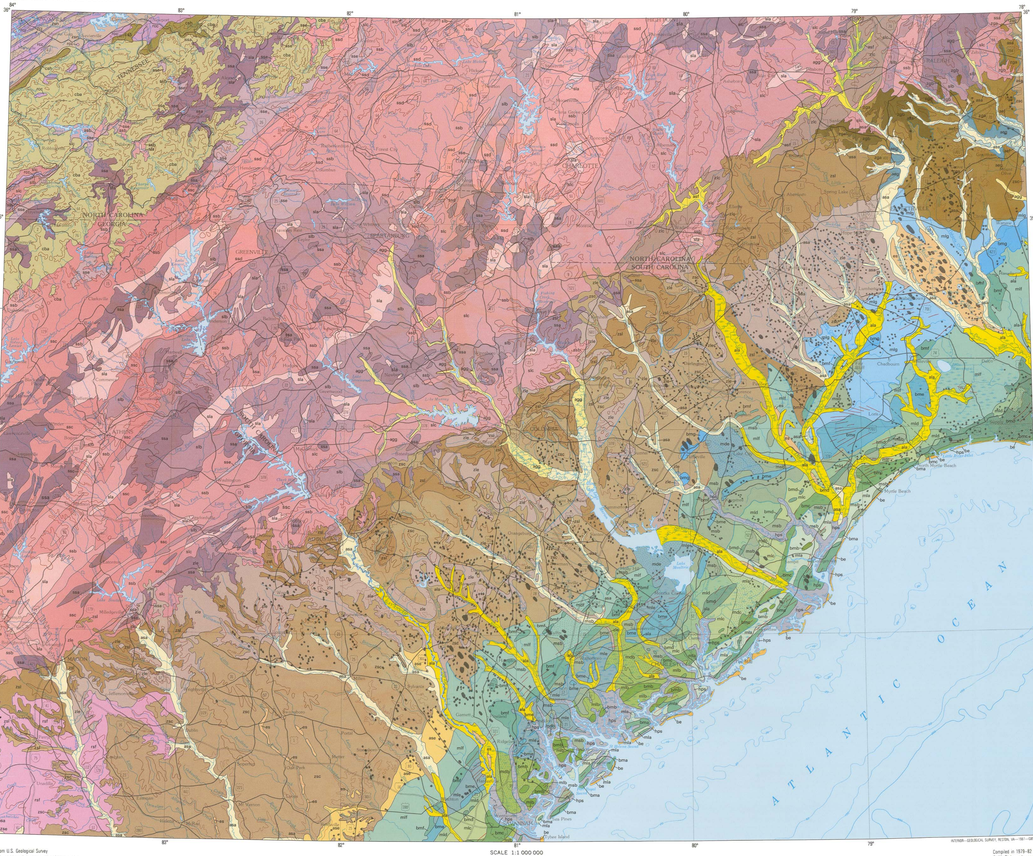
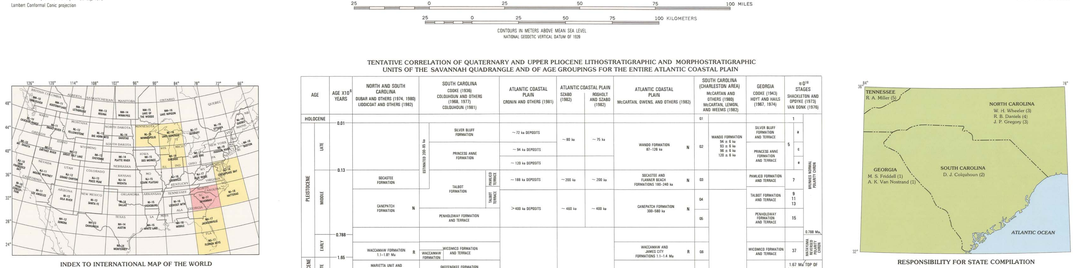
DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

PREPARED IN COOPERATION WITH THE
GEORGIA GEOLOGICAL SURVEY, UNIVERSITY OF SOUTH CAROLINA
UNIVERSITY OF NORTH CAROLINA, NORTH CAROLINA STATE UNIVERSITY
TENNESSEE DIVISION OF GEOLOGY

QUATERNARY GEOLOGIC ATLAS OF THE UNITED STATES
MISCELLANEOUS INVESTIGATIONS SERIES
MAP I-1420 (NI–17)



TENTATIVE CORRELATION OF QUATERNARY AND UPPER PLIOCENE LITHOSTRATIGRAPHIC AND MORPHOSTRATIGRAPHIC UNITS OF THE SAVANNAH QUADRANGLE AND OF AGE GROUPINGS FOR THE ENTIRE ATLANTIC COASTAL PLAIN



INDEX TO INTERNATIONAL MAP OF THE WORLD
1:1,000,000 TOPOGRAPHIC SERIES

Showing location of the Quaternary Geologic Map of the Savannah 4° x 6° Quadrangle in red [U.S. Geological Survey, Miscellaneous Investigations Series, Map I-1420 (NI–17)] and other published maps in the Quaternary Geologic Atlas of the United States in yellow.

