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Stratigraphic Names in the Midway and Wilcox Groups of the Gulf Coastal Plain

BY

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STRATIGRAPHIC NAMES IN THE MIDWAY AND WILCOX GROUPS OF THE GULF COASTAL PLAIN[1]

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ABSTRACT

In the past 100 years, more than 100 names have been used to designate parts or all of the outcropping Midway and Wilcox rocks in the Gulf Coastal Plain; less than half of these names are used currently by Coastal Plain geologists, and the validity of some of the remaining named rock units has been questioned in certain recent studies. A compilation of these names shows the development of present-day terminology.

Owing to the noncoincidence of certain time-rock and rock units within the Midway-Wilcox section, time, time-rock, and rock terms often have been used indiscriminately, resulting in a terminology that is in part confusing and misleading. Because of the importance and significance of this part of the Gulf Coastal Plain section, a proper definition of time-rock and rock units is desirable; a conceptual distinction of these units is imperative. One logical arrangement is to use the terms Midway and Wilcox strictly as rock terms (group) and to use the terms Paleocene and Eocene as time terms (age). If specific time-rock terms (stage) are needed, such a term as Sabinian is available.

INTRODUCTION

The nomenclatural history of rocks that now constitute the Midway and Wilcox groups of the Gulf Coastal Plain is involved and often confusing. In the past 100 years more than 100 names have been used to designate parts or all of these groups; less than half of these names are currently used by Coastal Plain geologists, and the validity of some of the remaining named units has been questioned in certain recent studies. This paper presents a summary of these names, with a brief pertinent statement of their history and usage, and shows the development of the present-day terminology of the Midway-Wilcox section. Primary purpose is to note the original and subsequent use of names without strictly judging the validity of their use.

Names that have been proposed or used to designate specific rock units of the Midway and Wilcox groups are listed with the following information: (1) original designation and original use, (2) location of type section, locality, or area, originally or subsequently designated, (3) brief statement of subsequent use where significantly different from previous use, and (4) statement of the generally accepted present-day use of a name. Generally accepted valid rock units are further described by a brief statement of their stratigraphic position, geographic extent, lithology, thickness, fossil content, and economic significance. Names used to designate time-rock units are discussed.

Generally accepted valid names are printed in bold-face **CAPITAL LETTERS**; invalid, obsolete, or abandoned names are printed in **Small Heavy Letters** and doubtful or questioned names are printed in regular **heavy letters**.

In addition to the lexicons of Wilmarth (1938) and Wilson et al. (1927), a number of papers review the nomenclatural history of Midway and Wilcox rocks in the Gulf Coastal Plain. The more complete reviews are: Gardner (1953), Harris (1896), Hughes (1958), Murray (1953, 1955), F. B. Plummer (1933), and Toulmin (1940).

DEFINITION OF MIDWAY-WILCOX SECTION

Much of the complexity and confusion of Midway and Wilcox terminology is the result of (1) complex stratigraphic relationships of highly variable rock units, especially in the Wilcox Group, and (2) **indiscriminate** use of Midway and Wilcox as time, time-rock, and rock terms owing in part to the non-coincidence of certain time-rock and rock units (Fig. 1). Chart 1 shows some of the different classifications of Midway and Wilcox rocks, and it is apparent that almost every

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The writer has drawn freely on the numerous published reports on the geology of the Gulf Coastal Plain, several of which are listed in the Selected Bibliography,

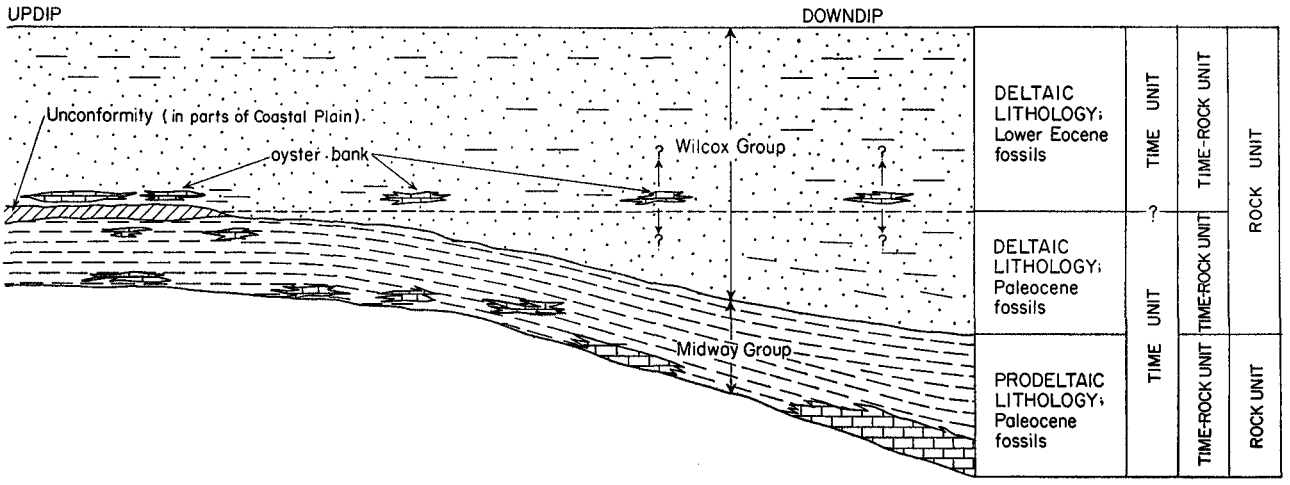

Figure 1. Diagrammatic cross-section of Midway and Wilcox rocks indicating time, time-rock, and rock categories.

possible combination of time-rock and rock units has been employed at one time or another. Because rocks of the Midway and Wilcox groups are economically and stratigraphically important and constitute a large part of the Tertiary section of the Gulf Coastal Plain, time-rock and rock units should be properly defined.

Of the methods of distinguishing time, time-rock, and rock units in the Midway-Wilcox section of the Gulf Coastal Plain, those for distinguishing rock units are best defined. The generally dark-colored marine shales of the Midway Group contrast with the so-called deltaic lignitic sands and carbonaceous shales of the Wilcox Group, although vertical lithologic transition, lateral gradation, and interfingering of these rock units are common. Even in a general way the definition of time and time-rock units in the Midway-Wilcox section is much less clear. Time and time-rock units within this section generally are defined on the basis of regional disconformity and the occurrence of the oysters **Ostrea thirsae** in the central and eastern Gulf Coastal Plain and **Ostrea duvali** in the western Gulf Coastal Plain. The use of such features in defining time and time-rock units, while convenient and expedient in light of present knowledge, is open to some question. In parts of the eastern and central Gulf Coastal Plain **Ostrea thirsae** occurs in beds immediately above a disconformity (marked in part by a bauxite sequence), so that time-rock and rock units are generally coincident. In Texas, however, oyster beds **(Ostrea duvali)** are known to occur at more than one interval in the southern part of the State and commonly are absent in the State north of the Colorado River.

Nevertheless, time and time-rock units are conceptually important, even though facts regarding the Midway-Wilcox section are not now available for the precise use of such units in a regional sense. Proper definition of time and time-rock units in this part of the geologic section awaits thorough study of the distribution, evolutionary development, and paleoecologic significance of Midway and Wilcox fossils.

A classification such as that of Murray (1953, 1955) recognizes the need for distinguishing time, time-rock, and rock units within the Midway-Wilcox section; future paleontologic studies may alter time boundaries, and additional stratigraphic studies may give basis for a different understanding of the vertical and lateral relationship of rock units, but at least the conceptual distinction of time, time-rock, and rock units and divisions is clearly made. If future writers carefully define or state the sense in which they use a name, little confusion can result, regardless of the classification used.

In this paper, the terms Wilcox and Midway are employed as rock terms to designate groups. Time units are designated Paleocene and Eocene ages. Should formally named time-rock units (stages) be needed, such a term as Sabinian is available.

MIDWAY LITHOLOGY; PALEOCENE FOSSILS	WILCOX LITHOLOGY; PALEOCENE FOSSILS	WILCOX LITHOLOGY; LOWER EOCENE FOSSILS	
EOCENE SYSTEM			Plummer, 1933
MIDWAY GROUP	WILCOX GROUP		
MIDWAY GROUP	SABINE GROUP		Howe and Garrett, 1934
	MANSFIELD SUBGROUP	WILCOX SUBGROUP	
MIDWAY GROUP		WILCOX GROUP	Murray, 1941
MIDWAY GROUP		SABINE GROUP	Barry and LeBlanc, 1942
PALEOCENE SERIES		EOCENE SERIES	Toulmin, 1944
MIDWAY GROUP		WILCOX GROUP	
EOCENE SERIES			Vestal, 1952
MIDWAY SUBSERIES		WILCOX SUBSERIES	
MIDWAY STAGE		SABINE STAGE	Murray, 1955
(UNNAMED)	WILCOX GROUP		
PALEOCENE SERIES		EOCENE SERIES	Durham and Smith, 1958
MIDWAY GROUP	WILCOX GROUP		

Chart 1. Different classifications of Midway and Wilcox rocks in the Gulf Coastal Plain.

Ackermon Formation

Original designation. Lowe (1914, p. 23–25).

Type section. Railroad cut on Aberdeen branch of Illinois Central Railroad at crest of ridge between Big Black and Oaknoxubee Creeks, known as Blanton Gap, 1.5 miles northeast of Ackerman, Choctaw County, Mississippi.

Original use. Named Ackerman beds to designate lowest division of Wilcox Group in Mississippi.

Subsequent use. Mellen (1939, p. 33) excluded the lower 50 feet of the Ackerman Formation, designating this sequence the Fearn Springs Formation; Hughes (1958, p. 142) and others of the Mississippi Geological Survey consider the Ackerman as defined by Lowe to represent parts of both the Manafalia and Tuscahoma formations.

Present status. Questioned; subsequent data based on Lowe's (1914) original concept of the formation.

Stratigraphic position. Underlies Holly Springs Formation and overlies Midway Group (Porters Creek Formation).

Thickness at type section. 400 feet.

Lithology. Dark gray clays and sandy clays, lignitic clays and lignite, with few concretionary beds of iron carbonate.

Extent. Mississippi and southwestern Alabama.

Fossil content. Plant fossils; 31 species listed in Lowe (1933, p. 39).

Economic significance. Abundant and fairly good grade lignite; iron carbonate ore, clay, especially brick and tile clay; masonry sands.

Alluvial Rocks

Original designation. Maclure (1809, p. 411–428).

Type area. Eastern Coastal Plain of United States.

Original use. General term applied to unconsolidated sediments now known as Tertiary rocks.

Subsequent use. Used as proposed by Maclure from 1809 – 1823.

Present status. Abandoned.

Appomatox Formation

Original designation. McGee (1888, p. 125, 328–330).

Type locality. On and near Appomatox River from its mouth to west of Petersburg, Virginia.

Original use. Applied to a sequence of poorly stratified, gravelly, orange clays and sands of late Tertiary age.

Subsequent use. In certain early reports, this name was erroneously applied to some rocks in Mississippi now known to be a part of the Wilcox Group.

Present status. Abandoned as a term to designate any Wilcox rocks.

Barrow Member

Original designation. Cited by F. B. Plummer (1933, p. 532).

Present status. Invalid; never proposed formally in publication; mentioned by F. B. Plummer (1933, p. 532); apparently intended to designate rocks now known as the Kincaid Formation.

Basal Clays

Original designation. Penrose (1890, p. 17).

Original use. As "Basal or Wills Point Clay" for the lowest division of the Tertiary in Texas; now known as Midway Group.

Subsequent use. Name abandoned in favor of Wills Point; Wills Point later restricted to lower part of Midway Group (see entry under Wills Point).

Present status. Abandoned and obsolete in any formal sense.

Basal Division

Original designation. Dumble (1892, p. 124).

Original use. As a division to include "Basal or Wills Point Clays" of Penrose (1890); rocks now considered as Midway Group.

Present status. Not used in a formal sense since Dumble (1892).

Basal Midway

Original designation. H. J. Plummer (1926, p. 14).

Original use. As a rock and paleontologic (Foraminifera) division of Midway to include basal 150 feet; from top of Tehuacana Limestone to top of Cretaceous (Navarro Formation).

Present status. Not used in any formal sense; equivalent to Kincaid Formation of modern usage.

BASHI MEMBER

Original designation. Heilprin (1831, p. 158–159).

Type locality. Mouth of Bashi Creek at Woods Bluff on Tombigbee River, NW ¼ Sec. 3, T. 11 N., R. 1 W., Clarke County, Alabama.

Original use. As a unit of the Eolignitic.

Subsequent use. As "Wood's Bluff or Bashi series" (Smith & Johnson, 1887); Bashi Formation (Wilmarth, 1938). MacNeil (1946) and Toulmin (1944) restricted Bashi to the fossiliferous marl; the lower part of the Bashi series of Smith & Johnson (1887) was placed in Tuscahoma Formation.

Present status. Generally recognized as the basal member of the Hatchetigbee Formation (following Toulmin, 1944).

BASHI MEMBER — (Cont'd)

Stratigraphic position. Basal member of Hatchetigbee Formation, which underlies Tallahatta Formation and overlies Tuscahoma Formation.

Thickness at type section. 15 feet.

Lithology. Fossiliferous, glauconitic, calcareous sandstone with large spherical concretions.

Fossil content. Abundant mollusks, foraminifers, and shark teeth; partial faunal list in LaMoreaux & Toulmin (1959, p. 144).

Economic significance. None known.

BAYOU LENANN MEMBER

Original designation. Wasem & Wilbert (1943, p. 186).

Type locality. Exposures near Bayou Lenann; Sec. 12, T. 6 N., R. 13 W., Sabine Parish, Louisiana.

Original use. Basal member of Pendleton Formation.

Stratigraphic position. Underlies Slaughter Creek Member of Pendleton Formation and overlies Marthaville Formation.

Thickness at type locality. 90 feet.

Lithology. Glauconitic, fossiliferous sand grading upward into lignitic silts and sands with thin seams of lignite.

Extent. Southwestern Louisiana and extreme eastern Texas.

Fossil content. Mollusks, especially **Cardium tuomeyi,** common in basal part.

Economic significance. None known.

BELLS LANDING MEMBER

Original designation. Smith (1883, p. 256, 321).

Type locality. Exposures at Bells Landing, Alabama River, Monroe County, Alabama.

Original use. To designate a fossiliferous marl exposed at Bells Landing.

Subsequent use. Used by Smith & Johnson (1887, p. 46–51), as "Bell's Landing series" designating a sequence of rocks now generally considered a part of the Tuscahoma Formation; some workers have considered the Bells Landing a formation.

Present status. Considered a member of the Tuscahoma Formation.

Stratigraphic position. Near middle of Tuscahoma Formation, which overlies Nanafalia Formation and underlies Hatchetigbee Formation.

Thickness. 7 to 9 feet.

Lithology. Gray-green, very fine-grained, finely glauconitic, calcareous, very fossiliferous sand that weathers green-yellow; contains large pillow-shaped, calcareous sandstone concretions 5 to 6 feet thick.

Extent. Southwestern Alabama.

Fossil content. Very fossiliferous with fossils characteristically large; mostly mollusks; faunal lists given in LaMoreaux & Toulmin (1959, p. 130).

Economic significance. None known.

BENSON FACIES

Original designation. Murray (1948, p. 112).

Type locality. Roadcut on north side of State Highway 745, 0.5 to 0.6 mile west of Benson, SW ¼, NE ¼, Sec. 9, T. 10 N., R. 13 W., DeSoto Parish, Louisiana.

Original use. To designate lower part or facies of Cow Bayou Member, Logansport Formation, Wilcox Group.

Stratigraphic position. Underlies Lula facies of Cow Bayou Member and overlies Dolet Hills Member of Logansport Formation.

Thickness. Approximately 15 feet.

Lithology. Brown, lignitic clays with interbedded gray Siltstones.

