3, 8, and 15 hours of age. A minimum of 250 eggs were subjected to X-rays (140 KVP) at each age tested, an equal number of embryos served as controls. Resulting data were plotted on semi-logarithmic paper, according to the dosage used and number of embryos observed hatching. The plots were interpreted in terms of the classic "target theory" of inactivation and the appropriate LD_{xx} were determined. At three hours exponential plot results, suggesting single-hit killing; however, at 8 and 15 hours the plots were sigmoidal suggesting that many hits are required for inactivation. These plots are identical, either being exponential or sigmoidal, to those shown in a similar ultraviolet study. The relative sensitivities are very similar at 3 and 8 hours for both types of radiation, but differ greatly at 15 hours of age. My results confirmed Kelly's ('50) LD_{xx}s for X-ray inactivation at 3 and 15 hours but were significantly different at 8 hours.

Kelly, E. M. 1950. Effects of X-rays on eggs and differential susceptibility of haploid and diploid prepupae and pupae of *Habrobracon juglandis* (Ashmead). Unpublished thesis, University of Delaware, 22 pp. This work was supported by a grant (GY-7522) from the National Science Foundation (Undergraduate Research Participation Program).

Effects of DDT on the Growth Rate of Chlamydomonas eugametos and C. reinhardii. Allen Warner Phelps Jr., Southwestern at Memphis. *Chlamydomonas eugametos* and *C. reinhardii* were grown in liquid media containing various levels of DDT. Ethanol was used as a carrier because of the low solubility of DDT in water. Accordingly, an ethanol control was carried along with the normal control. The experiments were concluded when the first cultures approached maximum density (approx. 1 x 10^6 cells/ml). At this time, samples were plated in order to determine the viable cell count for each level of DDT. The data were analyzed by an analysis of variance. The results indicate that low levels of DDT may have a stimulatory effect on both species. This work was supported by a grant (GY-7522) from the National Science Foundation (Undergraduate Research Participation Program).

Correlation of Rates of Benzylic Bromination with Reactivity Indices. R. Roark, Southwestern At Memphis. Measurements are being made of the rates of bromination of arylmethanese relative to toluene. The current brominating agent is bromine, and other agents are being considered for the future. Several parameters that may be interpreted as reactivity indices have been calculated for the parent hydrocarbons and the corresponding radicals, using both Huckel—and SCF—MO methods. Attempts will be made to correlate the experimentally measured relative rates of bromination with some of these parameters, even though perfect correlation for any one parameter is not expected. The results of these convulations will be applied to an explanation of the reaction mechanism — in particular, the electronic structure of the transition state.

SCIENCE-MATHEMATICS TEACHERS SECTION

SATURDAY, NOVEMBER 21, 9:00 AM
FRAZIER JELKE SCIENCE CENTER, ROOM B
BETTY GURLEY, *Chairman*

Science Teacher Education for the 1970's. Bernard W. Benson, University of Tennessee at Chattanooga. A prospectus of the new *Guidelines for the Preparation of Secondary School Teachers of Science and Mathematics* was presented with the permission of David H. Ost. Coordinator, AAAS Teacher Education Project. This document, presently in preliminary form, will be available thru AAAS in 1971. It is intended to give direction to preservice education programs and to serve as a basis for evaluating existing programs. State academies of science are encouraged to consider the report and determine appropriate steps for implementation including a) endorsement by the group; b) aid to teacher education institutions and state education agencies; and c) development of performance objectives in mathematics and science and in education.

Innovations in Science Teaching. Ray A. Palmer, Jackson State Community College. A brief description of the Audio-Tutorial System of Teaching biology was presented. This "Systems approach" allows the student to progress at his own convenience and rate and allows much more student-instructor interaction than a conventional system of teaching biology. Statistics were presented to substantiate the success of the program at Jackson State. The success of any such systems approach to learning is largely dependent upon a faculty who are in accord with the philosophy of such approaches to learning and who are willing to strive to make such approaches succeed.