QUATERNARY GEOLOGIC MAP OF THE SAVANNAH 4° x 6° QUADRANGLE, UNITED STATES

State compilations by
Donald J. Colquhoun, Michael S. Friddell, Walter H. Wheeler, Raymond B. Daniels,
Joel P. Gregory, Robert A. Miller, and Amy K. Van Nostrand
Edited and integrated by
Gerald M. Richmond, David S. Fullerton, and David L. Weide

1987

QUATERNARY GEOLOGIC ATLAS OF THE UNITED STATES

LIST OF MAP UNITS

HOLOCENE

- aggs — ALLUVIAL SANDY GRAVEL
- asss — ALLUVIAL GRAVELLY SAND
- asf — ALLUVIAL RED SAND, SILT, AND CLAY
- als — ALLUVIAL SILT AND CLAY
- hpks — SALINE-MARSH DEPOSIT
- be — BEACH AND DUNE SAND

HOLOCENE TO LATE PLEISTOCENE

- es — EOLIAN SAND

LATE PLEISTOCENE

- cbs — GRANITIC OR ARKOSIC METASEDIMENTARY BOULDERY COLLUVIUM
- csch — SANDY SHALEY COLLUVIUM
- bmsa — BEACH AND NEARSHORE MARINE SAND
- mls — MARINE SAND, SILT, AND CLAY
- bmsb — BEACH AND NEARSHORE MARINE SAND
- mlb — MARINE SAND, SILT, AND CLAY
- bmsc — BEACH AND NEARSHORE MARINE SAND
- mlc — MARINE SILT AND CLAY
- msb — MARINE CLAY, SILT, SAND, AND GRAVEL

LATE PLEISTOCENE TO LATE PLIOCENE

- msb5 — MARINE SAND, UNDIFFERENTIATED

EARLY PLEISTOCENE TO LATE PLIOCENE

- asf — ALLUVIAL AND ESTUARINE SAND AND SILT
- bsmf — BEACH AND MARINE SAND
- msf — MARINE SILT AND CLAY
- msd — MARINE DELTA CLAY, SILT, SAND, AND GRAVEL

QUATERNARY AND TERTIARY

- cgs — CLAYEY, FINE GRAVELLY SAND DECOMPOSITION RESIDUUM
- csgs — CLAYEY COARSE GRAVELLY SAND DECOMPOSITION RESIDUUM
- zsc — SAND AND CLAYEY DECOMPOSITION RESIDUUM
- zsw — CLAYEY FINE-TO-MEDIUM SAND AND FINE SANDY CLAY DECOMPOSITION RESIDUUM
- zsf — MEDIUM TO COARSE SAND AND SANDY CLAY DECOMPOSITION RESIDUUM
- zsl — MEDIUM TO COARSE SAND DECOMPOSITION RESIDUUM
- zsn — SANDY SHALEY DECOMPOSITION RESIDUUM
- zsf — RED SILTY SAND TO SILTY CLAY DECOMPOSITION RESIDUUM
- zrb — CHERTY CLAY, SANDY CLAY, AND SILTY CLAY DECOMPOSITION AND SOLUTION RESIDUUM, UNDIFFERENTIATED
- zsf — CLAYEY SAND SOLUTION RESIDUUM CONTAINING CHERT PEBBLES
- rcc — CHERTY CLAY SOLUTION RESIDUUM
- rcj — RED-CLAY SOLUTION RESIDUUM
- sss — SILTY TO CLAYEY SANDY SAPROLITE, ROCK TORS, AND JOINT-BLOCK BOULDERS
- ssb — SILTY TO CLAYEY SANDY SAPROLITE
- sss — MICACEOUS SANDY SAPROLITE, UNDIFFERENTIATED
- ssed — SANDY CLAY SAPROLITE
- sla — QUARTZ-RICH SAPROLITE
- slc — CLAYEY SAPROLITE
- slb — MICACEOUS SAPROLITE
- slc — SILTY TO CLAYEY SAPROLITE

— CONTACT
— MARINE SCARP
— BEACH OR DUNE RIDGE
CAROLINA BAY.—Shallow, oval or elliptical, generally marshy closed depression in Atlantic Coastal Plain; 100 m or more in diameter. Many have elevated rims, attributed to meteorites, upwelling springs, eddy currents, eolian erosion, or combinations of these processes
THIN DEPOSIT OF EOLIAN SAND OVERLYING MAP UNIT

NOTE 1: This map is the product of interorganizational collaboration. Following a regional meeting in 1980, a committee was formed to plan and establish map units and related matters, separate Quaternary maps and map units were prepared by the State Surveys, and the Atlas was compiled and prepared by the State compilers. These maps and explanations were then assembled and integrated and supplemented by the editors to produce the quadrangle map and map explanation. Specifications for the preparation and description of separate units, and to definition of map units for the Quaternary Geologic Atlas of the United States, were resolved at additional meetings as well as by correspondence. The footnote on saprolite was written by D. C. Colquhoun, W. H. Wheeler, Jr., and R. B. Daniels, North Carolina University; the section on the Quaternary evolution of Quaternary and upper Pliocene stratigraphic units was prepared by G. M. Richmond with the cooperation of D. C. Colquhoun, W. H. Wheeler, Jr., and J. P. Owens. Agreement among workers was not unanimous, in part due to difficulties of dating. Therefore, the other diagrams and tables were prepared by the editors. The compilers reviewed the map prior to its submittal for publication.

