NORTH CAROLINA DEPARTMENT OF ENVIRONMENTAL QUALITY
DIVISION OF ENERGY, MINERAL, AND LAND RESOURCES
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NORTH CAROLINA GEOLOGICAL SURVEY
OPEN FILE REPORT 2025-09

MAP OF GEOMORPHIC LANDFORM ELEMENTS IN THE WALSTONBURG 7.5-MINUTE QUADRANGLE, NORTH CAROLINA
NCGS OPEN FILE REPORT 2025-09

This geologic map was funded in part by the USGS National Cooperative Geologic Mapping Program

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OVERVIEW

This map is a work in progress and will be revised upon completion of the Rocky Mount 100K sheet. Walstonburg 7.5 Minute Quadrangle is one of four 7.5 minute quadrangles ranked highest priority for detailed, 3D subsurface mapping on NC's Coastal Plain. The 4-quad area includes Falkland, Farmville, Walstonburg and Fountain quadrangles. The 4-quads straddle the Surry Paleoshoreline complex and are key to defining Early Pleistocene stratigraphic units that mantle vast areas of NC's Coastal Plain. The 4-quad area is also included in the 16 quads in the Rocky Mount 100K sheet (NCGS OFR 2025-08), the subject of multi-year deliverables to map the 32 quadrangles in the Rocky Mount 100K sheet (FY23 STATEMAP deliverable).

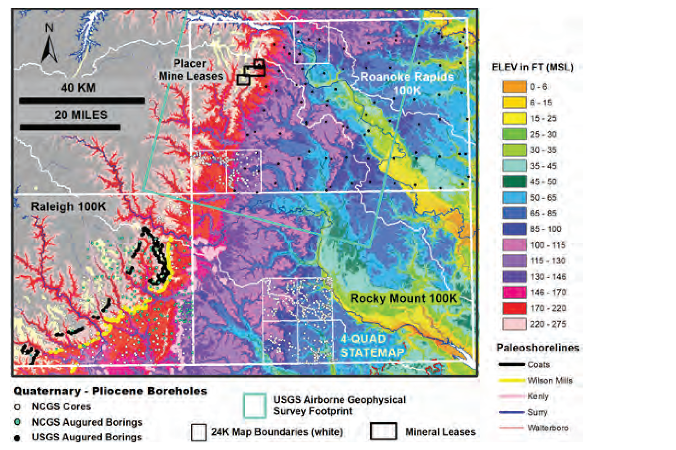


Figure 1. LiDAR basemap above shows distribution of major terraces and paleoshorelines (from Daniels and Kane, 2001; terminology from Daniels and others, 1984)), and the position of detailed study areas that included cores to define stratigraphic units. The Surry paleoshoreline separates the Sunderland terrace (purple) from the Wicomico terrace (dark blue). The Kenly paleoshoreline (pink) follows the boundary between the Sunderland (purple) and Coharie (red) terraces. The Bacons Castle formation forms the surficial unit west of the Surry paleoshoreline in Virginia (Mixon and others, 1989). Other Early Pleistocene units associated with the Surry paleoshoreline (Mixon and others, 1989) are the Moorings unit (barrier island) embedded in the paleoshoreline locally, and downstepping units, the Windsor and Charles City formations, east of the paleoshoreline. The Bacon's Castle or its NC equivalent pinches out at the toe of the Kenly paleoshoreline, as demonstrated by NCGS data collected in Drake and Red Oak quadrangles for EARTH MRI mapping.

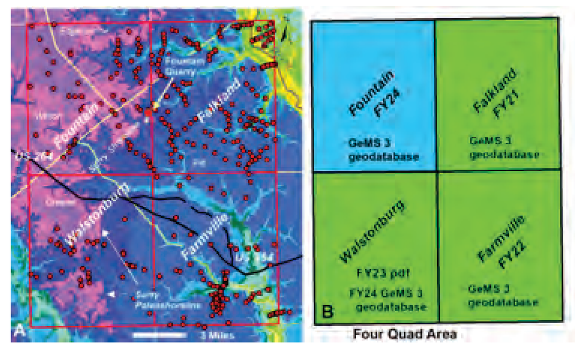


Figure 2. A. FY23 Data distribution (cores) in 4-quad area (Farmville, Fountain, Falkland, Walstonburg) that includes the Early Pleistocene Surry Paleoshoreline. Here, the USGS' 3D subsurface mapping method was applied (Newell and Dejong, 2011; Hughes, 2010). Basemap is LiDAR (color ramps on elevation: pink and purple > 30 m; blues, greens yellow < 30 m). The US 64/264 transportation corridor and county boundaries are shown. B. Recent STATEMAP deliverables auauthored by NCGS staff.

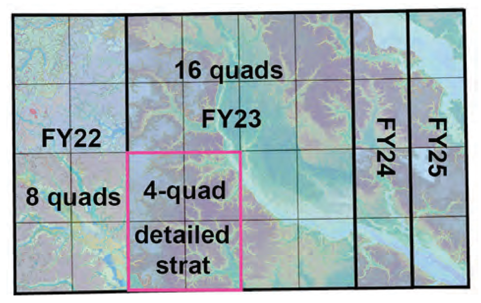


Figure 3. Export from ArcGIS Pro ™ of Rocky Mount 100K map showing 2004 QL2 LiDAR data (source, USGS recompiled into four quadrangle tiles for ease of use) and areas of study over four STATEMAP cycles. Note that the four-quad detailed study quadrangle maps are included in the Rocky Mount sheet. Stratigraphic data collected over many STATEMAP cycles will be utilized to define stratigraphic units for interstate correlation purposes and form the basis for future three-dimensional compilations of Quaternary facies.

