and abandoned
	Union County														
257	G. H. Vaughn	1	Annie Smith	C SE NW SE	8	11S	16W	1948	169	-6146	6348	--	Smackover	257	Discovery well, Bear Creek field
258	Sohio Pet. Co.	1	Max Schilling	50'N of C SE SW	12	16S	17W	1948	162	-5945	6193	--	Smackover	258	Dry and abandoned
259	G. H. Vaughn	1	J. W. Crisp Est.	C SE SE	34	16S	18W	1948	233	-6788	7182	--	Smackover	259	Dry and abandoned
260	Macmillan Pet. Co. et al	1	Cleg Nash	C SE NW	35	18S	15W	1949	242	-7522	8010	--	Smackover	260	Discovery well, Loutre Creek field
261	Curtis Kinard & Phillips Pet. Co.	1	W. B. Scales	C NE SW	3	18S	17W	1948	282	-7470	7874	--	Smackover	261	Discovery well, Cairo field
262	Carter Oil Co.	1	Riley Pepper	660'N, 660'E of SWc NW SE	15	19S	15W	1948	251	-7921	8261	--	Smackover	262	Dry and abandoned
263	S. W. Richardson & Shell Oil Co.	1	J. C. Pratt	695.5'N, 546.2'E of SWc	36	19S	15W	1948	278	-8308	9245	--	Smackover	263	Dry and abandoned
264	Carter Oil Co.	1	Ethridge	660'S, 760'W of NEc SW SE	20	19S	16W	1948	255	-8550	8875	--	Smackover	264	Dry and abandoned

TABLE 11

WILDCAT WELLS IN SOUTHERN ARKANSAS THAT PENETRATED THE SMACKOVER FORMATION FROM MAY 1, 1949, TO MAY 1, 1950

Ref. No.	Company	Well No.	Lease	Description	Sec.	Twp.	Rge.	Year Completed	Elevation	Top of Smackover Ft. Below Sea Level	Total Depth Ft.	Smackover Thickness Ft.	Formation at Total Depth	Ref. No.	Remarks
	Bradley County														
265	A. J. Slagter, Jr.	1	Annie Hayward	C NW NW NE	2	16S	9W	1949	89	-4366	4710	250	Eagle Mills	265	Dry and abandoned
	Columbia County														
266	McAlester Fuel Co.	1	Phillips-Shocklee	C NE SW	33	16S	19W	1949	321	-7063	7403	--	Smackover	266	Discovery well, Warnock Springs Extension
267	Wm. Hamm, Jr.	1	L. E. Davis	660'N&E of SWc SW NW	5	16S	21W	1950	335	-6745	7100	--	Smackover	267	Dry and abandoned
268	McAlester Fuel Co. et al.	A-1	T. O. Giles Est.	735'S,660'E of NWc NE	6	18S	18W	1949	210	-7530	7876	--	Smackover	268	Discovery well, Spottsville Field
	Lafayette County														
269	E. L. Pinkston	1	C. N. Knighton	C NW SE NE	15	15S	23W	1949	302	-6260	6791	--	Smackover	269	Dry and abandoned
270	McAlester Fuel Co.	A-1	Bodcaw Oil Co.	C NW NE	11	15S	25W	1949	326	-6369	6708	--	Smackover	270	Dry and abandoned
	Miller County														
271	Plains Prod. Co.	1	Bolin Stricklin	C NW SW SE	33	14S	27W	1949	268	-5932	6228	--	Smackover	271	Dry and abandoned
	Ouachita County														
272	Garland Anthony	1	Mike Berg	50'N of C NE SW	15	13S	17W	1950	210	-3091	--	186	--	272	Drlg. below 4000 feet in Eagle Mills - dry in Smackover
273	Lee & Burnett	B-1	Kate Curry	C SW SE SW	5	15S	19W	1949	294	-5306	5618	--	Smackover	273	Dry and abandoned
274	McAlester Fuel Co. et al.	B-1	A. S. Staggs Est.	50'W of C SW NW	26	15S	19W	1949	197	-5803	6231	--	Smackover	274	Dry and abandoned
	Union County														
275	Victor P. Grage et al.	2	The Southern Co.	1974'E & 483'N of SWc	4	16S	14W	1949	90	-5002	5107	--	Smackover	275	Dry and abandoned
276	Victor P. Grage et al.	1	The Southern Co.	4735'N & 2080'E of SWc	8	16S	14W	1949	88	-5042	5187	--	Smackover	276	Dry and abandoned
277	G. H. Vaughn et al.	1	The Southern Co.	660'N & 660'W of SEc SW NE	10	16S	17W	1949	130	-6103	6291	--	Smackover	277	Dry and abandoned
278	Carter Oil Co.	1	T. F. Russell	C SW NW	33	17S	16W	1949	240	-7100	8375	880	Louann Salt	278	Dry and abandoned
279	Don D. Montgomery et al.	1	J. K. Mahoney et al.	100'E of C NE NW	25	17S	18W	1949	271	-7304	7632	--	Smackover	279	Dry and abandoned
280	Jones & O'Brien, Inc.	1	Union Saw Mill	200'N & 330'W of SEc NE	19	18S	12W	1949	131	-6609	6747	--	Smackover	280	Dry and abandoned
281	Marine Oil Co.	1	Culberson	330'N & 860'E of C	1	18S	14W	1949	213	-6425	6764	--	Smackover	281	Dry and abandoned
282	C. H. Murphy & Co.	1	Pepper	330'S & 330'W of NEc SE NE	32	18S	15W	1950	221	-7483	7921	--	Smackover	282	Discovery well, Catesville Field - dry in Smackover
283	Spartan Drlg. Co.	1	Sally Irby	C NE SE	22	18S	17W	1950	286	-7504	7870	--	Smackover	283	Dry and abandoned
284	Lion Oil Co. et al.	1	Loftin	C SW NE	34	18S	18W	1949	207	-8293	8522	--	Smackover	284	Dry and abandoned
285	British American Oil Prod. Co. et al.	1	J. K. Sheppard	C NE NE	15	19S	17W	1950	267	-8262	8731	--	Smackover	285	Dry and abandoned
286	C. H. Murphy & Co.	1	W. K. Gregory	C SE SW	28	19S	18W	1950	207	-9063	9500	--	Smackover	286	Discovery well, Tubal Field