NOTE 2: The Pliocene-Pleistocene boundary defined by joint resolution of the International Union for Quaternary Research (INQUA Subcommission 1-d on the Pliocene-Pleistocene Boundary) and the International Commission on Stratigraphy (ICS) Working Group on the Pliocene/Pleistocene Boundary) and ratified by the International Geological Congress Executive Committee (IGCW, Project No. 41) (Newsletter 6) is shown at the base of the Vrica section in southern Italy. The age of that boundary currently is inferred to be 1.65 Ma (Aguirre and Pasini, 1985).

Time boundaries between the early Pleistocene and middle Pleistocene and between the middle Pleistocene and late Pleistocene have been proposed by the INQUA Working Group on the Plio-Pleistocene and the Pleistocene The boundary between the early Pleistocene and middle Pleistocene is placed at the Matuyama-Brunhes reversal (Richmond, 1986). The reversal has not been dated directly by radiometric controls. It is significantly older than the Bishop Tuff (revised K-Ar age 738 ka; Izett, 1982), and the estimated K-Ar age of 730 ka assigned to the reversal by Mankinen and Dalrymple (1979) is too young. The best estimate of the age of the reversal is provided by sediments that record the Matuyama-Brunhes reversal (Eardley and others, 1973). The terrestrial geologic record is compatible with an estimated age of about 780 ka, close to the reversal by Johnson (1982). The boundary between the middle Pleistocene and late Pleistocene is placed at the top of oxygen-isotope stage 6. The oxygen isotope stage 6 boundary is estimated to be at 128 ka, but not dated directly. It is correlated with sediments of age 127 ka by CLIMAP (Climate Mapping Project CLIMAP Project Members, 1984) and 128 ka by SPECMAP Project members (Ruddiman and McIntyre, 1984). Isotope stage 6 is characterized by sediments that record the last substantial ice-sheet retreat. A sidereal age of 132 ka is derived by projection of the Milankovitch orbital-climatic curve (Imbrie and others, 1984, p. 280).

The Pliocene-Holocene boundary is defined by the INQUA Subcommission on the Holocene. Currently in the United States, it is placed arbitrarily at 10,000 B.P. (Hopkins, 1975).

Aguirre, Emiliano, and Pasini, Giancarlo, 1984, Proposal of the ICS Working Group on the Pliocene/Pleistocene Boundary and the definition of the Pliocene/Pleistocene boundary stratotype: 6 p.

CLIMAP Project Members, 1984, The last interglacial ocean: Quaternary Research, v. 21, p. 123–224.

Eardley, A. J., Horberg, C. L., Kopenkovy, V., Nash, W. P., Picard, M. D., Gray, D. C., and Kiulia, G. C., 1973, Matuyama-Brunhes boundary, Utah, USA: Geological Society of America Bulletin, v. 84, no. 1, p. 211–215.

Hopkins, D. M., 1975, Time stratigraphic nomenclature for the Holocene epoch: Geology, v. 3, no. 1, p. 10.

Imbrie, J., and others, 1984, Oxygen isotopic and some older, compositionally similar, ash beds in California, Nevada, and Utah: U.S. Geological Survey Open-File Report 82–582, 47 p., 1 pl.

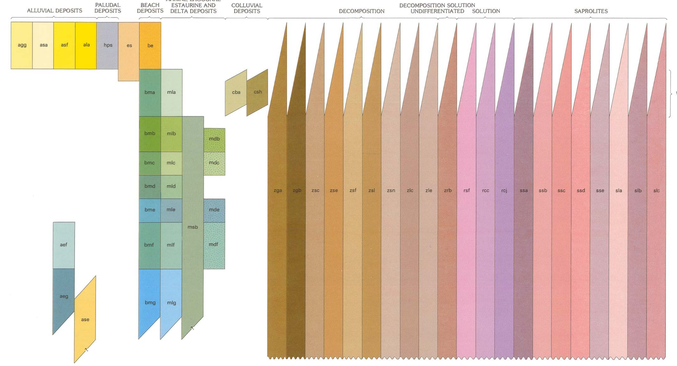
Johnson, R. G., 1982, Brunhes-Matuyama magnetic reversal dated at 790,000 yr B.P. by marine-astronomical correlations: Quaternary Research, v. 17, no. 2, p. 135–147.

Mankinen, E. A., and Dalrymple, G. B., 1979, Revised geomagnetic polarity time scale for the interval 0–5 m.y. B.P.: Journal of Geophysical Research, v. 84, no. B–6, p. 615–626.

