TIGRAPHY OF AN ARCHEOLOGICAL SITE, OCMULGEE FLOOD PLAIN, MACON, GEORGIA

U. S. GEOLOGICAL SURVEY, Water Resources Division,
WATER-RESOURCES INVESTIGATIONS 54-73

Prepared in cooperation with
U. S. National Park Service

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November 1973

UNITED STATES DEPARTMENT OF THE INTERIOR

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ABSTRACT

Archeological excavations on the Ocmulgee River flood plain at Ocmulgee National Monument revealed eight sedimentary units of Holocene age. Types of deposits found are natural levee, oberbank deposit, and a probable point bar. Since the 18th century, locally more than 10 feet of sediment has been deposited. These modern sediments are similar to those on other flood plains in the southeastern United States and probably resulted from erosion that began when extensive areas were laid bare for farming. They are red to reddish brown in contrast to underlying sediment, which is various shades of gray, brown, and yellow. Earliest traces of man are "spinner-type" projectiles in the lower sand member (Qls). Marrow mountain-type points are found in mottled silty sandy clay (Qmssc). Triangular stemmed Savannah River points were found throughout the intermediate sand (Qis). Fiber tempered pottery shards and steatite bowls were found in upper one half of the intermediate sand member (Qis).

INTRODUCTION

Purpose

In 1961 the National Park Service was advised that the proposed route of an interstate highway was to pass through Ocmulgee National Monument in Macon, Georgia. The route was to be on the flood plain, along the left bank of the Ocmulgee River. An investigation was initiated by the National Park Service to determine if the route would cover or otherwise damage any important archeological sites. The area of the investigation is shown in figure 1.

At the onset of the project, the archeologist recognized a need for geological interpretation of the stratigraphy exposed in the test pits. The National Park Service requested geologic assistance from the U.S. Geological Survey and as a result, this study was organized.

Method and Scope

The archeologist set up a grid system to facilitate test-pit reference. Gridlines running northeast-southwest are referred to as NE gridlines and those running northwest-southeast are referred to as NW gridlines. The gridline numbers represent feet from the respective origins. The pits are referred to by the numbers of the gridlines that intersect at the north corner of each pit, the first number being the NE gridline and second number the NW gridline. The layout of the grid system and the location and numbering system of test pits are shown on an insert of figure 3.

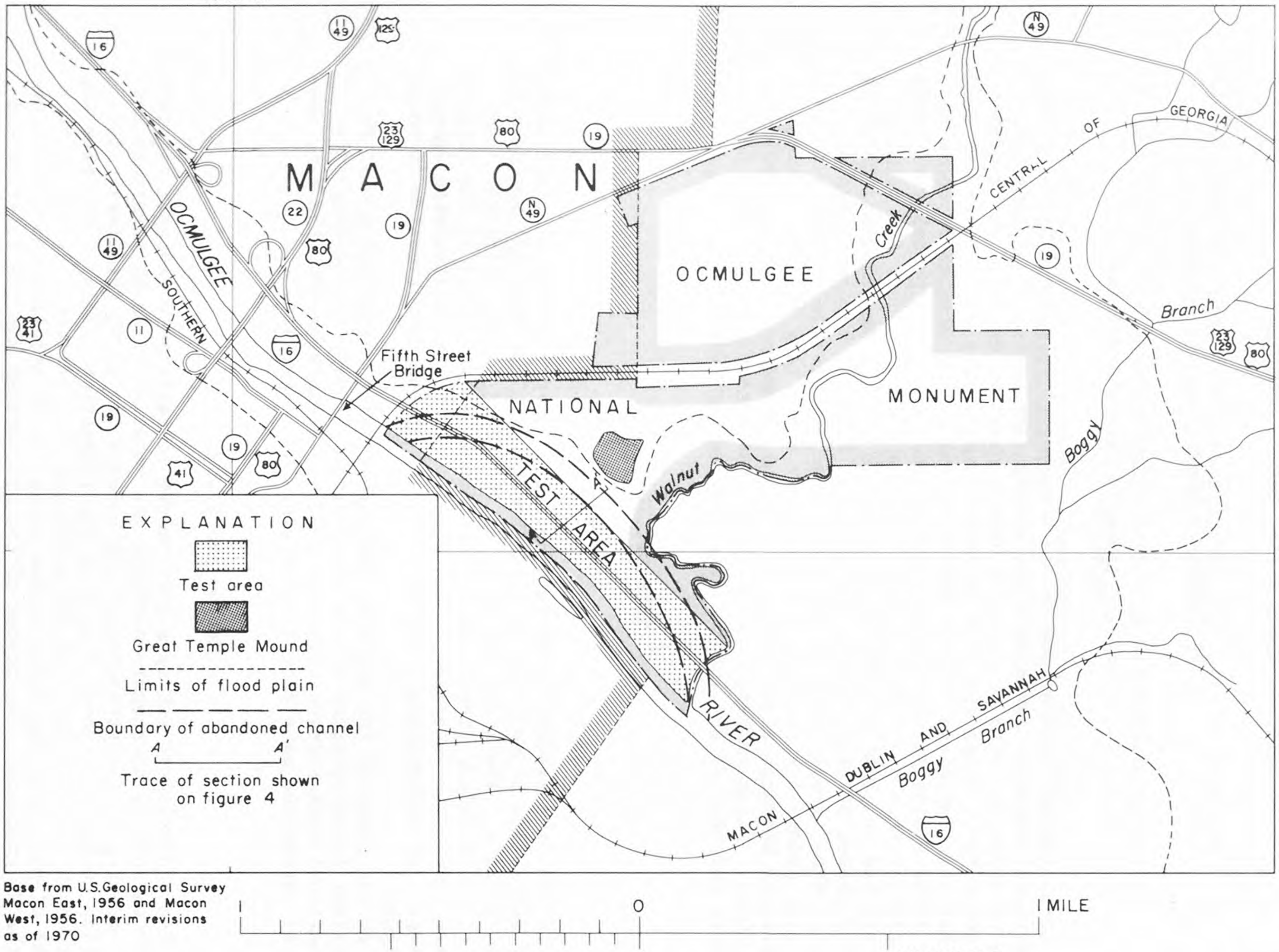


Figure 1.—Location of Ocmulgee National Monument and test area, Macon, Georgia.

Field work was done between January and June, 1962. Data from 54 pits and two trenches were used in the geologic analysis. The pits were 20 feet square at the surface and the walls sloped to a 10-foot square at a 12-foot depth. A 2-foot ledge at the 6-foot level was left to facilitate inspection and construction. Plans called for all pits to be dug to 12 feet, but due to ground water, most of them did not reach this depth. The average depth of the pits was 7 feet, the deepest being 12.2 feet and the shallowest being 2.2 feet. The trenches were between 2 and 7 feet in depth, 12 feet wide, and 225 feet and 700 feet in length. The bottom of the longest trench was irregular, as shown in figure 5.

