North Carolina Department of Environmental Quality
Division of Energy, Mineral and Land Resources
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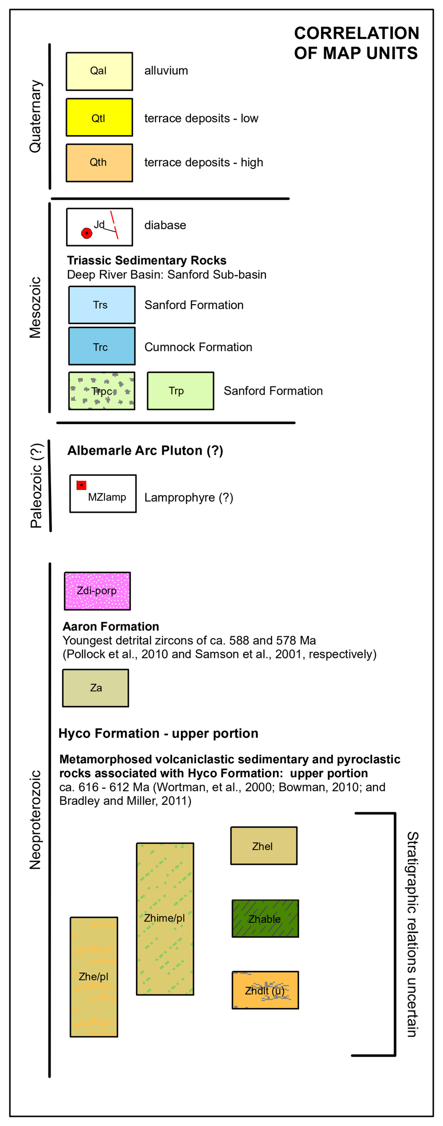
North Carolina Geological Survey
Open File Report 2020-06

CORRELATION OF MAP UNITS



INTRODUCTION

The Goldston 7.5-minute Quadrangle is in the east central-portion of the North Carolina Piedmont with the unincorporated communities of Goldston, Gulf and Carbonton within the quadrangle. The local transportation corridor of US HWY 421 is in the northeast portion of the quadrangle and SR 42 in the southeast portion.

The Deep River, a major tributary of the Cape Fear river basin, controls the drainage in the quadrangle. In the northern portion of the quadrangle the Little Bear Creek and Bear Creek drain to the northeast into the nearby Rocky river. The central and southern portion of the quadrangle drains directly into the Deep River from the south flowing Indian Creek, Little Indian Creek, Cedar Creek and the north flowing Smiths Creek, Little Pocket Creek, Pocket Creek and Patterson Creek and several unnamed tributaries. Natural exposures of crystalline and Triassic rocks primarily occur along these named and unnamed tributaries. Rock exposure at rock cuts, ridges, resistant finned-shaped outcrops and pavement outcrops locally occur outside of drainages. The elevations in the map area range from approximately 500 feet above sea level near the township of Goldston to approximately 200 feet along the Deep River that flows towards the east in the central portion of the quadrangle.

Geologic Background

Pre-Mesozoic crystalline rocks in the Goldston Quadrangle are part of the redefined Hyco Arc (Hibbard et al., 2013) within the Neoproterozoic to Cambrian Carolina terrane (Hibbard et al., 2002; and Hibbard et al., 2006). In the region of the map area, the Carolina terrane can be separated into two lithotectonic units: 1) the Hyco Arc and 2) the Aaron Formation of the redefined Virgilina sequence (Hibbard et al., 2013). The Hyco Arc consists of the Hyco Formation which include ca. 633 to 612 Ma (Wortman et al., 2000; Bowman, 2010; Bradley and Miller, 2011) metamorphosed layered volcaniclastic rocks and plutonic rocks. Available age dates (Wortman et al., 2000; Bradley and Miller, 2011) indicate the Hyco Formation may tentatively be divided into lower (ca. 630 Ma) and upper (ca. 615 Ma) portions with an apparent intervening hiatus of magmatism. In northeastern Chatham County, Hyco Formation units are intruded by the ca. 579 Ma (Tadlock and Loewy, 2006) East Farrington pluton and associated West Farrington pluton. The Aaron Formation consists of metamorphosed layered volcaniclastic rocks with youngest detrital zircons of ca. 588 and 578 Ma (Pollock et al., 2010 and Samson et al., 2001, respectively). Hibbard et al. (2013) interprets an at least 24 million year unconformity between the Aaron and underlying Hyco Formation.