The 4-quad area was justified for detailed mapping for two reasons:

Science Justification: Despite wide use, sequence stratigraphy is not yet included in stratigraphic codes (Catuneanu and others, 2009). The 4-quad area which includes the Surry paleoshoreline, is useful for integrating sequence stratigraphy, and stratigraphic nomenclature for the Pliocene and Early Pleistocene section. Science questions are: What is the sequence stratigraphic framework of Early Pleistocene strata near the Surry paleoshoreline? How do these units relate to global coastal onlap cycles, marine isotope stages, systems tracts, parasequences, and relict geomorphic features? Ideas tested are that the Surry shoreline marks the transition from normal to forced regression, and that each allo-unit is a chronostratigraphic slab (Pattison, 2010). Recent Sr 87/86 isotope dates on fossils place the base of the Quaternary here as Calabrian, correlating with MIS 63 (Farrell and Thornton, 2020; Wehmiller et al, 2012).

Characterizing Facies-Controlled Economically Valuable Placers: In Coastal Depositional Systems, heavy minerals commonly occur in shoreface, ebb-tidal delta, beach ridge accretion plains, and other fine-grained sand and heterolithic (interlayered sand and mud) facies. Distribution of these facies is predictable along ancient shorelines, but requires 3D subsurface analysis to identify, confirm, and quantify their thickness, extent and economic value. NCGS is currently mapping these facies near the Surry and older paleoshorelines in the Fall Zone (EARTH MRI), along-strike or near new mine leases.

DATSETS UTILIZED – TO INTERPRET GEOMORPHOLOGY

Geologic maps of the Coastal Plain are historically based on morphostratigraphic units interpreted from non-standardized (sources)—low-resolution, 2 m, 5 ft and 10 ft contour intervals depicted on 7.5-minute topographic quadrangles. The landform elements in the current map, defined as Digital Map Units (DMUs), were interpreted from high-resolution LiDAR basemaps. This 4-quad area is also a component of the Rocky Mount 100K sheet, that will contribute to a revised geomorphic model of Coastal Plain evolution based on landform elements interpreted from LiDAR.

LiDAR origin: 2004 LiDAR (original source 20 ft DEMs from NC Flood Plain Mapping Program), Q2, 10ft DEMs downloaded from the USGS website and reprojected as STATE PLANE NAD 83 meters. Landform elements were interpreted from hillshade, slope and contour lines (1 m, 0.5 m and 0.25 m) derived from the elevation grids and orthoimages (county) dated circa 2011 (these best matched the 2004 LiDAR data). More recent QL1 LiDAR data was constantly undergoing updating for the area. For a standardized unchanging dataset, the QL2 2004 data was chosen.

Prior to the late-stage (2022) download of LiDAR from the USGS website, NCGS staff (Farrell and Amy Keyworth) processed and tiled the 20 DEMS from the NC Flood Plain Mapping Program in house. It is confirmed that the contour lines in both data sets (10FT DEMs from USGS versus 20FT DEMs from NC) are exactly the same, although tiled differently.

The map shown here includes components (roads, geography, etc) of a geopdf (NC_Walstonburg_20220823_TM_geo) downloaded from the USGS website. This was edited in Adobe Acrobat Pro so that all layers except for map collar, road features, and contours were turned off. Polygon shapefiles depicting DMUs and core locations were draped over the geopdf and made 40% transparent. Polygons are draped over a 35% transparent hillshade. Contours shown are 1 m contours derived from the LiDAR.

BACKGROUND

In the 4-quad area, NCGS collected subsurface data incrementally over many STATEMAP cycles. Coring was expensive and NCGS did not own a Geoprobe rig until 2016. To date, 2029 ft of shallow core were collected at 46 borehole locations in the Walstonburg Quadrangle. The coring methods included: Geoprobing, split-spoon coring, and wireline/mud-rotary drilling. The highest quality data for the shallow subsurface was collected with the NCGS's Geoprobe. Other methods (wireline/mud-rotary) could recover the deeper, more consolidated older section, but commonly lost the shallow Quaternary stratigraphy due to shallow overpressure zones (heaving sands). Natural gamma logs were collected at boreholes drilled by the NC DENR DEQ for EPA Non-Point Source grants. Temporary wells were installed in open boreholes: these were cased with PVC, logged, and uninstalled and plugged after collection of the natural gamma log. (Geoprobe, Inc. does not have a downhole tool for logging natural gamma emissions).