The mean elevation of the bottom of each geologic unit was shot in by use of a rod and hand level, using as a bench mark the reference stake at the north corner of each pit. Channel samples were taken in various pits, but not in all pits. As grain-size analyses of materials sampled have not been made, size data given in the report are estimates made by the author using standard particle size. Sketches were made where important geologic relationships were exposed. Due to flood waters engulfing the pits and the subsequent slow drainage from some pits, it was not possible to get elevations in each pit. It was often necessary to clean off pit faces after such flooding to obtain geologic data.

Historical Sketch

In 1756 only 6,000 people lived in Georgia and most of them lived in the Coastal Plain. Their main crops were rice and indigo, both well adapted to the swampy bottomland. Cotton, although first planted in 1738, did not become the main crop until after the invention of the cotton gin in 1793. The Piedmont then rapidly opened up to cotton farming. Between 1790 and 1810 cotton production doubled, with most of the increased production in the Piedmont. Because of thin erosive Piedmont soils and intensive cultivation of cotton, many farms were worn out in a few years with gullying a common problem. One large gully near Milledgeville was first described in 1846 by Sir Charles Lyell, who reported that it did not exist 20 years previously (Ireland, 1939). Erosion of the red soils of the Piedmont probably started as soon as the lands were cleared and roads were built, but severe erosion occurred after the Civil War, when the owners were unable to maintain their plantations. The floods of the 1880's were especially noted for the amount of red sediments carried by the rivers. It is probable that deposits from this erosion exist on most flood plains of the Georgia Piedmont. This deposition on the Ocmulgee at Macon is discussed further on in this report.

Acknowledgment

The author wishes to acknowledge the help received at the site by the National Park Service Archeological Research Unit, whose scientists were never too busy to discuss geologic problems and were always ready to assign personnel to the author when the need arose.

PHYSIOGRAPHY

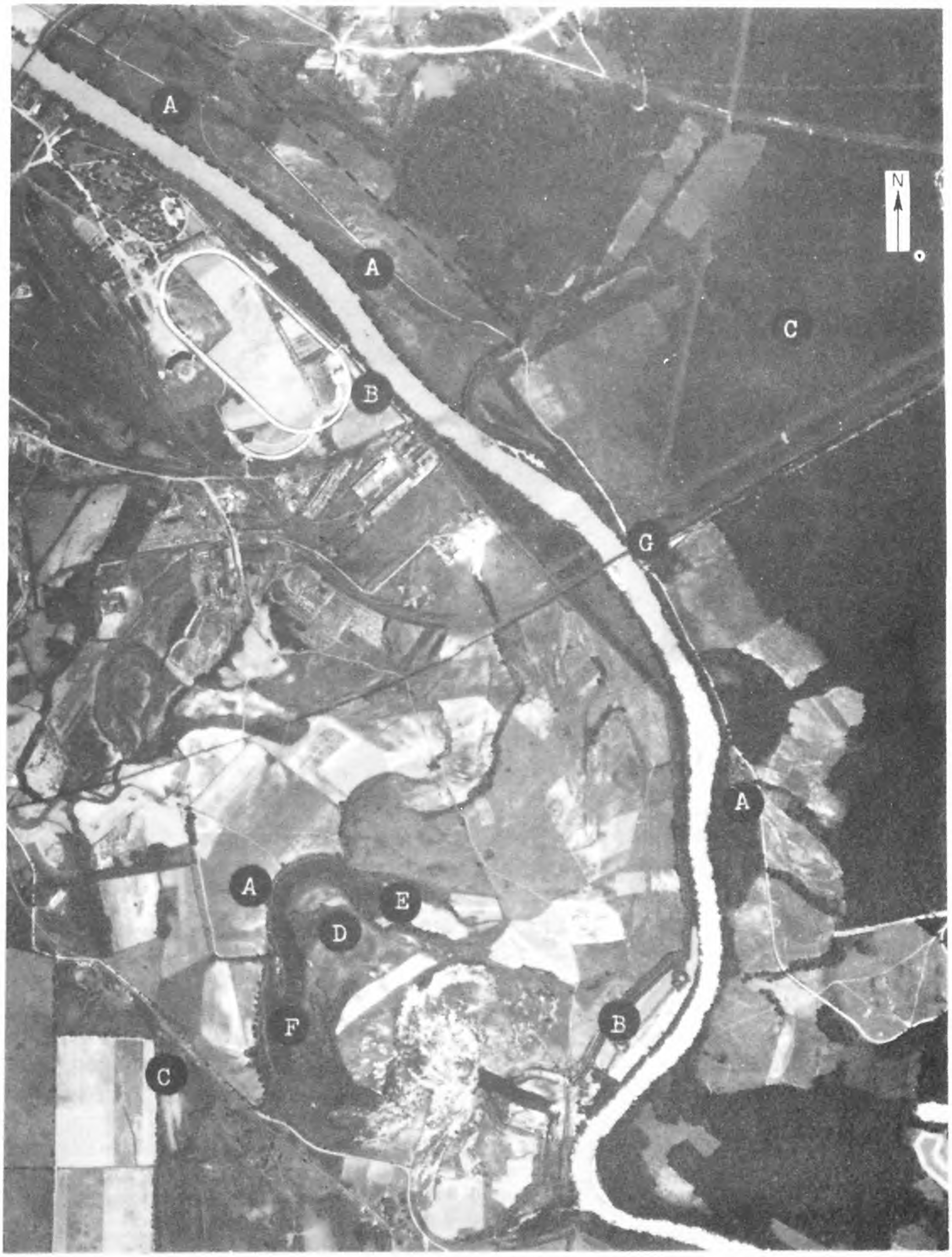
The Ocmulgee River crosses the Fall Line in Macon, the boundary between the Piedmont and the Coastal Plain physiographic provinces, and drains an area of 2,240 square miles. The river is entrenched in the hard crystalline rock of the Piedmont above Macon, and in the less resistant Coastal Plain sediments below Macon. For about 6 miles upstream from the Fifth Street bridge ("C" on figure 1, at northern end of test area) at Macon, the gradient of the river is 3 feet per mile. Downstream from the bridge, for a distance of more than 10 miles, the gradient is about 1.2 feet per mile. The flood plain in the upstream reach is narrow, only about 1/4 to 1/2 mile wide, but widens abruptly at the bridge and is 2 miles wide a mile south of it. About 10 miles south of the bridge the flood plain is 6 miles wide. South of this point the gradient is about 1 foot per mile, but the flood plain gradually narrows to 2 miles and maintains this width to the confluence of the Ocmulgee and the Oconee Rivers about 140 river miles below Macon. The explanation for the wide flood plain downstream from the Fall Line may involve more than just the change in gradient, but probably the most important factor is the reduced load capacity of the stream due to the lower gradient. However, it is beyond the scope of this paper to attempt a full explanation.

The Ocmulgee River flood plain at the National Monument is not a plane surface, but has an extreme variation in altitude of about 10 feet. Locally the variation in altitude is from 2 to 5 feet. The highest altitudes extend parallel to the river, along a natural levee, 10 to 50 feet from the shoreline. The lowest altitudes in the study area are in an abandoned channel (fig. 1) near the east edge of the flood plain.