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TERTIARY AND QUATERNARY STRATIGRAPHY IN HENRY AND NORTHERN CARROLL COUNTIES, TENNESSEE*

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ABSTRACT

In Henry and northern Carroll Counties, Tennessee, the Tertiary bedrock formations are covered extensively by a thick mantle of Tertiary (?) and Quaternary surficial deposits. Consequently, the bedrock formations are poorly exposed, and lithologic and stratigraphic relationships are not clearly understood. The Tertiary sediments make up the Clayton, Porters Creek, Wilcox and Claiborne Formations. The Clayton Formation is a nearshore marine sand and clay that cannot be mapped separately from the underlying McNairy Sand (of Cretaceous age) because of lithologic similarities and inadequate outcrops. The Wilcox and Claiborne Formations consist of nonmarine and nearshore marine sand, silt and clay that, in large part, lack distinguishing characteristics. However, these formations can be subdivided on the basis of gross lithologic differences and stratigraphic position. The Porters Creek Clay, which separates the underlying Clayton from the overlying Wilcox and Claiborne, is the only distinctive unit. It consists of a thick body of deeper water marine clay and sand. The Tertiary (?) and Quaternary surficial deposits make up the high-level fluvial deposits and the present flood-plain alluvium.

INTRODUCTION

The present report is a byproduct of a geologic quadrangle mapping project of the U. S. Geological

*Publication authorized by the Director, U. S. Geological Survey.

Survey, Water Resources Division, in cooperation with the Tennessee Department of Conservation, Division of Geology. The purpose of the report is to summarize and to make available information concerning the Ter-

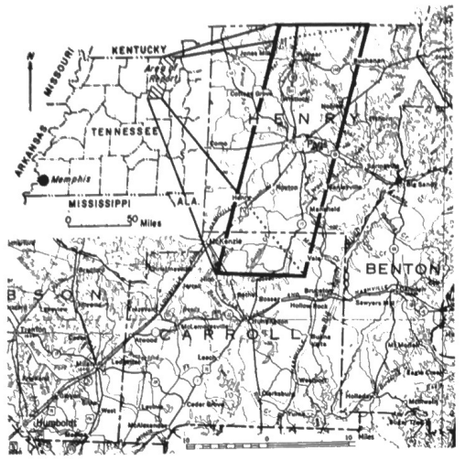

Figure 1. Location of the area described in this report.

tiary and Quaternary stratigraphy in Henry and northern Carroll Counties, Tennesse (fig. 1). Emphasis is placed on the description of the lithologic character of the units. The lithologies are based on a study of numerous scattered outcrops and the logs of several test wells. The descriptions of the lithologies closely follow certain standards set by the Tennessee Division of Geology for the description of rocks and rock formations. These standards include the use of (1) the "Rock-Color Chart" distributed by the Geological Society of America, (2) the Wentworth grade scale sand-size gauge, and (3) the scale of bedding thicknesses adopted by the Division.

Stratigraphy

The exposed geologic formations lie on the eastern flank of the Mississippi embayment, a southward plunging structural trough or syncline. The local structure is homoclinal. The strike of the formations is north-northeast—south-southwest in the southern half of the study area and north-south in the northern half. The dip ranges from about 30 to 50 feet per mile to the west-northwest and west and is greater in the older units than in the younger units.

Tertiary sediments make up the Clayton, Porters Creek, Wilcox, and Claiborne Formations. These units consist chiefly of clastics which, except for the Porters Creek Clay, were deposited in nonmarine and shallow-water nearshore marine environments. Environments of deposition probably include streams, lakes, deltas, coastal marches or fresh-water lagoons, barrier bars and beaches, and the open sea. The Porters Creek is largely a shallow-water offshore marine deposit. The geologic sequence indicates several transgressive and regressive cycles of the sea.

Tertiary (?) and Quaternary sediments make up the high-level fluvial deposits and the present flood-plain alluvium, which form an extensive mantle over the Tertiary bedrock formations in much of the area. These stream-laid clastics show a complex history of alluviation and valley cutting dating back possibly to the Pliocene and continuing through the Pleistocene and Recent.

