North Carolina Geological Survey
Open File Report 2025-05

Preliminary Map of Geomorphic Landform Elements for Eight 1:24,000 Scale Quadrangles in the Western Quarter of the Rocky Mount 100K Sheet (30 X 60 Minute Quadrangle), North Carolina
NCGS Open File Report 2025-05

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

Declination diagram is from USGS 1985 GeoPDF of the Rocky Mount 30 X 60 quadrangle.

Research was supported by the U.S. Geological Survey, National Cooperative Mapping Program under STATEMAP (Award 2022, G22AC00395).

OVERVIEW

This map is the product for Year 1 in a multi-year STATEMAP project to produce a surficial geologic map of the Rocky Mount 100K sheet (30 X 60 quadrangle) based on landform elements interpreted from high-resolution LiDAR as a base map. This is new research with respect to Coastal Plain mapping because previous morphostratigraphic maps of the Coastal Plain were based on topography from non-standardized (sources)—low-resolution, 2 m, 5 ft and 10 ft contour intervals depicted on 7.5-minute topographic quadrangles. New mapping shown in this deliverable was based on high-resolution LiDAR.

Year 1 (FY22) of the multi-year project consisted of new mapping in 8 quadrangles in the western quarter of the Rocky Mount 100K sheet. This area includes difficult to interpret Fall Zone units and will require significant revision. Year 2 (FY23) included 16 quadrangles. Year 3 (FY24) and Year 4 (pending proposal FY25) will cover the remaining 8 quadrangles.

DATA SETS

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 ortho-images (county) dated circa 2011 (these best matched the 2004 LiDAR data). More recent QL1 LiDAR data is constantly updated across segments of the Coastal Plain. For a standardized unchanging dataset, the QL2 2004 data was chosen.

METHODS

At beginning of multi-year project, data was assembled into an ArcGIS Pro ™ map project (projected in STATE PLANE NAD 83 M). A common topology was created in the geodatabase and for linework. The project was distributed to all the participants. The eight 7.5-minute quadrangles in the FY22 deliverable were divided between geologists as follows: Calley Anthony (Nashville, Rocky Mount), James Chapman (Saratoga, Stantonsburg), Dwain Veach (Wilson, Winstead Crossroads), Stalin A. Rosero (Fremont), and MacKenzie S. Hamilton (Elm City). Under direction of PI Farrell (geomorphologist, stratigrapher), each geologist was responsible for interpreting linework (heads-up digitizing on screen in ARC GIS PRO) to characterize the landform elements. Topology on linework was applied as the lines were created, and errors removed.

Landform analysis using LiDAR is a labor intensive activity with a long learning curve. Geologists were introduced to the concepts of morphostratigraphic mapping of the Coastal Plain incrementally. First the incised drainages were mapped. For Year 1, the mappers focused on mapping the Holocene wetland flat which forms a valley bottom deposit across the Coastal Plain and side valleys containing undifferentiated Quaternary alluvium. Also man-made features that interrupted the LiDAR were mapped (e.g. causeways, interstates, excavations, spoil piles, mines, etc.). In Year 1, mappers provided PI Farrell with topologically correct linework that would outline/map the youngest landform elements in the incised drainages.

PI Farrell integrated linework from all 8 quadrangles, then continued interpreting and digitizing the older landscape features. As an example, ~60 hours of additional linework interpretation was required per quad. During this review, drainages were extended further upstream, and older, higher terrace sets were mapped. PI Farrell made the polygons from the linework, coded the polygons (>5000) as best as possible with time constraints, and developed the DMUs. Significant further work is required in these 8 quadrangles.

FUTURE WORK

The goal of this multi-year compilation is a 1:100,000-scale digital geologic map of surficial geology of the Rocky Mount 30 X 60 quadrangle using the USGS Geologic Mapping Schema (GeMS). Revisions to the geodatabase will be required after all 32 7.5-minute quadrangles are interpreted and assigned the final revised DMUs. As the study area expands from west to east across the Rocky Mount 100K, the geomorphic model based on high-resolution LiDAR and the DMUs will be revised to include new information. Also, high-resolution LiDAR permits interpretation and mapping of features that 5 ft, 10 ft and 2 m contours could not resolve.

Problems in displaying the DMUs on a 100K scale pdf deliverable are acknowledged. These problems result from our new mapping at the 24K scale, which includes polygons that are not simplified for display on a print product at the 100K scale. However, zooming in on the high-quality pdf clarifies the units.