Land Cover

The area has a mixed deciduous forest cover. Upstream from the 2,500 NE gridline and along the bank of the present channel are trees more than 50 years old and as much as 3 feet in diameter. Elsewhere, the forest is much younger with the trees generally less than 8 inches in diameter. The aerial view in figure 2A, taken in 1938, shows far less wooded area than was present in 1962.

Land forms and deposits of the Mississippi River flood plain have been classified by Fish (1952, p. 670-672) according to origin as point bar, natural levee, back swamp, and clay plug. Similar land forms and deposits are recognized on the Ocmulgee flood plain and are illustrated in figures 2A and 2B. The distinction between land form and type of deposition is not always clear. In this report the word deposit, or deposition, is used in conjunction with the land-form terms to indicate a type of deposit.



Aerial photograph by National Park Service, 1938

Figure 2A.—Aerial view of Ocmulgee River and flood plain showing test area and various land forms of the flood plain.

Aerial photograph by National Park Service, 1938

Figure 2B.—Aerial view of Ocmulgee River and flood plain 1 mile upstream from test area showing point bars and chute cutoffs.

SCALE FOR FIGURES 2A AND 2B

0 — 1 MILE

EXPLANATION FOR FIGURES 2A AND 2B

A — Natural levee

B — Manmade levee

C — Back swamp

D — Point bar

E — Clay plug

F — Abandoned meander, oxbow lake

G — Macon, Dublin, and Savannah RR bridge

H — Chute cutoff

– – – – Limits of test area

STRATIGRAPHY

Flood-plain deposits

The section of the flood-plain deposits studied is considered as part of a geologic formation of Holocene age and the subdivisions are considered as informal members. To help men working on the project, the archeologist in charge and the author decided upon informal names for these subdivisions. The names were abbreviated by using the first letter of each word in the name. The members are listed below in order of relative age, the youngest at the top and the oldest at the bottom. The prefix Q is used to show that each is of Quaternary age except for the unit artificial fill, which is not dated.

Names of informal members	Geologic symbol used on illustrations
Artificial fill	af
Modern silty sandy sediments	Qmsss
Modern flood-plain sediments	Qmfps
Black sandy loam	Qbsl
Intermediate sand	Qis
Mottled silty sandy clay	Qmssc
Lower sand	Qls
Lower mottled sand	Qlms

The complete geologic section studied was exposed in only a few pits. These pits were along the 450 NW gridline between the 3,000 and 4,500 NE gridlines. In most of the pits only a partial section was exposed. The total of the maximum thicknesses of each flood-plain unit is 33 feet, but the total thickness of the flood-plain section in its thickest part is probably less than 20 feet. A summary of the data taken from the pits is given in table 1. The approximate thickness and extent of each member is shown on the fence diagram in figure 3.

The variation in color between the various layers is more noticeable than the variation in particle size. Mottling is also very prominent. These two, color and mottling, along with position in the section, were found to be the most reliable criteria for identifying members. The size of the material and layering were also useful. Table 2 is a generalized stratigraphic section of the deposits investigated.

Correlation of Stratigraphy and Archeology

The most important horizons, archeologically speaking, are the black sandy loam (Qbsl) and the boundary between pottery and no pottery found in the intermediate sand (Qis). Artifacts of the Early-Man type were not found, so it is assumed that all units investigated were deposited in Post-Early-Man time (See table 3.).

Table 1.--Geologic data from archeological test pits at Ocmulgee National Monument, Macon, Georgia

Pit No.	Land-surface elevation (feet above msl)	Thickness of informal members of flood-plain deposits (feet)						Depth of pit (feet)	Remarks
		Qmsss	Qmfps	Qbsl	Qis	Qmssc	Qls		
450-1000	288.9	a4.5	-	-	-	-	-	4.5	
500-600	288.3	1.7	4.3	-	-	a .6	-	6.6	
700-1000	291.3	3.7	2.5	-	-	a4.2	-	10.4	
750-500	287.9	.6	2.4	-	-	a1.6	-	5.6	Rubble 0.6 to 1.6
750-740	290.3	1.6	2.1	-	-	a7.9	-	11.6	
1000-450	288.5	3.5	a1.5	-	-	-	-	5.0	
1000-660	290.5	1.8	-	-	-	a4.8	-	9.0	Road fill 1.8 to 4.2
1000-950	288.4	2.3	1.9	(b)	2.5	a4.3	-	11.0	
1250-660	289.7	4.9	4.4	-	-	a2.9	-	12.2	
1250-900	291.8	2.0	.8	-	4.0	-	a3.2	10.0	Dipping beds
1500-450	287.0	2.0	a1.5	-	-	-	-	3.5	
1510-680	289.8	4.0	1.5	(b)	1.5	a .5	-	7.5	
1500-850	290.4	1.7	1.1	0.6	a2.8	-	-	8.0	Top 1.8 ft. fill

a - Bottom of member not exposed
b - Included in Qmfps

Table 1.--Geologic data from archeological test pits at Ocmulgee National Monument, Macon, Georgia--Cont.

Pit No.	Land-surface elevation (feet above msl)	Thickness of informal members of flood-plain deposits (feet)						Depth of pit (feet)	Remarks
		Qmss	Qmfps	Qbsl	Qis	Qmssc	Qls		
1750-450	287.9	-	3.4	-	-	a .5	-	3.9	
1760-680	289.2	.7	1.7	-	.7	a2.9	-	6.0	Qis missing in two faces due to erosion
2000-800	292.0	6.9	3.3	(b)	a1.8	-	-	12.0	Dipping beds
2010-680	290.4	1.4	.5	-	1.0	a3.1	-	6.0	
2260-680	290.7	2.5	1.2	.8	4.8	a2.8	-	12.1	
2250-750	291.4	5.5	1.5	1.0	a4.0	-	-	12.0	
2500-450	288.5	1.9	1.1	-	-	-	-	-	Incomplete
2500-680	292.0	5.5	1.0	1.0	a2.0	-	-	9.5	
2750-450	290.0	.3	1.1	-	.7	a .2	-	2.3	
3000-450	290.3	1.0	.8	.3	1.8	a3.2	-	7.1	
3010-680	290.2	4.5	a3.9	-	-	-	-	8.4	
3125-450	290.6	1.1	.7	-	1.4	a .6	-	3.8	
3250-210	288.9	1.4	.8	-	.4	a1.0	-	3.6	
3250-450	290.0	.7	.7	-	1.3	2.7	a4.7	10.1	

a - Bottom of member not exposed
b - Included in Qmfps

Table 1.--Geologic data from archeological test pits at Ocmulgee National Monument, Macon, Georgia--Cont.