The generalized stratigraphic column (table 1) shows the relationships of the post-Cretaceous geologic formations in Henry and northern Carroll Counties. The nomenclature and rank of the units follow the current usage of the Tennessee Division of Geology.

Table 1. Generalized Stratigraphic Column of the Post-Cretaceous Geologic Units in Henry and Northern Carroll Counties

SYSTEM	SERIES	FORMATION AND GROUP	
QUATERNARY	Pleistocene and Recent	Alluvium	
TERTIARY(?) AND QUATERNARY	Pliocene(?) and Pleistocene	Fluvial deposits	
TERTIARY	Middle Eocene	Claiborne Formation	
	Lower Eocene	Wilcox Formation	
	Paleocene	Midway Group	Porters Creek Clay
			Clayton Formation

Clayton Formation

The type locality of the Clayton is a cut on the Central of Georgia Railroad about a mile east of Clayton, Barbour County, Alabama. Roberts and Collins (1926, p. 236-237) first recognized the Clayton in Tennessee but limited their usage to an isolated exposure of limestone in southeastern Hardeman County. Later, Roberts (1928, p. 436-437) recognized the Clayton and Porters Creek as making up the Midway Group and extended the usage of Clayton to include beds of glauconitic sand and clay. More recent workers have found that the Clayton in Tennessee also includes a nearer shore marine sand and clay facies that is similar to the underlying Upper Cretaceous formations.

Areal Distribution.—In Hardeman and western McNairy Counties, Tennessee, the Clayton is a distinctive, mappable unit that outcrops in a belt from 3 to 5 miles wide. North-northeast of this area the formation is not mapped separately from the underlying McNairy Sand because the units, for the most part, cannot be distinguished lithologically. Recognition of facies changes in the Clayton and correlation of the logs of test wells indicate that the formation extends across the State in a belt several miles wide east of the outcrop belt of the Porters Creek Clay.

Lithology and Thickness.—The Clayton Formation consists of a variable sequence of sand and subordinate clay. The formation is poorly exposed in the report area because of extensive cover of high-level fluvial deposits, and lithologic and stratigraphic relationships are not clearly understood. However, the amount of fine- to very-fine grained micaceous sand in the upper part of the Clayton seems to increase from Central Carroll County to northern Henry County. This lithologic relationship may be significant inasmuch as comparison of electric and gamma-ray logs of two test wells in Henry County indicates that the upper part of the Clayton contains sand that is more radioactive than the clays. The thickness of the radioactive sand increases from about 5 to 15 feet to the north-northeast, across Henry County. The high radioactivity of the sand is probably caused by concentrations of certain heavy minerals such as monazite.

Sand in the Clayton is light gray, yellowish gray, very pale orange and white. Locally the sand is stained grayish orange pink, moderate orange pink, light red, pale red, and moderate reddish orange. The sand weathers grayish orange, dark yellowish orange, light brown, moderate brown, and moderate reddish brown. The sand consists of very fine- to coarse-grained quartz, but the finer sizes predominate. The degree of sorting is variable. The sand may be well sorted and clean, or poorly sorted and silty and clayey. Bedding ranges from very thin (0.4 in. - 2 in.) to thick (2 ft. - 4 ft.) and is either horizontal and irregular or lenticular. Crossbedding is common, particularly in the coarser sand. The sand is sparsely to very micaceous and locally contains small amounts of fine-grained heavy minerals. At some places the uppermost few feet of the Clayton consists of glauconitic sand.

Clay in the Clayton is medium dark gray and brownish gray. The clay initially weathers light gray, light brownish gray, and very light gray, then weathers to pinkish gray and white. The weathered clay locally is stained grayish orange, dark yellowish orange, and light brown. Bedding ranges from laminated (0.08 in. - 0.4 in.) to thin (2 in. - 6 in.) and is either horizontal and irregular or indistinct. The clay generally contains partings and interbeds of sand or is present in the sand as partings and interbeds or lenses. The clay is sparsely to very micaceous and locally contains disseminated particles of lignitic material. At rare localities there may be small lenses of impure lignite associated with the clay and finer sand.