The southern portion of the quadrangle is underlain by Triassic-aged sedimentary rocks of the Deep River Mesozoic basin which is separated into three sub-basins (Durham, Sanford, and Wadesboro). The Colon cross structure (Campbell and Kimball, 1923 and Reinemund, 1955), partially located within the quadrangle, is a constriction zone in the basin characterized by crystalline rocks overprinted by complex brittle faulting. The Colon cross-structure marks the transition between the Durham and Sanford sub-basins. The Goldston Quadrangle contains the Triassic-aged units from oldest to youngest of the Pekin, Cumnock and Sanford Formations of the Sanford sub-basin. Detailed descriptions of the Triassic sediments are provided in Reinemund (1955) and a detailed comparison of the Durham and Sanford sub-basins is provided in Clark et al. (2001). Dikes of Jurassic aged diabase intrudes both the Triassic sediments and crystalline rocks in the map area. Quaternary aged alluvium is present in most major drainages.

Folds

The Hyco Arc and Aaron Formation lithologies were folded and subjected to low grade metamorphism during the ca. 578 to 554 Ma (Pollock, 2007; Pollock et al., 2010) 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 observed ranging from shallowly to steeply dipping and are interpreted to be a result of open to tight folds that are locally overturned.

Preliminary stereogram analyses of data from two map scale synclines in the nearby Coleridge Quadrangle (Bradley et al, 2018), appears to indicate the presence of folds ranging from gentle to open. Subsequent domain analyses of primary bedding and layering in Hyco Formation and Aaron Formation units outside of the two synclines, indicate folds range from tight to open with the majority of the folds within the tight to close range. In general, it appears that the Hyco Formation and older portions of the Aaron Formation are more tightly folded compared to the Aaron Formation in the identified synclines in the Coleridge Quadrangle. This apparent range from gentle to tight folds is not well understood and may indicate: 1) normal disharmonic folding due to competency differences between units or 2) indicate that the younger units within the synclines in Coleridge are more appropriately assigned to the Albemarle Arc lithologies and were deposited above an angular unconformity. More investigation is needed.

Locally, metamorphic foliations are present with shallow dips (less than 50 degrees). These areas with shallow dipping foliation are often associated with intense sericitization and foliation parallel quartz veining. This relationship is identical to deformation observed within the Bear Creek Quadrangle (Bradley et al., 2019) in the vicinity of the Glendon fault (approximately 5 miles on-strike to the southwest). These shallow dipping foliations are interpreted to be associated with local deformation and folding along interpreted high angle reverse faults similar to the Glendon fault.

Faults

The map area has localized evidence of deformation associated with high angle reverse faults like the Glendon Fault in the nearby Bear Creek Quadrangle (Bradley et al., 2019). These areas are identified based on shallow dipping foliations and hydrothermally altered rock.

Abundant evidence of brittle faulting at the outcrop-scale, map-scale, and large-scale lineaments (as interpreted from hillshade LiDAR data) are present in the map area. Brittle faulting and lineaments are interpreted to be associated with Mesozoic extension. Significant brittle faults within the quadrangle include the Indian Creek Fault, Gulf Fault, and the Deep River Fault.