Extent. Area between Benson and Lula, DeSoto Parish, Louisiana.

Fossil content. Few marine and brackish-water fossils.

Economic significance. None known.

Betheden Formation

Original designation. Mellen (1939, p. 26).

Type locality. Livingston Spring at Betheden, Winston County, Mississippi; SW ¼, SE ¼, Sec. 23, T. 16 N., R. 13 E.

Original use. To designate sequence interpreted as ancient soil and residual material developed on the Porters Creek Formation.

Subsequent use. MacNeil (1946) considered the Betheden as equivalent to the Naheola Formation; MacNeil (1951) considered the Betheden as equivalent to part of the Fearn Springs Formation and placed unit in Wilcox Group.

Present status. Questioned; for discussion, see Mellen (1939, 1950), MacNeil (1946, 1951), and Hughes (1958); subsequent data based on Mellen's original concept of the formation.

Stratigraphic position. Overlies Porters Creek Formation and underlies Fearn Springs Formation as defined by Mellen (1939).

Thickness. 25 feet, locally absent.

Lithology. 25 feet, locally absent.

Betheden Formation — (Cont'd.)

Extent. Locally in Mississippi; widespread bauxite and kaolin deposits developed at the contact of the Porters Creek and Ackerman formations might also be included within the Betheden Formation as defined by Mellen.

Fossil content. Plant fossils associated with lignites.

Economic significance. Clays and lignite.

BEULAH CHURCH LENTIL

Original designation. Wasem & Wilbert (1943, p. 187).

Type locality. Not designated; noted to be well developed at type locality of Slaughter Creek Member of Pendleton Formation along Slaughter Creek in western part of Sabine Parish, Louisiana.

Original use. Lentil in uppermost part of Slaughter Creek Member.

Present status. No formal rank.

Stratigraphic position. Underlies High Bluff Member of Pendleton Formation and overlies Stone Coal Bluff Lignite of Slaughter Creek Member of Pendleton Formation.

Thickness. 30 feet.

Lithology. Lignitic silts, clays, sandy silts, and glauconitic sand.

Extent. Western part of Sabine Parish, Louisiana.

Fossil content. Sparingly fossiliferous.

Economic significance. Few lignites but probably not of commercial importance.

BISTINEAU MEMBER

Original designation. Mentioned in Meagher & Aycock (1942, p. 12–16, personal communication from G. E. Murray); proposed by Murray & Thomas (1945, p. 59).

Type locality. Exposures in T. 15 N., R. 10 W., southwestern Bienville Parish and Sec. 9 and 10 along Louisiana Highway 5650 from Ringgold to Lake Bistineau, Louisiana.

Original use. Upper member of Hall Summit Formation.

Present status. (See entry under Hall Summit Formation.)

Stratigraphic position. Underlies Marthaville Formation and overlies Grand Bayou Member of Hall Summit Formation.

Thickness in type area. 100 feet.

Lithology. Calcareous Siltstone and shale.

Extent. Area of Sabine Uplift in Louisiana.

Fossil content. None known.

Economic significance. None known.

Black Bluff Series

Original designation. Smith & Johnson (1887, p. 61–62).

Type locality. Black Bluff on Sucarhoochee Creek, at its junction with the Tombigbee River, Sumter County, Alabama.

Original use. To designate strata overlying "Midway or Pine Barren beds" and underlying "Naheola and Matthews Landing;" sequence consists largely of clay.

Subsequent use. Replaced by Sucarnoochee by Smith (1892).

Present status. Abandoned in any original use; Sucarnoochee also replaced by term Porters Creek.

Buff Sand

Original designation. Winchell (1857, p. 82–93).

Original use. To designate rocks now considered a part of the Midway Group.

Subsequent use. Followed for about 10 years, then abandoned.

Present status. Abandoned.

BUTLER CLAY

Original designation. F. B. Plummer (1933, p. 587).

Type locality. Clay pits at Butler, northern Bastrop County, Texas.

Original use. To designate a commercial sequence of clay at base of Rockdale Formation.

Subsequent use. Stenzel (1953, p. 53–54, citing W. W. Sharp, Jr., Univ. Texas, M. A. thesis, 1951) considered the Butler a member of the Calvert Bluff Formation and indicated the Butler occurs above the Simsboro Member of the Rockdale rather than below it, as given in F. B. Plummer (1933); Stenzel also stated the member is not a good stratigraphic unit because it lacks a mappable top boundary and is indistinguishable from the Calvert Bluff.

Present status. Considered informally as a bed in the Calvert Bluff Member of the Rockdale Formation.

Stratigraphic position. Overlies Simsboro Member of Rockdale Formation occurring in the lower part of the Calvert Bluff Member of the Rockdale Formation; if the Calvert Bluff is considered a formation, the Butler could possibly be considered a basal member of that formation.

Thickness. Approximately 40 feet.

Extent. Central part of Texas Coastal Plain.

Fossil content. Few fresh-water pelecypods.

Economic significance. Important deposit of brick clay.

Buttsgin Formation

Original designation. Liddle (1921, p. 82).
Type section. Near Butts Gin, approximately 6 miles northwest of Yancey in Seco Creek, Medina County, Texas.
Original use. To designate the lower 500 feet of sandy Siltstone and shale of Wilcox Group (here 600 feet thick) in Medina County, Texas.
Present status. Abandoned; not used subsequent to Liddle (1921).

CALDWELL KNOB MEMBER

Original designation. F. B. Plummer (1933, p. 577).
Type locality. Caldwell Knob, 10 miles north of Bastrop and approximately 2 miles south of Colorado River, Bastrop County, Texas.
Original use. To designate oyster bed of the uppermost part of the Seguin Formation.
Subsequent use. Redefined by Beckman & Turner (1943, p. 615) to include beds lying between oyster bed and a disconformity at the base of a gray, massive sand approximately 60 feet below oyster bed. Base of Wilcox Group drawn at base of this member by Beckman & Turner (1943).
Present status. Rank and status depend on status of Seguin Formation (see entry under Seguin Formation).
Stratigraphic position. Underlies Hooper Member of Rockdale Formation and overlies Solomon Creek of Seguin Formation; forms upper member of Seguin Formation.
Lithology. Member in Plummer's usage consists of oyster shells in matrix of calcareous Siltstone.
Extent. Brazos River to Rio Grande in Texas Coastal Plain.
Fossil content. Largely single species of oyster, **Ostrea duvali;** few other mollusks.
Economic significance. None except local use as road metal.

CALVERT BLUFF MEMBER

Original designation. F. B. Plummer (1933, p. 586).
Type section. Calvert Bluff on Brazos River, Jesse Webb league, Robertson County, Texas.
Original use. Designated as Calvert Bluff clay beds to constitute the upper member of the Rockdale Formation.
Subsequent use. Treated as a formation by Stenzel (1953).
Stratigraphic position. Underlies Sabinetown Formation of the upper part of the Wilcox Group and overlies Simsboro Member of Rockdale Formation.
Thickness at type section. 70 feet.
Lithology. Coarse to fine-grained, argillaceous sands; dense, black lignites and lignitic Siltstones; Siltstone interbedded with dark gray, compact, carbonaceous clays.
Extent. If used to include lignite and lignitic rocks of upper part of Wilcox Group, it is present throughout the Coastal Plain of Texas.
Fossil content. Plant fossils abundant; described by Berry (1930).
Economic significance. Includes important and abundant lignite and clay deposits throughout Coastal Plain of Texas.

Camden Series

Original designation. Hill (1888, p. 49–65).
Type area. Bluffs at Camden, Ouachita County, Arkansas.
Original use. To designate rocks from top of Cretaceous to top of rocks now included as a part of the Jackson Group; thus included rocks of the Midway, Wilcox, Claiborne, and Jackson groups.
Present status. Abandoned.

chalybeate member

Original designation. MacNeil (1946, p. 9).
Type locality. Exposures in ravine just north of main street in Chalybeate, Tippah County, Mississippi.
Original use. To designate Clayton Formation in Mississippi and in Alabama west of the Tombigbee River.
Subsequent use. Toulmin et al. (1951) do not recognize Clayton west of central Alabama and include rocks assigned to the Chalybeate by MacNeil as a part of the Porters Creek Formation; Murray (1953) defends MacNeil's use of Chalybeate.
Present status. Questioned; subsequent data based on MacNeil's original concept of member.
Stratigraphic position. Overlies Cretaceous rocks and underlies Porters Creek Formation.
Thickness. 20 to 80 feet.
Lithology. Hard, crystalline, extremely fossiliferous limestone interbedded with soft to tough marls, dark leaf-bearing shales, glauconitic sand, and fossiliferous Siltstone.
Extent. Chickasaw County, Mississippi, to Tombigbee River in Alabama.
Fossil content. Mollusks common; faunal list in Hughes (1958, p. 93).
Economic significance. Not known.

Chattahoochee Formation

Original designation. Smith (1888).
Type area. Not designated.

Chattahoochee Formation — (Cont'd.)

Original use. Name appears on columnar section accompanying geologic map of Alabama; used to include rocks overlying Ripley Formation (Cretaceous) and underlying Black Bluff beds (Sucarnoochee or Porters Creek Formation); unit included Midway and Fort Gaines.

Present status. Abandoned in any use in Midway Group.

CHEMARD LAKE LENTIL

Original designation. Mentioned in Meagher & Aycock (1942, p. 12–16, personal communication, G. E. Murray); proposed by Murray & Thomas (1945, p. 56).

Type locality. Coal Bed Springs in NW ¼, Sec. 3, T. 11 N., R. 1 1 W., DeSoto Parish, Louisiana.

Original use. To designate lignite lentil at top of Naborton Formation.

Present status. No formal rank.

Stratigraphic position. Uppermost part of Naborton Formation, underlying Dolet Hills Member of Logansport Formation.

Thickness. 6.5 feet.

Lithology. Massive, in part glossy, compact, dark lignite with 3-inch parting of gray, silty clay 1 foot below the top.

Extent. Known only from type locality.

Fossil content. Few plant structures.

Economic significance. Fair but woody lignite; has minimum of 60 feet of overburden.

Chickasaw (Chickasawian Stage)

Original designation. Dall (1898, p. 344–345).

Type area. Chickasaw Bluffs on Mississippi River, northwestern Mississippi; part of old Chickasaw Purchase (areas in northern Mississippi, northwestern Alabama, and southwestern Tennessee).

Original use. Suggested in letter from E. W. Hilgard as a substitute name for the lithologic term Lignitic.

Present status. Abandoned; rocks in type area now known to be part of the Jackson Group.

CLAYTON FORMATION

Original designation. Langdon (1891, p. 589–605).

Type section. Railroad cut on the Central of Georgia Railroad about 1 mile east of Clayton, Barbour County, Alabama.

Original use. Designated as "Midway or Clayton group;" applied to rocks now considered as Clayton Formation.

Subsequent use. See entry under Chalybeate Member.

Present status. Considered as lowest formation of Midway Group.

Stratigraphic position. Overlies Cretaceous rocks and underlies Porters Creek Formation of Midway Group; includes Pine Barren and McBryde members in Alabama.

Thickness. Maximum of 220 feet, thins to 20 feet in eastern Alabama.

Lithology. Varies from massive limestone with some sand at base to calcareous silt and sand or clayey chalk.

Extent. Southern Alabama, southwestern Georgia, northeastern Mississippi, southern Tennessee, southeastern Missouri, and Louisiana.

Fossil content. See entries under McBryde, Pine Barren, and Chalybeate members.

Economic significance. Not known.

COAL BLUFF MEMBER

Original designation. Smith (1886, p. 12).

Type section. Coal Bluff on the Alabama River, Wilcox County, Alabama; SE ¼, Sec. 7, T. 11 N., R. 7 E.

Original use. Designated as "Nanafalia and Coal Bluff section" for exposures at Coal Bluff.

Subsequent use. Brantly (1920, p. 149) restricted Coal Bluff to a lower division of the Nanafalia Formation designating this unit as the Coal Bluff beds; Toulmin (1944) and LaMoreaux & Toulmin (1959, p. 96) further restricted Coal Bluff to the lower part of the Coal Bluff beds as defined by Brantly, designating the upper part of Brantly's Coal Bluff beds as the gravel Creek Member; LaMoreaux & Toulmin (1959) extended the upper boundary of the Naheola Formation, placing the Coal Bluff Member within the Naheola and the Gravel Creek Member within the Nanafalia; a lignite at the base of the Coal Bluff beds of Brantly was placed by LaMoreaux & Toulmin in a lower member (Oak Hill Member) of the Naheola; Coal Bluff Member previously placed in Naheola by Toulmin (1955, p. 471).

Present status. Generally as used by Toulmin (1955) and LaMoreaux & Toulmin (1955, p. 471).

Stratigraphic position. Overlies Oak Hill Member of Naheola Formation and underlies Nanafalia Formation.

Thickness. 60 feet, thins eastward in Alabama.

Lithology. Light-colored, sparsely glauconitic, micaceous, fine- to medium-grained sand and thin layers of light-colored, glauconitic sandstone concretions as much as 4 feet thick enclosed in green, glauconitic, sandy, fossiliferous marl.

Extent. Southwestern Alabama.

Fossil content. Mollusks, foraminifers (75 species described by Cushman (1944); ostracodes (38 species described by Munsey (1953).

Economic significance. Not known, except used as local aquifer.

CONVERSE FORMATION

Original designation. Andersen (1960, p. 55).

Type locality. Series of outcrops along State Highway 174 from city limits of Converse westward for 1.7 miles, Secs. 8 and 9, T. 9 N., R. 13 W., Sabine Parish, Louisiana.

Original use. To designate sandstone in Sabine Parish; includes parts of Logansport Formation of Murray & Thomas (1945).

Stratigraphic position. Overlies Cow Bayou Member of Logansport Formation and underlies Lime Hill Member of Logansport Formation; includes parts of Cow Bayou and Lime Hill members of Murray & Thomas (1945).

Thickness. 50 to 230 feet.

Lithology. Fine- to medium-grained sand with lenses of calcareous clay and Siltstone.

Extent. West-central Louisiana (specifically Sabine Parish).

Fossil content. None known.

Economic significance. None known.

COW BAYOU MEMBER

Original designation. Mentioned in Meagher & Aycock (1942, p. 13); proposed by Murray & Thomas (1945, p. 57).

Type locality. Cow Bayou in SE ¼, Sec. 9, NW ¼, Sec. 16, T. 10 N., R. 14 W., 3 miles southeast of Hunter on gravel road to Converse, southwestern DeSoto Parish, Louisiana.

Original use. Applied to middle member of Logansport Formation.

Subsequent use. Part of unit placed in Converse Formation and remainder raised to formation rank by Andersen (1960); following data based on original concept of Murray & Thomas (1945).

Stratigraphic position. Underlies Lime Hill Member and overlies Dolet Hills Member of Logansport Formation.

Thickness. 75 to 100 feet.

Lithology. Lignitic and carbonaceous shales.

Extent. Central DeSoto Parish and Sabine Parish, Louisiana.

Fossil content. Not known.

Economic significance. None known.

Crainesville Horizon

Original designation. Harris (1896, p. 18–25).

Type locality. Exposures in vicinity of Crainesville, Hardeman County, Tennessee.

Original use. To designate a glauconitic sand within the upper part of the Midway Group of Tennessee and northern Mississippi.

Subsequent use. Lowe (1933, p. 23) suggested this unit may be the same as his Tippah Sandstone and further suggested that neither the Crainesville nor the Tippah should receive formal status as they probably represent Naheola-like sediments interfingering with the upper part of the Porters Creek Formation; Whitlatch (1936, p. 139) reached the same conclusions as Lowe in regard to the Crainesville horizon in Tennessee.

Present status. Informal, but generally abandoned.

Stratigraphic position. Upper part of Porters Creek Formation.

Thickness. Not known.

Lithology. Gray, fossiliferous, calcareous, compact clays with grains of glauconitic sandstone concretions.

Extent. Mississippi and Tennessee.

Fossil content. Not known.