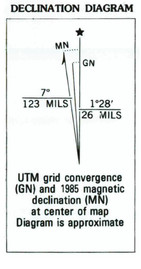
Nashville	Rocky Mount	Hartsease	Tarboro	Speed	Oak City	Hamilton	Quitsna
Winstead Crossroads	Elm City	Pinetops	Old Sparta	Conetoe	Robersonville West	Robersonville East	Williamston
Wilson	Saratoga	Fountain	Falkland	Greenville NW	Greenville NE	Leggetts Crossroads	Old Ford
Fremont	Stantonsburg	Walstonburg	Farmville	Greenville SW	Greenville SE	Grimesland	Washington

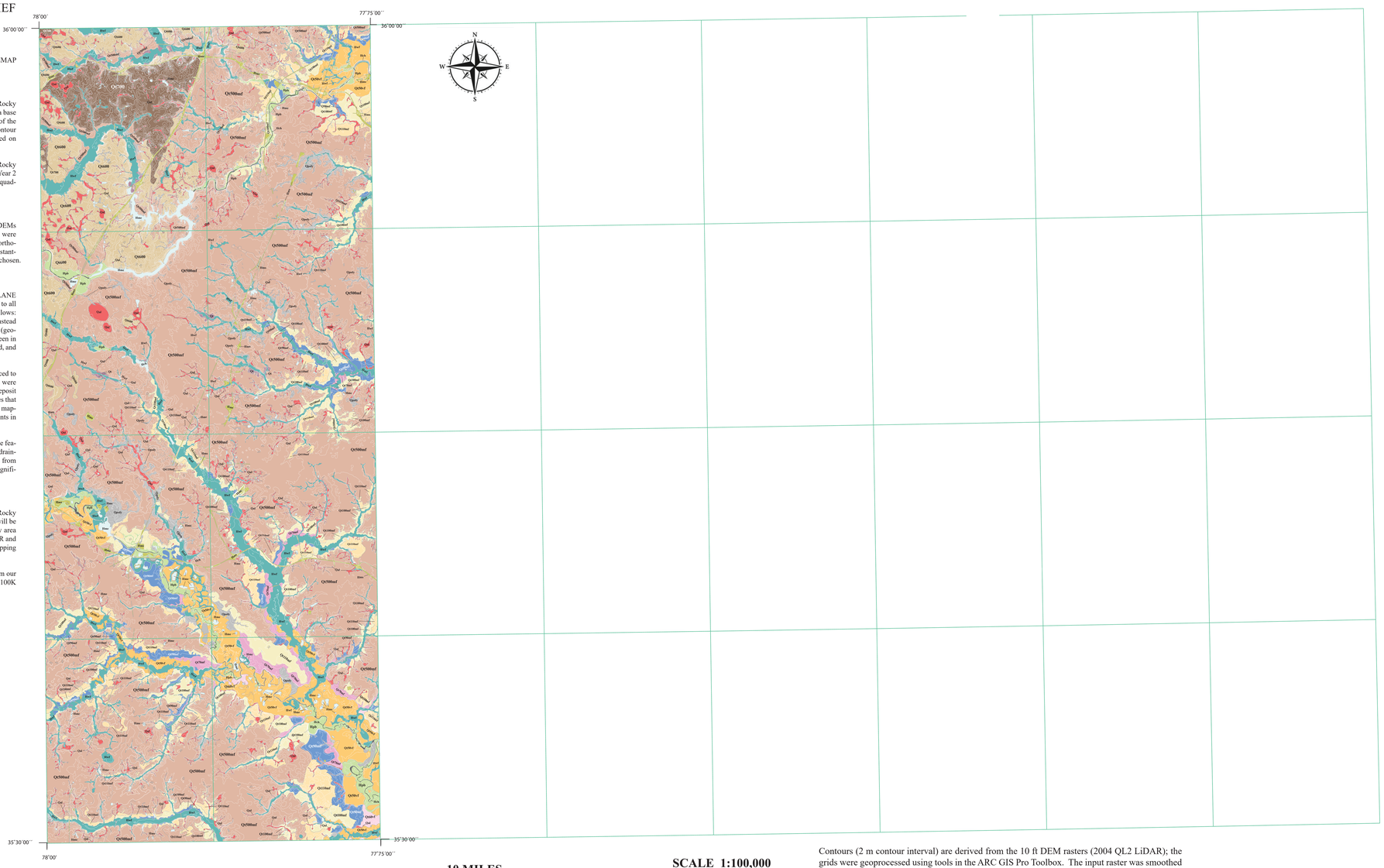
STUDY AREA CONSISTS OF 8 7.5-MINUTE QUADRANGLES

