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

MAP UNITS

CONTACTS

FAULTS

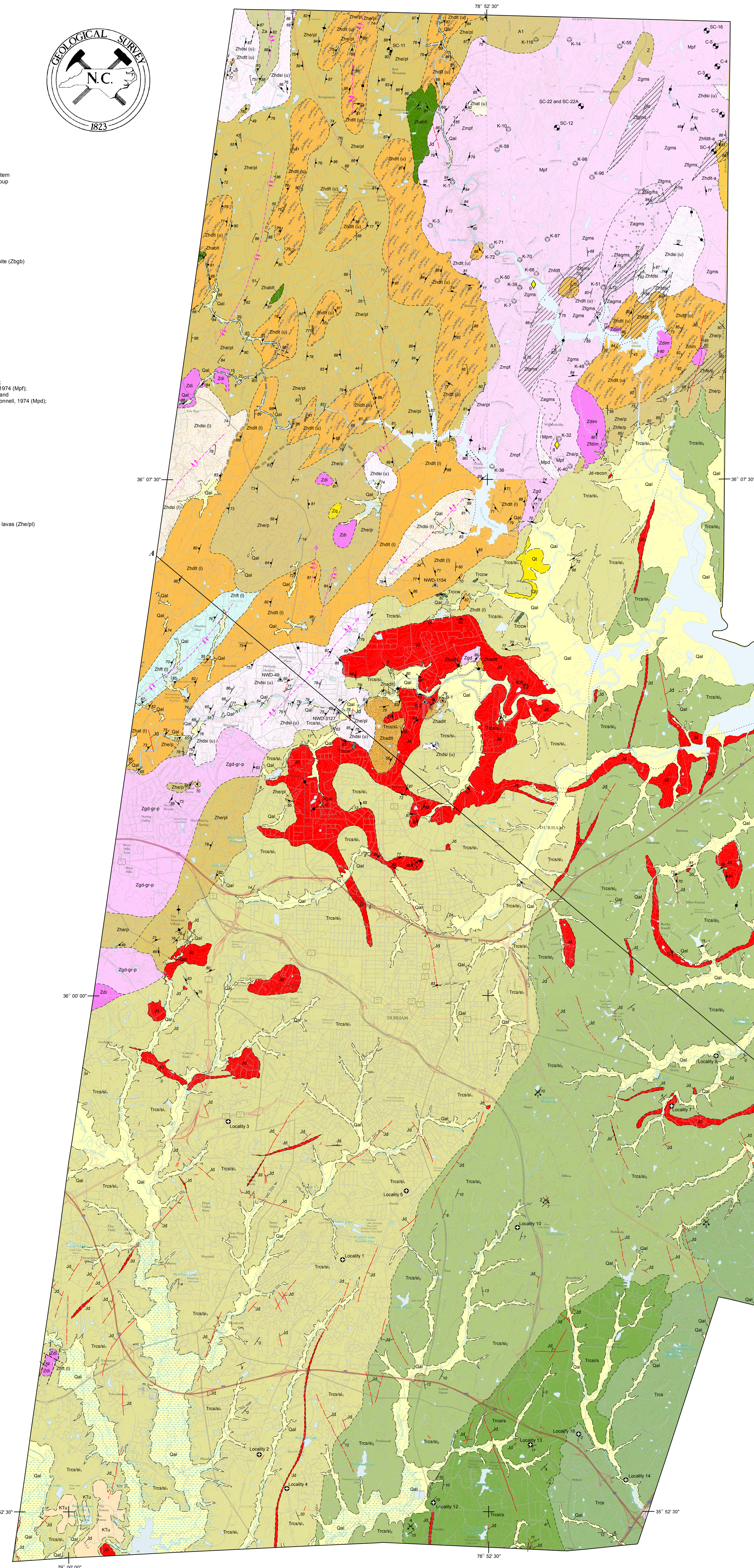
FOLDS

ASSORTED LINES

STRUCTURAL SYMBOLS

OTHER POINTS

OTHER POINTS EXPLANATIONS



INTRODUCTION

Pre-Mesozoic crystalline rocks in northeastern and northern Durham County are part of the redefined Hyco Arc (Hibbard et al., 2013) within the Neoproterozoic to Cambrian Carolina terrane of the Carolina Zone (Hibbard et al., 2002; and Hibbard et al., 2006; Hibbard et al., 2013). Within the map area, the Carolina terrane can be separated into two lithotectonic units: 1) the Hyco Formation of the Hyco Arc and 2) the Aaron Formation of the redefined Virgilina sequence (Hibbard et al., 2013). Age dates from Durham and Orange County have differentiated the Hyco Formation into a ca. 633-629 Ma lower member (Wortman et al., 2000; and Bradley and Miller, 2011) and a ca.616-612 Ma upper member (Wortman et al., 2000; Bowman, 2010; and Bradley and Miller, 2011). In Durham County, the Hyco Formation consists of layered meta-volcaniclastic and meta-plutonic rocks. The Aaron Formation, which is composed of metamorphosed layered volcaniclastic rocks, yields detrital zircon ages as young as 578 and 588 Ma (Samson et al., 2001 and Pollock, 2007, respectively). Deformation and low-grade metamorphism of both the Hyco Arc and the Aaron Formation occurred during the ca. 578 to 554 Ma (Pollock, 2007) Virgilina deformation (Glover and Sinha, 1973; Harris and Glover, 1985; Harris and Glover, 1988; and Hibbard and Samson, 1995). In the map area, original layering of Hyco and Aaron Formation lithologies are interpreted to range from shallowly to steeply dipping due to open to isoclinal folds that are locally overturned to the southeast.

Hyco Formation units of meta-volcaniclastic rocks include various lithologies that are grouped together to represent interpreted environments of deposition (or lithofacies). The dacitic lavas and tuffs unit is interpreted to represent dacitic domes and proximal pyroclastics. The felsic tuffs unit is interpreted to be distally deposited air fall tuffs and associated volcanosedimentary rocks. The andesitic to basaltic lavas and tuffs unit is interpreted to represent eruption of intermediate to mafic lava flows and associated pyroclastics. The epiclastic/pyroclastic units are interpreted to be deposits of active volcanics and eroded volcanic highlands.