Economic significance. Not known.

DOLET HILLS MEMBER

Original designation. Mentioned in Meagher & Aycock (1942, p. 13, personal communication, G. E. Murray); proposed by Murray & Thomas (1945, p. 57).

Type locality. Dolet Hills south of Naborton, along road from Grove Hill Church to Naborton, DeSoto Parish, Louisiana.

Original use. Applied to basal member of Logansport Formation.

Subsequent use. Raised to formation rank by Andersen (1960).

Stratigraphic position. Underlies Cow Bayou Member of Logansport Formation and overlies Naborton Formation.

Thickness. 100 feet.

Lithology. Predominantly fine- to medium-grained sand with lenses of Siltstone and lignitic Siltstone and clay.

Extent. West-central Louisiana and parts of extreme eastern Texas.

Fossil content. Not known.

Economic significance. None known.

Elstone Limestone

Original designation. Liddle (1921, p. 75).

Type locality. Exposures in vicinity of Elstone, Medina County, Texas.

Original use. To designate a glauconitic limestone, 30 to 40 feet thick, in the Midway Group of Medina County, Texas.

Elstone Limestone — (Cont'd.)

Subsequent use. F. B. Plummer (1933) designated this unit as Elstone lentil and implied equivalency with limestone lentils of the Pisgah Member of the Kincaid Formation of the central part of the Texas Coastal Plain. Gardner (1933, p. 76–77) considered the Elstone as the Elstone facies, apparently of the Kincaid Formation; she indicated the facies could be traced in certain areas from Medina County to the Rio Grande.

Present status. Generally abandoned; where used, used informally as lentil or facies.

Eolignitic

Original designation. Heilprin (1881, p. 158–159).

Original use. Used to designate all rocks below the Buhrstone (lower Claiborne in present use) and above the Cretaceous; as defined today, the Eolignitic included strata assigned to the Midway and Wilcox groups.

Subsequent use. Generally abandoned shortly after original proposal.

Present status. Abandoned and obsolete.

fearn springs formation

Original designation. Mellen (1939, p. 33–37).

Type locality. Roadcut one-fourth mile west of Fearn Springs, Winston County, Mississippi; SE ¼, NE ¼, Sec. 3, T. 13 N., R. 14 E.

Original use. To designate lower 50 feet of strata previously considered a part of Ackerman Formation.

Subsequent use. MacNeil (1946, 1951), Hughes (1958), and LaMoreaux & Toulmin (1953) used Fearn Springs as a sand member of Wilcox Formation, considering the entire Wilcox section in Mississippi as a formation.

Present status. Rank and extent of unit as proposed by Mellen (1939) have been questioned; subsequent data based on Mellen's (1939) original concept of unit.

Stratigraphic position. Overlies Betheden Formation (or Porters Creek) and underlies Ackerman Formation.

Thickness. Maximum of 50 feet.

Lithology. Clay and lignite; locally some sand and silt.

Extent. Eastern Mississippi.

Fossil content. None known.

Economic significance. Important deposits of clay; some siderite deposits.

Flatwoods Clay

Original designation. Hilgard (1860, p. 110–111, 275).

Type region. Low flat land covering several counties in northeastern Mississippi and generally known as the "Flatwoods Country."

Original use. To designate a phase of the Northern Lignitic that consists mostly of clay and forms a low flat belt; as used, it is equivalent to rocks now known as the Porters Creek Formation.

Subsequent use. Raised to rank of group by Killebrew & Safford (1874, p. 44) to include all strata occurring between the Lagrange (above) and the Cretaceous (below); as used in this sense, the unit was equivalent to rocks now assigned to Midway Group.

Present status. Abandoned in favor of geographic names, Porters Creek and Midway.

Fort Gaines Formation

Original designation. Smith (1888).

Type locality. Not known; probably exposures in vicinity of Fort Gaines, Clay County, Alabama.

Original use. To designate rocks between the Midway above (Midway in Smith's 1888, usage represented only upper part of Midway Group of modern use) and Cretaceous (Ripley Formation) below.

Present use. Abandoned.

GRAMPIAN HILLS MEMBER

Original designation. First used by Blanpied & Hazzard (1939) but no type locality was designated; type locality designated by LaMoreaux & Toulmin (1959, p. 100).

Type section. Continuous roadcut along Alabama Highway 41 on south side of Gravel Creek, 7.1 miles south of Camden on road to Monroeville, southern part of Wilcox County, Alabama.

Original use. Applied to upper division of Nanafalia Formation; equals Pseudobuhrstone of early reports,

Stratigraphic position. Underlies Tuscahoma Formation and overlies **Ostrea thirsae** Beds of Nanafalia Formation.

Thickness. 80 to 150 feet, thins east and west in Alabama from Wilcox County.

Lithology. Yellow-gray to green-gray indurated clay or claystone with several beds of green-gray, coarse-grained, glauconitic sand and sandstone; gray to green-gray, massive, blocky clay in upper part.

Extent. South-central Alabama.

Fossil content. Abundant molds of pelecypods and gastropods; partial faunal list in LaMoreaux & Toulmin (1959, p. 106).

Economic significance. None known.

GRAND BAYOU MEMBER

Original designation. Mentioned in Meagher & Aycock (1942, p. 12–14, personal communication, G. E. Murray); proposed by Murray & Thomas (1945, p. 59).

Type locality. Exposures in Secs. 19, 20, 29, and 30, T. 14 N., R. 9 W., Red River Parish, Louisiana.

GRAND BAYOU MEMBER — (Cont'd.)

Original use. Applied to middle member of Hall Summit Formation.
Present status. Depends on status of Hall Summit Formation (see that entry).
Stratigraphic position. Underlies Bistineau Member and overlies Loggy Bayou Member of Hall Summit Formation.
Thickness. Maximum of 80 feet.
Lithology. Carbonaceous and lignitic silts and clays.
Extent. Flanks of Sabine Uplift in Louisiana.
Fossil content. Not known.
Economic significance. None known.

GRAVEL CREEK MEMBER

Original designation. LaMoreaux & Toulmin (1959, p. 98).
Type locality. South side of Gravel Creek on Alabama Highway 41, Wilcox County, Alabama.
Original use. Applied to basal member of Nanafalia Formation.
Stratigraphic position. Underlies **Ostrea thirsae** Beds of Nanafalia Formation and overlies Coal Bluff Member of Naheola Formation.
Thickness. 2 to 50 feet.
Lithology. White to yellow, medium- to coarse-grained, cross-bedded sand with stringers and thin lenses of fine gravel and clay pebbles.
Extent. South-central Alabama.
Fossil content. Nonfossiliferous except for borings of **Halymenites.**
Economic significance. Aquifer in south-central Alabama.

GREGGS LANDING MEMBER

Original designation. Smith (1883, p. 256, 321).
Type locality. Exposures at Greggs Landing, Alabama River, northwestern part of Monroe County, Alabama.
Original use. To designate fossiliferous marl exposed at Greggs Landing and occurring 20 to 50 feet below the Bells Landing Member.
Subsequent use. Dall (1898, p. 346) applied the name Greggs Landing series to a sequence of rocks earlier (Smith et al., 1894, p. 162–170) designated as the Tuscahoma Formation.
Present status. Member of Tuscahoma Formation.
Stratigraphic position. Member of the Tuscahoma Formation occurring in the lower part of the formation; Tuscahoma Formation overlies Nanafalia Formation and underlies Hatchetigbee Formation.
Thickness. Approximately 5 feet.
Lithology. Blue-gray, calcareous, clayey sand containing few particles of lignite and many well-preserved fossils.
Extent. Southwestern Alabama.
Fossil content. Few corals and abundant mollusks; faunal list given in LaMoreaux & Toulmin (1959, p. 129–130).
Economic significance. None known.

grenada formation

Original designation. Lowe (1914, p. 23–25).
Type locality. Exposures near the town of Grenada, in Grenada County, Mississippi, along the Yalobusha River and its tributary, the Bogue River.
Original use. To designate uppermost division of Wilcox Group in most of Mississippi; essentially equivalent to the Hatchetigbee Formation of Alabama.
Subsequent use. Recent studies by members of the Mississippi Geological Survey indicate the Holly Springs Formation is equivalent to the Meridian (Claiborne Group) and younger beds; accordingly, the overlying Grenada Formation is questioned.
Stratigraphic position. Overlies Holly Springs Formation and underlies Tallahatta Formation; this and subsequent data based on Lowe's (1914) original concept of Grenada Formation.
Lithology. Sequence of lignite and lignitic clay, with interbedded gray clay and sand.
Extent. Mississippi.
Fossil content. Plant fossils; 62 species listed in Lowe (1933, p. 115).
Economic significance. Ceramic and fire-brick clay; lignite.

Gullette Bluff Beds

Original designation. Brantly (1920, p. 148–152).
Type locality. Exposures at Gullette Bluff, Wilcox County, Alabama.
Original use. To designate upper part of Nanafalia Formation; including the middle (**Ostrea thirsae** Beds) and upper (Pseudobuhrstone) division of the Nanafalia as established by Smith & Johnson (1887).
Subsequent use. LaMoreaux & Toulmin (1959) designated Smith & Johnson's (1887) upper division of the Nanafalia as the Grampian Hills Member and retained the middle member as the **Ostrea thirsae** Beds; they did not use Brantly's Gullette Bluff Beds.
Present status. Generally abandoned, following LaMoreaux & Toulmin (1959).

HATCHETIGBEE FORMATION

Original designation. Smith (1886, p. 10).

Type section. Hatchetigbee Bluff on Tombigbee River in Sec. 16, T. 18 N., R. 1 W., Washington County, Alabama (accessible only by boat).

Original use. As Hatchetigbee series for all strata between Tallahatta (above) and Bashi (below).

Present status. Generally considered a formation with the Bashi as a lower member.

Stratigraphic position. Underlies Tallahatta Formation and overlies Tuscahoma Formation.

Thickness. 70 feet at type section; 250 feet in southern Alabama; 35 feet in eastern Alabama.

Lithology. Light-colored sand, laminated, sandy, and carbonaceous clay; Bashi Member, glauconitic, sandy marl and sand with spherical concretions.

Extent. Parts of southeastern Mississippi, Alabama, and parts of western Georgia.

Fossil content. Nonfossiliferous except Bashi Member (see entry under Bashi Member).

Economic significance. Locally an aquifer.

hall summit formation

Original designation. Murray (1941, p. 941–942, abstract); Murray & Thomas (1945, p. 58–60).

Type locality. Vicinity of village of Hall Summit, T. 14 N., R. 9 W., north-central Red River Parish, Louisiana.

Original use. Applied to rocks representing a cycle of deposition and occurring as the upper unit of the Midway Group as defined by Murray & Thomas (1945).

Subsequent use. As "Hall Summit" Formation by Andersen (1960); studies by geologists of the U. S. Geological Survey indicate that rocks at the type locality of the Hall Summit Formation are considerably older than indicated by Murray & Thomas (1945) (Durham & Smith, 1958).

Present status. Stratigraphic position questioned; subsequent data following Murray & Thomas (1945).

Stratigraphic position. Underlies Marthaville Formation and overlies Logansport Formation.

Thickness. 25 to 300 feet.

Lithology. Calcareous silts and shales (Bistineau Member); carbonaceous and lignitic silts and clays (Grand Bayou Member); and massive to broken sand (Loggy Bayou Member).

Extent. Central Louisiana and extreme eastern part of Texas.

Fossil content. Few gastropods and one pelecypod species.

Economic significance. Road-surfacing material from weathered ironstone gravels.

HENRYS CHAPEL LENTIL

Original designation. First used by Stenzel (1953, p. 15); proposed by Stenzel (1953a, p. 14).

Type locality. Clay pits and exposures in vicinity of Henrys Chapel, Cherokee County, Texas. Type section: apparently the clay pit of Reliance Brick Company, 1,000 feet west of Troup works, General Refractories Company, which is located 0.6 mile southwest of church at Henrys Chapel (Locality 4 of Stenzel, 1953a, p. 11).

Original use. To designate commercial and associated ball clays occurring in the uppermost part of the Wilcox Group in Cherokee County, Texas.

Present status. Informal rank, as originally used.

Stratigraphic position. Uppermost part of Wilcox Group, immediately underlying Carrizo Sand.

Thickness. 20 feet.

Lithology. Gray ball clay, locally silty, and locally grading to lignitic clay containing xyloid lignite.

Extent. Northeastern Texas in vicinity of Cherokee County.

Fossil content. Plant roots.

Economic significance. Ball clay.

HIGH BLUFF MEMBER

Original designation. Wasem & Wilbert (1943, p. 187).

Type locality. High Bluff on Sabine River, Sabine Parish, Louisiana.

Original use. Upper member of Pendleton Formation.

Stratigraphic position. Underlies Sabinetown Formation and overlies Slaughter Creek Member of Pendleton Formation.

Thickness. Approximately 130 feet at type locality.

Lithology. Basal, glauconitic, fossiliferous sand overlain by silts and sands containing calcareous concretionary boulders; silts and shales grade upward into 65 feet of thin-bedded, lignitic silts and sands; uppermost 30 feet consists of cross-bedded sands.

Extent. West-central Louisiana.

Fossil content. Few mollusks, characterized by **Venericardia sabinensis.**

Economic significance. None known.

Hilbig Zone

Original designation. Claypool (1933).

Type locality. None designated, possibly Hilbig oil field 1 mile north of Rockne, Bastrop County, Texas.

Original use. Applied to a marine sequence in the Rockdale Formation, occurring from southern Bastrop to Guadalupe counties, Texas; probably equivalent to Pendleton Formation of Louisiana.

Present status. Published only in abstract of thesis; invalid and apparently abandoned.

Holly Springs formation

Original designation. Lowe (1914, p. 24).

Type locality. Vicinity of Holly Springs, Marshall County, Mississippi.

Original use. To designate sandstone sequence, interpreted as occurring in the middle of the Wilcox Group of Mississippi.

Subsequent use. Attaya (1951, p. 21) has indicated from work in Lafayette County, Mississippi, that the Holly Springs as defined by Lowe (1914) is equivalent to three formations, the Meridian, Tallahatta, and Kosiusko; rocks at type locality of Holly Springs interpreted as Tallahatta equivalents.

Present status. Stratigraphic position questioned; following data based on Lowe's (1914) original definition of formation.

Stratigraphic position. Overlies Ackerman Formation and underlies Grenada Formation.

Thickness. Approximately 350 feet.

Lithology. White to yellow, red, and purple, coarse-grained, cross-bedded sand and sandstone; few lenses of clay near middle part of formation.

Extent. Mississippi, western Tennessee, and Kentucky.

Fossil content. Nonfossiliferous except for plant fossils in clays of the middle part of formation; floral lists given in Lowe (1933, p. 76, 77).

Economic significance. Sandstone as building material and locally as a molding sand; ball clay in middle part of formation in northern Mississippi; aquifer.

HOOPER MEMBER

Original designation. Geologic map of northern Bastrop County by W. W. Sharp, Jr., in Stenzel (1953, p. 53).

Type locality. Apparently Hooper Bend on Colorado River, northwestern Bastrop County, Texas.

Original use. To designate a predominantly shale sequence between the Seguin Formation (below) and the Simsboro Member of the Rockdale Formation (above).

Present status. Name has never been properly proposed; original designation by Sharp (1951) in M. A. thesis; name with brief description used in abstract by Stenzel (1951); name appears on geologic map in Stenzel (1953).

Stratigraphic position. Overlies Seguin Formation and underlies Simsboro Member of Rockdale Formation.

Thickness. Approximately 325 feet.

Lithology. Glauconitic sands and lignitic shales.

Extent. Central part of Texas Coastal Plain.

Fossil content. Not known.

Economic significance. Contains few lignites and clays.

INDIO FORMATION

Original designation. Trowbridge (1923, p. 89–91).

Type locality. Exposures in vicinity of old Indio Ranch, Maverick and Dimmit counties, Texas.