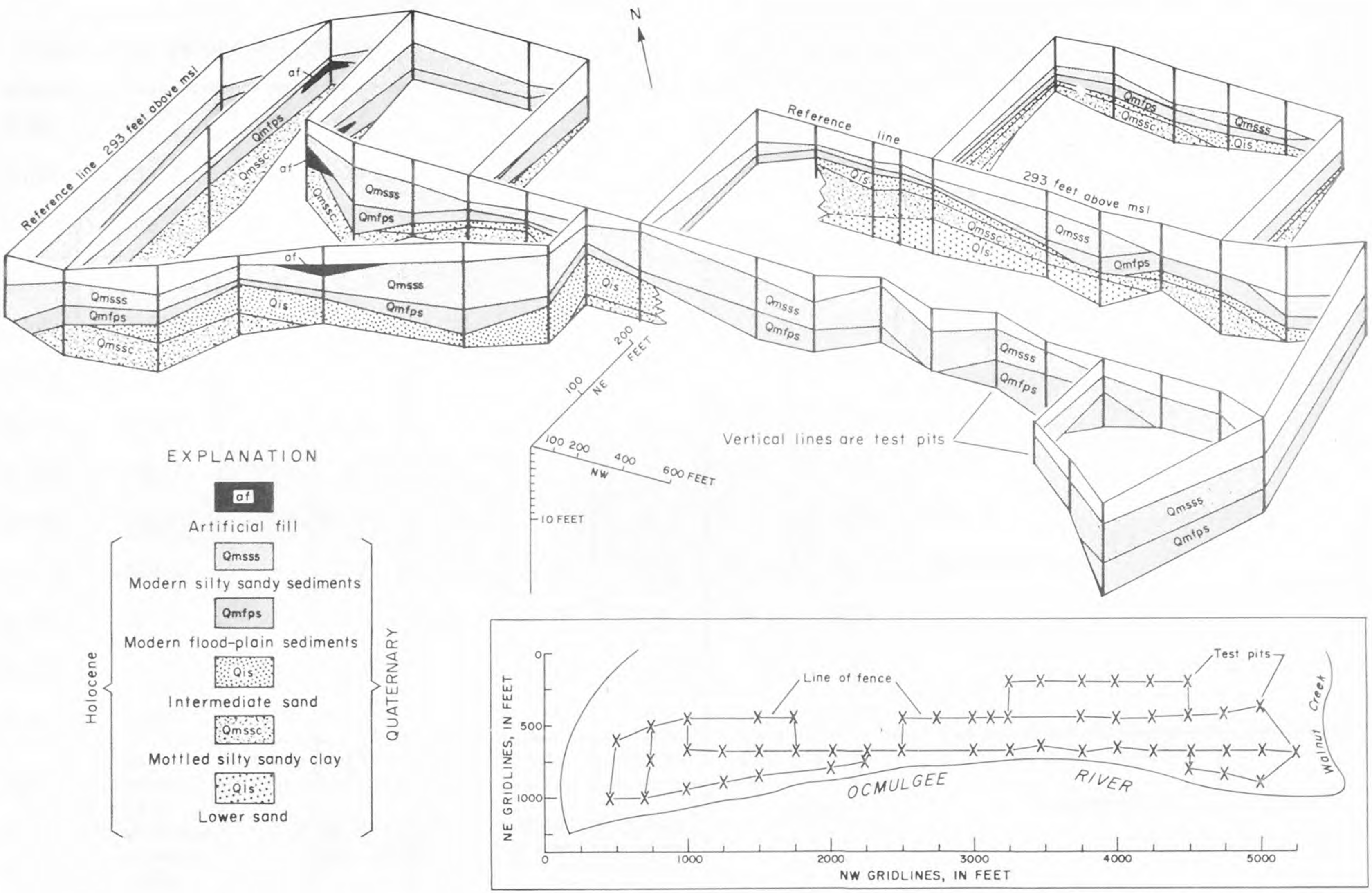
Pit No.	Land-surface elevation (feet above msl)	Thickness of informal members of flood-plain deposits (feet)						Depth of pit (feet)	Remarks
		Qmss	Qmfps	Qbsl	Qis	Qmssc	Qls		
3250-650	289.0	3.8	a3.0	-	-	-	-	6.8	
3480-200	289.3	1.7	1.7	-	0.6	-	-	-	Incomplete
3480-250	290.3	1.4	1.0	-	.5	-	-	-	Incomplete
3480-480	288.9	1.8	1.0	-	.2	1.0	a1.9	5.9	
3480-650	291.2	5.3	a2.3	-	-	-	-	7.6	
3760-210	288.1	.7	1.9	.2	-	a2.5	-	5.3	
3750-450	290.4	4.3	.8	.7	-	1.6	a2.0	9.4	
3760-680	289.5	a5.0	-	-	-	-	-	5.0	
4000-210	289.1	1.8	1.2	-	a2.0	-	-	5.0	
4000-460	290.7	4.3	1.9	-	-	.9	3.7	11.4	0.6 mottled clayey sand at bottom (Qlms)
4000-660	290.8	4.3	a3.6	-	-	-	-	7.9	
4250-210	289.1	1.5	.9	-	a1.2	-	-	3.6	
4250-450	288.6	-	1.7	.2	1.2	a1.1	-	4.2	Dipping beds

a - Bottom of member not exposed

Table 1.--Geologic data from archeological test pits at Ocmulgee National Monument, Macon, Georgia--Cont.

Pit No.	Land-surface elevation (feet above msl)	Thickness of informal members of flood-plain deposits (feet)						Depth of pit (feet)	Remarks
		Qmsss	Qmfps	Qbsl	Qis	Qmssc	Qls		
4260-680	291.5	3.3	a6.7	-	-	-	-	10.0	
4500-210	288.3	-	2.2	-	-	-	-	2.2	
4500-390	290.0	1.4	1.0	-	1.2	5.6	a1.3	11.5	
4500-450	288.3	-	2.3	-	1.0	3.1	a3.0	9.4	Qmfps dipping
4510-680	290.5	2.3	a4.9	-	-	-	-	7.2	
4500-810	291.3	a4.0	-	-	-	-	-	4.0	
4750-430	285.9	2.6	1.7	-	a1.6	-	-	5.9	
4760-680	289.7	a4.0	-	-	-	-	-	4.0	
4750-850	290.0	a4.5	-	-	-	-	-	4.5	
5000-385	285.4	3.1	2.4	-	-	-	-	5.5	
5010-680	290.0	a4.5	-	-	-	-	-	4.5	
5000-900	290.0	5.5	a5.0	-	-	-	-	10.5	
5250-700	287.5	4.5	a2.5	-	-	-	-	7.0	

a - Bottom of member not exposed



Index map showing grid system, location of archeological test pits, and line of fence diagram.

Figure 3.—Fence diagram of flood-plain deposits at Ocmulgee National Monument, Macon, Georgia.

Table 2.--Generalized stratigraphic section of flood-plain deposits investigated at Ocmulgee National Monument.