The Vermiforma antiqua fossil locality reported by Cloud et al. (1976) is present within the Hyco Formation (upper member) along the South Fork of the Little River. Seilacher et al. (2000) indicates the feature may be a tectograph instead of a true fossil.

A small section of the Cary sequence (Parker, 1979; Farrar, 1985) of the Easternmost Carolina terrane (Blake et al., 2012) is located in the southeastern section of the map. A zircon age date of ca. 575 Ma was reported by Goldberg (1994) for the Big Lake-Raven Rock schist unit. This date may indicate that the Easternmost Carolina terrane is equivalent to the Aaron Formation of the redefined Virgilina sequence (Hibbard et al., 2013). In Durham County, the Cary sequence is composed of upper greenschist facies metaplutonic rocks of the Beaverdam Complex and meta-volcaniclastic rocks.

The central and southern portions of Durham County are part of the Triassic-aged Durham sub-basin of the Deep River Mesozoic basin. Lithologies in the basin include variously interlayered mudstones, siltstones, sandstones, and conglomerates. Generally the basin is dominated by interlayered conglomerates and sandstones proximal to the Jonesboro Fault and incrementally fines away from the fault. Jurassic-aged diabase dikes and sills intrude basin sediments. Diabase dikes also intrude the crystalline rocks of the County. The Durham sub-basin lacks marker beds, making the identification of formal formations difficult (Clark et al., 2001). Instead, an alternate method of lithofacies associations is used to group sedimentary rocks of the Durham sub-basin based on lithology and interpreted depositional environment (Hoffman and Gallagher, 1989; Watson, 1998; and Clark et al., 2001). Location of the Lithofacies Association I and II contact in the Northeast Durham Quadrangle was modified from Spencer (1987) to edge match with Hoffman and Gallagher (1989) contacts. This contact was extended into the Lake Michie Quadrangle to edge-match with the Northeast Durham Geologic map (Phillips et al., 2004 (revised 2010)). Extent of diabase sills in the Northwest Durham Quadrangle were modified from Spencer (1987).

The former Triangle Brick pit in southeast Durham County is a world-class Triassic fossil locality in the Trcsi/s unit. Recovered specimens include plants, invertebrates, and vertebrates. Clark et al. (2001) and Peyer et al. (2008) provide additional information and references related to fossils recovered from the Triangle Brick site.