Ruddiman, W. F., and McIntyre, A., 1984, Ice-age thermal response and climatic role of the surface Atlantic Ocean, 40°–63° N: 63°: N: Geological Society of America Bulletin, v. 95, p. 381–396.

RESPONSIBILITY FOR STATE COMPILATION
(1) GEORGIA GEOLOGICAL SURVEY
(2) UNIVERSITY OF SOUTH CAROLINA
(3) UNIVERSITY OF NORTH CAROLINA
(4) NORTH CAROLINA STATE UNIVERSITY
(5) TENNESSEE DIVISION OF GEOLOGY

CORRELATION OF MAP UNITS



DESCRIPTION OF MAP UNITS

HOLOCENE

aggs ALLUVIAL SANDY GRAVEL.—Includes lighter gray to dark-brown, poorly sorted, sandy, pebble-to-boulder gravel; grades upward into sandy to silty clay; locally contains lenses of organic, moderately sorted to well-sorted, micaceous sand. Common in streams predominantly of quartz and quartzite but in places includes many granitic gneiss and schist clasts. Deposit underlies flood plains, alluvial fans, and low terraces. Thickness 3–10 m

asss ALLUVIAL GRAVELLY SAND.—White to orange-red, fine to coarse sand containing lenses of pebble-to-cobble gravel, and sandy silt containing lenses of kaolinitic clay. Sand chiefly quartz and feldspar, gravel chiefly quartz and quartzite. Deposit underlies flood plains, alluvial fans, and low terraces. Thickness 3–10 m

asf ALLUVIAL RED SAND, SILT, AND CLAY.—Reddish-gray, reddish-brown, or purplish-red sand, silt, and clay; micaceous. Deposit underlies flood plains and low terraces. Mapped areas include organic muck and swamp deposits of flood plains, and reworked colluvium along margins of valley floors. Thickness 3–10 m

als ALLUVIAL SILT AND CLAY.—Dark-brown, dark-gray or black, highly organic silt and clay. Clay chiefly smectite or Coastal Plain kaolinite; micaceous. Minor lenses of sand and gravel in deposit at depth. Mapped areas include local deposits of peat and organic muck. Deposit underlies flood plains. Thickness 0–10 m

hpks SALINE-MARSH DEPOSIT.—Gray, black, brown, or dark-green, micaceous, kaolinitic to smectitic clay and silt; contains lenses of fine sand, fine sandy clay, and herbaceous peat intermixed and interbedded. In places includes sand and gravel at depth. Deposit underlies salt marshes and tidal flats; commonly deeply weathered, and contains yellowish-red, brown, and gray mottled horizons. Thickness 0–10 m

be BEACH AND DUNE SAND.—White, gray to yellowish-brown, angular to subangular, fine to medium sand; well sorted, laminated, and crossbedded; mostly quartz and feldspar. Deposit includes beach sand and sand in dunes and sand sheets. Mapped areas include small deposits of shell and gravel on modern beach; also includes thin elongate masses, too small to map, on coastal sand-ridge deposits (hgs). Thickness 2–20 m

HOLOCENE TO LATE PLEISTOCENE

es EOLIAN SAND.—Light- to dark-gray, yellowish-orange to dark-reddish-brown medium sand, well-sorted, massive to crossbedded; mostly quartz. Forms linear dunes and sheets and parabolic fields, with some interdune depressions commonly contain organic material. Deposit overlies Pleistocene river terraces on east side of river valleys. Thickness 1–15 m

LATE PLEISTOCENE

cbs GRANITIC OR ARKOSIC METASEDIMENTARY BOULDERY COLLUVIUM.—Pale- to dark-brown, yellowish-red, grayish-yellow, poorly sorted, silty, sandy loam to sandy clay. Angular to subangular, pebble- to boulder-size rock clasts make up 15–60 percent of deposit. Clasts are of granitic gneiss, schist, and metasedimentary rocks; also includes vein quartz rocks in eastern part. Material mantles steep slopes and includes debris-avalanche, mudflow, landslide, creep, and probably solifluction deposits. Locally, decomposed material is cut by gullies and ravines. Map unit includes some rock outcrops, areas of saprolite, and boulders; alluvial-fan deposits. The colluvium overlies crystalline rocks of the Piedmont and Blue Ridge provinces and the shoreless zoning deposits of Quaternary age, where present

Named deposits within each map unit include both lithostratigraphic and soil-stratigraphic units or names, or both. The lithostratigraphic units are the Silver Bluff, Princess Anne, Pamlico, Talbot, Penholloway, Wicomico, and Wando Formations and the Canepatch Formation. The soil-stratigraphic and morphostratigraphic units include those in the Coastal Plain terrace sequence and some morphostratigraphic units include deposits of more than one age. Furthermore, pedisediment—a thin veneer of sediment—is commonly present on nearly level ground; deposits of eolsands in terms of redistributed age.