Past Work

Reinemund (1955), is an important work, that has laid the foundation for the geology within the Triassic basin. For this mapping effort, Reinemund's maps were georeferenced to a digital elevation model from Hillshade LiDAR. Geologic contacts within the Triassic basin were digitized and modified if needed. Most of the geology south of the Deep River within the Triassic basin was digitized as presented by Reinemund.

The map area is located within the study area of Green et al. (1982), Abdelzahir (1978), and Green (1977). Their studies document the presence of an overlapping series of metavolcanic and metavolcaniclastic lithologies sourced from distinct areas.

Mineral Resources

Clay Products

The red claystones of the Pekin and Sanford Formations continue to supply area brick manufacturers raw material. In the 1950's, it was reported that 6 brick and tile producers were active in the map and nearby areas (Reinemund, 1955). It has been and continues to be an important location for clay products. Several abandoned and active clay pits are present in the map and are identified. The former Boren and Pomona clay pits within the Goldston Quadrangle are well known for their abundance of Triassic aged plant, invertebrate and vertebrate fossils. Representative species are summarized by Olsen et al. (1991).

Coal Deposits

Coal has been mined within the map area since before the Revolutionary War – ca. 1750's. Reinemund (1955) estimates the total production in the Deep River Coal Field exceeded 1 million tons. Most of the production was from two mines with extensive underground workings – the Carolina Mine and the Cumnock (also known as the Egypt) Mine. Reinemund (1955) provides an extensive review of the coal deposits and geology of the Deep River Coal Field.

Oil and Gas Potential

Natural gas exploration wells have been drilled within the quadrangle and are indicated on the map. A summary of the natural gas potential of the Sanford sub-basin is provided in Reid et al. (2011). A compilation map showing seismic lines, drill holes and hydrocarbon shows is provided in Reid et al. (2010). An overview of the Triassic rift / lacustrine basins, their hydrocarbon potential in North Carolina, a regulatory framework overview and data access information can be found in Reid et al. (2018).

Quaternary Deposits

Quaternary deposits in the Goldston Quadrangle were previously mapped by Reinemund (1955), along with bedrock mapping, however, the mapping was conducted prior to 1:24,000 topographic map availability. The Quaternary mapping for this project utilized digital county soil survey parent material maps (Soil Survey Staff, 2019), high resolution LiDAR surface topography, data from Reinemund (1955), and new field observations (outcrops and hand augers). The Quaternary fluvial sediment were divided into 3 map units (modern floodplain and two terrace levels), similar in concept to mapping by Reinemund (1955).

The oldest and highest terrace deposits (Qth) contains fluvial deposits of an ancestral Deep River, which has since incised to its present level. The elevation of this terrace level ranges from as high as 350 feet asl in Moore County to 250 feet asl (eastern edge of Goldston Quadrangle), about 35 to 100 feet above the modern Deep River floodplain. There appear to be multiple terrace levels within this map unit that we chose to not differentiate because of the high degree of dissection and because of lithological differences were not readily observed. Possible causes for the river's overall incision during the Quaternary include tectonic, glacial isostatic adjustment (forebulge of Laurentide Ice Sheet) and climatic processes. The age of deposits within the high terrace unit are speculatively middle Pleistocene based on the terrace height above the modern floodplain (Mills, 2000), degree of dissection, and weathering characteristics (Suther et al., 2011).

The low terrace deposits (Qtl) contain younger Deep River fluvial deposits, with terrace elevations ranging from 255 feet asl in Moore County to 225 feet asl (eastern edge of Goldston Quadrangle), about 10 to 15 feet above the modern Deep River floodplain. The age of deposits within the low terrace unit are speculatively late Pleistocene to early Holocene based the terrace height above the modern floodplain (Mills, 2000; Suther et al., 2011). In some areas, the landforms appears to be a strath terraces with thin fluvial deposits (silty to sandy; < 4 feet thick) above residuum developed in Triassic bedrock. In other areas, the terrace may be the cut-and-fill variety, but thicknesses are unknown without test cores.

