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NORTH CAROLINA DEPARTMENT OF ENVIRONMENTAL QUALITY
DIVISION OF ENERGY, MINERAL AND LAND RESOURCES

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NORTH CAROLINA GEOLOGICAL SURVEY

OPEN FILE REPORT 2021-04

Introduction

The Atlantic Coastal Plain of eastern North Carolina (Fig. 1) is poorly understood from scientific, stratigraphic, and mapping perspectives. It is mantled primarily by Pliocene and Pleistocene deposits [illegible] Outcrops are rare, [illegible] detailed geologic maps at [illegible] shows underlying sub- [illegible] unit is affiliated with a [illegible] age dates suggest that [illegible]. If this is the case the [illegible] in ramp or interfluve [illegible]

Location and Geologic Setting

[illegible] intervening terraces that [illegible] the Coastal Plain so [illegible] glacio-eustatic changes [illegible] incised valleys. The stratigraphy in valley fills differs from that of the ramp or interfluve (Farrell and others, 2003), and forms the "alluvial aquifer system" (Tesoriero and others, 2005).

The Surry Scarp, a Pleistocene paleoshoreline complex, trends north through Fountain quad (Figs. 1, 4A). Regional-scale conceptual models (Mixon and others, 1989; Winker and Howard, 1977; Oaks and DuBar, 1974; Daniels and others, 1966) and NCGS SM data suggest that the Surry shoreline is the highstand position for the main early Pleistocene T-R cyclic event. Stratigraphic relationships near the scarp are complex and include several early Pleistocene units; each contains similar repeating facies, and fossils are rare. In Virginia (Mixon and others, 1989) these are the Moorings Unit and the Bacons Castle, Windsor, and Charles City Formations (Fig. 5). In NC and VA, these correlative units occur within the shoreline complex, and both landward and seaward of it. These are not lithologically distinct bodies of rock that are easily mappable; these are allo-units that are mapped by establishing bounding surfaces, their terminations, and the geologic facies above them. Our goal is to describe facies and establish units in a sequence stratigraphic context, and to determine the stratigraphy's relationship to surficial landforms. Sequence stratigraphy emphasizes facies relationships and stratal architecture within a chronological framework (Catuneanu and others, 2009).

Strategy for Performing the Investigation

Geologic mapping in the NC Coastal Plain requires a non-traditional method, called three-dimensional (3D) subsurface mapping (see Newell and Dejong, 2010; and Hughes, 2010), to define and map surficial geologic units. This method combines a geomorphic interpretation of the relict Quaternary landscape with targeted subsurface analysis along profiles that transect geomorphic features. It is useful because the NC Coastal Plain is notorious for its low relief, few outcrops, lack of defined units and type sections, recurring facies, colluvium on side slopes, and extensive wetlands cover, even on uplands: bedrock mapping methods do not apply.

To produce the map, landforms were interpreted from the highest resolution Light Detecting and Ranging (LiDAR) elevation data (20 cm). LiDAR tiles, as floating point ASCI files were downloaded from the Floodplain Mapping Program's website (www.ncfloodmaps.com). These were transformed from ASCI files to raster grids, mosaiced into 10 X 10 rasters, and reprojected as State Plane Nad 1983 meters. Hillshade, slope, and contour lines (1.0, 0.5, and 0.25 meters) were constructed from the raster grids. Orthoimagery (2012, 2010) from the NCONEMAP was used in conjunction with elevation grid color ramps, contour lines, hillshade and slope to interpret landforms. Farrell and others (2003) summarize the method of comprehensive landscape analysis. A series of landform elements was interpreted and digitized starting with the Holocene depositional system and working backward in time into older landscapes. Key transects cross cutting the Surry paleoshoreline and other features were chosen for subsurface analysis. Geologic cores were acquired in plastic tubes with the Geoprobe drill rig. These are 1.5-inch diameter continuous cores (discrete sampling method) collected in 4-foot increments. Cores were logged using the methods of Farrell and others (2012, 2013). High-resolution photos of cores were compiled as photomosaics for archiving. Allostratigraphic units were defined on cross sections, and extrapolated regionally using geomorphic map. Data locations were collected using GPS.

Geomorphic and Stratigraphic Description of Four Quadrangle Region (Figure 4)

The northeast quadrant of Fountain quadrangle is situated within the Surry Palaeoshoreline Complex, at elevations below 36.5 m (120 ft) in a stratigraphically complex, highly dissected region at the border between the "Sunderland Terrace" (see Fig. 2) and the "Wicomico Terrace". In this area, the incised valley of Otter Creek, steps down through a series of Early Pleistocene terraces from an older upland at 36.5 m (120 ft) to younger terraces at about 75 ft. These are underlain by estuarine and marginal marine deposits characterized by heterolithic tidal deposits, and possible tidal channel, inlet and shoreface sands that merge with paleoshoreline affiliated facies downstream near the Surry paleoshoreline. Near the Surry shoreline complex, four, surficial, early Pleistocene units occur beneath upland, predominantly marine flats: in adjacent Virginia, these are called the Bacons Castle Formation, Moorings Unit (informal), and the Windsor and Charles City Formations. All four units are Early Pleistocene in age (Mixon et al., 1989), becoming successively younger in age towards the east. These may be conformable as indicated by stratigraphic details observable in core and outcrop. All four units potentially include similar, repeating facies. Several rise in elevation landward, and upstream into incised valleys. The current study includes marine interfluve units associated with correlatives of the Windsor and Charles City Formations, and a number of terraces in the local incised drainages. The map deliverable shows two units, tentatively called Q wm (Windsor Formation, marine) and Q lzm (Lizzie Formation, marine; terraces are numbered in sequence. The nomenclature utilized here is considered draft only.