Original use. Trowbridge (1923) judged the Wilcox Group to include 3 distinct formations; he designated the basal formation in southern Texas as Indio Formation.

Subsequent use. Used by different workers for rocks of Wilcox Group throughout most of Texas Coastal Plain except northeastern Texas.

Present status. Carrizo Sand and Bigford Formation placed with Indio Formation into Wilcox Group by Trowbridge (1923); the Carrizo and Bigford are now generally placed in the Claiborne Group, thus making the Indio Formation as proposed by Trowbridge the same as the Wilcox Group as now defined.

Stratigraphic position. Overlies Midway Group and underlies Carrizo Sand.

Thickness. 650 to 700 feet.

Lithology. Thin-bedded and laminated, argillaceous sand and arenaceous shale, and including some layers of massive clay and lenses of sandstone; few beds of lignite and many calcareous and sandy concretions.

Extent. Southern Texas and northeastern Mexico.

Fossil content. Few foraminifers, oysters, and fossil leaves; locally few other mollusks.

Economic significance. Lignites, some sandstone building stone, clays, and road metal.

KERENS MEMBER

Original designation. F. B. Plummer (1933, p. 559).

Type locality. Exposures along Trinity River, north of the St. Louis and Southwestern Railroad, east of Kerens, Navarro County, Texas; stations 16, 17, 19, 20, and 21 of H. J. Plummer (1926, p. 48–50).

Original use. Applied to upper two-thirds of Wills Point Formation.

Subsequent use. Member expanded by Gardner (1933, p. 22) to include Wortham lentil of F. B. Plummer (1933).

Stratigraphic position. Overlies Mexia Member of Wills Point Formation and underlies Seguin Formation of Wilcox Group.

Thickness. 300 to 500 feet.

Lithology. Dark gray, silty or sandy clay, with few rough-surface, boulder-like, calcareous concretions.

Extent. Coastal Plain of eastern Texas.

Fossil content. Arenaceous foraminifers, thick-shelled gastropods, and abundant pelecypods; fossils described by H. J. Plummer (1926) and Gardner (1933).

Economic significance. Some brick and tile clay.

KINCAID FORMATION

Original designation. Gardner (1933a, p. 744).

Type locality. Old Kincaid ranch (Lewis ranch) three-fourths mile above to one-fourth mile below Bob Evans' apiary, Uvalde County, Texas.

Original use. Used as formation to designate lower division of Midway Group in Texas.

Stratigraphic position. Overlies Cretaceous rocks (Navarro Formation) and underlies Wills Point Formation of Midway Group.

Thickness. Average of 150 feet.

Lithology. Glauconitic sands, soft gypsiferous clays, and hard indurated limestone lentils, with calcareous concretions.

Extent. Coastal Plain of Texas and part of Louisiana.

Fossil content. Abundant foraminifers and mollusks; described by H. J. Plummer (1926) and Gardner (1933); faunal lists in F. B. Plummer (1933, p. 547, 549, 550, and 551).

Economic significance. Crushed rock for building material, road ballast, and concrete from limestone lentils; greensand fertilizer; some clay deposits.

Lafayette Formation

Original designation. Hilgard (1891, p. 129–131).

Type area. Lafayette County, Mississippi.

Original use. Defined subsequently by McGee (1891).

Subsequent use. Discussed by Hilgard (1892) and defined by McGee (1891) to replace Orange Sand and noted to include Cretaceous, Eocene, and Pleistocene rocks; use generally discontinued after 1915 (Murray, 1955, p. 671).

Present status. Abandoned and obsolete.

Lagrange Group

Original designation. Safford (1864, p. 361, 369–370).

Type locality. Exposures at LaGrange, Fayette County, Tennessee.

Original use. Used as "Orange Sand or LaGrange Group" for strata in Tennessee, underlying Bluff lignite (Pliocene) and overlying Porters Creek Formation (Midway Group).

Subsequent use. Used variously as formation and subgroup.

Present status. Abandoned.

Lignitic (Group, Stage)

Original designation. Safford (1856, p. 162–163).

Original use. To designate sequence of sands and clays characterized by beds of lignite; used in a rock sense.

Subsequent use. Generally as a rock term but also as a time-rock term; in early reports (up to 1905) used variously to designate (1) Wilcox Group, (2) Wilcox and Midway groups, (3) Wilcox and part of Claiborne groups, (4) Claiborne Group, and (5) lower part of Claiborne Group (Murray, 1955, p. 674).

Present status. Discarded since 1905–1906 in preference to either of two geographic terms, Sabine or Wilcox.

Lignitic Phase of Wilcox

Original designation. Dumble (1920, p. 40).

Original use. To designate rocks now known to be part of both Wilcox and Claiborne groups.

Present status. Abandoned; never considered formally.

LIME HILL MEMBER

Original designation. Mentioned in Meagher & Aycock (1942, p. 12–16, personal communication, G. E. Murray); proposed by Murray & Thomas (1945, p. 57).

Type locality. Exposures on and near Lime Hill, along Louisiana Highway 180 in the SW ¼ of Sec. 23, T. 10 N., R. 11 W., 2.5 miles northeast of Pleasant Hill, northeastern Sabine Parish, Louisiana.

Original use. To designate upper phase of Logansport Formation.

Subsequent use. Raised to formation rank by Andersen (1960, p. 59) who placed part of Lime Hill of Murray & Thomas (1945) in the Converse Formation.

Stratigraphic position. As defined by Murray & Thomas (1945), underlies Loggy Bayou Member of Hall Summit Formation and overlies Cow Bayou Member of Logansport Formation.

Thickness. Maximum of 225 feet.

Lithology. Calcareous shales and silts; locally sandy.

Extent. West-central Louisiana.

Fossil content. Foraminifers, ostracodes, mollusks, and fossil leaves.

Economic significance. None known.

LITTIG MEMBER

Original designation. F. B. Plummer (1933, p. 536).

Type section. Roadcut 1.5 miles by road south-southwest of Littig on the south side of Wilbarger Creek, eastern Travis County, Texas; station 61 of H. J. Plummer (1926, p. 58).

Original use. To designate basal glauconitic sand of the Midway Group *in* parts of Texas; basal member of Kincaid Formation.

Stratigraphic position. Overlies Navarro Formation (Cretaceous) and underlies Pisgah Member of Kincaid Formation.

LITTIG MEMBER — (Cont'd.)

Thickness. 8 inches to 15 feet.

Lithology. Green-black calcareous glauconite that weathers yellow-green or buff, containing phosphate nodules and calcareous concretions.

Extent. Coastal Plain of eastern Texas.

Fossil content. Abundant foraminifers and mollusks; described in H. J. Plummer (1926) and Gardner (1933).

Economic significance. Greensand fertilizer; local aquifer.

logansport formation

Original designation. Murray (1941, p. 941–942, abstract); discussed by Murray & Thomas (1945, p. 57–58).

Type locality. Low bank on eastern side of Sabine River just above bridge at Logansport, DeSoto Parish, Louisiana.

Original use. To designate middle formation of Midway Group in Louisiana, as defined by Murray & Thomas (1945).

Subsequent use. Discarded by Andersen (1960) as name was shown by Wilson et al. (1957) to be preoccupied; Andersen raised members within Murray's Logansport to formational rank.

Present status. Questioned; name preoccupied.

Stratigraphic position. Underlies Hall Summit Formation and overlies Naborton Formation; includes Lime Hill, Cow Bayou, and Dolet Hills members.

Thickness. 300 to 400 feet.

Lithology. Cyclic sequence with basal massive to broken sandstone, middle lignitic and carbonaceous shales, and upper calcareous silts and shales.

Extent. Louisiana and parts of eastern Texas.

Fossil content. Foraminifers and mollusks; faunal lists given in Barry & LeBlanc (1942, p. 15, 16, 17, and 18).

Economic significance. Brick clay; road metal; few lignites of possible value.

LOGGY BAYOU MEMBER

Original designation. Mentioned in Meagher & Aycock (1942, p. 12–16, personal communication, G. E. Murray); proposed by Murray & Thomas (1945, p. 59).

Type locality. Exposures at and in the vicinity of Yellow Bluff, NW ¼, Sec 8 and SW ¼, Sec. 5, T. 14 N., R. 10 W., near the junction of Love Lake and Loggy Bayou, Red River Parish, Louisiana.

Original use. To designate basal member of Hall Summit Formation.

Present status. Depends on classification of Hall Summit Formation.

Stratigraphic position. Underlies Grand Bayou Member of Hall Summit Formation and overlies Logansport Formation.

Thickness. 20 to 60 feet.

Lithology. Massive to broken sands with subordinate amounts of sandy shale and clay-ball conglomerates.

Extent. Area of Sabine Uplift in Louisiana and Texas.

Fossil content. None known.

Economic significance. Road metal.

LONE OAK LENTIL

Original designation. F. B. Plummer (1933, p. 539).

Type section. Lone Oak quarry west of Lone Oak, Hunt County, Texas.

Original use. Basal limestone lentil in Pisgah Member of Kincaid Formation.

Subsequent use. Not used by Gardner (1933, p. 22); following data based on F. B. Plummer's original (1933) use of term.

Stratigraphic position. Basal limestone lentil in Pisgah Member, Kincaid Formation, Midway Group.

Thickness. Not known, probably thin (less than 10 feet).

Lithology. Impure, oolitic limestone.

Extent. Vicinity of Lone Oak, Hunt County, Texas.

Fossil content. Reported as "few fossils" by F. B. Plummer (1933, p. 539).

Economic significance. Local use as crushed stone.

losoya creek conglomerate

Original designation. F. B. Plummer (1933, p. 575, 602).

Type section. Losoya Creek, at bridge on the South Flores road south of San Antonio, Bexar County, Texas.

Original use. To designate a 1-foot bed of "wave-worn beach pebbles and marine shells," representing a basal conglomerate of the Sabinetown Formation.

Present status. Not used subsequent to F. B. Plummer (1933); apparently known from type locality only.

LULA FACIES

Original designation. Murray (1948, p. 112).

Type locality. Exposures in roadcuts and gullies in W ½, Sec. 11, T. 10 N., R. 14 W., along State Highway 747 from half a mile to 1.5 miles north of the village of Lula, DeSoto Parish, Louisiana.

Original use. To designate upper part or facies of Cow Bayou Member, Logansport Formation.

Present status. Informal rock unit.

Stratigraphic position. Underlies Lime Hill Member and overlies Benson facies of Cow Bayou Member of Logansport Formation.

LULA FACIES — (Cont'd.)

Thickness. 40 to 75 feet.

Lithology. Gray to brown, thin-bedded, micaceous, fine-grained, argillaceous sands and silts with numerous limonitic sand laminae and disc-shaped, limonitic concretions.

Extent. Area between Benson and Lula, DeSoto Parish, Louisiana.

Fossil content. Leaves and plant fragments.

Economic significance. Possibly a local source of road metal.

Lytton Formation

Original designation. Hill & Vaughan (1902, p. 6).

Type locality. Exposures in vicinity of Lytton Springs, Caldwell County, Texas.

Original use. To designate lowest formation of Tertiary age in the Austin Quadrangle, Texas.

Present status. Abandoned; no known use of term since Hill & Vaughan (1902); essentially the same as rocks now assigned to the Midway Group.

MANSFIELD GROUP

Original designation. Hilgard (1869, p. 340–341).

Type locality. Outcrops in vicinity of Mansfield, DeSoto Parish, Louisiana.

Original use. As a distinct group within the Lignitic (Wilcox).

Subsequent use. Some subsequent dispute occurred as to the stratigraphic position of rocks included within the Mansfield, and it was determined that the group as proposed by Hilgard included strata now known as Wilcox, Claiborne, and Jackson groups; name revived by Howe & Garrett (1934) and Durham & Smith (1958) as a subgroup to include those rocks of Louisiana with a Wilcox Lithology but with a Midway fauna; as used by these writers, a rock term (subgroup) is defined both on a rock (lower boundary) and a time (upper boundary) basis.

Present status. No general acceptance or rejection of term.

MARTHAVILLE FORMATION

Original designation. Used in general sense by several workers including Blanpied & Hazzard (1939, p. 128); mentioned by Meagher & Aycock (1942, p. 12); used and defined by Barry & LeBlanc (1942, p. 21, citing unpublished report of G. E. Murray on file at Louisiana Geological Survey); defined by Murray & Thomas (1945, p. 60); first valid use as formation with notation of type locality in Barry & LeBlanc (1942, p. 21).

Type locality. Exposures in vicinity of Marthaville, northwestern Natchitoches Parish, Louisiana.

Original use. To designate sequence occurring between Pendleton Formation (above) and Hall Summit Formation (below); occurs near middle of Wilcox Group in Louisiana.

Stratigraphic position. Overlies Hall Summit Formation and underlies Pendleton Formation.

Thickness. Approximately 300 feet.

Lithology. Lower unit of predominantly sandstone, middle unit of lignitic shale, and upper unit of calcareous silt and clay; glauconitic lentils present in both upper and lower units.

Extent. Sabine Uplift area of Louisiana and Texas.

Fossil content. Corals, mollusks, and ostracodes; faunal list and descriptions given by Barry & LeBlanc (1942); characterized by **Ostrea thirsae** and **Ostrea multilirata.**

Economic significance. Residual ironstone concretions and oysters used as road metal.

MATTHEWS LANDING MEMBER

Original designation. Smith (1886, p. 13).

Type locality. Exposures at Matthews Landing, on Alabama River, Wilcox County, Alabama; N ½, Sec. 12, T. 12 N., R. 6 E.

Original use. Used by Smith (1886) and Smith & Johnson (1887, p. 57–60) as "Naheola and Matthews Landing Series"; both Naheola and Matthews Landing applied to marl bed now considered as Matthews Landing Member; considered as basal part of Naheola Formation.

Subsequent use. Generally considered as a basal member of Naheola Formation; Toulmin (1944), on lithologic grounds, considered Matthews Landing as an upper member of Porters Creek Formation.

Present status. Generally that of Toulmin (1944); an upper member of the Porters Creek Formation.

Stratigraphic position. Uppermost part of Porters Creek Formation, which overlies the Clayton Formation and underlies the Naheola Formation.

Thickness. 6 to 20 feet; thins westward in Alabama.

Lithology. Gray to green-brown, fossiliferous, glauconitic, sandy clay, sand, and silt; contains large, flat, broad, calcareous sandstone concretions.

Extent. Southwestern Alabama and eastern Mississippi.

Fossil content. Foraminifers and mollusks; faunal lists given in LaMoreaux & Toulmin (1959, p. 59–61).

Economic significance. None known, except possible utilization of glauconite.

McBRYDE MEMBER

Original designation. MacNeil (1946, p. 7).

Type locality. Roadcuts along Alabama Highway 21, Secs. 28 and 33, T. 12 N., R. 10 E., about 3 miles west of McBryde Station, Wilcox County, Alabama.

Original use. To designate upper member of Clayton Formation; unit formerly known as the **Nautilus** rock.

Stratigraphic position. Underlies Porters Creek Formation and overlies Pine Barren Member of Clayton Formation.

Thickness. Approximately 50 feet.

Lithology. Light gray to white, massive, fine-grained, sandy to silty, argillaceous chalk with indurated layers; becomes more clayey and intertongues with lower part of the Porters Creek Formation west of type locality in Alabama.

Extent. Southwestern Alabama.

Fossil content. Abundant specimens of **Hercoglossa ulrichi;** few bryozoans and one oyster; abundant foraminifers; faunal lists given by LaMoreaux & Toulmin (1959, p. 41, 42, 43, and 44).

Economic significance. None known.

McKay Marl Bed

Original designation Not known; apparently first used in reference to a fossil locality by Lowe (1933, p. 103–105).

Type locality. McKay's property; excavation in face of bluffs on east side of Souwashee Creek, 3 miles southwest of Meridian, Louderdale County, Mississippi (Lowe, 1933).