Correlation of electric, gamma-ray, and lithologic logs of test wells that were drilled downdip from the outcrop belt of the Clayton in Tennessee indicates that the formation in Henry and northern Carroll Counties ranges in thickness from about 55 to 65 feet and is thinnest to the north.

Fossil Content.—Clay containing comminuted plant remains is present in the Clayton, but no well preserved fossils were found. The fresh lignitic clay probably contains palynomorphs which could be identified. Locally some of the sand contains marine animal borings.

Porters Creek Clay

The type locality of the Porters Creek Clay is a group of exposures on Porters Creek west of Middleton, Hardeman County, Tennessee. The Porters Creek was first described by Safford (1864, p. 368-369). He applied the name to strata, chiefly clay, which he questionably considered to be Tertiary in age. The lower boundary of the Porters Creek is variously defined in the geologic literature of Tennessee because of differing opinions as to what should be included in the underlying Clayton. Early workers did not recognize the facies changes in the Clayton from offshore to nearshore marine deposits from Hardeman County to the north-northeast along the outcrop belt. Consequently some geologists mistakenly have included in the Clayton beds of sand and clay which are now known to be in the Porters Creek. Other geologists have thought that the Porters Creek overlapped the Clayton to the north of Hardeman County and rested uncomformably on the Upper Cretaceous formations.

Areal Distribution.—The Porters Creek crops out in a more or less continuous north-northeastward - south-southwestward trending belt through Tennessee from Hardeman County to Henry County. Along the strike the belt varies greatly in width. In northern Carroll County the belt is about 3 to 5 miles wide. The belt narrows to the north-northeast, and in northern Henry County it is only about 1.5 to 2 miles wide. This apparent constriction of the outcrop belt is not related to thinning of the formation but rather to extensive fluvial deposits, which cover much of the outcrop area, and to a slight steepening of the regional dip.

Lithology and Thickness.—The Porters Creek consists of a thick body of clay containing minor lenses, interbeds, and partings of sand. The Formation was

deposited in a restricted, shallow-water, offshore, marine environment. Locally the clay is intersected by clastic dikes composed of sand resembling that in the Porters Creek or in the upper part of the Clayton. The dikes range generally from less than 1 inch to more than 5 feet in width. (Some large dike-like features as much as a few hundred feet wide may be faulted or slumped sand lenses or channel fillings.) Glenn (1906, p. 31) attributed the origin of the dikes to the injection of sand into fissures formed during earthquakes in early Eocene times. The clay and sand of the Porters Creek in Henry and northern Carroll Counties is, for the most part, similar to the clay and sand in the formation elsewhere in Tennessee. However, at several places, the upper part of the formation consists of black silty clay that locally contains partings and interbeds of light-gray sand, disseminated particles of lignitic material, and scattered nodules of pyrite. The black silty clay suggests shallower-water, nearshore conditions.

Clay in the Porters Creek is olive black, grayish black, and brownish black. The clay initially weathers olive gray, medium dark gray, and brownish gray, then weathers to light olive gray, medium light gray, and light brownish gray. The dry clay has a smooth, waxy or soapy texture, is hard and brittle, and has a conchoidal to hackly fracture. Fractures commonly are stained dark yellowish orange, light brown, and moderate brown and at places have limonite coatings. Vertical joints, commonly filled with platy limonite, locally intersect the clay. Bedding ranges from massive (greater than 6 ft.) to laminated and is either horizontal and irregular or indistinct. Locally the clay contains partings and interbeds of fine-grained, micaceous sand. The clay is sparsely to moderately silty, finely micaceous, and locally glauconitic.

Sand in the Porters Creek is light olive gray, yellowish gray, and very pale orange. The sand weathers dark yellowish orange and light brown. The sand consists of very fine- to fine-grained quartz and varies from well sorted to silty and clayey. Bedding ranges from very thin to thick and is either horizontal and irregular or indistinctly crossbedded. At places the sand contains partings and interbeds of clay. The sand generally is micaceous and at places is sparsely glauconitic and locally contains small amounts of fine-grained heavy minerals.