bmsa BEACH AND NEARSHORE MARINE SAND (barrier island facies of Silver Bluff Formation on Georgia and South Carolina and of Wando Formation in South Carolina).—White to gray, light-tan to yellowish-brown, well sorted, fine to medium quartz sand, places shelly; well crossbedded. Base of unit is commonly coarse to very coarse sand. Deposit is leached to a depth of about 4 m, below which it includes unleached calcareous shell debris. Thickness 18–30 m

mls MARINE SAND, SILT, AND CLAY (lagoon facies of Princess Anne Formation in Georgia and South Carolina and of Wando Formation in South Carolina).—Light-gray to tan silty sand or silt that grades down into blush-gray to gray silty clay. Sand is predominantly fine grained; includes subordinate, and thin layers of medium to coarse sand, silty sand, and organic debris. Along its seaward border, deposit includes beach sand and washover sand in barrier islands. Deposit is leached to a depth of about 4 m, below which it includes unleached calcareous shell debris. Thickness 18–30 m

bmsb BEACH AND NEARSHORE MARINE SAND (barrier island facies of Princess Anne Formation in Georgia and South Carolina and of Wando Formation in South Carolina).—White to gray, light-tan to yellowish-brown, well sorted, fine to medium quartz sand, places shelly; well crossbedded. Base of unit is commonly coarse to very coarse sand; sand is leached to a depth of about 4 m, below which it includes unleached calcareous shell debris. Thickness 18–30 m

mlb MARINE SAND, SILT, AND CLAY (lagoon facies of Princess Anne Formation in Georgia and South Carolina and of Wando Formation in South Carolina).—Light-gray to tan silty sand or silt that grades down into blush-gray to gray silty clay. Sand is predominantly fine grained; includes subordinate, and thin layers of medium to coarse sand, silty sand, and organic debris. Along its seaward border, deposit includes beach sand and washover sand in barrier islands. Deposit is leached to a depth of about 4 m, below which it includes unleached calcareous shell debris. Thickness 18–30 m

msb MARINE CLAY, SILT, SAND, AND GRAVEL (delta facies of Princess Anne Formation and of Wando Formation in South Carolina).—Pale- to dark-gray to yellowish-brown, micaceous, kaolinitic to smectitic clay, silt, sand, and gravel; commonly contains lenses of sand and gravel, and organic debris. Deposit underlies flood plains, alluvial fans, and low terraces. Thickness 3–10 m

bmsc BEACH AND NEARSHORE MARINE SAND (barrier island facies of Pamlico Formation in Georgia, of Talbot Formation underlying Pamlico terrace in South Carolina, and of Socastee Formation in North Carolina and South Carolina).—White to gray, light-tan to yellowish-brown, well sorted, fine to medium quartz sand, places shelly; well crossbedded. Base of unit is commonly coarse to very coarse sand. Deposit is leached throughout, commonly to depth of about 4 m, below which it includes unleached calcareous shell debris. Thickness 6–10 m

mlc MARINE SILT AND CLAY (lagoon facies of Pamlico Formation in Georgia, of Talbot Formation underlying Pamlico terrace in South Carolina, and of Socastee Formation in North Carolina and South Carolina). Mapped areas include small deposits of eolian sand (es) on northeast and east sides of river valleys, and alluvial gravelly sand (asss) along secondary river channels. Thickness 1–15 m

msc MARINE DELTA CLAY, SILT, SAND, AND GRAVEL (delta facies of Talbot Formation underlying Pamlico terrace in South Carolina and of Socastee Formation in North Carolina).—Light-gray to dark-brown, micaceous, kaolinitic to smectitic clay, silt, sand, and gravel; commonly contains lenses of sand and gravel, and organic debris. Deposit underlies flood plains, alluvial fans, and low terraces. Thickness 3–10 m

bmsd BEACH AND NEARSHORE MARINE SAND (barrier island facies of Talbot Formation in Georgia and South Carolina and of Canepatch Formation in North Carolina and South Carolina).—White to gray, light-tan to yellowish-brown, fine to medium quartz sand, places shelly; well crossbedded. Base of unit is commonly coarse to very coarse sand. Deposit is leached throughout, commonly to depth of about 4 m, below which it includes unleached calcareous shell debris. Thickness 6–10 m

msd MARINE SILT AND CLAY (lagoon facies of Talbot Formation in Georgia and South Carolina and of Canepatch Formation in North Carolina and South Carolina).—Light-gray to tan silty sand or silt that grades down into blush-gray or gray silty clay or clay. Sand is predominantly fine grained; includes subordinate, and thin layers of medium to coarse sand, silty sand, and organic debris. Along its seaward border, deposit includes beach sand and washover sand in barrier islands. Deposit is leached to a depth of about 4 m, below which it includes unleached calcareous shell debris. Thickness 18–30 m

bmse BEACH AND NEARSHORE MARINE SAND (barrier island facies of Penholloway Formation in Georgia and South Carolina and of Canepatch Formation in North Carolina and South Carolina).—White to gray, light-tan to yellowish-brown, fine to medium quartz sand, well sorted to very well sorted, places shelly; well crossbedded. Base of unit is commonly coarse to very coarse sand. Deposit is leached throughout, commonly to depth of about 4 m, below which it includes unleached calcareous shell debris. Thickness 6–10 m