All pre-Mesozoic rocks in Durham County have been metamorphosed to at least the chlorite zone of the greenschist metamorphic facies. Many of the rocks display a weak or strong metamorphic foliation. Although subjected to metamorphism, the rocks retain relict igneous, pyroclastic, and sedimentary textures and structures that allow for the identification of protolith rocks. As such, the prefix "meta" is not included in the nomenclature of the pre-Mesozoic rocks described in the quadrangle. Jurassic diabase is not metamorphosed.

The nomenclature of the International Union of Geological Sciences subcommission on igneous and volcanic rocks (IUGS) after Le Maitre (2002) is used in classification and naming of the units. The classification and naming of the rocks is based on relict igneous textures, modal mineral assemblages, or normalized mineral assemblages when whole-rock geochemical data is available. Past workers within the County and adjacent areas (Bain and Harvey, 1977; Horton et al., 1992; McConnell, 1974; McConnell and Glover, 1982; Spencer, 1987; Wright, 1974) have used various nomenclature systems for the igneous rocks. The raw data, when available, of these earlier workers was recalculated and plotted on ternary diagrams and classified based on IUGS nomenclature. Pyroclastic rock terminology follows that of Fisher and Schminke (1984). Triassic units follow the nomenclature of Clark et al. (2001) and Hoffman and Gallagher (1989).

A preliminary review of the area geology is provided in Bradley (2013). This map is a compilation of modified and edited data from the Durham County portions of the Rougemont (Bradley et al., 2011), Lake Michie (Rhodes et al., 2012; McConnell, 1974), Northwest Durham (Bradley et al., 2004), Northeast Durham (Phillips et al., 2004), Creedmoor (Clark et al., 2002), Chapel Hill (Bradley et al., 2004), Southwest Durham (Hoffman and Gallagher, 1989), Southeast Durham (Hoffman and Gallagher, 1989), Raleigh 30' x 60' (Clark et al., 2004), Farrington (Bradley et al., 2007), and Green Level (Watson, 1998) geologic maps.

DESCRIPTION OF UNITS

Sedimentary Units

Qal – Alluvium: Unconsolidated poorly sorted and stratified deposits of angular to subrounded clay, silt, sand and gravel- to cobble-sized clasts, in stream drainages. May include point bars, terraces and natural levees along larger stream floodplains. Structural measurements depicted on the map within Qal represent outcrops of crystalline rock inliers surrounded by alluvium.

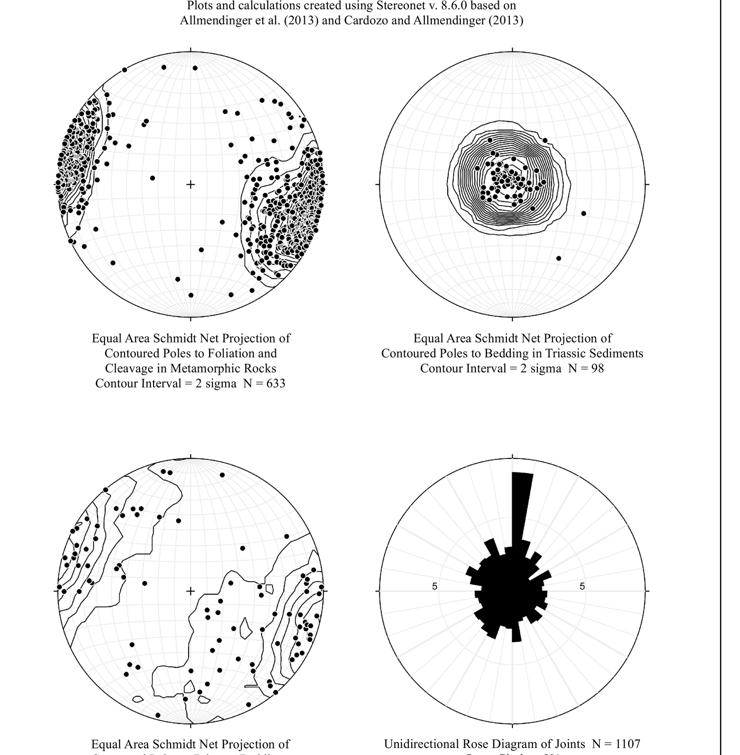
Qt – Quaternary terrace deposits: Unconsolidated clay, silt, sand and pebbles on flat plain above current floodplain level; cobble and boulder float (up to 40 cm diameter) consisting of diabase, granodiorite and various volcanics (tuffs and lavas).