Member	Thickness (feet)	Character
Modern silty sandy sediments (Qmsss)	0 to 6.9	Alternate layers of reddish brown crossbedded sand and red silty sand grading to a single bed of layered sand where thin. Layers range in thickness from 0.1 to 2.0 feet, average 0.5 foot.
Modern flood-plain sediments (Qmfps)	0 to 6.7 (both units)	Upper unit - Alternate layers of reddish brown crossbedded sand and red and brown mottled silty sandy clay grading to a single bed of red sandy silt where deposit is thin. Lower unit - Mixed zone of red silt and clay fragments in humic-stained sand and silt of the underlying Qbsl. Thickness usually 0.3 to 0.5 foot. Locally drainage channel deposits from 0.3 to 1 foot thick occur at this horizon. They contain thin beds 0.01 to 0.3 foot of gray sand separated by thin beds of red clay and red silt 0.01 to 0.1 foot thick.
Black sandy loam (Qbsl)	0 to 1.0	Black sandy loam present locally. A soil horizon best developed on the next lower unit, the Qis.
Intermediate sand (Qis)	0 to 4.8	Even grained gray sand devoid of depositional features where thin. Contains much charcoal locally. Thicker deposits show some crossbedding and banded staining.
Mottled silty sandy clay (Qmssc)	0 to 7.9	Mottled gray, brown, and yellow clayey sand containing sand lenses, grading laterally to yellow and brown mottled clay. Contains a few iron-manganese concretions up to 0.02 foot in diameter associated with the mottling. Locally top one to two feet is mottled gray and brown sand referred to (see p. 26) as the hard brown sand by archeologists (Qhbs).
Lower sand (Qls)	0 to 4.7	Banded, even-grained, locally crossbedded brown sand.
Lower mottled sand (Qlms)	Unknown	Brown, mottled sand with no apparent bedding. One foot exposed in pit 400-460.

Table 3.--Relation of stratigraphy to archeology at Ocmulgee National Monument.

Geologic		Deposits on left bank below Great Temple Mound and above flood plain	Flood Plain		Archeological period
System	Series		Flood-plain deposits	Cultural material	
QUATERNARY	Holocene	Colluvium	Artificial fill / Modern silty sandy		Post 1700 A.D.
			Modern flood plain		
			Black sandy loam / Intermediate sand	Steatite bowls, pot shards. First pottery found was fiber tempered. No pottery below this level.	
			Mottled silty sandy clay	Triangular stemmed Savannah River points.	Archaic
				Morrow Mountain-type base. Quartz points. First stemmed points.	
			Lower sand	POST-EARLY MAN Typical "spinner-type" projectile points. Some bifaced blades.	
			Lower mottled sand(?) Base of unit not exposed	Barren (Recognized in only one pit and at one station in trench.)	
	Pleistocene(?)	Terrace clay			
			Terrace clay absent		
CRETACEOUS	Upper Cretaceous	Tuscaloosa Formation			

In the area of investigation, the surficial deposits can be classified as a natural levee and back swamp. Underlying these are a probable point bar and clay plug. Overbank deposits include the clay plug and back swamp as well as deposits that extend out away from the channel beyond the natural levee, but that are contiguous with and in a sense, a part of the natural levee. Figure 4 is a diagramatic cross section showing the arrangement of the members and their classification. Figure 5 shows the members as found in a trench dug along the 3,225 NE gridline between the -100 and 600 NW gridlines. Most of the Qmsss and parts of the Qmfps, Qbsl, and Qis were removed by bulldozer before the trench was started.

Artificial fill (af).--Material dredged from the river has been plastered locally against the left bank upstream from the 1,500 NE gridline. Road fill was encountered in four pits.

Modern silty sandy sediments (Qmsss).--The geologic relations of the Qmsss are shown in figure 4. This unit, thought to have formed since 1900 A.D., is both a natural-levee deposit and an overbank deposit. It covers most of the area, as shown on the fence diagram in figure 3. Near the present channel it is a series of alternate layers of brown well bedded, locally crossbedded sand and red silty sand. (See figure 6.) The part deposited within the channel tends to widen and add to the height of the natural levee. That part which extends beyond the natural levee is an overbank deposit and adds to the thickness of the flood plain. The alternate beds of brown sand and red silty sand deposited within the channel are not continuous, but grade laterally from one into the other. They appear to have more continuity perpendicular to the channel than they do parallel to the channel. A sinuous contact is present at places between these beds and suggests large ripple marks at the time of deposition. The member is thickest near the present channel and thins away from the channel toward the valley wall. Even though the deposit beyond the natural levee appears to be a continuous layer of sandy material, this part of the Qmsss was not all deposited by the same flood. It probably was laid down in narrow tongues extending out from the natural levee. The age of the Qmsss is thought to extend from not earlier than 1900 A.D. up to the present time. Perhaps the construction of Lloyd Shoals Dam dates the base of the Qmsss. This is discussed further on the following pages.

Modern flood-plain sediments (Qmfps).--The Qmfps member, which probably dates from about 1700 A.D. to about 1900 A.D., is quite similar to the Qmsss being both a material-levee and overbank deposit. However, it contains red clay and a higher proportion of red silt. It is composed of alternate layers of brown well bedded and locally crossbedded sand, and red and dark red mottled silt, silty clay, and clay. Near the present channel the top bed is a red and dark red mottled silty clay. The beds of sand, silt, and silty clay thin away from the present channel and beyond the natural levee grade to a single bed of red silt or silty clay with discontinuous stringers of brown sand (fig. 7). The overbank part of the Qmfps is usually thin and, as shown in table 2, has two distinct units; an upper unit of bedded red silt or silty clay and a lower unit of mixed older sediments. In the lower mixed zone, which averages about 0.3 foot in thickness, individual fragments of red silt and clay occur surrounded by the black sandy loam of the Qbsl and were being filled at the time the lower mixed one was being formed. The channels are filled with well-bedded sand ranging in color from gray to brown and contain thin beds (0.01 to 0.1 foot) of red silt and red clay. The thickness of the channel fill averages about 0.3 foot and the maximum thickness exposed is 1 foot.