FUTURE WORK

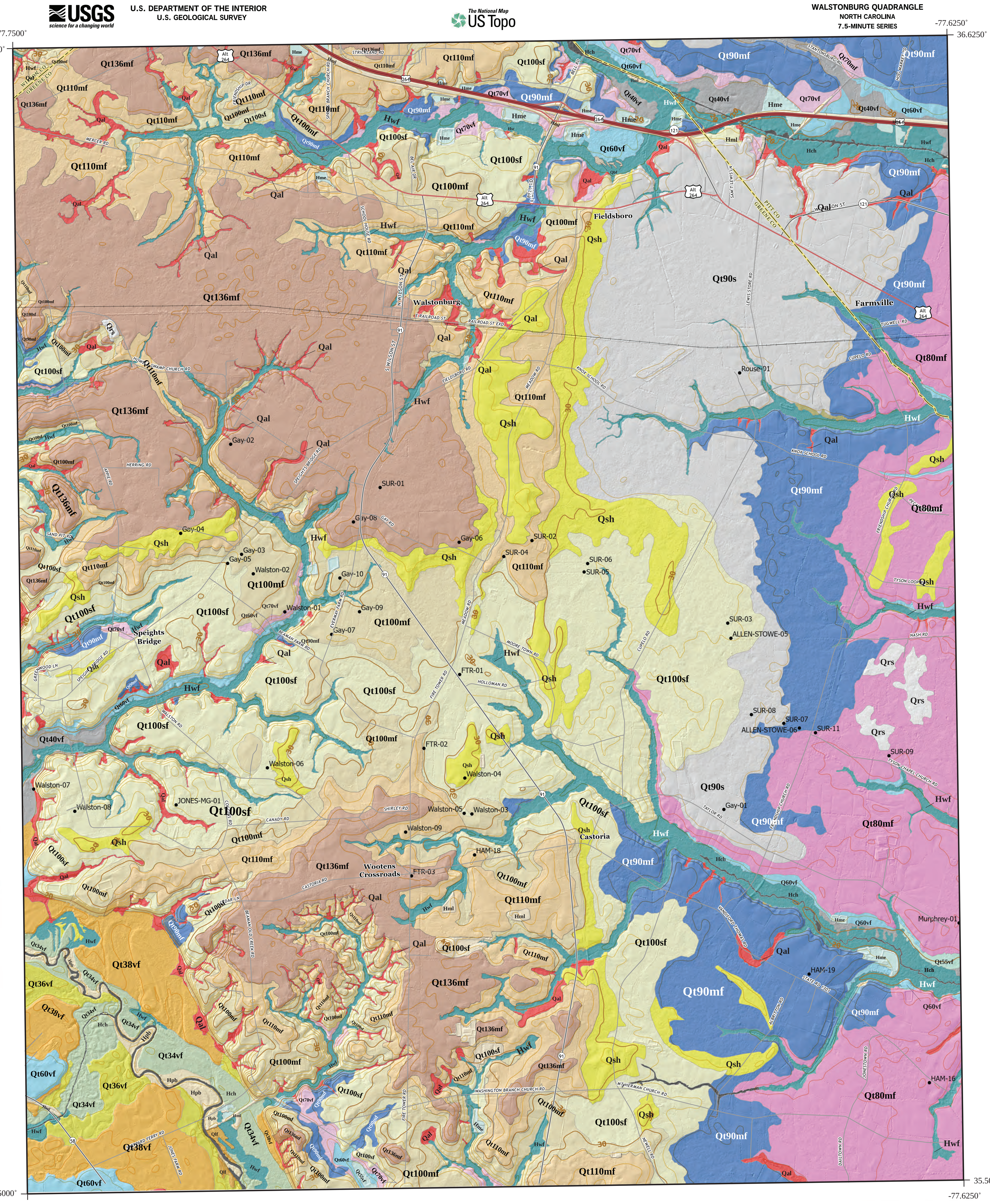
Over the FY21-FY24 STATEMAP funding cycles, maps for the four quads were completed as stand-alone deliverables. In FY25, all four quads will be completed along with GeMS geodatabases for each map. Once the four-quads are completed, the stratigraphic data will be compiled into a 3D database (future STATEMAP Proposal). These cores and the 3D distribution of sedimentary facies and bounding surfaces will ultimately be used to define new formal stratigraphic units, in conjunction with the interstate correlation activities funded by the USGS for the NC/VA Coastal Plain. For the current map product, the landform elements depicted are informal units, that are an intermediate step to grouping these, integrating with the subsurface analysis to define new formal units. Subsurface data will be shown in future versions of this map as the DMUs are updated, and stratigraphic units are proposed for NC's stratigraphy. As mapping proceeds from west to east across the Rocky Mount 100K sheet, the morphostratigraphic model will be revised to accommodate new data.

CONTRIBUTERS

Erik D. Thornton was the principal collaborator with respect to running the drilling operation in the 4-quad area and the compilation of stratigraphy. Amy Keyworth was a major contributor with respect to processing and tiling LiDAR in house during early phases of this mapping. Other NCGS geologists who assisted with field work include: Katie Cummings, Colby Brown, Calley Anthony, McKenzie Hamilton, Stalin Rosero Pozo, Kevin Smith, Walt Haven, Bob Brooks, Sean Groom and Laura DeMoe. Dennis Foyles drilled the Geoprobe cores.

The late H.E. Mew, Jr. of the Division of Water Quality was instrumental in including NCGS as a partner in a joint federal-state collaboration (NC DWQ /USGS/EPA/NCGS) funded by the EPA's 319H grant program to map shallow aquifers and confining units and integrate these studies with groundwater monitoring and water quality studies. This permitted collection of deep cores (wireline/mud rotary) with downhole natural gamma logs. Timothy Spruill and Doug Smith of the U.S. Geological Survey also participated in the field work.

USGS science for a changing world
U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY
The National Map US Topo
WALSTONBURG QUADRANGLE
NORTH CAROLINA
7.5-MINUTE SERIES



Produced by the United States Geological Survey
North American Datum of 1983 (NAD83)
World Geodetic System of 1984 (WGS84). Projection and 1 000-meter grid:Universal Transverse Mercator, Zone 18S
This map is not a legal document. Boundaries may be generalized for this map scale. Private lands within government reservations may not be shown. Obtain permission before entering private lands.
Imagery....NAIP, September 2020 - September 2020
Roads....U.S. Census Bureau, 2016
Names....GNIS, 1980 - 2022
Hydrography....National Hydrography Dataset, 2006 - 2018
Contours....National Elevation Dataset, 2008
Boundaries....Multiple sources; see metadata file 2019 - 2021
Wetlands....FWS National Wetlands Inventory Not Available

MN
GN
9°45´
173 MILS
1°34´
28 MILS
UTM GRID AND 2019 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

U.S. National Grid
100,000 - m Square ID
TE
Grid Zone Designation
18S

SCALE 1:24 000
1 0.5 0 KILOMETERS 1 2
1000 500 0 METERS 1000 2000
1 0.5 0 MILES 1
1000 0 1000 2000 3000 4000 5000 6000 7000 8000 9000 10000 FEET

This map was produced to conform with the National Geospatial Program US Topo Product Standard.