In the immediate study area, coastal and incised valley landforms are preserved geomorphically between elevations of 16 and 37 meters. The toe of the Surry paleoshoreface is at about 28 m; the main highstand elevation that explains most of the geomorphic features associated with the Surry Scarp is at about 30 m. Other landforms and surficial stratigraphy indicate slightly higher sea levels (34-37 m) associated with the shoreline complex. Two units are associated with the shoreline complex itself (28-34+ m): the Windsor Formation and the Moorings unit. The Moorings unit is locally associated with barrier island facies. The Windsor outcrops surfically, east of the 30 m contour. It is notched and overlain by the Lizzie Formation near the 26 m contour in Falkland quad. The sea level maximum associated with the flooding event that formed the Surry paleoshoreline complex was likely at about 34 – 37 m, with a shoreline complex and embayed coast between 34 and 28 m. A second near-occupation of the same shoreline formed the shoreline features at about 26 m in the current map area, the boundary between "Windsor" and "Lizzie" Formations. Valleys incised into the marine Windsor (Q wm) and Lizzie (Q lzm) units include a group of Pleistocene terraces that step down from 26 to 8 m in Falkland quadrangle.

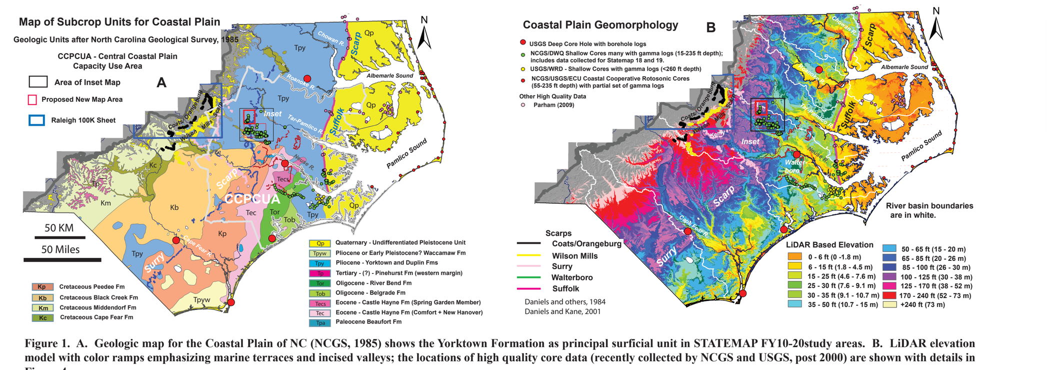


Figure 1. A. Geologic map for the Coastal Plain of NC (NCGS, 1985) shows the Yorktown Formation as principal surficial unit in STATEMAP FY16-20 study area. B. LiDAR elevation model with color ramps emphasizing marine terraces and incised valleys; the locations of high quality core data (recently collected by NCGS and USGS, post 2000) are shown with details in Figure 4.

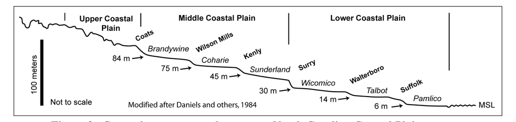


Figure 2. Coastwise terraces and scarps on North Carolina Coastal Plain.

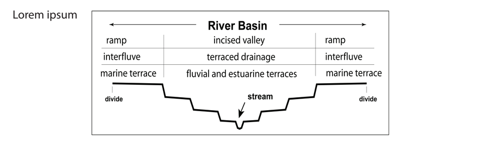


Figure 3. Stairstep topography bordering river basins and strandplain.

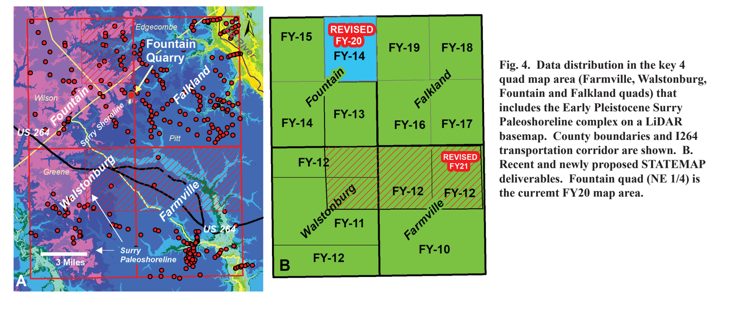


Fig. 4. Data distribution in the 4 quad map area (Farmville, Walstonburg, Fountain and Falkland quads) that includes the Early Pleistocene Surry Paleoshoreline complex on a LiDAR basemap. County boundaries and I264 transportation corridor are shown. B. Recent and newly proposed STATEMAP deliverables. Fountain quad (NE 1/4) is the current FY20 map area.