Present status. Generally abandoned; never with any formal status; probably represents extension of Bashi Member of Hatchetigbee Formation into Mississippi. According to Lowe (1933, p. 104), C. W. Cooke and E. N. Lowe in 1912 and Lowe in 1914 were unable to locate the McKay locality.

Stratigraphic position. Probably represents a part of Bashi Member of Hatchetigbee Formation.

MEXIA MEMBER

Original designation. F. B. Plummer (1933, p. 559).

Type locality. Clay pit at the brick yard in west edge of Mexia, Limestone County, Texas.

Original use. To designate basal member of Wills Point Formation.

Stratigraphic position. Lower part of Wills Point Formation, which overlies Kincaid Formation and underlies Wilcox Group (Seguin Formation).

Thickness. 50 to 75 feet.

Lithology. Dark, thin-bedded or compact, fossiliferous clays with a thin, glauconitic sand at base.

Extent. Coastal Plain of northeastern Texas.

Fossil content. Abundant mollusks and foraminifers; described by H. J. Plummer (1926) and Gardner (1933).

Economic significance. Primarily brick clay.

Middleton Formation

Original designation. Safford (1892, p. 511–512).

Type locality. Exposures at and in the vicinity of Middleton, Hardeman County, Tennessee.

Original use. To designate a 400- to 500-foot sequence of laminated sands and shales occurring between the Ripley Formation below and the Porters Creek Formation above; essentially equivalent to the Clayton Formation of modern usage.

Subsequent use. Safford & Killebrew (1900, p. 104, 158, 159) described same unit as above but indicated it was equivalent in part to the Clayton, Porters Creek, and Ripley formations; as thus defined, the Middleton was essentially equivalent to the Midway Group of modern usage.

Present status. Abandoned.

MIDWAY GROUP

Original designation. Smith (1886, p. 14); used as "Pine Barren or Midway section."

Type locality. West bank of Alabama River, Midway Landing, about 4 miles below Prairie Bluff Landing, Wilcox County, Alabama.

Original use. In original use as well as most early use, Midway was applied to basal rocks of the Tertiary section that are now generally known as the Clayton Formation.

Subsequent use. Based on paleontologic studies, Harris (1894) expanded the Midway to include all rocks underlying the Wilcox (Lignitic) and overlying the Cretaceous; employed as a stage by Harris; expanded use of Midway generally followed since Harris (1894) but used indiscriminantly as a rock and time-rock term; as a rock term it includes the Porters Creek and Clayton formations and equivalent rocks; as a time-rock term it includes an additional sequence of rocks mainly of Wilcox lithology but with Midway (Paleocene) fossils.

Present status. Used as a rock and time-rock term; suggest restriction of use to rock term.

Stratigraphic position. Overlies Cretaceous rocks and underlies Wilcox Group.

Thickness. In outcrop approximately 500 feet; varies regionally.

Lithology. See entries under various formations and members included within the Midway Group.

Extent. Throughout Gulf Coastal Plain and lower part of Mississippi Valley.

Fossil content. Abundant marine fossils; see entries under subdivisions of Midway Group.

Economic significance. See entries under subdivisions of Midway Group.

Monterey

Original designation. Langdon (1891, p. 587–605).
Type locality. Not designated.
Original use. On columnar section to designate limestones between the Ripley Formation and the Lignitic (Wilcox Group); as used, was equivalent to what is now known as Midway Group.
Present status. Abandoned; apparently not used subsequent to Langdon (1891).

Myriek Formation

Original designation. Vaughon (1900, p. 2).
Type locality. Myrick's lower apiary, Frio River, Uvalde County, Texas.
Original use. To designate rocks now assigned to the Midway, Wilcox, and part of the Claiborne groups.
Present status. Abandoned and obsolete.

NABORTON FORMATION

Original designation. First valid designation by Murray & Thomas (1945, p. 56); described in Murray (1942); mentioned in Meagher & Aycock (1942, p. 13) and Barry & LeBlanc (1942, p. 13).
Type locality. Exposures along local road between Louisiana Highway 9 and Bethlehem Church (between Naborton and Goss), Secs. 3 and 4, T. 12 N., R. 12 W., eastern part of DeSoto Parish, Louisiana.
Original use. To designate formation occupying the middle part of the Midway Group of Louisiana.
Stratigraphic position. Underlies Logansport Formation and overlies Porters Creek Formation.
Thickness. Maximum of 200 feet.
Lithology. Calcareous Siltstone and shale; includes Chemard Lake lentil at top.
Fossil content. Abundant fossil leaves.
Economic significance. None known except lignite lentil at top of formation.

NAHEOLA FORMATION

Original designation. Smith (1886, p. 13).
Type locality. Naheola Landing, settlement on Tombigbee River, Choctaw County, Alabama; SE ¼, Sec. 30, T. 15 N., R. 1 E.
Original use. To designate rocks occurring between the Nanafalia series above and the Black Bluff series (Porters Creek Formation) below; used as "Naheola and Matthews Landing series;" in same report Naheola also applied to a basal marl now known as Matthews Landing Member of the Porters Creek Formation.
Subsequent use. Cooke (1933, p. 192–195) restricted the overlying Nanafalia Formation, excluded a lower member (lower division of Smith & Johnson, 1887; Coal Bluff beds of Brantly, 1920), and assigned the member to the Ackerman Formation; Toulmin (1944) and LaMoreaux & Toulmin (1959, p. 96) designated the member of the Nanafalia assigned to the Ackerman by Cooke (1933) as the Coal Bluff Member of the Naheola; LaMoreaux & Toulmin (1959) designated a lower member of the Naheola as the Oak Hill Member and placed the basal marl member (Matthews Landing Member) in the Porters Creek Formation.
Present status. Generally that as outlined by LaMoreaux & Toulmin (1959).
Stratigraphic position. Overlies Porters Creek Formation and underlies Nanafalia Formation.
Thickness. 80 to 120 feet.
Lithology. Lower unit contains very fine-grained sand, micaceous silt, and gray, laminated, carbonaceous clay with lignite at top; upper unit contains light-colored, sparsely glauconitic, micaceous, fine- to medium-grained sand and thin layers of silt and clay.
Extent. Southern Alabama.
Fossil content. See entries under Coal Bluff Member and Oak Hill Member.
Economic significance. None known, other than local aquifer.

NANAFALIA FORMATION

Original designation. Smith (1883, p. 318–321).
Type locality. Nanafalia Landing on Tombigbee River, Marengo County, Alabama; SE ¼, Sec. 31, T. 14 N., R. 1 E.
Original use. To designate a unit now known as the **Ostrea thirsae** Beds of the Nanafalia Formation.
Subsequent use. Used by Smith (1886, p. 12) and Smith & Johnson (1887, p. 51–57) as "Nanafalia and Coal Bluff section;" later considered as a formation and redefined by Cooke (1933, p. 192–195) and LaMoreaux & Toulmin (1959, p. 96); for the last two uses, see entry under Naheola Formation.
Present status. Used as a formation including a basal sand member (Gravel Creek), a middle member (**Ostrea thirsae** Beds), and an upper member (Grampian Hills), following LaMoreaux & Toulmin (1959).
Stratigraphic position. Overlies Naheola Formation and underlies Tuscahoma Formation.
Thickness. 140 to 250 feet.
Lithology. See lithology under following entries; Gravel Creek Member, **Ostrea thirsae** Beds, and Grampian Hills Member.
Extent. Southern Alabama.
Fossil content. See entries under members noted above.
Economic significance. Not known.

Nautilus Rock

Original designation. Smith et al. (1894, p. 192–198).

Original use. To designate a limestone in the lower part of the Midway Group; unit now known as the McBryde Member of the Clayton Formation; characterized by the nautiloid cephalopod **Hereoglossa ulrichi.**

Present status. Abandoned in any formal sense.

Noxubee Sand

Original designation. Mellen (1950, p. 10).

Original use. Intended to designate a basal sand unit of the Ackerman Formation: "For this basal sand the writer reserved the name Noxubee with Miss Wilmarth, Secretary to the Committee on Geologic Names of the U. S. Geological Survey; the name was not used because of the decision against naming members until the larger subdivisions were more widely recognized." Mellen (1950, p. 10–11).

Present status. Never proposed subsequently.

OAK HILL MEMBER

Nomenclator. Smith et al. (1894, p. 188).

First valid designation. Toulmin et al. (1951, p. 42).

Type locality. Roadcuts near Oakhill Post Office, Wilcox County, Alabama (designated by Toulmin et al., 1951).

Original use of name. As "Oak Hill-Pine Barren group" to designate rocks now considered as the Midway Group.

Subsequent use. Name revived by Toulmin et al. (1951) to designate basal member of the Naheola Formation in Alabama; MacNeil (1946) had previously considered this unit as the Fearn Springs Member correlating it with that unit in Mississippi.

Present status. As outlined by Toulmin et al. (1951); following data based on their definition.

Stratigraphic position. Overlies Matthews Landing Member of the Porters Creek Formation and underlies Coal Bluff Member of the Naheola Formation.

Thickness. 100 to 125 feet, thins eastward in Alabama.

Lithology. Predominantly gray, laminated, carbonaceous clay, very fine-grained sand, and micaceous silt; some cross-bedded sand; local round sandstone concretions several feet in diameter; lignite at top of member.

Extent. Southwestern Alabama.

Fossil content. Nonfossiliferous except for a 6-inch bed of oysters near the top of the member.

Economic significance. Lignite; local aquifer.

Orange Sand

Original designation. Safford (1856, p. 162).

Original use. Introduced to include rocks in Tennessee now known to be both Cretaceous and Tertiary.

Subsequent use. Used in several early reports and applied to a variety of bright-colored sands of the Coastal Plain; restricted by Safford (1864) as "Orange sand or LaGrange group" to include rocks now known as Wilcox, Claiborne, and Jackson.

Present status. Abandoned and obsolete.

OSTREA THIRSAE BEDS

Original designation. Smith & Johnson (1887, p. 51).

Original use. To designate a middle division of the Nanafalia Formation characterized by an abundance of **Ostrea thirsae.**

Present status. Used in much the original sense; informal.

Stratigraphic position. Overlies Gravel Creek Member and underlies Grampian Hills Member of the Nanafalia Formation.

Thickness. 70 to 80 feet.

Lithology. Medium-grained, glauconitic sand, clayey Siltstone, calcareous sand, and sandy shell marl; pinches out to west in Alabama and interfingers with nonfossiliferous, cross-bedded sandstone.

Extent. Southern Alabama; generally judged equivalent of Marthaville Formation of Louisiana and Caldwell Knob Member of Seguin Formation of Texas.

Fossil content. In addition to large numbers of **Ostrea thirsae**, unit contains abundant foraminifers and ostracodes, and at some localities (e. g., Nanafalia Landing, Marengo County, Alabama) several mollusks.

Economic significance. Not known.

PEARSON MEMBER

Original designation. Wasem & Wilbert (1943, p. 182, in footnote; spelled Pierson).

Type locality. Outcrops near the railway station of Pearson, just north of Natchitoches, Natchitoches Parish, Louisiana.

Original use. Lower division of Sabinetown faunal unit.

Present status. Generally considered a member of Sabinetown Formation.

Stratigraphic position. Basal part of Sabinetown Formation which overlies Pendleton Formation and underlies Carrizo Sand.

Thickness. 30 feet.

PEARSON MEMBER — (Cont'd)

Lithology. Fossiliferous, locally calcareous and indurated, glauconitic sand with shale and clay, some concretionary siderite.

Extent. Sabine Uplift area of Louisiana and Texas.

Fossil content. Predominantly molluscan, discussed in Barry & LeBlanc (1942).

Economic significance. Local use as road metal.

PENDLETON FORMATION

Original designation. Wasem & Wilbert (1943, p. 182).

Type locality. Pendleton Bluff, west side of Sabine River, ¼ mile upstream from Pendleton Bridge on Louisiana Highway 6, Sabine County, Texas.

Original use. Used as a faunal unit within the Wilcox Group by Claypool (1933), Barry (1941), and Barry & LeBlanc (1942), elevated to formation by Wasem & Wilbert to include all strata above the Marthaville Formation and below the Pearson Member of the Sabinetown Formation.

Present status. Essentially that of Wasem & Wilbert (1943), Andersen (1960) suggested certain modifications in the concept of the formation but was not specific except to indicate a somewhat greater thickness.

Stratigraphic position. Overlies Marthaville Formation and underlies Sabinetown Formation.

Thickness. 275 to 300 feet (Wasem & Wilbert, 1943), up to 975 feet in subsurface (Andersen, 1960).

Lithology. Glauconitic sands, lignitic clays and silts, calcareous concretions, lignite.

Extent. Sabine Uplift area of Texas and Louisiana.

Fossil content. Large and diverse including mollusks, foraminifers, ostracodes, corals, and echinoids (Harris, 1897, 1899, Claypool, 1933, Howe & Garrett, 1934, Barry & LeBlanc, 1942, Wasem & Wilbert, 1943).

Economic significance. Lignite, local use for road metal, aquifer.

Pendleton Ferry Formation

Original suggestion. Murray & Thomas (1945, p. 56, footnote).

Original use. "The term Pendleton is preoccupied by the Pendleton Sandstone of the middle Devonian of Indiana If, in the future, it is considered advisable to abandon the Tertiary name Pendleton, the writers would suggest its change to Pendleton Ferry, since the type locality is the old Pendleton Ferry Landing" (Murray & Thomas, 1945, p. 56).

Present status. Suggestion of Murray & Thomas (1945) not proposed formally in subsequent reports.

PINE BARREN MEMBER

Original designation. Smith (1886, p. 14).

Original use. As "Midway or Pine Barren section" to designate strata now included in the Clayton Formation.

Subsequent use. Designated a member by LaMoreaux & Toulmin (1959, p. 36) for strata comprising the lower part of the Clayton Formation, includes in the upper part the **Turritella** rock of Smith et al (1894, p. 193–198), in original use of name by Smith (1886), Pine Barren generally dropped in favor of Midway.

Present use. As outlined by LaMoreaux & Toulmin (1959).

Type locality. (Designated by LaMoreaux & Toulmin, 1959) Pine Barren Creek and in roadcuts on the south side of the creek along Alabama Highway 21 to the southern junction with Alabama Highway 28, locality on Pine Barren Creek is former site of Palmers Mill, Wilcox County, Alabama.

Stratigraphic position. Overlies Prairie Bluff Chalk (Cretaceous) and underlies McBryde Member of Clayton Formation.

Thickness. Maximum of 170 feet.

Lithology. Light gray, calcareous silt, coarse-grained, glauconitic sand, crystalline, fossiliferous limestone.

Extent. Southwestern Alabama.

Fossil content. Mollusks (especially oysters), foraminifers, shark teeth, faunal lists in LaMoreaux & Toulmm (1959, p. 40–41).

Economic significance. Local use as road metal and aquifer.

PISGAH MEMBER

Original designation. F. B. Plummer (1933, p. 536).

Type locality. Exposures on Pisgah Ridge, Navarro County, Texas, on road between Richland and Wortham, 6 miles north of the Limestone County line.

Original use. Upper member of Kincaid Formation, including Tehuacana, Rocky Cedar Creek, and Lone Oak limestone lentils.

Subsequent use. Restricted by Gardner (1933, p. 22) to exclude Tehuacana lentil.

Stratigraphic position. Underlies Tehuacana Member of Gardner (1933) and overlies Littig Member of Kincaid Formation.

Thickness. Maximum of 115 feet.

Lithology. Clay, glauconitic clay, and glauconitic sand containing lentils of limestone.

Extent. Coastal Plain of Texas.

Fossil content. Mollusks, foraminifers, corals (H. J. Plummer, 1926, Gardner, 1933).

Economic significance. Primarily crushed rock for building material, road metal, and concrete from limestone lentils.

PORTERS CREEK FORMATION

Original designation. Safford (1864, p. 360–372).

Type locality. Exposures along Porters Creek west of Middleton, Hardeman County, Tennessee.

Original use. Used as a group for lower Tertiary rocks of Tennessee.