Contour Interval 1 m
Derived from 2004 LiDAR Elevation Grid
Projected in STATE PLANE NAD 83 m

NORTH CAROLINA
QUADRANGLE LOCATION

1	2	3
4		5
6	7	8

1 Saratoga
2 Fountain
3 Falkland
4 Stantonsburg
5 Farmville
6 Jason
7 Snow Hill
8 Hookerton
ADJOINING QUADRANGLES

ROAD CLASSIFICATION
Expressway
Secondary Hwy
Ramp
Local Connector
Local Road
4WD
Interstate Route
US Route
State Route

WALSTONBURG, NC
2022

SURFICIAL GEOLOGIC MAP UNITS/GEOMORPHIC LANDFORM ELEMENTS

HOLOCENE LANDFORM ELEMENTS

Hme

Hme Man-Made Excavation – Man-made excavations such as ponds, lakes and lagoons that are commonly infilled with water; may be associated with spoil heaps, dams and mining operations.

Hml

Hml Modified Land – Undifferentiated modified land that includes man-made earthen structures such as spoil piles from mining and dredging, dams associated with ponds and lagoons, roadways (cuts and causeways) that interfere with the natural landscape, and associated excavations.

Hch

Hch Stream Channel – Natural stream and river channels; may be dredged and straightened.

Hwf

Hwf Wetland Flat (Holocene) – Vegetated wetland flat at base of incised valleys; commonly with an anastomosed channel network activated during flood stage. Hwf is the main component of the active flood plain; it may be drained by a single main channel, which is commonly trenched and straightened by human activity. Locally or seasonally, Hwf may become lacustrine. Basal quartz sand fines up into organic-rich sand and mud. Deposits are typically less than 3 m thick. Flat is typically flanked by colluvium, alluvial fan, and partly buried channel belts. It is incised into pre-existing deposits and may be separated stepwise from other active or inactive wetland flats. Upstream, especially in first order streams, the flat narrows and is replaced by undifferentiated Quaternary alluvium. the wetland flat rises in elevation across the Coastal Plain in drainages from sea level (bay head delta in estuaries) to the Fall Zone. It is intermittently replaced by Hpb, the Holocene point bar complexes. Downstream and in larger river systems, Hwf is replaced by large-scale point bar complexes, and is restricted to low-lying flood basins between meander belts. Upstream in the Fall Zone, Hwf may merge with older terraces and colluvium.

Hpb

Hpb Point bar complex (Holocene) – The Holocene point bar complex is part of the active flood plain and occurs in two settings. It intermittently replaces the wetland flat (Hwf) along incised drainages that typically lack a major channel. Along major streams, Hpb occurs as a small-scale narrow complex adjacent to the principal channel, where it is the 'zone in which the channel meanders'. In this setting, Hpb is incised (1-2 m) into a slightly older, higher elevation point bar complex, which becomes active during major floods.

Hsc

Hsc Side Valley Colluvium – A narrow zone of colluvium marginal to the wetland flat or other feature; at the base of slopes and in association with breaklines in topographic relief.

UNDIFFERENTIATED HOLOCENE/PLEISTOCENE LANDFORM ELEMENTS

Qal

Qal Undifferentiated Quaternary alluvium – Qal is here specifically defined as valley-fill alluvium, colluvium, feeder channels and alluvial fans that are upstream components of the currently active landscape (Holocene depositional system). In many cases, sediment may be Pleistocene or Pliocene in age. Typically, Qal occurs upstream or updrainage from the Holocene wetland flat (Hwf, Hwf2) and is common in first order streams. It is not flat, but may have an irregular surface. Surfaces of some colluvial deposits and alluvial fans are concave downward. Incised feeder channels may lead down slope from sediment sources to fan sinks, especially in areas where clay-rich sediment forms steep banks that separate terraces.

Qrs

Qrs Remobilized sand – Remobilized sand refers to sands that through a variety of processes now form topographic highs in otherwise flat landscapes. Qrs map units may help identify rims affiliated with Carolina Bays, sand ridges, or inherited high-standing sand accumulations. An alternative interpretation is that, in certain cases, these are erosion resistant remnants of the older, higher landform elements that are mud-dominated, rather than sand dominated. This can only be resolved by direct drilling into the features.

Qbf

Qbf Barforms – Transverse or attached barforms with several possible origins. Barforms that postdate the Hwf and incised valley terraces may have formed in response to Holocene major flood events that impacted the local basin. Alternatively, these barforms may be remnants of older point bar deposits that are currently undergoing burial by the Holocene wetland flat.

Qsh

Qsh Shoreline sand – Shoreline marker unit helps emphasize shoreline landforms such as barrier islands, strand lines,shorefaces, alongshore bars, barrier islands, and dunes.

Qlf

Qlf Levee overwash fans – overwash fans along channels, that form during overtopping of natural levees during floods; usually associated with point bar complexes.