The Porters Creek in Henry and northern Carroll Counties ranges in thickness from about 85 to 150 feet. The formation varies greatly in thickness because of an erosional disconformity at the upper contact with the Wilcox Formation.

Fossil Content.—In the southern part of the outcrop belt in Tennessee the Porters Creek locally contains a fossil megafauna consisting chiefly of mollusks. Imprints of shells in the clay are found as far north as Henry County. The sand locally contains marine animal borings. Whitlatch (1940, p. 240) found poorly preserved fossil-leaf impressions in black laminated clay in the upper part of the Porters Creek at one locality in northern Henry County.

Wilcox Formation

The type locality of the Wilcox is Wilcox County, Alabama, where the formation is extensively developed. The Wilcox is given both formational and group rank in the geologic literature of the Gulf Coastal Plain. Roberts and Collins (1926, p. 238-240) subdivided the Wilcox Group in Tennessee into the Holly Springs and the Grenada Formations, after the Mississippi section as proposed by Lowe (1913, p. 23-25). The Ackerman Formation of Mississippi was thought to be overlapped near the southern boundary of Tennessee. Later work showed that the Holly Springs and Grenada Formations of Mississippi were the nearshore marine and nonmarine equivalent of the Claiborne, thus the names were abandoned. Present usage in the surface geology of Tennessee recognizes a relatively thin interval of strata above the Porters Creek Clay and at the base of the former Holly Springs Formation to be the Wilcox.

Areal Distribution.—The Wilcox Formation crops out in a more or less continuous, north-northeastward - south-southwestward trending belt through Tennessee from Hardeman County to Henry County. Much of the outcrop belt is covered by alluvium and high-level fluvial deposits and by the Claiborne Formation, which overlaps the Wilcox. Consequently, the actual outcrop areas are spotty and irregular in detail. In Henry and northern Carroll Counties the outcrop belt is about 4.5 to 6.5 miles wide. The Wilcox is poorly exposed in this area, and the character of the formation was determined partly from test wells.

Lithology and Thickness.—The Wilcox is a heterogeneous body of nonmarine sediments consisting chiefly of sand, silt and clay. These lithologies are variously interbedded and interlensed, and no sequence is laterally persistent over any great distance. Single exposures show gradations from relatively clean sand to silty sand to silty clay. The Wilcox in Henry County seems to contain more sand and less silt and clay than in areas to the south. Distinctive lithologies in the Wilcox in Tennessee are the so-called "sawdust sand" and clay conglomerate.

Sand in the Wilcox is light gray, yellowish gray, pinkish gray, very light gray, and very pale orange. The sand initially weathers grayish orange, dark yellowish orange, and moderate reddish orange, then weathers to pale reddish brown, light brown, and moderate reddish brown. The sand consists chiefly of very fine- to coarse-grained quartz. The degree of sorting is variable. The sand may be well sorted and clean, or poorly sorted and variably silty and clayey. Bedding ranges from very thin to thick and is horizontal and irregular, crossbedded or indistinct. The sand is sparsely to very micaceous and at places contains small amounts of fine-grained heavy minerals.

Silt in the Wilcox is olive gray, brownish gray, and medium gray. The silt initially weathers light olive gray, light brownish gray, and light gray, then weathers to yellowish gray, pinkish gray, and very light gray. Locally the silt is stained grayish orange, dark yellowish orange, pale red, and light brown. The silt is variably sandy and clayey and generally is interbedded with, or grades into, sand or clay. Bedding ranges from laminated to thick and is generally horizontal and irregular or indistinct. The silt is sparsely to very micaceous and at places contains disseminated particles of lignitic material.

Clay in the Wilcox is dark gray, brownish gray, medium gray, and pale yellowish brown. The clay initially weathers light brownish gray, light gray, and yellowish gray, then weathers to pinkish gray, light gray, and white. The weathered clay locally is stained pale yellowish orange and moderate orange pink. The clay is variably sandy and silty and is commonly interbedded with, or grades into, sand or silt. Bedding ranges from laminated to thick and is generally horizontal and irregular or indistinct. Some of the clay is lignitic.