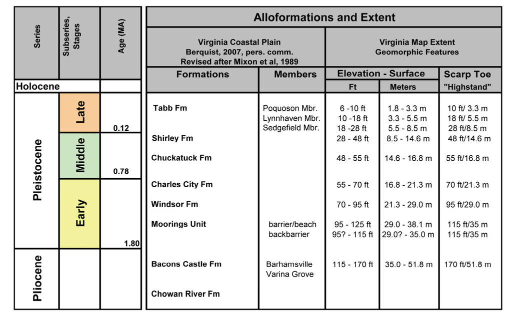


Figure 5. Chart showing relative ages and map units for Virginia's Coastal Plain Map (Mixon and others, 1989) This diagram does not incorporate revisions to the Pleistocene proposed by Gibbard and others (2010).

Table 1. Locations of cores previously collected in Fountain Quadrangle for STATEMAP and EPA 319i Non-Point Source Grants.

HOLE_ID	NCGS_ID	DATE_DRILLED	PROJECT	PI	GEO_IN_FIELD	QUAD	COUNTY	LAT_DD	LONG_DD	DEPTH_FT	DEPTH_M	ELEV_FT	ELEV_M	CORING_METHOD	DRILLERS
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Fountain	Wilson	35.718180	-77.723332	68	20.73	124.23	37.87	Geoprobe Discrete Sampling	D. Foyles
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Fountain	Wilson	35.708877	-77.728891	59	17.98	118.02	35.97	Geoprobe Discrete Sampling	D. Foyles
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Fountain	Wilson	35.737301	-77.737156	65	19.81	122.28	37.27	Geoprobe Discrete Sampling	D. Foyles
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Fountain	Wilson	35.727361	-77.730161	60	18.29	125.7	38.31	Geoprobe Discrete Sampling	D. Foyles
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Fountain	Pitt	35.677913	-77.635770	54.9	16.73	93.92	28.63	Geoprobe Discrete Sampling	D. Foyles
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Fountain	Pitt	35.678163	-77.627972	54.5	16.61	91.78	27.98	Geoprobe Discrete Sampling	D. Foyles

TECHNICAL REPORT

Primary deliverables support revised mapping in Fountain Quadrangle, Northeast Quadrant (1/4 quad): 1) collect ~1200 ft of core for the subsurface analysis to describe stratigraphy; and 2) 1:24,000 and 1:12,000 Geopdfs of plotter-printable geologic maps for Fountain NE quadrant. Fountain NE is contiguous with previous SM deliverables and is edgematched with Falkland NW quadrant, the FY19 deliverable.

The subsurface analysis to support the map was conducted in four person teams for maximum efficiency, with 76 total staff field days that included rig mobilization and maintenance, and coring. The field team included: PI Senior Geologist K. Farrell, Temporary Geologist I Erik Thornton, Temporary Licensed Driller Dennis Foyles, and Temporary Geological Technician Colby Brown. The temporary positions are supported by STATEMAP. In some cases, the field team consisted of three members.

Field Staff and Time		Field Days
Farrell	PI - Senior Geologist	20
Thornton	STATEMAP Geologist I	19
Foyles	Licensed Driller	18
Brown	Geological Technician	19
	Total Staff Field Days	76

Data Collection Statistics for Mapping Quaternary Unconsolidated Coastal Plain:

Quadrangle	Mapping Type	Purpose	Stations	Stratigraphy Coreholes	Total Footage
Drake	Coastal Plain	Correlate with EARTH MRI Project	1	1	68.9
Falkland	Coastal Plain	Test Geoprobe/Education	1	1	49.8
Fountain	Coastal Plain	Subsurface Analysis - Improve coverage	17	17	908.8
	Totals		19	19	1027.5

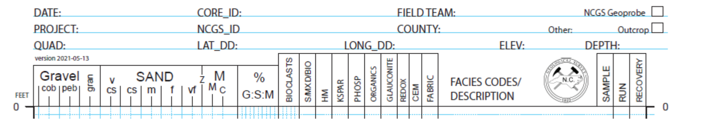
Subsurface Analysis:

A total of 1027.5 ft of core was collected at 19 new sites to characterize the complete Quaternary section. These included: 1) a corehole in adjacent Falkland quadrangle to demonstrate coring to school children and test the recently repaired Geoprobe rig; 2) 17 new coreholes in Fountain NE quadrant, 3) a core in Drake Quadrangle (~2.5 quads to NE) to correlate stratigraphic units in the EARTH MRI mapping project area with STATEMAP. The coreholes ranged from 24 to 83 ft deep; recovery was typically 80-95%. Deepest cores bottomed out in probable Paleogene or Cretaceous "basement". During drilling, cores were split, washed and described in a graphic log format (Farrell and others, 2012, 2013). Cores were photographed in the field with a cell phone. Cross sections were constructed from the field logs in Adobe Illustrator.