mle MARINE SILT AND CLAY (lagoon facies of Penholloway Formation in Georgia and South Carolina and of Canepatch Formation in North Carolina and South Carolina).—Light-gray to tan silty sand or silt that grades down into blush-gray or gray silty clay or clay. Sand is predominantly fine grained; includes subordinate, and thin layers of medium to coarse sand, silty sand, and organic debris. Along its seaward border, it is locally characterized by washover and tidal-inlet channel-and-fill structures common. Based has been coarse to very coarse sand. Deposit is leached throughout, commonly to depth of about 4 m, below which it includes unleached calcareous shell debris. Thickness 18–30 m

msf MARINE DELTA CLAY, SILT, SAND, AND GRAVEL (delta facies of Wicomico Formation in Georgia and South Carolina and of Wicomico Formation in North Carolina and South Carolina).—White to gray, light-tan to yellowish-brown, fine to medium quartz sand, places shelly; well crossbedded. Base of unit is commonly coarse to very coarse sand; sand is leached to a depth of about 4 m, below which it includes unleached calcareous shell debris. Thickness 6–10 m

bmsf BEACH AND MARINE SAND (barrier island facies of Wicomico Formation in Georgia and South Carolina and of Wicomico Formation in North Carolina and South Carolina).—White to gray, light-tan to yellowish-brown, fine to medium quartz sand, places shelly; well crossbedded. Base of unit is commonly coarse to very coarse sand; sand is leached throughout, commonly to depth of about 4 m, below which it includes unleached calcareous shell debris. Thickness 6–10 m

msf MARINE SILT AND CLAY (lagoon facies of Wicomico Formation in Georgia and South Carolina and of Wicomico Formation in North Carolina and South Carolina).—Light-gray to tan silty sand or silt that grades down into blush-gray or gray silty clay or clay. Sand is predominantly fine grained; includes subordinate, and thin layers of medium to coarse sand, silty sand, and organic debris. Along its seaward border, it is locally characterized by washover and tidal-inlet channel-and-fill structures common. Based has been coarse to very coarse sand. Deposit is leached throughout, commonly to depth of about 4 m, below which it includes unleached calcareous shell debris. Thickness 18–30 m

msd MARINE DELTA CLAY, SILT, SAND, AND GRAVEL (delta facies of Wicomico Formation in Georgia and South Carolina and of Wicomico Formation in North Carolina and South Carolina).—Light-gray to dark-brown, micaceous, kaolinitic to smectitic clay, silt, sand, and gravel; commonly contains lenses of sand and gravel, and organic debris. Deposit underlies flood plains, alluvial fans, and low terraces. Thickness 3–10 m

EARLY PLEISTOCENE TO LATE PLIOCENE

asf ALLUVIAL AND ESTUARINE SAND AND SILT (estuarine facies of Macteria unit in North Carolina).—Medium-gray, yellowish- to reddish-brown, mottled sand, silt, and clay; micaceous. Deposit underlies flood plains and alluvial fans and in thick bedded, crossbedded. Deposit grades downward into massive clayey sand, poorly to well sorted. Contains local lenses and beds of angular to subangular, pebble- to boulder-size gravel. Deposit is part of Tertiary deposits. Thickness is unknown but probably exceeds 30 m

asv ALLUVIAL SAND.—Light-gray, fine- to coarse, coarse to fine, slightly clayey sand; poorly to well sorted. Contains local lenses and beds of angular to subangular, pebble- to boulder-size gravel. Deposit is part of Tertiary deposits. Thickness is unknown but probably exceeds 30 m

bmsg BEACH AND NEARSHORE MARINE SAND (barrier island facies of Macteria unit in North and South Carolina and of Duplin Formation in South Carolina).—White to gray, light-tan to yellowish-brown, fine to medium quartz sand, places shelly; well crossbedded. Base of unit is commonly coarse to very coarse sand. Deposit is leached throughout, commonly to depth of about 4 m, below which it includes unleached calcareous shell debris. Deposit has been as coarse to very coarse sand. Deposit is leached throughout, commonly to depth of about 4 m, below which it includes unleached calcareous shell debris. Thickness 6–10 m

msg MARINE SILT AND CLAY (lagoon facies of Bear Bluff Formation in North and South Carolina and of Duplin Formation in South Carolina).—Pale- to gray to yellowish-brown silty sand or silt that grades down into blush-gray or gray silty clay or clay. Smectite is predominant clay; includes subordinate, and thin layers of medium to coarse sand, silty sand, and organic debris. Deposit is massive to thin bedded, and contains thin laminae of fine sand. Deposit has been as coarse to very coarse sand. Deposit is leached throughout, commonly to depth of about 4 m, below which it includes unleached calcareous shell debris. Thickness 6–10 m

msb MARINE SILT AND CLAY (lagoon facies of Macteria unit in South Carolina).—Light- to dark-brown, micaceous, kaolinitic to smectitic clay, silt, sand, and gravel; commonly contains lenses of sand and gravel, and organic debris. Deposit underlies flood plains, alluvial fans, and low terraces. Thickness 3–10 m