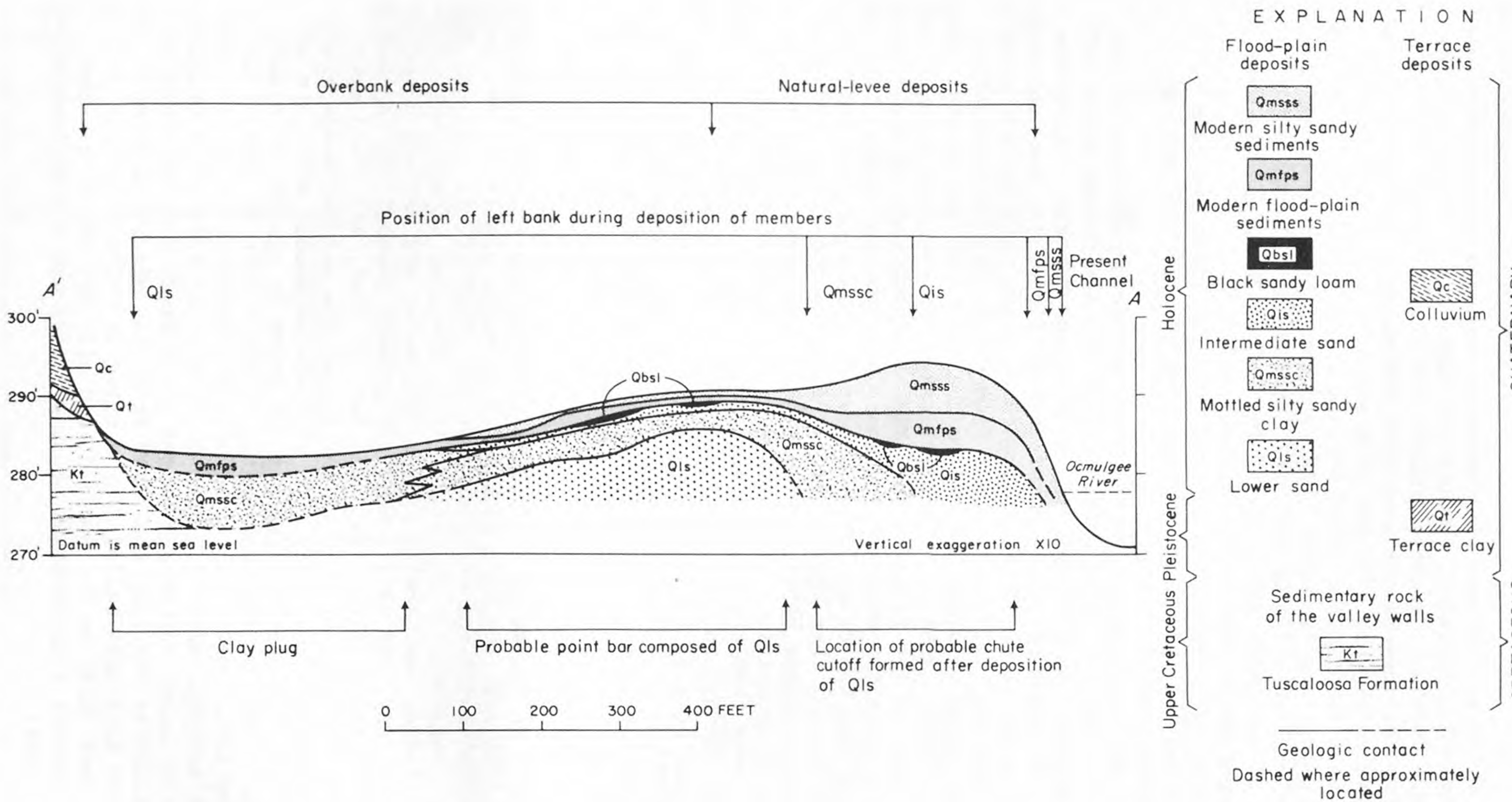


Figure 4.— Diagrammatic section of flood-plain deposits at Macon, Georgia showing type of deposits and their relation to the channel of the Ocmulgee River.

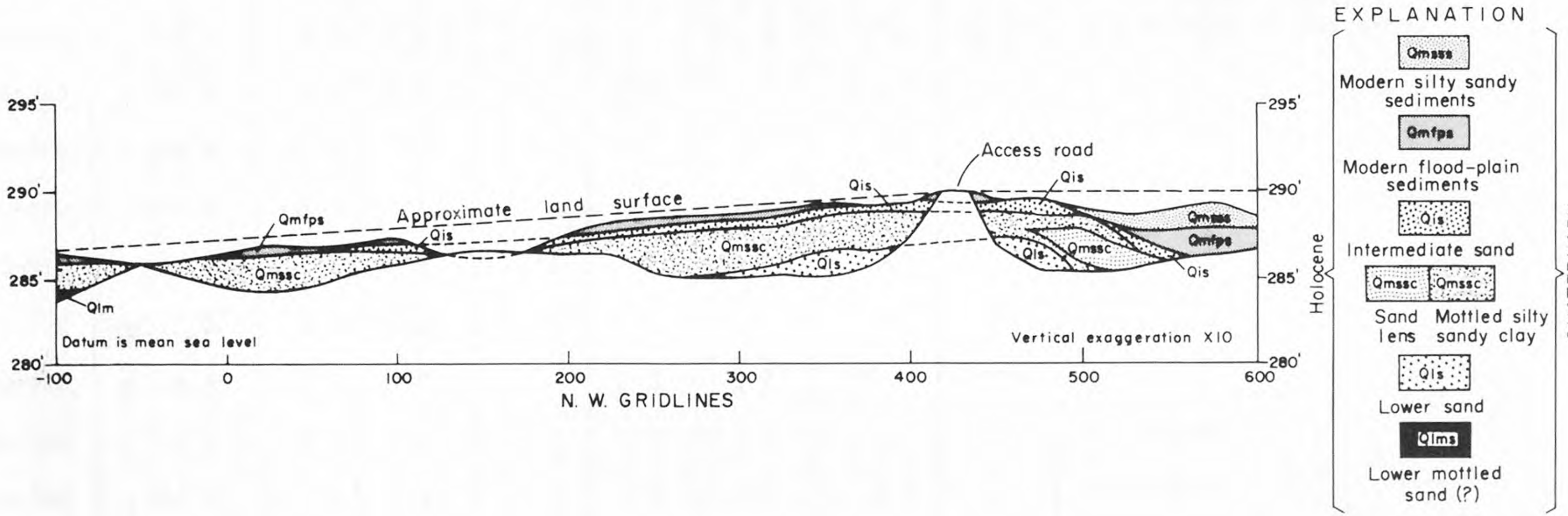


Figure 5.—Ocmulgee flood-plain deposits in trench along the 3225 N.E. gridline.

Table 1.--Geologic data from archeological test pits at Ocmulgee National Monument, Macon, Georgia--Cont.

Pit No.	Land-surface elevation (feet above msl)	Thickness of informal members of flood-plain deposits (feet)						Depth of pit (feet)	Remarks
		Qmss	Qmfps	Qbsl	Qis	Qmssc	Qls		
3250-650	289.0	3.8	a3.0	-	-	-	-	6.8	
3480-200	289.3	1.7	1.7	-	0.6	-	-	-	Incomplete
3480-250	290.3	1.4	1.0	-	.5	-	-	-	Incomplete
3480-480	288.9	1.8	1.0	-	.2	1.0	a1.9	5.9	
3480-650	291.2	5.3	a2.3	-	-	-	-	7.6	
3760-210	288.1	.7	1.9	.2	-	a2.5	-	5.3	
3750-450	290.4	4.3	.8	.7	-	1.6	a2.0	9.4	
3760-680	289.5	a5.0	-	-	-	-	-	5.0	
4000-210	289.1	1.8	1.2	-	a2.0	-	-	5.0	
4000-460	290.7	4.3	1.9	-	-	.9	3.7	11.4	0.6 mottled clayey sand at bottom (Qlms)
4000-660	290.8	4.3	a3.6	-	-	-	-	7.9	
4250-210	289.1	1.5	.9	-	a1.2	-	-	3.6	
4250-450	288.6	-	1.7	.2	1.2	a1.1	-	4.2	Dipping beds

a - Bottom of member not exposed

Black sandy loam (Qbsl).--The Qbsl is a soil horizon marked locally by the development of a black sandy loam. In other areas this zone is marked by a high content of charcoal, indicating that much land clearing took place. The Indians and early settlers cleared land by burning. Stumps were burned producing charcoal from the roots below the surface of the ground. The Qbsl surface is best developed on the Qis member. However, where the Qsi is absent, the Qbsl has developed locally on the Qmssc member (See figure 6.) and in at least one location on the Qls member. The Qbsl is thin and not everywhere present and, therefore, is not shown in figure 3. In pits where it was well exposed, it was mapped as a separate unit, otherwise, it was included with the underlying unit, as noted in table 1.