The target of 1200 was not achieved because the Quaternary section was thicker and took longer to drill once depths were greater than 50 ft. For example, to reoccupy a corehole on day 2 of drilling, it would typically take 6 hours to setup and drill an additional 20 ft to refusal. An average of ~60 ft of core was collected daily.

To coordinate with EARTH MRI mapping projects and objectives, the field methods were modified. Four person field teams, rather than 3, were utilized to cover multiple objectives. Two staff drilled the core hole, while two geologists processed, logged, photographed and sampled the core in real time.

A new upgraded compilation log sheet was developed and used in both STATEMAP and EARTH MRI projects to standardize stratigraphic descriptions between projects and upgrade core logging in the field. These new log sheets help streamline data collection so that 3D data can be compiled into spreadsheets. The field logs serve as templates for type sections, which VA, NC and SC foresee developing in future, STATEMAP funded collaborations.



A new activity is to routinely collect and bag sediment samples from the core split that is removed from the top of each opened geoprobe core. These are cataloged and boxed and available for possible heavy mineral and/or geochemical analyses in collaboration with the USGS. In this manner, cores will not be destroyed later by invasive sampling, if facies within are considered 'heavy mineral' or phosphate-rich deposits.

Geomorphic Mapping Revisions

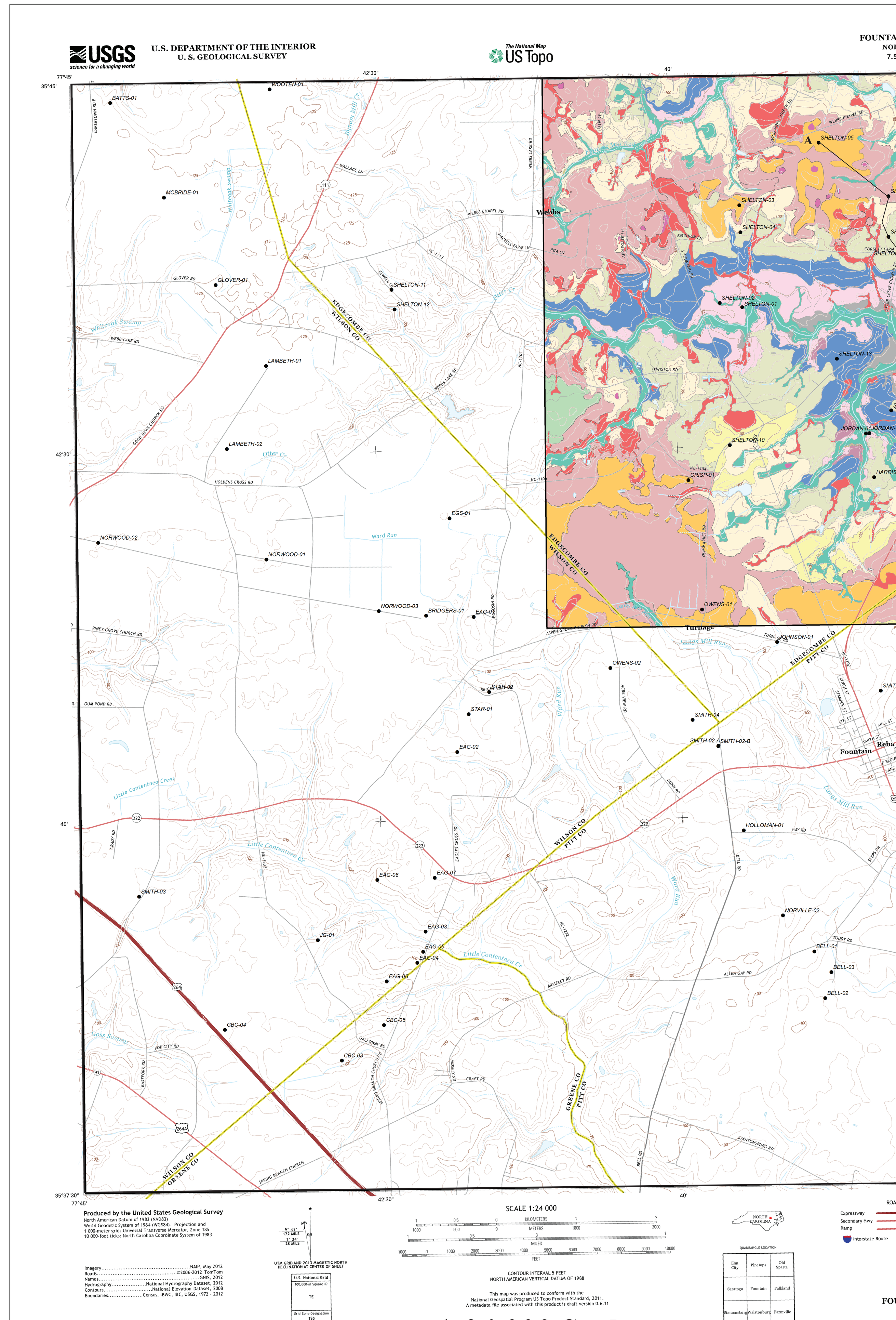
Fountain NE quadrant includes 486 polygons that are mapped and geocoded with a total linear circumferences of about 869,225 linear meters. These were modified based on the FY19 deliverable legend.