K/Tu – post-Chatham Group undifferentiated sediments: Yellowish-orange to brownish-yellow to yellowish-gray, unconsolidated to friable unit that consists of distinctive subrounded to well- rounded granules, pebbles and small cobbles of white- to rose-colored quartz interlayered with clay, sandy-clay and clayey-sand. Lesser amounts of moderately indurated, yellowish-white, medium- to coarse-grained arkosic sandstone present. Unit is mainly exposed on shores of B. Everett Jordan Lake. Unit is in unconformable contact with Triassic sediments. Unit outcrops in few locations at or above approximately 250 feet elevation. As such, unit extent interpreted from topography when station location data are sparse. Distribution of unit in the Southwest Durham and Chapel Hill Quadrangles of the County were interpreted from edge matching with geologic maps of Green Level (Watson, 1998) and Farrington quadrangles (Bradley et al., 2007). A detailed unit description is available in Watson (1998).

TRIASSIC BASIN SEDIMENTS

LOCATION OF DURHAM COUNTY

REFERENCES



Equal Area Schmidt Net Projections and Rose Diagram

This geologic map was funded in part by the USGS National Cooperative Geologic Mapping Program.
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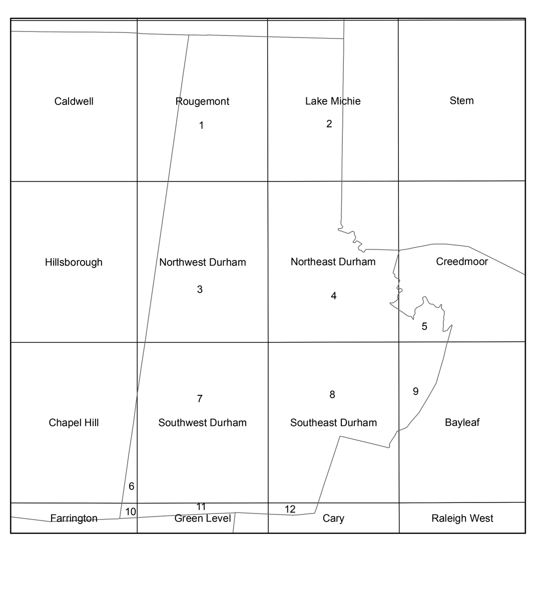
Disclaimer:
This Open-File report is preliminary and has been reviewed internally for conformity with the North Carolina Geological Survey editorial standards. Further revisions or corrections to this preliminary map may occur.

This map was compiled using existing NCGS data, except for the western portion of the Lake Michie quadrangle where data from a student thesis were utilized. Edge match issues exist and will be addressed during future mapping.

North Carolina State Plane NAD 83 meters coordinate system, Lambert Conformal Conic projection

Base map information: Base map is a composite of the USGS GeoPDF 7.5-minute quadrangles covering the County. Air photo, map collar and select features removed.

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.



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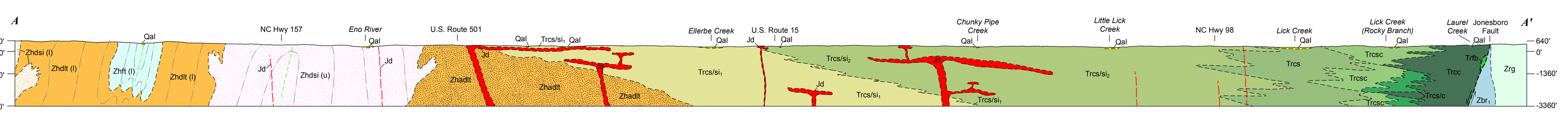

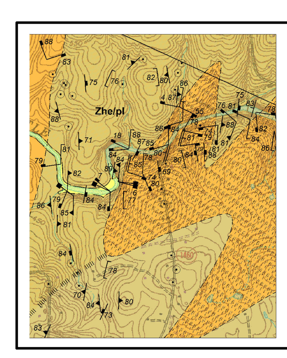

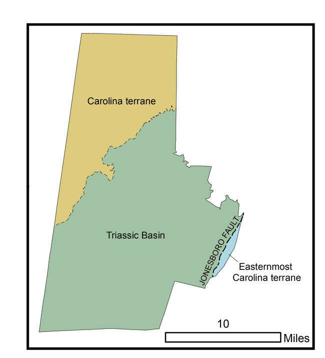

MAJOR GEOLOGIC FEATURES

COMPILED GEOLOGIC MAP OF DURHAM COUNTY, NORTH CAROLINA

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2016