The Wilcox varies greatly in thickness along the outcrop belt because both the lower contact with the Porters Creek and the upper contact with the Claiborne are erosional disconformities. Across the outcrop belt the formation forms an irregular wedge between the underlying Porters Creek Clay and the overlying Claiborne Formation. This wedge generally is thinner from west to east in the updip direction. In Henry and northern Carroll Counties the Wilcox ranges in thickness from about 40 to 150 feet.

Fossil Content.—In the southern part of the outcrop belt in Tennessee, the clay of the Wilcox locally contains an excellent fossil megaflora. The plant remains are chiefly the imprints and carbonized parts of leaves and stems. The Wilcox clay in Henry and northern Carroll Counties may contain plant remains, and the fresh lignitic clay probably contains palynomorphs that can be identified.

Claiborne Formation

The type locality of the Claiborne is Claiborne Bluff and Claiborne Landing on the Alabama River, Monroe County, Alabama. In the geologic literature of the Gulf Coastal Plain, the Claiborne generally is given the rank of the group because at many places it can be subdivided into several formations. In Tennessee, however, the Claiborne cannot be satisfactorily subdivided at the surface on the basis of present information. Therefore, the Claiborne is considered to be a formation in the description of the surface geology. Present usage in Tennessee includes in the Claiborne all strata above the Wilcox Formation and below the Jackson (?) Formation.

Areal Distribution.—The Claiborne Formation crops out in all of western Tennessee west of the outcrop belt of the Wilcox Formation, except for areas in the western tier of counties where the Jackson (?) Formation overlies the Claiborne. In most of the area, however, the Claiborne forms the subcrop bedrock beneath extensive cover of high-level fluvial deposits, alluvium, and loess. Only the lower 100 to 150 feet of the Claiborne is described herein.

Lithology and Thickness.—The Claiborne Formation consists chiefly of sand and subordinate lenses of clay, which were deposited in nonmarine and nearchore marine environments. The clay lenses are present at differing stratigraphic horizons and, for the most part, do not seem to be very extensive. Clay lenses are common in the Claiborne Formations in Henry and northern Carroll Counties. The clay deposits mined in Henry County, southwest of Puryear and northwest of Whitlock, may be remnants of a widespread horizon in the Claiborne. However, details are obscured by a mantle of high-level fluvial deposits and by erosion during the Pleistocene and Recent.

Sand in the Claiborne is light gray, yellowish gray, grayish pink, very pale orange, very light gray, and white. Locally the sand is stained grayish orange, moderate orange pink, and pale red purple. The sand weathers pale yellowish orange, moderate reddish orange, dark yellowish orange, light brown, and moderate reddish brown. The sand consists chiefly of fine- to very coarse-grained quartz. The coarser fraction commonly contains scattered subangular to subrounded granules and small pebbles of quartz and quartzite. Sorting ranges from poor to well. Bedding ranges from very thin to thick and is crossbedded, lenticular, or horizontal and irregular. The sand is sparsely to very micaceous and locally contains small amounts of fine- to medium-grained heavy minerals.

Clay in the Claiborne is brownish black, dark gray, brownish gray, medium gray, and light gray. The clay weathers pinkish gray, very light gray, and white. The clay is commonly sandy and silty, but some beds are relatively free of sand and silt. Bedding ranges from thick to laminated and is horizontal and irregular or indistinct. The darker colored clay is carbonaceous; some is very lignitic and at places contains lenses of lignite. The very lignitic clay locally contains scattered nodules of pyrite.

Not much is known about the thickness of the Claiborne in Tennessee. However, a recent test well drilled in Lauderdale County, near the axis of the Mississippi embayment, indicates a maximum thickness of about 1,100 feet for the formation.