Fountain (1/4) Quadrangle: NE Quadrant Significant findings are:

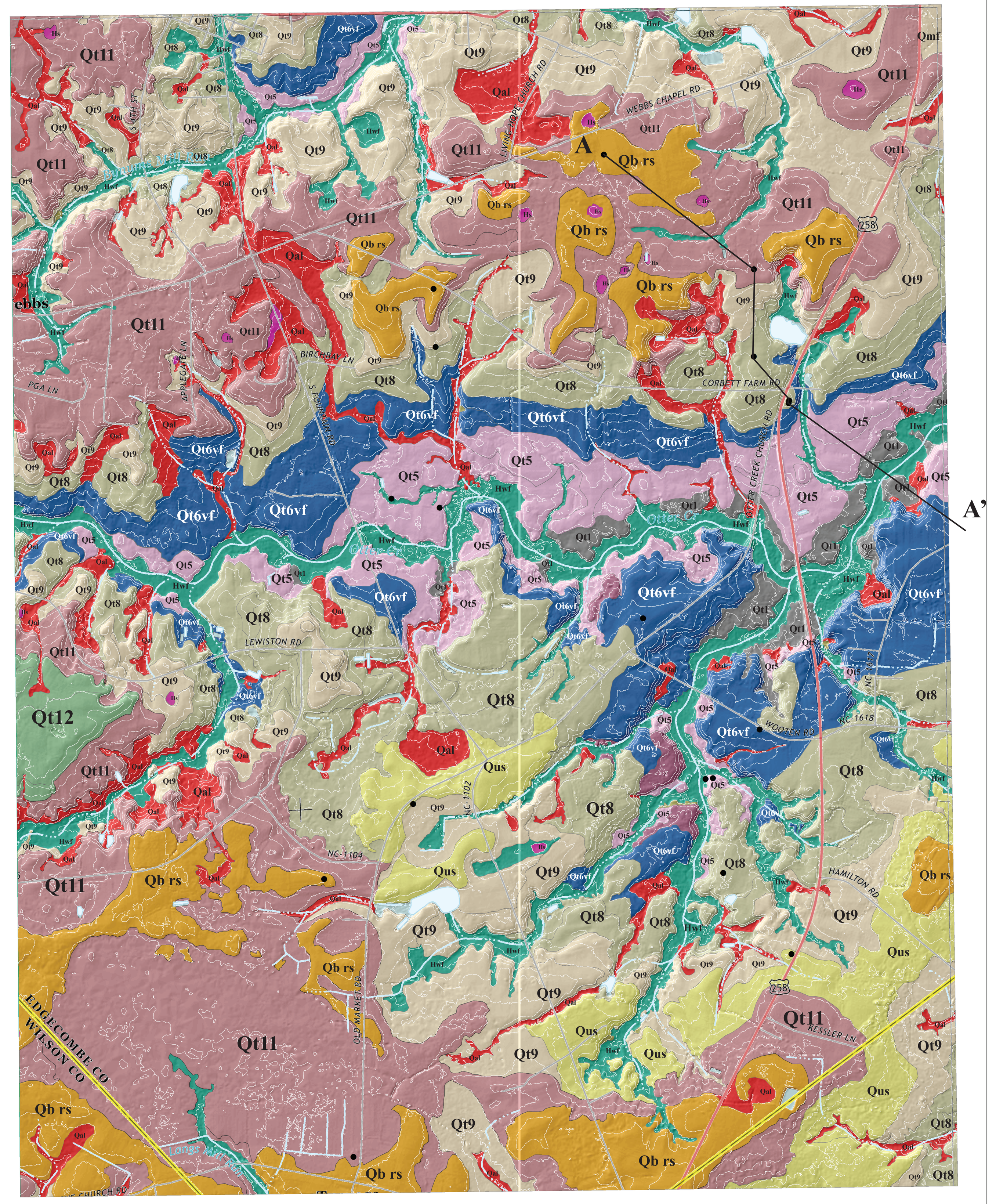
- A landowner requested a show and tell for school children during COVID. NCGS drilled a corehole (Case-03) to test the Geoprobe's working order on that property. Three families including six adults and 5 children visited the site during drilling, and children were provided bagged samples of sediment.
- The fossiliferous unit at the base of the Quaternary splits into two beds. The lower unit (Shell Bed 1) is an upward coarsening shelf sequence that is pale olive in color and includes Turritellid gastropods. Its top is reworked and forms a lag at the base of Shell Bed 2. A sequence boundary occurs at the base of the reworked Shell Bed 2 which correlates with the base of the Calabrian, and hence, the unit above the sequence boundary correlates with the Chowan River Formation (Farrell and Thornton, 2020). Above the sequence boundary, Shell Bed 2 is a clast-supported, high-energy, bioclastic (>70% bioclasts) deposit with large bivalves (Mercenaria eg). The unit is exposed in the Martin Marietta quarry at Fountain.
- Our coring investigations have mapped Shell Bed 2 across the 4-quad area, and correlated it to the EARTH MRI REEMS mapping area in Drake Quadrangle.
- Shell Bed 1 may be Gelasian in age since it predates the Calabrian bed, and appears to coarsen upward into Shell Bed 2. It typically is siliciclastic (<30% bioclasts) to mixed (30-70% bioclast) in composition.
- Both shell beds may have undergone secondary dissolution; this diagenetic process concentrates the insoluable residue within the layers. The residue of shell bed #2 is enriched in phosphate clasts; bed #1 is deficient in phosphate. Insoluable residue may include phosphate clasts, quartz sand and gravel, yellowish silty debris resulting from shell dissolution, internal molds, cemented zones, secondary minerals growing into void space (e.g. vivianite).
- Beneath the interfluves (120-105 ft terrace), Shell Bed 2 fines upward into phosphatic offshore mud. This is overlain by well-sorted, heterolithic, tidally bedded muds, and very fine to fine-grained sands, which include detrital organic debris, if below the redox. These heterolithic deposits may coarsen upward into coarse to very coarse sands and gravels with abundant feldspar; these sands may include detrital organic debris if below the redox.
- Heavy minerals may be concentrated in intervals of heterolithic, tidally bedded sand and mud.
- Feldspar is concentrated in facies that are coarse to very coarse-grained sands and granular gravels.
- Glauconite may occur in the offshore muds that overlie shell bed 2.
- During the Early Pleistocene Falling Stage, a series of subtle, tidally-bedded sequences are inset into the drainage of Otter Creek. Younger terraces are also present.