Deposits on the modern (Holocene) floodplain (Qal) consist mainly of silt loam to silty clay loam where exposed along the Deep River or its tributaries in the Triassic Basin. Fine to medium sand occurs in points bars and river channels, along smaller creeks in crystalline terrain (where it can be gravelly) and likely at depth from reworking of Pleistocene and older sediments. Along the Deep River valley, the modern floodplain slope in elevation from about 240 feet asl (Moore County) to 215 feet asl (eastern edge of Goldston Quadrangle). This map unit likely also includes very low terraces which are blanketed by modern overbank flood deposits from times of high-water levels.

DESCRIPTION OF MAP UNITS

All pre-Mesozoic rocks in the map area 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. Dikes of Jurassic aged diabase intrude the crystalline rocks and Triassic sediments of the map area. Triassic-aged sediments and Jurassic diabase dikes are not metamorphosed. Quaternary aged alluvium is present in most major drainages.

Map units of metavolcanic and metavolcaniclastic rocks include various lithologies that when grouped together are interpreted to indicate general environments of deposition. The dacitic lava and tuff units is interpreted to represent dacitic domes and proximal pyroclastics. The andesitic to basaltic lavas (with tuffs or conglomerates) units are interpreted to represent eruption of intermediate to mafic lava flows and associated pyroclastic and/or epiclastic deposits. The epiclastic/pyroclastic units are interpreted to represent deposition from the erosion of dormant and active volcanic highlands. Some of the metavolcaniclastic units within the map area display lithologic relationships similar to dated units present in northern Orange and Durham Counties. Due to these similarities, the metavolcanic and metavolcaniclastic units have been tentatively separated into upper and lower portions of the Hyco Formation; geochronologic data in the map area is needed to confirm this interpretation. A review of the regional lithologies is summarized in Bradley (2013).

Unit descriptions common to Bradley et al. (2019) and Hanna et al. (2015) from the Bear Creek and Siler City Northeast geologic maps, respectively were used for conformity with on-strike units in neighboring quadrangles. Unit descriptions and stratigraphic correlations were maintained from adjacent mapping in Orange County (Bradley et al., 2016). 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. Pyroclastic rock terminology follows that of Fisher and Schmincke (1984).

Sedimentary Units

dg - Disturbed ground: consists of fill in highway embankments, railway embankments, and mine spoil piles, as well as areas of removed earth in mined-out-areas (former coal mines)

Qal - Modern (Holocene) floodplain deposits: silt loam to silty clay loam, with fine to medium sand deposits in point bars and channels deposits in the Deep River valley; smaller tributaries in the Carolina terrane can have more sandy or gravelly alluvium; brown to gray; soft; crudely stratified; observed as much as 10 feet thick, but likely thicker in the Deep River Valley. Includes very low terraces that are periodically inundated by modern floods. Contains weak to moderately developed soil profiles. Structural measurements depicted on the map within Qal represent outcrops of crystalline rock inliers surrounded by alluvium.

Qtl – Quaternary low terrace deposits: silt loam to clay loam to sand, with some gravelly zones near unit base; yellowish brown to brown; in some areas, difficult to differentiate from high levels of modern floodplain; ranges from 2 feet to several feet thick or more; some areas are strath terraces with thin terrace deposits over red, clayey residuum developed into Triassic bedrock. [this unit is similar in concept to Qg2 of Reinemund (1955)]

Qth – Quaternary high terrace deposits: silt loam to sandy loam to gravelly loamy sand (up to 40% gravel); yellowish brown to reddish brown; gravel consists primarily of white, rounded to subrounded quartz pebbles, with rare cobbles; the fluvial depositional sequence generally fines upwards, with gravelly zones typically revealed along eroding slopes; total thickness of map unit is typically 2 to 10 feet; may consist of a lag deposit in steeper areas overlying a red, silty clay to clay residuum developed into fine-grained Triassic bedrock. Mapped areas may include multiple, undifferentiated high terrace levels. Contains E and Bt horizons of an Ultisol soil profile, with significant alteration extending several feet into the unit. May exhibit crude stratification or cross bedding at depth. [this unit is similar in concept to Qg3 of Reinemund (1955)]

Triassic Sediments

Trs – Sanford Formation: Mainly red to brown, locally purple, coarse-grained, arkosic sandstones and conglomerates. Subordinate amounts of claystone, siltstone and fine-grained sandstone (Reinemund, 1955).