QUATERNARY VALLEY FILL TERRACES

Qt34vf

Qt34vf Pleistocene valley fill terrace at 14-13 m – Point bar complex at 14-13 m; incised into and postdates Qt36vf. Locally may merge into Hpb system. Typically Hpb is incised into this unit. Defined in Contentnea Creek area (Walstonburg).

Qt36vf

Qt36vf Pleistocene valley fill terrace at 15-14 m.

Qt38vf

Qt38vf Pleistocene valley fill terrace at 17-14 m – Flat to wave-swept valley-fill terrace at 17-14 m; includes internal downsteps that resemble bars deposited from a succession of standing waves. Very sandy. Farmland with subtle topography; lacks well developed point bar system in some areas. Some upstream areas in smaller-scale drainages have well-developed point bar topography. Closely affiliated with Qt40vf, which may be an estuarine terrace, and can be mapped directly to it. Defined in Contentnea Creek area (Walstonburg).

QUATERNARY MARINE/ESTUARINE TERRACES

Qt40vf

Qt40vf Pleistocene valley fill at 21-14 m. With fluvial and estuarine components. Upstream, unit is incised into Qt60vf and/or Qt55vf, as a downstep. In downstream confluence areas it tends to converge in elevation with Qt55vf, so that these landform elements are difficult to separate geomorphically (areas with larger sediment supply). This unit may mark the transition from older marine/estuarine terraces (Early Pleistocene) to younger point bar terraces which may be Middle Pleistocene.

Qt55vf

Qt55vf Pleistocene valley fill at 21-14 m. Flat estuarine terrace at 21-14 m that forms as a downstep from Qt60vf. Downstream, Qt55vf forms a broad flat at 14 m. It is likely Early Pleistocene, forming during falling stages in sea level after occupation of the Surry paleoshoreline.

Qt60vf

Qt60vf Pleistocene valley fill at 22-18 m. Estuarine terrace at 22-18 m that has downstepped from Qt80mf, a principal marine flat. Qt60vf similarly downsteps to form Qt55 vf. It is likely Early Pleistocene, forming during falling stages in sea level after occupation of Surry paleoshoreline

Qt70mf

Qt70mf Pleistocene marine and estuarine flats at ~25-22 m. Marine and estuarine flats at 25-22 m are slightly incised into Qt80mf (Otter Creek, Falkland). Down valley, the estuarine terrace merges with the equivalent marine flat along the open paleoshoreline. (This unit may be grouped with Qt90mf and Qt80mf, but exhibits downstepping, especially in the incipient incised valley.

Qt80mf

Qt80mf Pleistocene marine flat at 25.5 to 24 m; Marine flat at 25.5 to 24 m is locally separated from more landward Qt90mf by a subtle downstep in topography; it is underlain by the same geologic unit as Qt90mf. This unit helps demonstrate the early stages of incised valley formation (Otter Creek - Falkland) during the falling stage in sea level from the Qt90s event. Early Pleistocene, falling stage marine ramp.

Qt90mf

Qt90mf Pleistocene marine/estuarine flat at 27.0 to 25.5 m, that marks a reoccupation of the Surry paleoshoreline after the highstand at 30 m, and the incipient formation of incised valleys that formed as sea level fell after forming the Surry shoreline; estuarine equivalents are mapped upvalley.

Qt90s

Qt90s Pleistocene shoreline sands at 27-28 m form a marine flat that postdates the main Surry paleoshoreline highstand at 30 m (Qt100sf); it formed at a paleo- sea level of about 27-28m and marks the landward most extent of the regional-scale marine flat (Qt90mf, Qt80 mf, Qt70 mf) that extends from 27-24 m; it occurs along the open coast (Surry) and in estuaries, only occurs near the paleoshoreline; upestuary it merges with the downstepping Qt90mf.

Qt100sf

Qt100sf Sand flat at 28-30 m occurs along the Surry paleoshoreline; it is slightly higher in elevation and more landward than Qt90s (the 27-28 m flat); it is seaward and slightly lower in elevation than Qt100mf, the principal highstand flat at 29-32 m. In upstream incised valleys, this unit is mappable marking a high-stand or the first downstep after the first occupation of the Surry paleoshoreline. May include remobilized sands marking Carolina Bay rims.

Qt100mf

Qt100mf Pleistocene marine flat at 29-32 m is associated with the primary occupation of the Surry Paleoshoreline complex; flat likely formed at a sea level of approximately 30 – 31 m; it includes remobilized sands that outline Carolina Bays and define other shoreline-related sandy features; unit has an uneven topography because of the remobilized sands; it is closely affiliated with Qt100sf, which is slightly lower in elevation; locally unit occurs as a 33 m marine platform landward of a landform that is shaped like a barrier island.

Qt110mf

Qt110mf Marine/estuarine flat at 32-34 m that occurs as a widespread downstep from Qt136, a major marine terrace; associated with the incipient formation of Surry paleoshoreline complex; unit is geomorphically complex especially with respect to its interfacing with the eastern margin of Qt136mf.

Qt136mf

Qt136mf Pleistocene marine flat at 34-36 m is a geomorphically complex area that likely includes beach ridge accretion plain near the Surry paleoshoreline, remobilized sands that demarcate Carolina Bay ovals, and numerous colluvial failures likely caused by thick shallow sands; closely affiliated with Qt138 to west, as a local downstep.