Table 2. Locations of new cores collected for FY20 STATEMAP deliverables.

PROJECT	PI	GEO_IN_FIELD	QUAD	COUNTY	LAT_DD	LONG_DD	DEPTH_FT	DEPTH_M	ELEV_FT	ELEV_M	GEOCHEM	CORING_METHOD	DRILLERS
STATEMAP-28-FY20	K. Farrell	K.Farrell, E.Thornton, C.Brown	Falkland	Pitt	35.669999	-77.580466	49.8	15.18	84.35	25.71	NO	Geoprobe Discrete Sampling	D. Foyles
STATEMAP-28-FY20	K. Farrell	K.Farrell, E.Thornton, C.Brown	Drake	Nash	36.027100	-77.804121	68.9	21	143	43.59	NO	Geoprobe Discrete Sampling	D. Foyles
STATEMAP-28-FY20	K. Farrell	K.Farrell, E.Thornton, C.Brown	Fountain	Edgecombe	35.724099	-77.657431	43.5	13.26	74.34	22.66	YES	Geoprobe Discrete Sampling	D. Foyles
STATEMAP-28-FY20	K. Farrell	K.Farrell, E.Thornton, C.Brown	Fountain	Edgecombe	35.724610	-77.660527	42	12.8	75.36	22.97	NO	Geoprobe Discrete Sampling	D. Foyles
STATEMAP-28-FY20	K. Farrell	K.Farrell, E.Thornton, C.Brown	Fountain	Edgecombe	35.735590	-77.657639	68	20.73	112.2	34.2	YES	Geoprobe Discrete Sampling	D. Foyles
STATEMAP-28-FY20	K. Farrell	E.Thornton, C.Brown	Fountain	Edgecombe	35.732539	-77.657550	59.5	18.14	97.93	29.85	YES	Geoprobe Discrete Sampling	D. Foyles
STATEMAP-28-FY20	K. Farrell	K.Farrell, E.Thornton, C.Brown	Fountain	Edgecombe	35.742506	-77.646558	80.3	24.48	112.4	34.26	YES	Geoprobe Discrete Sampling	D. Foyles
STATEMAP-28-FY20	K. Farrell	K.Farrell, E.Thornton, C.Brown	Fountain	Edgecombe	35.709671	-77.640561	49.3	15.03	69.36	21.14	YES	Geoprobe Discrete Sampling	D. Foyles
STATEMAP-28-FY20	K. Farrell	K.Farrell, E.Thornton, C.Brown	Fountain	Edgecombe	35.709706	-77.640091	24	7.32	78.15	23.82	NO	Geoprobe Discrete Sampling	D. Foyles
STATEMAP-28-FY20	K. Farrell	K.Farrell, E.Thornton, C.Brown	Fountain	Edgecombe	35.731808	-77.637085	63	19.2	96.19	29.32	YES	Geoprobe Discrete Sampling	D. Foyles
STATEMAP-28-FY20	K. Farrell	K.Farrell, E.Thornton, C.Brown	Fountain	Edgecombe	35.736386	-77.636999	66.5	20.27	109.48	33.37	YES	Geoprobe Discrete Sampling	D. Foyles
STATEMAP-28-FY20	K. Farrell	K.Farrell, E.Thornton, C.Brown	Fountain	Edgecombe	35.729332	-77.634882	60	18.29	83.76	25.53	YES	Geoprobe Discrete Sampling	D. Foyles
STATEMAP-28-FY20	K. Farrell	K.Farrell, E.Thornton, C.Brown	Fountain	Edgecombe	35.729467	-77.634847	28	8.53	86.88	26.48	NO	Geoprobe Discrete Sampling	D. Foyles
STATEMAP-28-FY20	K. Farrell	K.Farrell, E.Thornton, C.Brown	Fountain	Edgecombe	35.708568	-77.659401	60	18.29	104.66	31.9	YES	Geoprobe Discrete Sampling	D. Foyles
STATEMAP-28-FY20	K. Farrell	K.Farrell, E.Thornton, C.Brown	Fountain	Edgecombe	35.726571	-77.705875	83	25.3	119.52	36.43	YES	Geoprobe Discrete Sampling	D. Foyles
STATEMAP-28-FY20	K. Farrell	K.Farrell, E.Thornton, C.Brown	Fountain	Edgecombe	35.724356	-77.705472	32	9.75	97.97	29.86	NO	Geoprobe Discrete Sampling	D. Foyles
STATEMAP-28-FY20	K. Farrell	K.Farrell, E.Thornton, C.Brown	Fountain	Edgecombe	35.718144	-77.644438	40.4	12.31	88.32	26.92	YES	Geoprobe Discrete Sampling	D. Foyles
STATEMAP-28-FY20	K. Farrell	K.Farrell, E.Thornton, C.Brown	Fountain	Edgecombe	35.704696	-77.665192	61.3	18.68	115.06	35.07	YES	Geoprobe Discrete Sampling	D. Foyles
STATEMAP-28-FY20	K. Farrell	K.Farrell, E.Thornton, C.Brown	Fountain	Edgecombe	35.712228	-77.637035	48	14.63	88.42	26.95	YES	Geoprobe Discrete Sampling	D. Foyles