Trc – Cumnock Formation: Gray and black claystone, shale and siltstone. Gray sandstone. Contains beds of coal and carbonaceous (organic-rich) shale (Reinemund, 1955). Includes coal horizons.

Trp – Pekin Formation: Gray, Brown to maroon, white mica bearing, interbedded mudstones, siltstones arkosic sandstones and locally conglomerates. Outcrops and boulders of float identified as part of Pekin Formation are strongly indurated compared to sediments identified as part of Chatham Group. Identified as the Pekin Formation by Reinemund (1955).

Trpc – Conglomerate of the Pekin Formation: Reddish-brown to dark brown to purplish-red, irregularly bedded, poorly sorted, cobble to boulder conglomerate. Clasts are chiefly miscellaneous felsic and intermediate metavolcanic rocks and quartz. Typically present adjacent to border faults. Outcrops and boulders of float identified as part of Pekin Formation are strongly indurated compared to sediments identified as part of Chatham Group. Identified as the Pekin Formation-basal conglomerate by Reinemund (1955).

Intrusive and Metaintrusive Units

Jd – Diabase: Black to greenish-black, fine- to medium-grained, dense, consists primarily of plagioclase, augite and may contain olivine. Locally has gabbroic texture. Occurs as dikes up to 100 ft wide. Diabase typically occurs as spheroidally weathered boulders with a grayish-brown weathering rind. Red station location indicates outcrop or boulders of diabase.

MZlamp – Lamprophyre (?): Gray to pinkish gray, fine- to medium-grained, exceptionally dense, with alkali-feldspar, plagioclase and amphibole. The groundmass consists of alkali feldspar and plagioclase, with alkali feldspar more abundant than plagioclase. Plagioclase crystals (greater than 1 cm) also occur as subhedral and commonly zoned. Locally, amphibole occurs in elongate slender prismatic laths (1-4 mm) and is randomly oriented. Sparse amygdules of quartz (1 cm) up to 5 mm present locally. The rock is unmetamorphosed but may have magmatic and/or hydrothermal alteration. Occurs as dikes that are coincident with diabase. Outcrop and boulders are typically spheroidally weathered with reddish-brown weathering rind. Red square station locations mark outcrops or boulders.

Zdi – porphyritic: Diorite porphyry: Mesocratic to melanocratic (CI=50-60), greenish-gray to grayish-green, fine- to medium-grained groundmass with euhedral to subhedral phenocrysts (2-12 mm) of white to pale yellow plagioclase. Major minerals include plagioclase and amphibole. Plagioclase crystals are typically sericitized and saussuritized. Amphiboles are present as small clusters and are typically altered to chlorite and actinolite masses. The unit occurs as large boulders and/or outcrop that is nonfoliated and locally it includes aphanitic to porphyritic andesite to basalt.

Metavolcanic and Metavolcaniclastic Units

Aaron Formation

Za – Aaron Formation: Distinctive metasedimentary package that ranges from fine-grained siltstones to coarse-grained sandstones, pebbly sandstones and conglomerates. Siltstones are similar in appearance to Hyco Formation lithologies. The sandstones, pebbly sandstones and conglomerates (classified as litharenite, feldspathic litharenite and lithic feldsarenite by Harris (1984)) are distinctive and commonly contain rounded to subrounded clasts of quartz ranging from sand- to gravel-sized. In the sandstones, feldspar is the most prominent mineral grain; quartz veins from sparse to abundant in hand sample. Lithic clasts are typically prominent and range from sand- to gravel-size. Harris (1984), performed a detailed stratigraphic study of the Aaron Formation to the immediate west of the map area. Harris (1984) interpreted the Aaron Formation to have been deposited by turbidity currents in a retrogradational submarine fan setting.