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WALSTONBURG CORE DATA

NCGS_STD_ID	HOLE_ID	DATE_DRILLED	PI	GEO_IN_FIELD	QUAD	COUNTY	LAT_DD	LONG_DD	DEPTH_FT	DEPTH_M	ELEV_FT	ELEV_M	CORING_METHOD	DRILLERS	CORE_PHOTOS	GAMMA_LOGS
GR-2011-019-00	Walston-04	10/5/2011	K. Farrell	K.Farrell, J.Glass	Walstonburg	Greene	35.5445965	-77.6908959	28.00	8.53	96.44	29.39	Geoprobe Discrete Sampling	NC-DENR DWQ	ARCHIVAL	NO
GR-2011-020-00	Walston-05	10/6/2011	K. Farrell	K.Farrell, J.Glass	Walstonburg	Greene	35.5407570	-77.6910395	48.00	14.63	119.80	36.51	Geoprobe Discrete Sampling	NC-DENR DWQ	ARCHIVAL	NO
GR-2011-021-00	Walston-06	10/6/2011	K. Farrell	K.Farrell, J.Glass	Walstonburg	Greene	35.5459938	-77.7172450	48.00	14.63	99.84	30.43	Geoprobe Discrete Sampling	NC-DENR DWQ	ARCHIVAL	NO
GR-2011-022-00	Walston-07	10/13/2011	K. Farrell	K.Farrell, J.Glass	Walstonburg	Greene	35.5439901	-77.7484995	36.00	10.97	100.56	30.65	Geoprobe Discrete Sampling	NC-DENR DWQ	ARCHIVAL	NO
GR-2011-023-00	Walston-08	10/13/2011	K. Farrell	K.Farrell, J.Glass	Walstonburg	Greene	35.5415197	-77.7430483	52.00	15.85	109.22	33.29	Geoprobe Discrete Sampling	NC-DENR DWQ	ARCHIVAL	NO
GR-2011-024-00	Walston-09	10/13/2011	K. Farrell	K.Farrell, J.Glass	Walstonburg	Greene	35.5387853	-77.6989077	24.00	7.32	118.54	36.13	Geoprobe Discrete Sampling	NC-DENR DWQ	ARCHIVAL	NO
GR-2011-025-00	Gay-07	10/18/2011	K. Farrell	K.Farrell, J.Glass	Walstonburg	Greene	35.5604690	-77.7084362	16.00	4.88	97.01	29.57	Geoprobe Discrete Sampling	NC-DENR DWQ	ARCHIVAL	NO
GR-2012-001-00	Gay-08	2/8/2012	K. Farrell	K.Farrell, J.Glass	Walstonburg	Greene	35.5726832	-77.7053213	52.00	15.85	118.92	36.25	Geoprobe Discrete Sampling	NC-DENR DWQ	ARCHIVAL	NO
GR-2012-002-00	Gay-09	2/9/2012	K. Farrell	K.Farrell, J.Glass	Walstonburg	Greene	35.5628788	-77.7046768	44.00	13.41	101.17	30.84	Geoprobe Discrete Sampling	NC-DENR DWQ	ARCHIVAL	NO
GR-2012-003-00	Gay-10	2/9/2012	K. Farrell	K.Farrell, J.Glass	Walstonburg	Greene	35.5665840	-77.7072378	40.00	12.19	108.84	33.17	Geoprobe Discrete Sampling	NC-DENR DWQ	ARCHIVAL	NO
GR-2024-001-00	ALLEN-STOWE-05	4/24/2024	K. Farrell	K. Farrell, C. Anthony, S. Rosero, M. Hamilton	Walstonburg	Greene	35.5594676	-77.6550965	48.90	14.90	93.21	28.41	Geoprobe Discrete Sampling	D. Foyles	FIELD	NO
GR-2024-002-00	ALLEN-STOWE-06	4/25/2024	K. Farrell	K. Farrell, C. Anthony, S. Rosero	Walstonburg	Greene	35.5495727	-77.6461183	43.10	13.14	82.48	25.14	Geoprobe Discrete Sampling	D. Foyles	FIELD	NO
GR-2024-003-00	HAM-16	9/5/2024	K. Farrell	K. Farrell, M. Hamilton, C. Anthony	Walstonburg	Greene	35.5106631	-77.6294083	39.20	11.95	78.71	23.99	Geoprobe Discrete Sampling	D. Foyles	FIELD	NO
GR-2024-005-00	JONES-MG-01	9/25/2024	K. Farrell	K. Farrell, M. Hamilton, C. Anthony	Walstonburg	Greene	35.5420739	-77.7295025	40.15	12.24	93.54	28.51	Geoprobe Discrete Sampling	D. Foyles	FIELD	NO
GR-2024-006-00	HAM-18	10/17/2024	K. Farrell	K. Farrell, C. Anthony, S. Rosero	Walstonburg	Greene	35.5362015	-77.6897336	50.30	15.33	111.94	34.12	Geoprobe Discrete Sampling	D. Foyles	FIELD	NO
GR-2024-007-00	HAM-19	10/31/2024	K. Farrell	K. Farrell, C. Anthony, S. Rosero	Walstonburg	Greene	35.5226916	-77.6452669	37.15	11.32	80.31	24.48	Geoprobe Discrete Sampling	D. Foyles	FIELD	NO
GR-2025-001-00	GAY-11	2/7/2025	K. Farrell	K. Farrell, C. Anthony, S. Rosero	Walstonburg	Greene	35.6093174	-77.7420561	56.00	17.07	114.50	34.90	Geoprobe Discrete Sampling	D. Foyles	FIELD	NO
GR-2025-002-00	HERRING-01	2/14/2025	K. Farrell	K. Farrell, C. Anthony, S. Rosero, E. Becker	Walstonburg	Greene	35.5924273	-77.7349427	49.40	15.06	116.70	35.57	Geoprobe Discrete Sampling	D. Foyles	FIELD	NO
GR-2025-003-00	HERRING-02	2/25/2025	K. Farrell	K. Farrell, C. Anthony, S. Rosero, E. Becker	Walstonburg	Greene	35.5821606	-77.7310112	49.70	15.15	113.71	34.66	Geoprobe Discrete Sampling	D. Foyles	FIELD	NO
GR-2025-005-00	GAY-13	3/7/2025	K. Farrell	K. Farrell, H. Hanna, Q. Zhang, S. Rosero, E. Becker	Walstonburg	Greene	35.6247183	-77.7393462	55.80	17.01	116.83	35.61	Geoprobe Discrete Sampling	D. Foyles	FIELD	NO
GR-2025-006-00	GAY-14	3/11/2025	K. Farrell	K. Farrell, C. Anthony, M. Hamilton, E. Becker	Walstonburg	Greene	35.5961955	-77.6625810	31.25	9.53	89.86	27.39	Geoprobe Discrete Sampling	D. Foyles	FIELD	NO
GR-2025-007-00	HAM-20	4/15/2025	K. Farrell	K. Farrell, S. Rosero, E. Becker	Walstonburg	Greene	35.5291225	-77.6764866	59.10	18.01	104.92	31.98	Geoprobe Discrete Sampling	D. Foyles	FIELD	NO