1:24,000 Scale



CONTOUR INTERVAL = 1 METER

1 Mile

2 Kilometers

1:12,000 Scale

Legend for Geologic Map Units - Geomorphic Landscape Elements - Revised after Legend for Falkland NW, FY19 Deliverable

Holocene

Stream Channel

Man-Made Excavation - Pond or Lagoon, Mining Operations.

Man-Made Earthenware Structures - such as Spoil Piles from Mining and Dredging, Dams, Causeways through Wetlands.

H wf H wf—Wetland Flat (Holocene): Wetland flat at base of incised valleys; commonly with anastomosed channel network activated during flood stage, or a single main channel, which is commonly trenched and straightened by human activity; may exhibit lacustrine conditions. 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 partly incised into pre-existing deposits, and may be separated in stepwise fashion from other active wetland flats. Upstream, the flat narrows and is replaced by channel deposits or undifferentiated Quaternary alluvium. Typical facies include: muddy and sandy peat, gravelly sand and other facies.

H wf2 H wf2—Wetland Flat 2 (Holocene - reactivated Pleistocene flat): Wetland flat that merges with the Hwf in upstream reaches of incised valleys. In some cases, H wf2 is separated vertically by a step-like feature from H wf. An incised channel may connect the two wetland flats. In other cases, the two flats gradually merge in upstream reaches. H wf2 is dryer than H wf; it may be continuous with a set of valley fill terraces. Not present or mapped.

H sc H sc—Side valley colluvium, slightly higher Holocene facies, positioned marginal to wetland flat; may include side bars and lunate bars associated with channels; not mapped on Fountain NE.

H s H s—Sinkhole (Holocene): Incipient ovate depression that is commonly incised into surrounding landscape; may occur in conjunction with depressions in centers of Carolina Bays.

Undifferentiated Quaternary Deposits:

Q urs Q urs: Undifferentiated remobilized sands that usually on interfluve flats such as the 24-26 m marine terraces.

Q us Q us: Undifferentiated sands @28-30 m that help define marine shorelines.

Qb rs Qb rs: Undifferentiated remobilized sands and in some cases muddy rims on Carolina Bays, on interfluves > 32 m.

Undifferentiated Pleistocene Depositional Systems including Valley Fill and Falling Stage Deposits:

Qal Qal Undifferentiated Quaternary Alluvium - currently active landscape. Includes the Holocene material in side valleys and on alluvial fans and colluvium on side slopes.

Qt0 Qt0 Pleistocene Valley Fill Terrace @ 13-17 m on Falkland NW. (DOES NOT OCCUR ON FOUNTAIN NE).

Qt1 Qt1 Pleistocene Valley Fill Terrace @ 15-21 m on Falkland NW. Joins nicely with terraces on Fountain NE. Very distinct flat terrace mapped downstream to 11 m on Falkland SE. May be Middle Pleistocene.

Qt2 Qt2 Pleistocene Valley FillTerrace @ 16-20 m on Falkland NW; not currently identified on Fountain NE.

Qt3 Qt3 Pleistocene Valley Fill Terrace @ 17-22 m on Falkland NW; not currently identified on Fountain NE.

Qt4 Qt4 Pleistocene Valley Fill Terrace @ 21-23.5 m on Falkland NW; not currently identified on Fountain NE

Qt5 Qt5 Early Pleistocene Valley Fill Terrace @ 23-25 m on Falkland NW.

Qt6 vf Qt6 Early Pleistocene Valley Terrace @ 25-26.5 m; merges with marine terrace equivalent Q lzm1.