Fossil Content.—Some of the clay lenses in the Claiborne contain an abundant fossil megaflora. These plant remains consist chiefly of the imprints and carbonized parts of leaves and stems. Berry (1916, 1930) made extensive collections of plant fossils from clay pits near Puryear, Whitlock, Paris, and Henry. In his report Berry followed the stratigraphy of the early workers which placed his collecting localities in the Wilcox. It is now thought that most of the collecting sites in Henry County were in the Claiborne.

The fresh lignitic clay and lignite in the Claiborne provide excellent materials for palynological study. Dr. R. H. Tschudy, Paleontology and Stratigraphic Branch, U. S. Geological Survey, has identified pollen, hystrichospheres, and dinoflagellates from samples collected in Henry and northern Carroll Counties.

Fluvial Deposits

The fluvial deposits, which are remnants of terrace deposits of present streams or of an earlier drainage

system, are made up of sand and gravel with minor lenses of clay and are covered by a thin cap of silt. In northern Carroll and southern Henry Counties the fluvial deposits are composed of sand, containing little or no gravel, but in central and northern Henry County gravelly sand and sandy gravel are predominant.

Sand in the fluvial deposits is yellowish gray and grayish orange. The sand weathers yellowish orange, reddish orange, and moderate reddish brown. The sand consists chiefly of fine- to very coarse-grained quartz. The degree of sorting is variable. The sand may be poorly sorted and variably silty and clayey, or well sorted and clean. Bedding generally is poor or indistinct and is locally crossbedded.

Gravel in the fluvial deposits is varicolored because of iron oxide stains. In northern Carroll and southern Henry Counties it consists chiefly of granules and well-rounded pebbles of quartz and quartzite and is present as local scatterings and small lenses in the sand. In central and northern Henry County there are thick gravel lenses composed of chert, quartz and quartzite. The gravel ranges in size from granules to boulders and has a sand matrix. Bedding is generally poor or indistinct, but some of the thicker gravel lenses are crossbedded. Locally the gravel is cemented with iron oxide to form ferruginous conglomerate. Potter (1955) included information concerning the mineralogy, petrology, and geomorphic history of the gravel deposits in northern Henry County.

Silt, capping the fluvial deposits, is moderate yellowish brown to grayish orange. The silt is variably clayey and sandy and commonly grades into sand below. The silt resembles loess which is eolian in origin. However, numerous outcrops indicate that the silt (or loess) is reworked and consists of fluvial or colluvial deposits.

In Henry and northern Carroll Counties the fluvial deposits range in thickness from 0 to 80 feet; the silt cap is locally as much as 6 feet thick.

Alluvium

The alluvium, which underlies the flood plains, is a heterongeneous body consisting of sand, gravel, silt, and clay. The upper part generally is composed of fine-grained sand, silt, and clay, and the lower part is made up of fine-to very coarse-grained sand and scattered gravel. The alluvium is locally derived; that is, it consists of materials that were eroded from the bedrock and fluvial deposits within the drainage basin.

The alluvial deposits are olive gray, medium gray, moderate yellowish brown, light olive gray, light gray, and pale yellowish brown. Bedding is generally poor or indistinct. The sediments commonly are poorly sorted and grade from one lithology to another.

The alluvium beneath the flood plains of the major streams is as much as 30 feet thick. Generally it is thickest downstream, where the flood plains are broad, and is thinnest in the headwater areas, where it merges with colluvial materials, which have washed down the hillsides.

Conclusions

The Tertiary stratigraphy in Henry and northern Carroll Counties is complicated because of the similarities in the lithologic character of several formations, the erosional disconformities that make stratigraphic relationships uncertain, and the Tertiary (?) and Quaternary surficial deposits which cover extensive outcrop areas. Although useful geologic quadrangle maps are being made of the area, much is still not known concerning the stratigraphy. Suggested investigations that are beyond the scope of the mapping project but which should be helpful in refinement of the geology are as follows: (1) the collection and interpretation of much additional shallow subsurface information; (2) a comprehensive study of palynomorphs from clays in the formations as compared with regional control material; and (3) the study of the minearology and petrology of the sediments in order to obtain a better understanding of the environments of deposition.

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