1	2	3
4	5	6
7	8	9

1 - HENDERSON
2 - ROANOKE RAPIDS
3 - ELIZABETH CITY
4 - RALEIGH
5 - ROCKY MOUNT
6 - PLYMOUTH
7 - FAYETTEVILLE
8 - KINSTON
9 - BAYBORO

DECLINATION DIAGRAM





10 MILES

20 KILOMETERS

SCALE 1:100,000

Contour Interval = 2 meters

Contours (2 m contour interval) are derived from the 10 ft DEM rasters (2004 QL2 LiDAR); the grids were geoprocessed using tools in the ARC GIS Pro Toolbox. The input raster was smoothed using the Focal Statistics tool (Image Analyst Tools, Statistical, Focal Statistics). The Neighborhood was defined as Rectangular cell (Unit type) with a Width of 10 m and a Height of 10 m (Projection of map is North Carolina State Plane NAD83 Meters). The chosen Statistics type was 'Mean'. The Contour tool (Spatial Analyst Tools, Surface, Contour) was utilized to create 2 m and 10 m contours from the smoothed grid. The contour lines were smoothed using the Smooth Line tool (Cartography Tools, Generalization, Smooth Line). The selected Smoothing Algorithm was the 'Polynomial Approximation with Exponential Kernal (PAEK)' with an assigned Smoothing Tolerance of 100-meters. Lastly, the attribute table for the contour lines was edited to delete all lines less than 150 m in length. The 10 m contours are labelled in the map.

SURFICIAL GEOLOGIC MAP UNITS/GEOMORPHIC LANDFORM ELEMENTS

HOLOCENE LANDFORM ELEMENTS

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.

Hms Man-Made Earthen Structure - includes man-made 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, constructed land, and associated excavations.

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

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 complex. Downstream and in large 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 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.

UNDIFFERENTIATED HOLOCENE/PLEISTOCENE LANDFORM ELEMENTS

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.

Qt Unassigned terraces – Unassigned incised valley deposits. Miscellaneous terraces were identified and coded, but have unknown affiinities to other terrace data sets at this time. As more mapping is conducted, these will be defined and established as mappable units.

Q16 Uncoded polygons – Uncoded polygons that lack a Geo_Code will be reviewed for assignment to a DMU.

QUATERNARY VALLEY FILL TERRACES

Qt50vf Pleistocene valley fill at 25 - 21 m. Well developed point bar deposits caused by meandering streams; very sandy; includes classic scroll bar topography, abandoned channels, reactivation chutes, and other related features. Becomes active during flood stage but normally is a relict landform.

QUATERNARY MARINE/ESTUARINE TERRACES

Qt70mf Pleistocene marine/estuarine terrace at 22 - 18 m.

Qt80mf Pleistocene marine/estuarine terrace at 25 to 22 m.

Qt90mf Pleistocene marine/estuarine flat at 27.0 to 25.5 m.

Qt100mf Pleistocene marine/estuarine terrace at 29-32 m; flats are associated with the occupation of the Surry Paleoshoreline complex; likely formed at a sea level of approximately 30 – 31 m.

Qt110mf Marine/estuarine flat at 32 - 34 m.

Qt500mf Pleistocene marine terrace at 34 - 50 m.

Qt600mf Pliocene or Pleistocene marine terrace at 50 - 60 m. Undifferentiated marine terraces at elevations of 50 - 60 m.

Qt700mf Pliocene or Pleistocene marine terrace at > 60 m. Undifferentiated marine terraces at elevations > 60 m.

This geologic map was funded in part by the USGS National Cooperative Geologic Mapping Program, award number G22AC00395. The views and conclusions contained in this document are those of the authors and should not be interpreted as necessarily representing the official policies, either express or implied, of the U.S. Government. This map and explanatory information is submitted for publication with the understanding that the United States Government is authorized to reproduce and distribute reprints for governmental use.

Disclaimer:
This Map Manuscript 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.

PRELIMINARY MAP OF GEOMORPHIC LANDFORM ELEMENTS FOR EIGHT 1:24,000 SCALE QUADRANGLES IN THE WESTERN QUARTER OF THE ROCKY MOUNT 100K SHEET (30 X 60 MINUTE QUADRANGLE), NORTH CAROLINA

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2025