Subsequent use. Generally restricted to upper clay sequence of Midway Group; gradually replaced Sucarnoochee Clay as a name; applied in wide areas of the central and eastern Gulf Coastal Plain.

Present status. Upper formation of Midway Group.

Stratigraphic position. Overlies Clayton Formation and underlies Naheola and equivalent formations.

Thickness. 20 to 60 feet.

Lithology. Variable but predominantly a clay, silty to limy.

Extent. Western Tennessee, western Kentucky, southwestern Illinois, southeastern Missouri, Arkansas, eastern Mississippi, southwestern Alabama.

Fossil content. Mollusks and foraminifers, especially in southern part of outcrop; faunal lists in LaMoreaux & Toulmin (1959, p. 59, 60, 61, 62).

Economic significance. Brick clay; bentonites in Mississippi.

Pseudobuhrstone Beds

Original designation. Smith & Johnson (1887, p. 51).

Original use. Lithologic term applied to upper 40 feet of Nanafalia Formation.

Subsequent use. Unit designated Grampian Hills Member of Nanafalia Formation by Blanpied & Hazzard (1939).

Present status. Abandoned in any formal sense.

ROCKDALE FORMATION

Original designation. F. B. Plummer (1933, p. 583).

Type locality. Exposures in vicinity of Rockdale, central part of Milam County, Texas.

Original use. To designate all nonmarine strata, comprising most of the Wilcox Group in Texas.

Subsequent use. Stenzel (1951, 1953) has suppressed the term Rockdale as a formation by elevating members within the Rockdale to formation rank; subsequent data based on F. B. Plummer's (1933) definition of Rockdale.

Stratigraphic position. Overlies Seguin Formation and underlies Sabinetown Formation (where present).

Thickness. 300 to 1,000 feet in outcrop.

Lithology. Sandy clay, sand, siliceous clay, lignite, and sandstone concretions.

Extent. Coastal Plain of Texas.

Fossil content. Mostly plant fossils (Berry, 1930).

Economic significance. Clay products, lignite, road metal, possible glass sands.

ROCKY CEDAR CREEK LENTIL

Original designation. Harris (1896, p. 155).

Type locality. Ola quarry 1 mile south of Ola and along Rocky Cedar Creek between Ola and Wills Point, Kaufman County, Texas (noted by F. B. Plummer, 1933).

Original use. To designate limestone lentil in lower part of Midway Group in northeastern Texas.

Subsequent use. Employed by F. B. Plummer (1933, p. 539) as a middle limestone lentil in the Pisgah Member of Kincaid Formation; used by Gardner (1933) to designate upper limestone lentil of Pisgah Member of Kincaid Formation.

Stratigraphic position. Lentil within Pisgah Member of Kincaid Formation; overlies Littig Member of Kincaid Formation and underlies Wills Point Formation.

Thickness. Thin, but exact thickness not known.

Lithology. Coquinoid, oolitic, compact, indurated marl.

Extent. Locally in Kaufman County, Texas.

Fossil content. Few mollusks, especially **Turritella mortoni.**

Economic significance. Crushed rock.

ROSETTE BED

Original designation. Cuyler & Weeks (1940, p. 24).

Type locality. None designated; roadcut exposures noted by Cuyler & Weeks (1940, p. 24) on State Highway 29, 6.8 miles south of Mendoza, Caldwell County, Texas.

Previous use. Same unit previously designated as Wortham aragonite lentil by F. B. Plummer (1933, p. 559).

Present status. Informal.

Rutledge Limestone

Original designation. Smith (1892).

Type locality. Not definitely known; probably exposures at Rutledge, Crenshaw County, Alabama.

Original use. Used as "Clayton or Rutledge limestone."

Present status. Abandoned in favor of Clayton Formation, an earlier and established name.

Sabine (stage, group)

Original designation. Veatch (1905, p. 84–85).

Type area. Sabine Uplift and Sabine River. Louisiana and Texas.

Sabine (stage, group) — (Cont'd.)

Original use. Introduced as a substitute for the lithologic term Lignitic.

Subsequent use. Used by Veatch (1906) but generally abandoned in favor of term Wilcox which was introduced in 1906; although Wilcox was used much more than the term Sabine, Howe (1933) judged that on the basis of priority and the fact that the Louisiana section (Sabine Uplift) contains in its lower part a 1,300-foot sequence not present in the Alabama section, the term Sabine should be used in preference to the term Wilcox; Howe & Garrett (1934) employed Sabine as a group name to include the Wilcox and Mansfield subgroups; Barry & LeBlanc (1942) used Sabine as a group equivalent to Howe & Garrett's Wilcox subgroup; Murray (1953, 1955) used Sabine as a stage, the time-rock equivalent of the Wilcox subgroup of Howe & Garrett and the Sabine Group of Barry & LeBlanc; further use of Sabine mostly by Louisiana geologists.

Present status. Term generally replaced by Wilcox; might be retained as a time-rock term as employed by Murray (1953, 1955).

Sabine Phase of Wilcox

Original designation. Dumble (1920, p. 45).

Original use. Not specific; used as a general term.

Present status. Abandoned; never considered formally; beds to which Dumble referred now known to be a part of the Claiborne Group.

Sabine River Beds

Original designation. Penrose (1890, p. xxxvi, 17, 22).

Original use. Used as "Timber Belt or Sabine River beds" to designate rocks now assigned to the Wilcox and part of the Claiborne groups.

Subsequent use. Not used subsequently in any formal designation or assignment; usage of Penrose has been cited by some workers in discussing the Sabine and Wilcox controversy (see entries under Sabine and Wilcox) as invalidating name Sabine. According to Howe (1933), who favored use of Sabine for rocks generally known as Wilcox Group, Penrose had no intention to name a rock unit and hence the name Sabine is available.

Present status. Abandoned; apparently never considered as a formal unit.

SABINETOWN FORMATION

Original designation. F. B. Plummer (1933, p. 602).

Type locality. Sabine Bluff on Sabine River, ¼ mile below old ferry landing, Sabine County, Texas.

Original use. To designate uppermost, marine part of Wilcox Group in western part of the Gulf Coastal Plain.

Subsequent use. Pendleton and Sabinetown faunas noted to be distinct by several writers, including Murray & Thomas (1945, p. 63). The Pendleton beds (included in the Sabinetown by F. B. Plummer, 1933) generally are correlated with the Tuscahoma of Alabama, and the Sabinetown beds are correlated with the Bashi Member of the Hatchetigbee Formation.

Present use. In restricted sense, excluding beds of the Pendleton Formation.

Stratigraphic position. Overlies Rockdale Formation (Texas) or Pendleton Formation (Louisiana) and underlies Carrizo Formation.

Thickness. Variable owing either to erosion or nondeposition; average 50 feet.

Lithology. Siltstone and clay, locally sandy, glauconitic, or lignitic.

Extent. Coastal Plain of Texas and Sabine Uplift area of Louisiana and Texas.

Fossil content. Abundant mollusks; faunal lists given in F. B. Plummer (1933, p. 605), Harris (1899), and Barry & LeBlanc (1942).

Economic significance. None known.

SALT MOUNTAIN LIMESTONE

Original designation. Langdon (1891, p. 599).

Type locality. Salt Mountain, 6.0 miles south of Jackson, on County Road 15, Clarke County, Alabama.

Original use. Applied to Coral Limestone of Smith & Johnson (1887); judged to be a part of the Vicksburg.

Subsequent use. True stratigraphic position determined and placed in Wilcox Group by Crider et al. (1932, p. 9).

Stratigraphic position. Underlies Tuscahoma Formation and overlies Nanafalia Formation; lower part of Wilcox Group.

Thickness. 90 feet.

Lithology. Hard, white, crystalline limestone forming irregular ledges, 2 to 8 feet thick, with beds or lenses of soft, white limestone.

Extent. Known in outcrop only from type locality.

Fossil content. Reef-building corals, spines and plates of echinoderms, bryozoans, foraminifers, and ostracodes (Toulmin, 1940).

Economic significance. Outcrop too restricted.

Seco Formation

Original designation. Liddle (1921, p. 85).

Type locality. Seco Creek, 3 miles southwest of Yancey, Medina County, Texas.

Original use. Proposed for upper 100 feet of Wilcox Group in Medina County, Texas.

Present status. Abandoned.

SEGUIN FORMATION

Original designation. F. B. Plummer (1933, p. 574).

Type locality. Banks of Moss Branch, 10 miles northwest of Bastrop, and approximately 1 mile north of old Caldwell village, Bastrop County, Texas.

Original use. To designate locally fossiliferous silty clays and Siltstones occurring between the Rockdale Formation (above) and the Midway Group (below).

Subsequent use. Formation apparently suppressed by Beckman & Turner (1943) as they have (Fig. 5, p. 620) redefined the members of the Seguin Formation (originally defined by F. B. Plummer, 1933), assigning the lower member (Solomon Creek) to the Wills Point Formation and the upper member (Caldwell Knob Member) to the Rockdale Formation; in both title and text of their paper, however, Beckman & Turner consistently referred to the Solomon Creek and Caldwell Knob members of the Seguin Formation.

Present use. Suggest use of Seguin Formation in original sense, regardless whether it is placed in Paleocene or Eocene.

Stratigraphic position. Overlies Wills Point Formation and underlies Rockdale Formation; lowest formation of Wilcox Group in Texas.

Lithology. Upper member an oyster biostrome; lower member, fine-grained sandstone, Siltstone, and clay, locally lignitic or carbonaceous, and large concretions of hard calcareous sand (unit commonly referred to as the three-boulder bed).

Extent. Central and southern Coastal Plain of Texas.

Fossil content. Mollusks and echinoids; faunal lists given in F. B. Plummer (1933, p. 581) and Beckman & Turner (1943).

Economic significance. None noteworthy; local use of calcareous concretions as road metal.

SIMSBORO MEMBER

Nomenclator. W. A. Reiter, personal communication to F. B. Plummer.

Original designation. F. B. Plummer (1933, p. 586).

Type area. Exposures in vicinity of Simsboro, Freestone County, Texas.

Original use. To designate sequence of predominantly fine- to medium-grained sand occurring in the middle part of the Rockdale Formation.

Subsequent use. Considered a formation by Stenzel (1951, 1953).

Stratigraphic position. Overlies Hopper Member and underlies Calvert Bluff Member of Rockdale Formation.

Thickness. 250 to 300 feet.

Lithology. Gray, soft sand containing fossil wood, lumps of water-rolled clay, seams and lentils of blue-gray clay; locally lignitic; commonly cross-bedded; fine- to medium-grained.

Extent. Central part of Texas Coastal Plain from Uvalde to Freestone counties.

Fossil content. Few poorly preserved plant fossils.

Economic significance. Local use as road metal; possible use as glass sand.

SLAUGHTER CREEK MEMBER

Original designation. Wasem & Wilbert (1943, p. 186).

Type locality. Banks of Slaughter Creek near headwaters of stream in southwestern corner of Sec. 26, T. 6 N., R. 13 W., Sabine Parish, Louisiana.

Original use. To designate middle member of Pendleton Formation.

Stratigraphic position. Underlies High Bluff and overlies Bayou Lenann members of Pendleton Formation.

Thickness. 60 feet.

Lithology. Fossiliferous, glauconitic sand with pipe-like limonitic nodules, grading upward into fossiliferous clays with glauconitic sand lentils near the top; local lenses of lignite.

Extent. Sabine Uplift area of Louisiana.

Fossil content. Mostly mollusks and ostracodes.

Economic significance. Persistent lignite seam about 30 feet below the top of the member.

SOLOMON CREEK MEMBER

Original designation. F. B. Plummer (1933, p. 577).

Type locality. Solomon Creek, 6 miles southwest of Elgin, Bastrop County, Texas.

Original use. To designate marine strata in lowest part of Wilcox Group in Texas, occurring between the Caldwell Knob Member and overlying the Wills Point Formation.

Subsequent use. Member restricted and assigned to the Wills Point Formation (Midway Group) by Beckman & Turner (1943); subsequent data following F. B. Plummer (1933).

Stratigraphic position. Overlies Wills Point Formation and underlies Caldwell Knob Member of Seguin Formation.

Thickness. 50 to 75 feet.

Lithology. Gray, laminated, silty clay; fine-grained, gray sand, containing large, flat, rough-surfaced, calcareous concretions of sandstone.

Extent. Central part of Texas Coastal Plain.

Fossil content. Mostly mollusks; F. B. Plummer (1933) and Beckman & Turner (1943).

Economic significance. Local use as road metal.

Squirrel Creek Formation

Original designation. Liddle (1921, p. 77).

Type locality. East and west branches of Squirrel Creek, Medina County, Texas.

Original use. To designate sequence of impure, medium hard, locally glauconitic limestone forming the upper 75 to 100 feet of the Midway Group in Medina County, Texas.

Subsequent use. Considered as Squirrel Creek facies by Gardner (1933, p. 76–77).

Present status. Generally abandoned.

STONE COAL BLUFF LIGNITE

Original designation. Wasem & Wilbert (1943, p. 187).

Type locality. Stone Coal Bluff on Sabine River, Sec. 33, T. 6 N., R. 13 W., Sabine Parish, Louisiana.

Original use. To designate persistent seam of lignite in Slaughter Creek Member of Pendleton Formation.

Present status. Informal rock unit.

Stratigraphic position. Thirty feet from top of Slaughter Creek Member of Pendleton Formation.

Thickness. 1 to 6 feet.

Lithology. Black lignite that contains abundance of pyrite in the form of nodules and pyritized wood; some carbonized wood.

Extent. Locally in Sabine Parish, Louisiana.

Fossil content. Pyritized wood.

Economic significance. Summarized by Meagher & Aycock (1942, p. 35–36).

Sucarnoochee Clay

Original designation. Smith & Johnson (1887, p. 61).

Type locality. Black Bluff on Sucarnoochee Creek, a tributary to the Tombigbee River, Sumter County, Alabama.

Original use. To designate sequence of clays forming the upper part of the Midway Group of the eastern part of the Gulf Coastal Plain.

Subsequent use. Used by Smith (1892) as "Sucarnoochee Clay or Black Bluff group" to designate a 100-foot sequence of clays underlying the Naheola Formation and overlying the Clayton Formation.

Present status. Abandoned in favor of earlier name Porters Creek.

TEHUACANA MEMBER

Original designation. Harris (1896, p. 129, 155).

Type locality. Exposures in vicinity of Tehuacana, Limestone County, Texas.

Original use. To designate a limestone sequence occurring in the middle part of the Midway Group in the vicinity of Tehuacana, Texas.

Subsequent use. F. B. Plummer (1933) designated the Tehuacana as a limestone lentil in the Pisgah Member of the Kincaid Formation; Gardner (1932, Preliminary edition of Geologic Map of Texas) applied Tehuacana to the lower part of the Midway Group (essentially equivalent to the Kincaid Formation of present usage); Gardner (1933) treated the Tehuacana as a member of the Kincaid Formation.

Present status. As outlined by Gardner (1933).

Stratigraphic position. Overlies Pisgah Member of Kincaid Formation and underlies Mexia Member of Wills Point Formation.

Thickness. Approximately 75 feet in outcrop.

Lithology. Calcareous, glauconitic, fossiliferous sands; locally with lenses of sandy limestone.

Extent. Eastern part of Texas Coastal Plain.

Fossil content. Mollusks (especially oysters, **Venericardia, and Turritella)** and foraminifers; described by H. J. Plummer (1926) and Gardner (1933).

Economic significance. Few local quarries for crushed stone.

Timber Belt Beds

Original designation. Penrose (1890, p. xxxvi, 17, 22).

Original use As "Timber Belt or Sabine River beds" to designate strata now known as a part of the Wilcox, Claiborne, and Jackson groups; named for the timber region of eastern Texas.

Present status. Abandoned; apparently never considered formally.

TIPPAH SANDSTONE FACIES

Original designation. Lowe (1915, p. 64).