EARLY PLEISTOCENE TO LATE PLEISTOCENE

msb5 MARINE SAND, UNDIFFERENTIATED.—Light-gray to light-brown, fine to medium quartz sand, well sorted, laminated, and crossbedded; mostly quartz and feldspar. Deposit includes beach sand, sand in dunes and sand sheets, and locally includes lower estuarine sand. Thickness 6.5–9 m

EARLY PLEISTOCENE TO LATE PLIOCENE

asf ALLUVIAL AND ESTUARINE SAND AND SILT (estuarine facies of Waccamaw Formation in North Carolina).—Medium-gray, yellowish- to reddish-brown, mottled sand, silt, and clay; micaceous. Deposit underlies flood plains and alluvial fans, low to moderate relief; medium to thick bedded, crossbedded. Deposit grades downward into massive clayey sand, poorly to well sorted. Contains local lenses and beds of angular to subangular, pebble- to boulder-size gravel. Deposit is part of Tertiary deposits. Thickness is unknown but probably exceeds 30 m

bmsf BEACH AND MARINE SAND (barrier island facies of Waccamaw Formation in North and South Carolina).—White to gray, light-tan to yellowish-brown, fine to medium quartz sand, places shelly; well crossbedded. Base of unit is commonly coarse to very coarse sand. Deposit is leached throughout, commonly to depth of about 4 m, below which it includes unleached calcareous shell debris. Thickness 6–10 m

msf MARINE SILT AND CLAY (lagoon facies of Waccamaw Formation in North and South Carolina).—Light-gray to tan silty sand or silt that grades down into blush-gray or gray silty clay or clay. Sand is predominantly fine grained; includes subordinate, and thin layers of medium to coarse sand, silty sand, and organic debris. Along its seaward border, it is locally characterized by washover and tidal-inlet channel-and-fill structures common. Based has been coarse to very coarse sand. Deposit is leached throughout, commonly to depth of about 4 m, below which it includes unleached calcareous shell debris. Thickness 18–30 m

msd MARINE DELTA CLAY, SILT, SAND, AND GRAVEL (delta facies of Waccamaw Formation in North and South Carolina).—Light- to dark-gray, micaceous, kaolinitic to smectitic clay, silt, sand, and gravel; commonly contains lenses of sand and gravel, and organic debris. Deposit underlies flood plains, alluvial fans, and low terraces. Thickness 3–10 m

QUATERNARY AND TERTIARY

cgs CLAYEY, FINE GRAVELLY SAND DECOMPOSITION RESIDUUM.—Gray, yellowish-brown, or yellowish-red, clayey to slightly silty, gravelly, fine to coarse sand. Gravel not abundant, chiefly pea-size, well-rounded quartz. A reticulated, mottled zone commonly is present at a depth of 1–2 m near contacts with units zgs and zsl. Less than 5 percent weatherable minerals in upper 1.5 m, locally as much as 10 percent at depth. Boulders, cobbles, and exposures of bedrock (pliothite) are absent. The residuum is developed on relatively undissected uplands underlain by Miocene to Pliocene alluvial deposits 6–15 m thick. It is overlain locally by eolian sand of younger Quaternary age. Thickness of residuum about 2 m

csgs CLAYEY COARSE GRAVELLY SAND DECOMPOSITION RESIDUUM.—Gray, yellowish-red, clayey, sandy gravel. Color grades down into red or gray zone, or into a thick, reticulated, mottled zone. Sand is medium to coarse and chiefly quartz. Gravel is well rounded and also quartz. Many clasts as much as 6 cm in diameter. Weatherable minerals absent in upper 3 m of residuum along interstream divides. Almost all feldspar is weathered to kaolin. Thermally nodules (pliothite) 1–2 cm in diameter are abundant. Above mottled zone, clay is commonly 30 percent or more of fine earth fraction. Thickness 3–10 m. The residuum is developed on dissected uplands and slopes underlain by Miocene to Pliocene alluvial deposits 6–15 m thick. It is commonly above 6 m thick on uplands but may be only 1 m thick on valley slopes

zsc SAND AND CLAYEY DECOMPOSITION RESIDUUM.—White, light-yellow, yellowish-red, or red, clayey sand and sandy clay. Sand is medium to coarse, commonly deeply weathered, and contains yellowish-red, brown, and gray mottled horizons. Thickness 6–10 m

zsw CLAYEY FINE-TO-MEDIUM SAND AND FINE SANDY CLAY DECOMPOSITION RESIDUUM.—Mottled very pale orange, yellowish-orange, reddish-orange, or brick red, clayey, fine to medium sand; locally contains some subrounded fine gravel, and very fine to fine sandy clay. Sand and gravel are chiefly quartz. Mapped areas include some local deposits of eolian sand, and some reworked colluvium, alluvium, and residuum. Residuum is developed on some of map unit, in Georgia. Thickness less than 1 m to about 3 m