Hyco Formation – Upper Portion

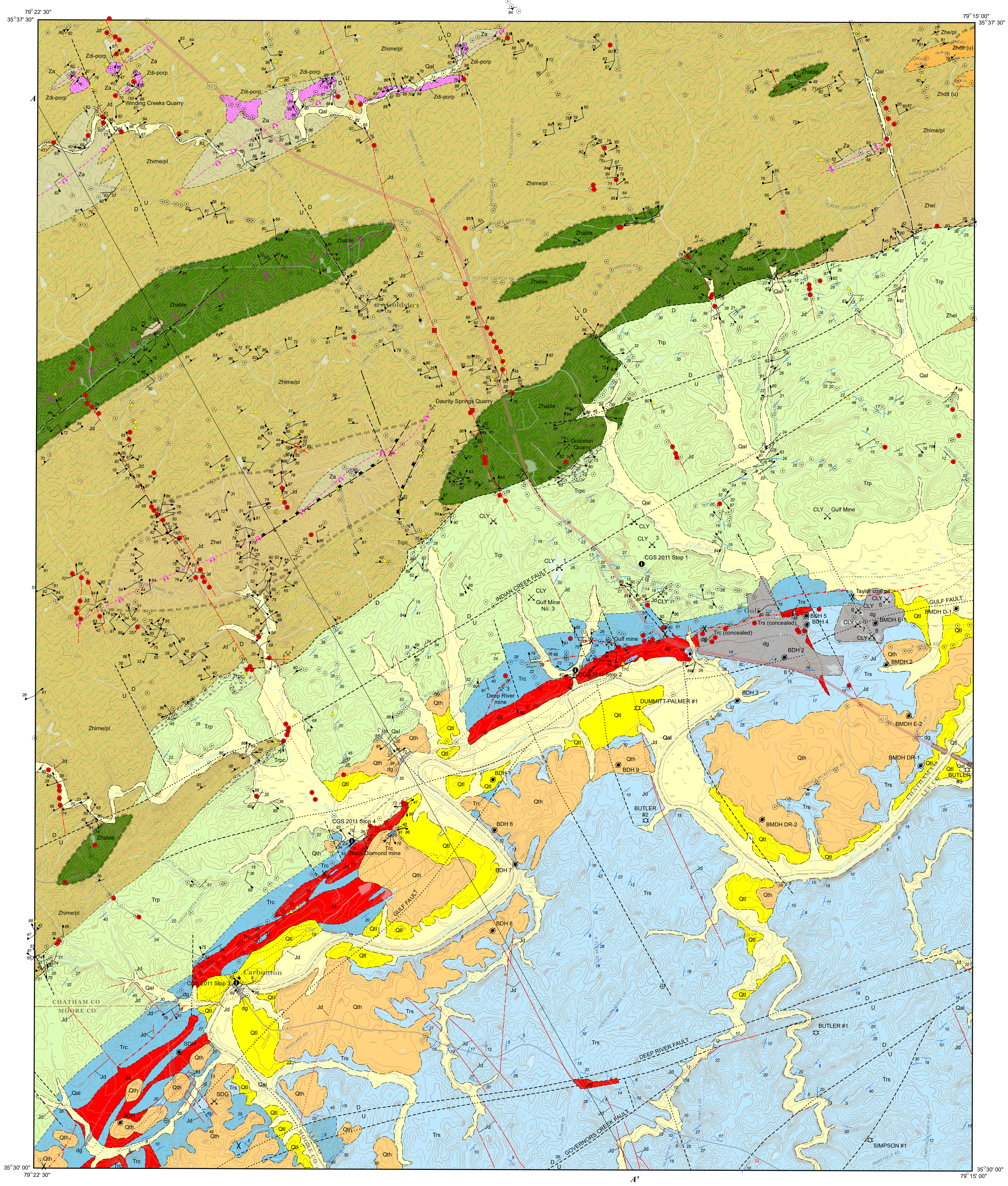
Zhel - Epiclastic rocks and lavas: Conglomerate, conglomeratic sandstone, sandstone, siltstone and mudstone. Siltstones and mudstones typically display bedding ranging from mm-scale up to 10 cm, bedding layers traceable for several feet locally, may exhibit soft sediment deformation. Locally interbedded with a relict vitric texture. Locally contain interbedded dacitic to basaltic lavas. Conglomerates and conglomeratic sandstones typically contain subrounded to angular clasts of dacite in a clastic matrix. Deposition interpreted as distal from volcanic center, in deep water(?), and via turbidite flows.