Q lzm1 Q lzm1 (Qt6): Early Pleistocene marine terrace that extends from 26.5 meters to 24.5 m. (DOES NOT OCCUR ON FOUNTAIN NE)

Qt7 Qt7 Early Pleistocene shoreline features @ 25.2-27.2 m; marks shoreline of Q lzm1 marine terrace in Falkland NW.

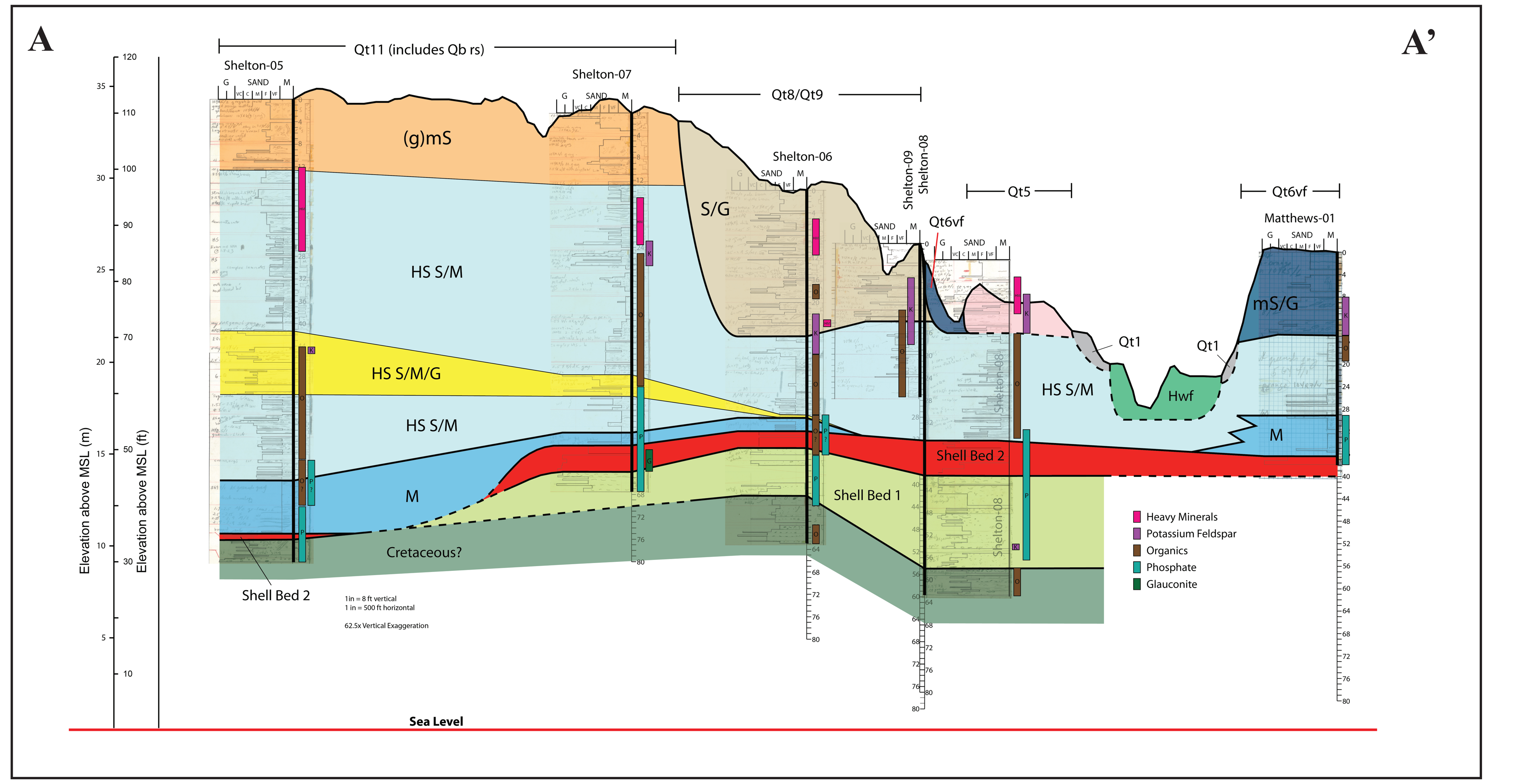
Qt8 Qt8 Early Pleistocene marine terrace @ 27-29 m.

Qt9 Qt9 Early Pleistocene marine terrace @ 29-31 m.

Qt10 Qt10 Early Pleistocene marine terrace - topographic lows to emphasize Carolina Bays; not currently identified on Fountain NE; occurs on Falkland NW.

Qt11 Qt11 Early Pleistocene marine terrace @ 32-34.5 m.

Qt12 Qt12 Early Pleistocene marine terrace @ elevation 35-36 m.



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Disclaimer: This Open-File Map 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.

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GEOLOGIC MAP WITH GEOMORPHIC LANDSCAPE ELEMENTS OF THE FOUNTAIN 7.5 MINUTE QUADRANGLE, NORTHEAST QUADRANT, NORTH CAROLINA - REVISED

By
Kathleen M. Farrell, Erik D. Thornton and Colby W. Brown

Geology mapped from July 2020 to June 2021. Landscape analysis, map preparation, digital cartography and editing by Kathleen M. Farrell.

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