NCGS_STD_ID	HOLE_ID	DATE_DRILLED	PI	GEO_IN_FIELD	QUAD	COUNTY	LAT_DD	LONG_DD	DEPTH_FT	DEPTH_M	ELEV_FT	ELEV_M	CORING_METHOD	DRILLERS	CORE_PHOTOS	GAMMA_LOGS
GR-2002-020-00	SUR-05	5/7/2002	K. Farrell	K.Farrell, A.Keyworth, L.DeMoe	Walstonburg	Greene	35.5669000	-77.6746000	25.00	7.62	96.78	29.50	Split Spoon	Graham & Currie	ARCHIVAL	YES
GR-2002-021-00	SUR-06	5/7/2002	K. Farrell	K.Farrell, A.Keyworth, L.DeMoe	Walstonburg	Greene	35.5678000	-77.6741000	30.00	9.14	96.78	29.50	Split Spoon	Graham & Currie	ARCHIVAL	YES
GR-2002-001-00	FTR-01	7/17/2002	K. Farrell	K.Farrell, A.Keyworth, L.DeMoe, D.Smith (USGS)	Walstonburg	Greene	35.5559000	-77.6914000	58.00	17.68	95.14	29.00	Wireline - Mud Rotary	NC-DENR DWQ	ARCHIVAL	YES
GR-2002-017-00	SUR-02	7/22/2002	K. Farrell	K.Farrell, A.Keyworth, L.DeMoe	Walstonburg	Greene	35.5704000	-77.6815000	65.00	19.81	111.55	34.00	Split Spoon	Graham & Currie	ARCHIVAL	YES
GR-2002-002-00	FTR-02	7/23/2002	K. Farrell	K.Farrell, A.Keyworth, L.DeMoe	Walstonburg	Greene	35.5479000	-77.6963000	44.00	13.41	101.70	31.00	Split Spoon	Graham & Currie	ARCHIVAL	YES
GR-2002-018-00	SUR-03	7/23/2002	K. Farrell	K.Farrell, A.Keyworth, L.DeMoe	Walstonburg	Greene	35.5611000	-77.6555000	55.00	16.76	99.41	30.30	Split Spoon	Graham & Currie	ARCHIVAL	YES
GR-2002-019-00	SUR-04	7/23/2002	K. Farrell	K.Farrell, A.Keyworth, L.DeMoe	Walstonburg	Greene	35.5687000	-77.6853000	70.00	21.34	104.99	32.00	Split Spoon	Graham & Currie	ARCHIVAL	YES
GR-2002-003-00	FTR-03	7/26/2002	K. Farrell	K.Farrell, A.Keyworth, L.DeMoe	Walstonburg	Greene	35.5340000	-77.6982000	55.00	16.76	118.11	36.00	Split Spoon	Graham & Currie	ARCHIVAL	YES
GR-2002-022-00	SUR-07	8/8/2002	K. Farrell	K.Farrell, A.Keyworth, L.DeMoe	Walstonburg	Greene	35.5501000	-77.6482000	50.00	15.24	86.94	26.50	Split Spoon	Graham & Currie	ARCHIVAL	YES
GR-2002-023-00	SUR-08	8/8/2002	K. Farrell	K.Farrell, A.Keyworth, L.DeMoe	Walstonburg	Greene	35.5511000	-77.6525000	45.00	13.72	90.22	27.50	Split Spoon	Graham & Currie	ARCHIVAL	YES
GR-2002-024-00	SUR-09	8/8/2002	K. Farrell	K.Farrell, A.Keyworth, L.DeMoe	Walstonburg	Greene	35.5464000	-77.6342000	45.00	13.72	79.40	24.20	Split Spoon	Graham & Currie	ARCHIVAL	YES
GR-2004-007-00	SUR-11	3/9/2004	K. Farrell	J.Chapman	Walstonburg	Greene	35.5490350	-77.6439669	52.00	15.85	76.70	23.38	Split Spoon	NC-DENR DWQ	ARCHIVAL	YES
GR-2011-015-00	Walston-02	9/5/2011	K. Farrell	K.Farrell, J.Glass	Walstonburg	Greene	35.5671607	-77.7187960	48.00	14.63	102.73	31.31	Geoprobe Discrete Sampling	NC-DENR DWQ	ARCHIVAL	NO
GR-2011-008-00	Murphrey-01	9/19/2011	K. Farrell	K.Farrell, J.Glass	Walstonburg	Greene	35.5280580	-77.6251380	32.00	9.75	78.86	24.04	Geoprobe Discrete Sampling	NC-DENR DWQ	ARCHIVAL	NO
GR-2011-006-00	Rouse-01	9/19/2011	K. Farrell	K.Farrell, J.Glass	Walstonburg	Greene	35.5883932	-77.6534429	28.00	8.53	91.38	27.85	Geoprobe Discrete Sampling	NC-DENR DWQ	ARCHIVAL	NO
GR-2011-009-00	Gay-01	9/20/2011	K. Farrell	K.Farrell, J.Glass	Walstonburg	Greene	35.5407870	-77.6563510	40.00	12.19	89.18	27.18	Geoprobe Discrete Sampling	NC-DENR DWQ	ARCHIVAL	NO
GR-2011-010-00	Gay-02	9/20/2011	K. Farrell	K.Farrell, J.Glass	Walstonburg	Greene	35.5813348	-77.7216028	52.00	15.85	114.98	35.05	Geoprobe Discrete Sampling	NC-DENR DWQ	ARCHIVAL	NO
GR-2011-011-00	Walston-01	9/21/2011	K. Farrell	K.Farrell, J.Glass	Walstonburg	Greene	35.5629690	-77.7146470	40.00	12.19	91.37	27.85	Geoprobe Discrete Sampling	NC-DENR DWQ	ARCHIVAL	NO
GR-2011-013-00	Gay-03	10/4/2011	K. Farrell	K.Farrell, J.Glass	Walstonburg	Greene	35.5693087	-77.7203260	52.00	15.85	106.52	32.47	Geoprobe Discrete Sampling	NC-DENR DWQ	ARCHIVAL	NO
GR-2011-014-00	Gay-04	10/4/2011	K. Farrell	K.Farrell, J.Glass	Walstonburg	Greene	35.5716878	-77.7284370	48.00	14.63	119.22	36.34	Geoprobe Discrete Sampling	NC-DENR DWQ	ARCHIVAL	NO
GR-2011-016-00	Gay-05	10/5/2011	K. Farrell	K.Farrell, J.Glass	Walstonburg	Greene	35.5683481	-77.7222112	20.00	6.10	100.77	30.72	Geoprobe Discrete Sampling	NC-DENR DWQ	ARCHIVAL	NO
GR-2011-017-00	Gay-06	10/5/2011	K. Farrell	K.Farrell, J.Glass	Walstonburg	Greene	35.5703233	-77.6912337	16.00	4.88	115.86	35.32	Geoprobe Discrete Sampling	NC-DENR DWQ	ARCHIVAL	NO
GR-2011-018-00	Walston-03	10/5/2011	K. Farrell	K.Farrell, J.Glass	Walstonburg	Greene	35.5406710	-77.6900204	31.00	9.45	60.94	18.58	Geoprobe Discrete Sampling	NC-DENR DWQ	ARCHIVAL	NO