zsf MEDIUM TO COARSE SAND AND SANDY CLAY DECOMPOSITION RESIDUUM.—Light-gray, yellowish-gray, very pale orange, or light-reddish-brown, micaceous medium to coarse sand; contains local zones of kaolinitic sandy clay or clay, leached and partly decomposed saprolite shell fragments, and subrounded fine quartz pebble gravel. Mapped areas include some bedrock outcrops and areas of saprolite. Residuum is developed on some of map unit, in Georgia. Thickness 1–7 m

zsl MEDIUM TO COARSE SAND DECOMPOSITION RESIDUUM.—Yellowish-gray, yellowish-red, or orange-red medium to coarse sand; well sorted, slightly micaceous, slightly silty or clayey. Upper 0.5–4 m includes some eolian sand. Mapped areas include some local deposits of eolian sand, and some reworked colluvium, alluvium, and residuum. Residuum is developed on some of map unit, in Georgia. Thickness 1–7 m

zsn SANDY SHALEY DECOMPOSITION RESIDUUM.—Grayish-brown, yellowish-brown, or yellowish-red, clayey, fine to coarse sand and sandy clay. Contains chips or fragments of sandstone. Mapped areas include thin, locally derived stony loam colluvium, especially on steep slopes, and bedrock outcrops, especially along ridge crests. Residuum present only in northwestern part of map area, in Valley and Ridge Province in Tennessee. Thickness commonly less than 2 m but may be as much as 6 m at foot of slopes

zsf RED SILTY SAND TO SILTY CLAY DECOMPOSITION RESIDUUM.—Red, reddish-brown, strong-brown, yellowish-red, or red, micaceous silty sand or clay. Locally includes rounded pebbles and cobbles, chiefly quartz; clay is kaolinitic or soft clay. Thickness generally 2–5 m, rarely more than 15 m

zrb CHERTY CLAY, SANDY CLAY, AND SILTY CLAY DECOMPOSITION AND SOLUTION RESIDUUM, UNDIFFERENTIATED.—Map unit comprises three residua that cannot be separated at scale 1:1,000,000. One is yellowish-red, clayey to sandy residuum on Tertiary deposits; the second is reddish-brown developed on limestone. The second is yellowish-brown sandy clay decomposition residuum on Tertiary deposits. Residuum contains as much as 10 percent chert fragments and is developed on sandstone. In Georgia, it locally contains limonitic bosworth and commercial-grade iron ore. The third is pale-yellowish-brown to white, clayey to silty, fine to coarse sand decomposition residuum containing shale chips and local hematitic zones. It is developed on shale. Mapped areas include thin, locally derived stony loam colluvium, especially on steep slopes, and bedrock outcrops, especially along ridge crests. Residuum present only in northwestern part of map area, in Valley and Ridge Province in Tennessee. Thickness commonly less than 2 m but may be as much as 6 m at foot of slopes

zsf CLAYEY SAND SOLUTION RESIDUUM CONTAINING CHERT PEBBLES.—Yellowish-gray, grayish-pink, orange-pink, or reddish-brown, clayey, medium to coarse quartz sand; locally contains chert pebbles. Deposit is cemented with limonite in places and is residual on sandy limestone of Tertiary age. Mapped areas include some bedrock outcrops and saprolite and high-level alluvium. Unit present only in southwest part of map area, in Valley and Ridge Province in Tennessee. Thickness 1–3 m

rcc CHERTY CLAY SOLUTION RESIDUUM.—Reddish-yellow to yellowish-brown, or pale-brown to light-reddish-brown, commonly mottled, clay or sandy to silty clay. Contains 10–50 percent chert fragments, and in places, abundant yellowish-orange, brucitic, fine to coarse sand. Mapped areas include some bedrock outcrops and areas of saprolite. Residuum is developed on steep slopes, both deposits may be exposed in places. Thickness of residuum on steep slopes, both deposits may be exposed in places. Thickness of residuum on steep slopes, both deposits may be exposed in places. Thickness of residuum on steep slopes, both deposits may be exposed in places. Thickness of residuum on steep slopes, both deposits may be exposed in places. Thickness of residuum on steep slopes, both deposits may be exposed in places. Thickness of residuum on steep slopes, both deposits may be exposed in places. Thickness of residuum on steep slopes, both deposits may be exposed in places. Thickness of residuum on steep slopes, both deposits may be exposed in places. Thickness of residuum on steep slopes, both deposits may be exposed in places. Thickness of residuum on steep slopes, both deposits may be exposed in places. Thickness of residuum on steep slopes, both deposits may be exposed in places. Thickness of residuum on steep slopes, both deposits may be exposed in places. Thickness of residuum on steep slopes, both deposits may be exposed in places. Thickness of residuum on steep slopes, both deposits may be exposed in places. Thickness of residuum on steep slopes, both deposits may be exposed in places. Thickness of residuum on steep slopes, both deposits may be exposed in places. Thickness of residuum on steep slopes, both deposits may be exposed in places. Thickness of residuum on steep slopes, both