Type locality. Exposures along broken hills and ridges in Tippah County, Mississippi.

Original use. To designate a 100-foot sequence of sand and sandstone overlying the Porters Creek Formation and underlying the Wilcox Group.

Subsequent use. Considered as a member of the Porters Creek Formation by Cooke (1925); Grim (1936) and Lowe (1933, p. 23) suggested unit might best be considered a phase of the Porters Creek and not be given formal status; Conant (1941) designated the Tippah as a sand lentil, stating it occurs in the lower part of the Porters Creek Formation.

Present status. Informal; probably represents a sand facies in the Porters Creek Formation, occurring at varying stratigraphic intervals.

TIPPAH SANDSTONE FACIES — (Cont'd.)

Stratigraphic position. Lentil or facies in lower part of Porters Creek Formation.

Thickness. 75 to 100 feet.

Lithology. Light to dark gray sand and sandstone; locally glauconitic; upper 5 feet consists of hard, fossiliferous, coarse-grained, glauconitic sandstone.

Extent. North-central Mississippi.

Fossil content. Few mollusks.

Economic significance. Not known.

TURRITELLA ROCK

Original designation. Smith et al. (1894, p. 193–198).

Original use. Applied to a very fossiliferous, yellow to yellow-gray, sandy, crystalline limestone in the Clayton Formation.

Subsequent use. Retained by LaMoreaux & Toulmin (1959, p. 36) to designate a bed forming the upper part of the Pine Barren Member of the Clayton Formation in southwestern Alabama.

Present status. Informal rock unit.

TUSCAHOMA FORMATION

Original designation. Smith et al. (1894, p. 162–170).

Type locality. Exposures at Tuscahoma Landing on the Tombigbee River, NE ¼, Sec. 31, T. 13 N., R. 1 W., Choctaw County, Alabama.

Original use. Used as "Tuscahoma or Bells Landing series" to designate a sequence of rocks earlier named Bells Landing series by Smith & Johnson (1887, p. 46). Bells Landing has priority but has been used in two different senses: (1) to designate a sequence of rocks exposed at Tuscahoma Landing and (2) to designate a marl within the section at Tuscahoma Landing.

Present status. Considered a formation containing two marl members, designated as Bells Landing and Greggs Landing members.

Stratigraphic position. Overlies Nanafalia Formation and underlies Hatchetigbee Formation.

Thickness. Approximately 275 feet.

Lithology. Fine-grained sand and sandy clay, mostly thin-bedded, gray, and commonly cross-bedded; one or more beds of lignite in upper part.

Extent. Southwestern Alabama.

Fossil content. Fossils occur only in marl members but are generally abundant; predominantly mollusks, some corals; faunal list given in LaMoreaux & Toulmin (1959, p. 129–130).

Economic significance. Local aquifer.

Upper Midway

Original designation. H. J. Plummer (1926, p. 14).

Original use. As a rock and paleontologic (foraminiferal) division of Midway to include an upper 440-foot sequence of rocks in the Midway Group of Texas.

Present status. Informal designation; as used by H. J. Plummer (1926), was equivalent to the Wills Point Formation.

WILCOX GROUP

Original designation. Crider & Johnson (August, 1906, p. 5, 9); generally attributed to Crider (September, 1906, p. 7, 25–28).

Original use. Introduced as a substitute for the lithologic term Lignitic.

Subsequent use. Generally accepted as the substitute name for Lignitic, although the term Sabine (also introduced as a substitute name for Lignitic) has priority; used variously as age, group, stage, formation, series, and subgroup.

Present status. Generally used as a group name but commonly used as a time-rock term.

Stratigraphic position. Overlies Midway Group and underlies Claiborne Group.

Thickness. Variable; 500 to 1,500 feet in outcrop.

Lithology. Predominantly a sequence of clastic sediments, generally interpreted as nonmarine in origin; marine rocks common in Alabama and Louisiana.

Extent. Throughout Gulf Coastal Plain.

Fossil content. Marine fossils chiefly in Alabama and Louisiana; mostly plant fossils in other parts of the Gulf Coastal Plain.

WILLS POINT FORMATION

Original designation. Penrose (1890, p. xlii, 17, 19).

Type locality. Exposures in vicinity of Wills Point, Van Zandt County, Texas.

Original use. To designate all strata between the Wilcox Group (above) and Cretaceous rocks (below); used as "Basal or Wills Point clays."

Subsequent use. Harris (1896, p. 115–270) established the correlation of Penrose's Wills Point with the Midway of the eastern part of the Gulf Coastal Plain and restricted the Wills Point to the upper part of the Midway Group in Texas.

Present status. Considered as a formation within the Midway Group in the restricted sense of Harris (1896).

WILLS POINT FORMATION — (Cont'd.)

Stratigraphic position. Overlies Kincaid Formation and underlies Wilcox Group.

Thickness. 250 feet in central part of Texas Coastal Plain; thickens to 600 feet in northeastern Texas and 3,100 feet in northeastern Mexico.

Lithology. Lower member of dark, thin-bedded or compact, fossiliferous clay and an upper member of dark gray, silty or sandy clay.

Extent. Texas Coastal Plain, southwestern Arkansas, northeastern Mexico.

Fossil content. Abundant mollusks, corals, and foraminifers; faunal lists given in F. B. Plummer (1933, p. 566–568), H. J. Plummer (1926), and Gardner (1933).

Economic significance. Mostly brick and clay.

Woods Bluff Marl

Original designation. Heilprin (1881, p. 157).

Original use. To designate a highly fossiliferous marl exposed at Woods Bluff on Tombigbee River, Alabama.

Subsequent use. Used by Smith (1883, p. 257, 321) in much the same sense as used by Heilprin (1881); used as "Woods's Bluff or Bashi series" by Smith & Johnson (1887, p. 43–47) to include the marl bed as originally defined and about 60 feet of rock below the marl.

Present status. Abandoned in favor of term Bashi; some recent workers consider the Bashi as a formation, and, accordingly, Woods Bluff could be considered a member of that formation; most workers consider the Bashi as a member of the Hatchetigbee Formation, using the name Bashi to designate the fossiliferous marl within the formation; Bashi currently is used in much the sense as Woods Bluff was used originally by Heilprin (1881).

WORTHAM LENTIL

Original designation. F. B. Plummer (1933, p. 559).

Type locality. Not clear; F. B. Plummer (1933, p. 559) noted "a typical exposure of the bed is that in the town of Eureka in Navarro County." He also noted exposures in a stream valley 1 mile east of Wortham, Freestone County, Texas.

Original use. Apparently meant to designate a concretionary aragonite lentil at the top of the Mexia Member of the Wills Point Formation; used in sense of both a member and a lentil within a member.

Subsequent use. Given no formal status by Gardner (1933, p. 22) who designated the unit as an aragonite bed within the Kerens Member of the Wills Point Formation; U. S. Geological Survey follows Gardner (1933).

Present status. As outlined by Gardner (1933).

Thickness. 8 to 10 inches.

Lithology. Impure, concretionary, persistent bed of limestone, 8 to 10 inches thick; arranged in the form of rosettes. Field geologists have referred to this unit as the "Rosette Bed."

Extent. Central part of Texas Coastal Plain.

Fossil content. None known.

Economic significance. None known.

SELECTED BIBLIOGRAPHY

Adams, G. E. et al., 1926, Geology of Alabama: Alabama Geol. Survey, Spec. Rept. 14, 312 p.

Alexander, C. I., 1929, Ostracoda of the Midway (Eocene) of Texas: Jour. Paleontology, v. 8, p. 206–237.

_____, 1935, Stratigraphy of the Midway Group (Eocene) of southwestern Arkansas and northwestern Louisiana: Am. Assoc. Petrol. Geologists, Bull., v. 19, p. 696–699.

Andersen, H. V., 1960, Geology of Sabine Parish: Louisiana Dept. Conservation, Geol. Bull., no. 34, 164 p.

Attaya, J. S., 1951, Lafayette County geology: Mississippi State Geol. Survey, Bull, 71, 49 p.

Barry, J. O., 1941, Correlation of Wilcox faunal units of Louisiana (abstract): Am Assoc. Petrol. Geologists, Bull., v. 25, p. 941.

_____ & LeBlanc, R. J., 1942, Lower Eocene faunal units of Louisiana: Louisiana Dept. Conservation, Geol. Bull., no. 23, 208 p.

Beckman, M. W., & Turner, F. E., 1943, Stratigraphy and age of the Seguin Formation of central Texas: Am. Assoc. Petrol. Geologists, Bull., v. 27, p. 608–621.

Berquist, H. R., 1943, Clay County, geology: Mississippi State Geol. Survey, Bull. 53, 91 p.

Berry, E. W., 1917, Geologic history indicated by the fossiliferous deposits of the Wilcox Group (Eocene) at Meridian, Mississippi: U. S. Geol. Survey, Prof. Paper 108-E, p. 61–72.

_____, 1922, Additions to the flora of the Wilcox Group: U. S. Geol. Survey, Prof. Paper 131, p. 1–21.

_____, 1930, Revision of the lower Eocene Wilcox flora of the southeastern states: U. S. Geol. Survey, Prof. Peper 156, 196 p., 50 pls.

_____, 1941, Additions to the Wilcox flora from Kentucky and Texas: U. S. Geol. Survey, Prof. Paper 193-E, p. 83–99.

Blanpied, B. W., & Hazzard, R. T., 1939, Tentative correlation charts of the Gulf Coast Mesozoic and Cenozoic systems: Shreveport Geol. Society, Guidebook, 14th Ann. Field Trip, p. 125–128.

Brantly, J. E., 1920, Petroleum possibilities of Alabama; pt. 2, Coastal Plain area: Alabama Geol. Survey, Bull 22, p. 121–220.

Bornhouser, Max, 1947, Marine sedimentary cycles of Tertiary in Mississippi Embayment and Central Gulf Coast area: Am. Assoc. Petrol. Geologists, Bull., v. 31, p. 698–712.

Casey, R. S., 1941, The Eocene Wilcox with special references to the Upper Gulf Coast of Texas: Oil and Gas Journal, v. 39, p. 74, 76, 106, 108.

Claypool, C. B., 1933, The Wilcox of central Texas (abstract of thesis): Univ. Illinois, 12 p.

Conant, L. C., 1941, Tippah County mineral resources: Mississippi State Geol. Survey, Bull. 42, 228 p.

_____, 1942, Union County mineral resources: Mississippi State Geol. Survey, Bull. 45, 158 p.

Conrad, T. A., 1865, Observations on the Eocene Lignite Formation of the United States: Philadelphia Acad. Nat. Sci., Proc., p. 70–73.

Cooke, C. W., 1925, Correlation of the Eocene formations in Mississippi and Alabama: U. S. Geol. Survey, Prof Paper 140-E, p. 133–136.

———————, 1926, Geology of Alabama; the Cenozoic formations: Alabama Geol. Survey, Spec. Rept. 14, p. 252–297.

_____, 1933, Ackerman Formation in Alabama: Am. Assoc. Petrol. Geologists, Bull., v. 17, p. 192–195.

_____, 1943, Geology of the Coastal Plain of Georgia: U. S. Geol. Survey, Bull. 941, 121 p.

Crider, A. F., 1906, Geology and mineral resources of Mississippi: U. S. Geol. Survey, Bull. 283, 99 p.

———————, & Johnson, L. C., 1906, Summary of the underground water resources of Mississippi: U. S. Geol. Survey, Water-Supply Paper 159, 88 p.

_____et al., 1932, Tertiary formations of Mississippi and Alabama: Shreveport Geol. Society, Guidebook, 9th Ann. Field Trip, 14 p.

Cushman, J. A., 1940, Midway Foraminifera from Alabama: Contrib. Cushman Lab. Foram. Research, v. 16, p. 51–73.

_____, 1944, A Paleocene Foraminifera fauna from the Coal Bluff Marl Member of the Naheola Formation of Alabama: Contrib. Cushman Lab. Foram. Research, v. 20, p. 29–50.

_____, 1951, Paleocene Foraminifera of the Gulf Coastal Region of the United States and adjacent areas: U. S. Geol. Survey, Prof. Paper 232, 75 p., 24 pls.

_____, & Garrett, J. B., 1939, Eocene Foraminifera of Wilcox age from Woods Bluff, Alabama: Contrib. Cushman Lab. Foram. Research, v. 15, p. 77–89.

_____, & Todd, R., 1946, A foraminiferal fauna from the Paleocene of Arkansas: Contrib. Cushman Lab. Foram. Research, v. 22, p. 51–65.

Cuyler, R. H., & Weeks, A. W., 1940, Fault-line oil fields: Geol. Soc. America, Excursions, 53rd Ann. Meet., Austin, Texas, Excursion 3, p. 16–43.

Dall, W. H., 1898, A table of the North American Tertiary formations, correlated with one another and with those of western Europe, with annotations: U. S. Geol. Survey, 18th Ann. Rept., p. 323–348.

Deussen, Alexander, 1914, Geology and underground waters of the southeastern part of the Texas Coastal Plain: U. S. Geol. Survey, Water-Supply Paper 335, 365 p.

_____, 1924, Geology of the Coastal Plain of Texas west of Brazos River: U. S. Geol. Survey, Prof. Paper 126, 145 p. Reprinted by Bur. Econ. Geol., Univ. Texas, 1930.

Dumble, E. T., 1892, Report on the brown coal and lignite of Texas: Texas Geol. Survey, 243 p.

_____, 1895, Notes on the Texas Tertiaries: Texas Acad. Sci., Trans., v. 1, no. 3, p. 23–27.

_____, 1902, The Tertiary of the Sabine River: Science, n. s., v. 16, p. 670–671.

_____, 1920, The geology of East Texas: Univ. Texas, Bull. 1869, 388 p.

_____, 1923, Marine Wilcox of Mexico: Science, n. s., v. 8, p. 31.

Durham, C. O., & Smith, C. R., 1958, Louisiana Midway-Wilcox correlation problems: Louisiana Dept. Conservation, Geol. Pamphlet, no. 5, 17 p.

Echols, D. J., & Malkin, D. S., 1948, Wilcox (Eocene) stratigraphy, a key to production: Am. Assoc. Petrol. Geologists, Bull., v. 32, p. 11–33; correlation, p. 310.

Featherstonhaugh, G. W., 1835, Geological report of an examination made in 1834 of the elevated country between the Missouri and Red Rivers: U. S. 23rd Congress, 2nd Session, House Ex. Doc. 151, 97 p.

Finch, John, 1823, Geological essay on the Tertiary formations in America: Am. Jour. Sci., v. 7, p. 31–43.

Fisk, H. N., 1941, Midway-Wilcox deltaic mass (abstract): Am. Assoc. Petrol. Geologists, Bull., v. 25, p. 941.

Funnell, J. E., 1950, Recent studies of Wilcox Group clays in Arkansas: Am. Ceramic Soc., Bull., v. 29, p. 286–289.

Gardner, Julia, 1924, Fossiliferous marine Wilcox in Texas: Am. Jour. Sci., 5th ser., v. 7, p. 141–145.

_____, 1933, The Midway Group of Texas, including a chapter on the coral fauna by T. W. Vaughan & W. P. Popenoe: Univ. Texas, Bull. 3301, 403 p.

_____, 1933a, Kincaid Formation, name proposed for lower Midway of Texas: Am. Assoc. Petrol. Geologists, Bull., v. 17, p. 744–747.

_____, 1941, Analysis of Midway fauna of western Gulf Province: Am. Assoc. Petrol. Geologists, Bull., v. 25, p. 644–649.

Getzendander, F. M., 1930, Geologic section of the Rio Grande Embayment and implied history: Am. Assoc. Petrol. Geologists, Bull., v. 14, p. 1425–1437.

Grim, R. E., 1936, The Eocene sediments of Mississippi: Mississippi State Geol. Survey, Bull. 30, 240 p.

Hale, C. S., 1848, Geology of south Alabama: Am. Jour. Sci., 2nd ser., v. 6, p. 354–363.