Intermediate sand (Qis).--The next lower unit, the Qis, is a gray medium evengrained sand with very few sedimentary features preserved. It is thought to be mainly an overbank deposit, but has natural-levee bars near present channel. Bedding is generally not present over most of the area, probably because the Qis is a relatively thin layer and root action and plowing have destroyed this feature. Near the present channel of the river the Qis thickens and grades into well-bedded and crossbedded sands that are bar-line deposits formed on the channel side of the natural levee. This thickening is illustrated in figures 3 and 4.

During the early part of the investigation it was the author's opinion that the Qis appeared to grade downward into the Qmssc. However, in some areas a foot or more of firm mottled sand was present, similar to the Qmssc in its mottling, but having the texture of the Qis. The contact between the Qmssc and the Qis was placed at the top of the mottling. Later, more exposures of this contact were available and in some of these a distinct division was apparent between the gray sand of the Qis and the mottled sand below. The mottled sand is referred to as hard brown sand by the archeologists, but is included in the Qmssc in this report (See figure 7.).

The hard brown sand was mapped with the Qis in a few pits at the beginning of the project. The absence of mottling in the Qis, plus its even gray color, are the most striking differences between it and the Qmssc. The reason for the lack of mottling is probably because the area was cleared and was being farmed by the prehistoric Indians during and after the Qis was deposited.

The relation between the Qis and the clay plug part of the Qmssc in the abandoned channel is not clear. The Qis is shown as lensing out on top of the clay plug in figure 3, but possibly grades laterally into it. In the trench (fig. 5), the Qis thinned out completely with no gradation into the Qmssc.

Mottled silty sandy clay (Qmssc).--The Qmssc member, which is considered an overbank and natural-levee deposit, is generally a clayey sand. It grades laterally from a high sand content near the present channel (fig. 8) to high clay content in the right bank of the abandoned channel. Excavations were made only on the right side of the abandoned channel because of water problems. However, this channel is probably filled with clay similar to that excavated on the 100 to the -100 NW gridlines. Vertical gradation is also present. Locally, the uppermost part of this unit is a brown mottled sand that, when dry, is quite hard. It is the hard brown sand of the archeologists. Another sandy zone occurs about 1 to 3 feet from the top of the unit and is illustrated in figures 5 and 8. Other sandy zones are also present in the Qmssc and all appear to be bar deposits of the natural levee and their overbank equivalents.

Figure 7.--Mottled silty sandy clay (Qmssc) in pit 750-740. The mottling is various shades of yellow and brown. Material above the board is sand referred to by the archeologists as the hard brown sand. That below the board is sandy clay.

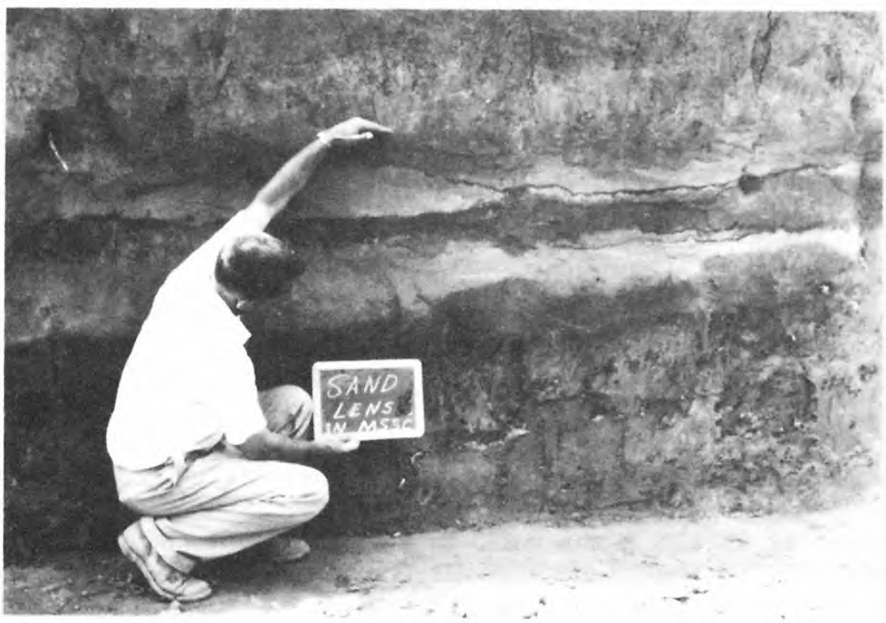


Figure 8.--Sand lens in the mottled silty sandy clay, (Qmssc) southwest wall of trench 3225 at station 500. Note two types of staining, irregular thin bands and a more even thick band.

The whole of the Qmssc member is mottled (fig. 7), with the exception of the bar-like sands shown in figures 8 and 9. The member contains a few 1/2-inch iron-manganese concretions.

The greatest thickness of Qmssc was encountered along the 750 NE grid-line. The thinnest sections occurred where the next lower member, the Qls, is at a relatively high altitude. The Qmssc is considered as an overbank deposit, with the exception of the deposits of the natural levee.

Figure 9.--Dredging fill plastered against modern flood-plain sediments (Qmfps) and mottled silty sandy clay (Qmssc). Contact is near vertical irregular line marked on face of pit. Contact between Qmfps and Qmssc is near horizontal and is located by line on board.

Lower sand (Qls).--The Qls member, a probable point bar, is a sand similar in appearance to the bar-like sands of the Qis. Although the Qls is exposed in the pits only from the 3,200 to 4,500 NE gridline (fig. 10), it may be rather extensive and probably exists under more of the area, but the pits were not deep enough to encounter it. A possible occurrence is in pit 1250-900. When this pit was logged, the Qls had not been recognized. The Qls contains some very faint bedding and stained zones very similar to the bar-like sands of the Qis. The Qls is thought to be part of a point bar formed when the main channel was to the northeast, as shown on the left in figure 4 and shown as an abandoned channel in figure 1. The thickest exposure of Qls, 4.7 feet, occurs in pit 3250-450. The deposit dips toward the abandoned channel and appears to be missing at the edge of the abandoned channel, as shown on the left in figure 5.

Lower mottled sand (Qlms).--The Qlms member is a mottled gray and brown sand with no recognizable sedimentary features. It was exposed in trench 3225 at station -100 (fig. 5) and in the bottom one foot of pit 4000-460. There were insufficient data to interpret this member.

Figure 10.--Contact of mottled silty clay (Qmssc) and lower sand (Qls) in southwest wall of trench 3225 at station 475.

Pre-flood-plain deposits

A small, poorly developed terrace is present along the east, or left valley wall at an altitude of about 300 feet above msl (mean sea level). A trench was planned to extend along the 3225 NW gridline between the river and the terrace at the base of the Great Temple Mound ("B" in fig. 1). Due to ground-water seepage, it was not possible to extend the trench through the abandoned channel; therefore, the trench was stopped at the -100 NE gridline. However, a small cut was made along the extension of the trench at the base of the Great Temple Mound. This cut exposed 10 feet of colluvium composed of coarse sand with a few gravel-sized stones and clay balls. No bedding was apparent in this material. Below the colluvium was a 0.5 foot layer of well-bedded gravelly sand that rested on a 3-foot bed of dark gray, slightly mottled, clay. Two feet of gray coarse sandy clay, mottled purple, red, and orange, exposed below the dark gray clay resembles the surficial Tuscaloosa Formation in the area, and for the purpose of this report, is referred to as the Tuscaloosa Formation.