Zhimelpl - Mixed intermediate to mafic epiclastic-pyroclastic rocks with interlayered intermediate to mafic lavas: Grayish-green to green, locally with distinctive reddish-gray or maroon to lavender coloration; metamorphosed conglomerate, conglomeratic sandstone, sandstone, siltstone and mudstone. Lithologies are locally bedded; locally tuffaceous with a cryptocrystalline-like groundmass. Siltstones are locally phyllitic. Locally contain interbedded intermediate to mafic lavas identical to the Zhable unit. Contains lesser amounts of fine- to coarse tuff and lapilli tuff with a cryptocrystalline-like groundmass. Pyroclastics, lavas, and epiclastics are mainly intermediate to mafic in composition. Minor dacitic lavas and tuffs present. Typically bedded; silicified and/or sericitized altered rock are locally present. Conglomerates and conglomeratic sandstones typically contain subrounded to angular clasts of andesite and basalt in a clastic matrix. Generally interpreted to have been deposited proximal to active intermediate to mafic composition volcanic centers and/or record the erosion of proximal intermediate to mafic composition volcanic centers after cessation of active volcanism.

Zhable – Andesitic to basaltic lavas with interlayered epiclastic rocks: Light green, gray-green, gray, and dark gray; typically unfoliated, amygdaloidal, plagioclase porphyritic, amphibole/pyroxene porphyritic and aphanitic; metamorphosed andesitic to basaltic lavas and shallow intrusions. Hyaloclastic texture is common and imparts a fragmental texture on some outcrops and float boulders. Contains lesser amounts of grayish-green, light green, and light gray to white; metamorphosed conglomerate, conglomeratic sandstone, sandstone, siltstone and mudstone.

Zhelpl - Mixed epiclastic-pyroclastic rocks with interlayered dacitic lavas: Grayish-green to greenish-gray, locally with distinctive reddish-gray or maroon to lavender coloration; metamorphosed conglomerate, conglomeratic sandstone, sandstone, siltstone and mudstone. Lithologies are locally bedded; locally tuffaceous with a cryptocrystalline-like groundmass. Siltstones are locally phyllitic. Locally contain interbedded dacitic lavas identical to Zhdlt unit. Contains lesser amounts of fine- to coarse tuff and lapilli tuff with a cryptocrystalline-like groundmass. Pyroclastics, lavas, and epiclastics are mainly felsic in composition. Minor andesitic to basaltic lavas and tuffs present. Silicified and/or sericitized altered rock are locally present. Conglomerates and conglomeratic sandstones typically contain subrounded to angular clasts of dacite in a clastic matrix. Portions of the Zhelpl unit are interpreted to have been deposited proximal to active volcanic centers and/or are interpreted to record the erosion of proximal volcanic centers after cessation of active volcanism.