Harris, G. D., 1894, The Tertiary geology of southern Arkansas: Arkansas Geol. Survey, Ann. Rept. 1892, v. 2, 207 p.

_____, 1895, New and otherwise interesting Tertiary Mollusca from Texas: Philadelphia Acad. Nat. Sci., Proc., p. 45–88.

_____, 1896, The Midway Stage: Bull. Am. Paleontology, v. 1, 157 p.

_____, 1897, The Lignitic Stage; pt. 1, Stratigraphy and pelecypods: Bull. Am. Paleontology, v. 2, no. 9, 102 p., 14 pls.

_____, 1899, The Lignitic Stage; pt. 2, Scaphlopoda, Gastropoda, Pteropoda, and Cephalopoda: Bull. Am. Paleontology, v. 3, 128 p.

_____, 1902, The geology of the Mississippi Embayment with special references to the State of Louisiana: Louisiana State Exp. Sta., Geol, and Agric. of Louisiana, pt. VI, p. 1–39.

Heilprin, Angelo, 1881, Notes on the Tertiary geology of the southern United States: Philadelphia Acad. Nat. Sci., Proc., p. 151–159.

_____, 1884, The Tertiary geology of the eastern and southern United States: Philadelphia Acad. Nat. Sci., Jour., v. 9, p. 115–154.

Hilgard, E. W., 1860, Report on the geology and agriculture of the State of Mississippi: Jackson, Mississippi, 391 p.

_____, 1867, On the Tertiary formation of Mississippi and Alabama: Am. Jour. Sci., 2nd se., v. 43, p. 29–41.

_____, 1869, Summary of results of a late geological reconnaissance of Louisiana: Am. Jour. Sci., 2nd ser. v. 48, p. 331–346.

_____, 1891, Orange Sand, LaGrange, and Appomatox: Am. Geol., v. 8, p. 129–131.

_____, 1892, The age and origin of the Lafayette Formation: Am. Jour. Sci., 3rd ser., v. 43, p. 389–402.

Hill, R. T., 1888, Neozoic geology of southwestern Arkansas: Arkansas Geol. Survey, Ann. Rept. 1888, v, 2, 260 p.

_____, & Vaughan, T. W., 1902, Description of the Austin Quadrangle (Texas): U. S. Geol. Survey, Geol. Atlas, Austin Folio, no. 76, 8 p.

Hoeman, E. C, & Redfield, R. C, 1946, Industrial sand from the Eocene Rockdale Formation in Texas: Univ. Texas, Pub. 4301 (Jan. 1, 1943) p. 283–300.

Howe, H. V., 1925, Extension of Midway Formation into Louisiana: Pan-Am. Geol., v. 43, p. 309.

_____, 1933, Review of the Tertiary stratigraphy of Louisiana: Am. Assoc. Petrol. Geologists, Bull., v. 17, p. 613–655.

_____, 1936, Review of Tertiary stratigraphy of Louisiana: Am. Assoc. Petrol. Geologists, Gulf Coast Oil Fields, A Symposium, p. 383–424.

_____, & Garrett, J. B., 1934, Louisiana Sabine Ostracoda: Louisiana Dept. Conservation, Bull. 4, 64 p.

Hughes, R. J., 1958, Kemper County geology: Mississippi Geol. Survey, Bull. 84, 274 p.

Kane, W. G., & Gierhart, G. B., 1935, Areal geology of Eocene in northeastern Mexico: Am. Assoc. Petrol. Geologists, Bull, v. 19, p. 1357–1388.

Kennedy, Wm., 1895, The Eocene Tertiary east of the Brazos River: Philadelphia Acad. Nat. Sci., Proc., p. 89–160.

_____, 1910, Report on geology of Rio Grande Valley: Copy of original manuscript on file at Bur. Econ. Geol., Univ. Texas.

Killebrew, J. B., & Safford, J. M., 1874, Introduction to the resources of Tennessee: Bur. Agric., 1st and 2nd Reports.

LeBlanc, R. J., 1941, Correlation of upper Midway faunas of Louisiana (abstract): Am. Assoc. Petrol. Geologists, Bull., v. 25, p. 941.

_____, & Barry, J. O., 1941, Fossiliferous localities of Midway Group in Louisiana: Am. Assoc. Petrol. Geologists, Bull., v. 25, p. 734–738.

Lamar, J. E., & Sutton, A. H., 1930, Cretaceous and Tertiary of Kentucky, Illinois, and Missouri: Am. Assoc. Petrol. Geologists, Bull., v. 14, p. 845–866.

LaMoreaux, P. E., & Toulmin, L. D., 1953, The Midway and Wilcox groups in central and western Alabama: Mississippi Geol. Soc., Guidebook, 10th Field Trip, p. 5–29.

_____, _____, 1959, Geology and ground water resources of Wilcox County, Alabama: Alabama Geol. Survey, County Rept. 4, 280 p.

Langdon, D. W., 1891, Variations in the Cretaceous and Tertiary strata of Alabama: Geol. Soc. America, Bull., v. 2, p. 587–605.

Liddle, R. A., 1921, The geology and mineral resources of Medina County: Univ. Texas, Bull. 1860, 177 p.

Lowe, E. N., 1914, Preliminary report on the iron ores of Mississippi: Mississippi State Geol. Survey, Bull. 10, p. 23–25.

———————, 1915, Mississippi, its geology, geography, soils, and mineral resources: Mississippi State Geol. Survey, Bull. 12, 335 p.

———————, 1933, Coastal Plain stratigraphy of Mississippi, pt. 1, Midway and Wilcox groups: Mississippi State Geol. Survey, Bull. 25, 125 p.

Maclure, W., 1809, Observations on the geology of the United States: Am. Philos. Soc., Trans., old ser., v. 6, p. 411–428.

MacNeil, F. S., 1946, Summary of the Wilcox and Midway stratigraphy of Alabama and Mississippi: U. S. Geol. Survey, Strategic Min. Inv., Preliminary Rept. (30195), 29 p.

———————, 1947, Correlation chart for the outcropping Tertiary formations of the eastern Gulf region: U. S. Geol. Survey, Oil & Gas Inv. Ser., Preliminary Chart 29.

———————, 1951, Fearn Springs Member of Wilcox Formation in Mississippi: Am. Assoc. Petrol. Geologists, Bull., v. 35, p. 1062–1073.

McGee, W. J., 1888, Three formations of the mid-Atlantic slope: Am. Jour. Sci., 3rd ser., v. 35, p. 120–143, 328–330, 367–385, 448–466.

_____, 1891, The Lafayette Formation: U. S. Geol. Survey, Ann. Rept. 12, pt. I, p. 347–351.

Meagher, D. P., & Aycock, L. C, 1942, Louisiana lignite: Louisiana Dept. Conservation, Geol. Pamphlet, no. 3, 55 p.

Mellen, F. F., 1939, Winston County mineral resources: Mississippi State Geol. Survey, Bull. 38, 169 p.

_____, 1950, Status of Fearn Springs Formation: Mississippi State Geol. Survey, Bull. 69, 20 p.

Moody, C. L., 1931, Tertiary history of the region of Sabine Uplift, Louisiana: Am. Assoc. Petrol. Geologists, Bull., v. 15, p. 531–551.

Munsey, G. C., 1953, A Paleocene ostracode fauna from the Coal Bluff Marl Member of the Naheola Formation of Alabama: Jour. Paleontology, v. 27, p. 1–20.

Murray, G. E., 1941, Midway stratigraphy of Sabine Uplift (abstract): Am. Assoc. Petrol. Geologists, Bull., v. 25, p. 941–942.

_____, 1942, Geology of DeSoto and Red River parishes, Louisiana: Louisiana State Univ., unpublished dissertation.

_____, 1947, Cenozoic deposits of Central Gulf Coastal Plain: Am. Assoc. Petrol. Geologists, Bull., v. 31, p. 1825–1850.

_____, 1948, Geology of DeSoto and Red River parishes, Louisiana: Louisiana Dept. Conservation, Bull. 25, 312 p.

_____, 1953, History and development of Paleocene and lower Eocene nomenclature, Central Gulf Coastal Plain: Mississippi Geol. Soc., Guidebook, 10th Field Trip, p. 48–60.

_____, 1955, Midway stage, Sabine stage, and Wilcox Group: Am. Assoc. Petrol. Geologists, Bull., v. 39, p. 671–696.

_____, & Thomas, P. E., 1945, Midway-Wilcox surface stratigraphy of the Sabine Uplift, Louisiana and Texas: Am. Assoc. Petrol. Geologists, Bull., v. 29, p. 45–70.

Penrose, R. A. F., Jr., 1890, A preliminary report on the geology of the Gulf Tertiary of Texas from Red River to the Rio Grande: Texas Geol. Survey, 1st Ann. Rept., 1889, p. 3–101.

Plummer, F. B., 1933, Cenozoic geology of Texas, in Sellards, E. H. et al., Geology of Texas, v. I, stratigraphy, Univ. Texas, Bull. 3232 (Aug. 22, 1932), p. 519–818.

Plummer, H. J., 1926, Foraminifera of the Midway Formation in Texas: Univ. Texas, Bull. 2644, 206 p.

_____, 1932, Foraminiferal evidence of the Midway-Wilcox contact in Texas: Univ. Texas, Bull. 3201, p. 51–68.

Safford, J. M., 1856, A geological reconnaissance of the State of Tennessee: Nashville, Tennessee, 164 p.

_____, 1864, On Cretaceous and superior formations of West Tennessee: Am. Jour. Sci., 2nd ser., v. 37, p. 360–372.

_____, 1869, Geology of Tennessee: Nashville, Tennessee, 550 p.

_____, 1892, Note on the Middleton Formation of Tennessee, Mississippi, and Alabama: Geol. Soc. America, Bull., v. 3, p. 511–512.

_____, 1892a, The Middleton Formation of Tennessee, Mississippi, and Alabama, with a note on the formations at LaGrange, Tennessee: Am. Geol., v. 9, p. 63–64.

_____, & Killebrew, J. B., 1900, The elements of the geology of Tennessee: Nashville, Tennessee, 264 p.

Scott, Gayle, 1934, Age of the Midway Group: Geol. Soc. America, Bull., v. 45, p. 1111–1158.

Sellards, E. H., 1920, The geology and mineral resources of Bexar County: Univ. Texas, Bull. 1932, 202 p.

Sharp, W. W., Jr., 1951, Butler clay (Wilcox Group), Bastrop County, Texas: Univ. Texas, unpublished M. A. thesis, 54 p.

Smith, E. A., 1883, Report for the years 1881 and 1882: Alabama Geol. Survey, 615 p.

_____, 1886, Summary of the lithological and stratigraphical features and subdivisions of the Tertiary of Alabama: Alabama Geol. Survey, Bull. 1, 85 p.

_____, 1888, Report of progress for years 1884 to 1888: Alabama Geol. Survey, 24 p., Montgomery, Alabama.

_____, 1892, On the phosphates and marls of Alabama: Alabama Geol. Survey, Bull. 2, 82 p.

_____, & Johnson, L. C, 188 , Tertiary and Cretaceous strata of the Tuscaloosa, Tombigbee, and Alabama rivers: U. S. Geol. Survey, Bull. 43, 189 p.

_____ et al., 1894, Report on the geology of the Coastal Plain of Alabama: Alabama Geol. Survey, Spec. Rept. 6, 759 p.

Stenzel, H. B., 1939, The geology of Leon County, Texas: Univ. Texas, Pub. 3818, 295 p.

_____, 1941, The surface relationships of the Carrizo Sand in Texas: Tulsa Geol. Soc., Digest, v. 9, p. 70–72.

_____, 1941a, Sedimentary cycles in the Eocene of the Texas Gulf Coastal Plain: Am. Assoc. Petrol. Geologists, Bull., v. 25, p. 933.

_____, 1950, Ball clay of the Troup district, Texas: Univ. Texas, Pub. 5019, p. 1–37.

_____, 1951, Buried hill at Wilcox-Carrizo contact in East Texas: Am. Assoc. Petrol. Geologists, Bull., v. 35, p. 1815–1828; reprinted as Univ. Texas, Bur. Econ. Geol., Rept. Inv., no. 10, 1951.

_____, 1951a, New observations on the Wilcox Group (abstract): Program and abstracts of 1951 Regional Meeting of the Am. Assoc. Petrol. Geologists and 18th Annual Meeting of the South Texas Geol. Soc., pages unnumbered.

_____, 1953, American Association Petroleum Geologists Field Trip No. 5 to Austin: Am. Assoc. Petrol. Geologists, Guidebook, March, 1953, p. 43–60.

_____, 1953a, The geology of Henrys Chapel Quadrangle, northeastern Cherokee County, Texas: Univ. Texas, Pub. 5305, 119 p.

Toulmin, L. D., Jr., 1940, The Salt Mountain Limestone of Alabama: Alabama Geol. Survey, Bull. 46, 126 p.

_____, 1940a, Correlation of lower Eocene formations of New Jersey and Alabama (abstract): Geol. Soc. America, Bull., v. 51, p. 2009–2010.

_____, 1944, General features of the Tertiary formations in Alabama: Southeastern Geol. Soc., Guidebook, 1st Field Trip, p. 5–15.

_____, 1944a, The Midway-Wilcox contact in Alabama: Alabama Acad. Sci. Jour., v. 16, p. 41–42.

_____, 1955, Cenozoic geology of southeastern Alabama, Florida, and Georgia: Am. Assoc. Petrol. Geologists, Bull., v. 39, no. 2, p. 207–235.

_____, 1955a, Coastal Plain geology of west-central Alabama, in Guides to Southeastern Geology: 1955 Ann. Meet., Geol. Soc. America and associated societies, p. 460–475.

_____ et al., 1951, Geology and ground-water resources of Choctaw County, Alabama: Alabama Geol. Survey, Spec. Rept. 21, 197 p.

Tourney, Michael, 1850, First biennial report on the geology of Alabama: Alabama Geol. Survey, 176 p.

Trowbridge, A. C, 1923, A geologic reconnaissance in the Gulf Coastal Plain of Texas near the Rio Grande: U. S. Geol. Survey, Prof. Paper 131-D, p. 85–107.

_____, 1932, The Tertiary and Quaternary geology of the Lower Rio Grande region, Texas: U. S. Geol. Survey, Bull. 837, 260 p.

Turner, J. T., 1952, Yalobusha County geology: Mississippi State Geol. Survey, Bull. 76, 48 p.

Vaughan, T. W., 1900, Description of the Uvalde Quadrangle (Texas): U. S. Geol. Survey, Geol. Atlas, Uvalde Folio, no. 64.

Veatch, A. C., 1905, Underground waters of Louisiana and southern Arkansas: U. S. Geol. Survey, Water-Supply Paper 1 14, p. 179–187.

_____, 1906, Geology and underground water resources of northern Louisiana and southern Arkansas: U. S. Geol. Survey, Prof. Paper 46, 422 p.

Vestal, F. E., 1952, Webster County geology: Mississippi State Geol. Survey, Bull. 75, 141 p.

_____, 1954, Marshall County geology: Mississippi State Geol. Survey, Bull. 78, 193 p.

Wasem, Richard, & Wilbert, L. J., Jr., 1943, The Pendleton Formation, Louisiana and Texas: Jour. Paleontology, v. 17, p. 181–195.

Whitlatch, G. I., 1936, Sand lenses in the Porters Creek Formation of West Tennessee: Tennessee Acad. Sci., Jour., v. 1 1, no. 2, p. 131–140.

Wilmarth, M. G., 1938, Lexicon of geologic names of the United States: U. S. Geol. Survey, Bull. 896, 2396 p.

Wilson, Druid, et **al.**, 1957, Geologic names of North America introduced in 1936–1955: U. S. Geol. Survey, Bull. 1056a, 405 p.

Winchell, Alexander, 1857, Notes on the geology of middle and southern Alabama: Am. Assoc. Adv. Sci., Proc., v. 10, p. 82–93.