Virginia Coastal Plain Units Revised after Mixon et al., 1989								Virginia Map Extent/Geomorphic Features		
Relative Age			Age (MA)	FORMATIONS	MEMBERS	Elevation - Surface Feet	Elevation - Surface Meters	Scarp Toe Highstand position
Quaternary	Holocene		0.01					
Quaternary	Pleistocene	Late		Tabb Fm	Poquoson Mbr.	6 - 10 ft	1.8 - 3.3 m	10 ft / 3.3 m
					Lynnhaven Mbr.	10-18 ft	3.3 - 5.5 m	18 ft / 5.5 m
			0.12		Sedgefield Mbr.	18 - 28 ft	5.5 - 8.5 m	28 ft / 8.5 m
		Middle		Shirley Fm		28 - 48 ft	8.5 - 14.6 m	48 ft / 14.6 m
			0.78	Chuckatuck Fm		48 - 55 ft	14.6 - 16.8 m	55 ft / 16.8 m
		Early		Charles City Fm		55 - 70 ft	16.8 - 21.3 m	70 ft / 21.3 m
				Windsor Fm		70 - 95 ft	21.3 - 29.0 m	95 ft / 29.0 m
				Moorings Unit	Barrier/beach	95 - 125 ft	29.0 - 38.1 m	115 ft / 35 m
					Backbarrier	95? - 115 ft	29.0 - 35.0 m	115 ft / 35 m
				Bacons CastleFm	Barhamsville Mbr. Varina Grove Mbr.	115 - 170 ft	35.0 - 51.8 m	170 ft / 51.8 m
			2.6	Chowan River Fm				
Pliocene			>2.6	Yorktown Fm				

Figure 4. The adjacent diagram shows the relationship between surface elevation and the various formations defined in the Coastal Plain Map of Virginia (Mixon et al., 1989). It incorporates revisions to the Quaternary proposed by Gibbard et. al. (2010). The goal of future STATEMAP proposals is to compile the 3D stratigraphy from the coreholes and use this information to develop up to date descriptions of the Quaternary section, and propose new formation names based on this information.

Disclaimer:
This Open File Report is preliminary. It has been reviewed internally for conformity with the North Carolina Geological Survey editorial standards. Further revisions or corrections to this preliminary map may occur.

NORTH CAROLINA GEOLOGICAL SURVEY 1823

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MAP OF GEOMORPHIC LANDFORM ELEMENTS IN THE WALSTONBURG 7.5-MINUTE QUADRANGLE, NORTH CAROLINA

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Map preparation, digital cartography and editing by Kathleen M. Farrell
2025