The materials above the Tuscaloosa Formation, in the cut at the base of the Great Temple Mound, are completely different from those in the archeological test pits and are, for the most part, at a higher altitude than the present flood-plain deposits. They belong to an earlier period of deposition, probably Pleistocene, with the possible exception of the colluvium which, in part, is probably a Holocene deposit.

Tuscaloosa Formation

The Tuscaloosa Formation of Late Cretaceous age forms the hills that border the Ocmulgee River valley at the site of the investigation. The formation extends below the flood-plain deposits to an unknown depth, where it rests on the crystalline rocks of the Piedmont.

SEDIMENTATION AND LITHOLOGY

Ancient and modern floods have deposited the sediments exposed in the test pits. It would seem, therefore, that some individual floods could be recognized from these sediments. The alternating beds of silty sand and sand of the two upper units suggest that each flood has laid down a sand bed, capped by a silty sand as the waters receded. However, this is not the case. During a flood, the currents change and pulsate so that a series of several alternating beds could be laid down in one flood. The overbank deposits of the natural levee are tongue-like and extend from the riverbank toward the valley wall. Succeeding floods deposit new "tongues" between the old ones, thus, creating a sheet-like deposit of discontinuous alternate layers of silty sand and sand. The in-channel deposits of the natural levee are sand bars deposited by high water and locally are connected to the overbank deposits of the natural levee and the back swamp by thin sand stringers.

The deposits of the back swamp accumulate very slowly, and the thickness of individual layers is probably related more to the length of time the flood plain is covered by water rather than the stage of the stream. The water entering the abandoned channel (fig. 1) during flood stages appears to carry considerable sediment, and after the floods of February 22 and 25, 1962, having stages of 19.7 and 20.0 feet, respectively, sand deposits were noted downstream from where the access road crosses the abandoned channel. These sand deposits were partially removed by later floods. Floods having a stage of 20 feet or greater occur, on the average, about once a year at Macon.

The materials deposited in the back swamp include some sands in small channels and extensions of the natural levee, but in the main are composed of clay with small amounts of silt and sand, which form a thin coating on surficial material such as grass, leaves, and twigs, as well as on the land surface. Eventually, the vegetal material and the sediments are enclosed in the deposit.

The materials of the point bar resemble those of the natural levee, but the layers appear to be more continuous. The point bar has an alternation of layers, but the change in materials is less pronounced. The sand appears to be much the same throughout the deposit with an admixture of silt, clay, and possibly humic material staining the zone near the top of each layer. Each of these layers probably represents an individual high flow, but not necessarily of flood proportions.

These deposits also exhibit thin, 0.01 to 0.05 foot, very irregular stained bands (figs. 8 and 10) that are secondary features, probably caused by the movement of ground water.

The sediments observed in the archeological test pits were probably deposited when the river channel was about the same altitude as the present channel. Figure 4 shows the postulated position of the left bank of the channel during flood-plain deposition. The Qls is a probable point bar, formed on the convex or right bank of the abandoned channel, shown on the left in figure 4. After deposition of the Qls, a chute cutoff ("H" in fig. 2B, and Fisk, 1952, p. 672) formed to the right of the ridge of Qls in the approximate position of the present channel. Thus, the ridge of the Qls became the foundation for the natural levee on the left bank. The Qmssc was then deposited on top and on both sides of the ridge of Qls, as indicated in figure 4.

To the right of the natural levee the deposits of Qmssc indicate that the channel was moving to the right, or narrowing. This process seems to have continued to the present time. The postulated positions for the left bank of the river at various times is shown in figure 4.

The Qis deposited on top of the Qmssc represents a continuation of the depositional processes that formed the Qmssc and, had these conditions continued, the Qis would appear as a sand zone in the Qmssc.

A major factor affecting sedimentation at Macon is Lloyd Shoals Reservoir, completed in 1910 and about 35 miles upstream from the site. The Ocmulgee River has a drainage area of 1,400 square miles at that point and the reservoir has accumulated a large amount of sediment. Between 1910 and 1935, sediment accumulated in the reservoir at the rate of 574 acre-feet per year (Montgomery, 1940, p. 20). This reduced the sediment load of the river immediately below the dam and probably accounts for the reduced silt and clay content of the Qmssc, as compared to the Qmfps.

The later deposits of Qmfps and the deposits of Qmsss have also been influenced by the construction of levees on the right bank, by dredging of the channel, and by bridge construction (See figure 2A.).

Mineral composition.--The mineral constituents of the deposits are derived from the crystalline rocks of the Piedmont. Most of the material is sand sized and composed of quarts and mica, with minor amounts of feldspar and heavy minerals.

Mottling and concretions.--The most striking feature of the Qmssc is the mottling. In many of the pit faces, the variation in color is associated with root holes. Root holes and post molds found in the Qis have an accumulation of iron-stained material outlining them. It seems that the inclusion of vegetal material causes iron oxides to precipitate. A few pea-size iron-manganese concretions were found associated with the mottling in the Qmssc.

On the right bank, about 5 miles downstream from the test site at Burns Brick Co. clay pit, mottling is associated with vegetal material and concretions (See figure 11.). Many small black to very dark reddish brown iron-manganese concretions were present in the clay. The material surrounding them grades from dark reddish brown near the concretion through brownish yellow to yellow in the main mass of the clay. The concretions appeared to have formed in place and were not originally deposited with the clay.

Figure 11.--Mottled clay cut at Burns Brick Company clay pit. Clay is similar to mottled silty sandy clay (Qmssc).

Stained zones in the sand deposits.--The bar-like sand deposits of the Qis, the Qmssc (fig. 8), and the Qls (fig. 10) show similar types of staining that appear to be a coating on the individual sand grains. Relatively wide, even bands of 0.2 to 0.5 foot of stained sand occur in all three deposits. These probably formed when the material was at the surface and represent a slight accumulation of humic, or clayey material.

SUMMARY

During late Pleistocene, the Ocmulgee River cut a valley that has been partially refilled in Holocene time, creating a wide flood plain south of Macon. All the deposits investigated are of Holocene age, deposited after the river stabilized at about its present level.

A natural levee, overbank deposits, and a probable point bar are in the section studied. The sediments, mainly sand with varying amounts of silt and clay, were derived from the crystalline rocks of the Piedmont. The sand is composed of quartz and mica, with minor elements of feldspar and heavy minerals. Man's activities have influenced sedimentation along the river. Since the 18th century, more than 10 feet of sedimentation has occurred locally at the site of this study. These modern sediments are similar to the deposits found on other flood plains in the southeastern United States, their source probably being soils laid open to erosion by farming. They are red to reddish brown as contrasted with the earlier deposits, which are various shades of gray, brown, and yellow.

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