Zhdlt (u) – Dacitic lavas and tuffs of the upper portion of the Hyco Formation: Greenish-gray to dark gray, siliceous, metamorphosed aphanitic dacite, porphyritic dacite with plagioclase phenocrysts, and flow banded dacite. Dacite with hyaloclastic textures are common. Welded and non-welded tuffs associated with the lavas include greenish-gray to grayish-green, fine tuff, coarse plagioclase crystal tuff and lapilli tuff. Locally, interlayers of immature conglomerate and conglomeratic sandstone with abundant dacite clasts are present. The dacites are interpreted to have been coherent extrusives or very shallow intrusions associated with dome formation. The tuffs are interpreted as pyroclastic flow deposits, air fall tuffs or reworked tuffs generated during formation of dacite domes. Wortman et al. (2000) reports an age of 615.7+3.7/-1.9 Ma U-Pb zircon date for a dacitic tuff from the unit in the Rougemont quadrangle.



EXPLANATION OF MAP SYMBOLS

CONTACTS, FAULTS, AND OTHER FEATURES

inferred contact
concealed contact
diabase contact, location known
inferred diabase contact U and D present when coincident with fault
concealed diabase contact
brittle fault - inferred
concealed fault
gradational contact - inferred
fault-high angle reverse - ? - Identity or existence questionable, location approximate
fold axis - inferred (anticline)
fold axis - inferred (syncline)
overturned fold axis - inferred (syncline)
coal bed
lineament - lidar inferred
cross section line
surficial units contact

IN CROSS SECTION

contact
brittle fault
fold form lines
topographic profile
gradational contact
lineament - lidar inferred
inferred fold axis

PLANAR AND LINEAR FEATURES

strike and dip of bedding or layering
strike and dip of bedding or layering (multiple observations at one location)
strike of vertical bedding or layering
strike and dip of Triassic bedding (from USGS PP 246)
strike and dip of foliation
strike and dip of foliation (multiple observations at one location)
shear foliation (multiple observations at one location)
dike orientation
strike and dip of cleavage
strike and dip of cleavage (multiple observations at one location)
lamprophyre
fault plane
axial surface
strike and dip of inclined joint
strike and dip of inclined joint surface (multiple observations at one location)
strike of vertical joint
strike of vertical joint surface (multiple observations at one location)
bearing and plunge of crenulation lineation
clast lineation
fold hinge
observation station location
diabase station location
horizontal Triassic bedding (from USGS PP 246)
indicates location of vuggy and/or massive quartz

PROSPECTS, QUARRIES AND OTHER FEATURES

Brick Clay
CLY Clay Pit-brick clay, active (DEQ, DEMLR permitted mines database)
CLY Clay Pit-brick clay, abandoned (DEQ, DEMLR permitted mines database)
CLY 1 - 4 Pomona and Boren Clay Pit, abandoned, (DEQ, DEMLR permitted mines database, aerial photography)
CLY 5 - 8 Chatham Brick and Tile Clay Pit, abandoned, (DEQ, DEMLR permitted mines database, aerial photography)

Coal
Coal pits – abandoned (Reinemund, 1955)
1 Gulf Mine – abandoned
2 Black Diamond Mine – abandoned
3 Deep River Mine – abandoned

Other: Prospect and Gravel Pit
Prospect pit – commodity unknown
SDG Gravel pit – abandoned

Crushed stone or other
Gaurity Springs Quarry – crushed stone, active in May 2020 (DEQ, DEMLR permitted mines database)
Goldston Quarry – crushed stone, active as sales yard in May 2020 (DEQ, DEMLR permitted mines database)
Winding Creeks Quarry – crushed stone, inactive in January 2020 (DEQ, DEMLR permitted mines database)
Old Quarry-stone, abandoned (Reinemund, 1955) – three locations
Abandoned Quarry – crushed stone (USGS historic topographic map and this study)
2011 Carolina Geological Society Field Trip Stops
BMDH D-1 Diamond Drill Hole (Reinemund, 1955)
Oil and Natural Gas Test Well – Ex. Butler #1, #2, #3; Simpson #1, Dummitt-Palmer #1

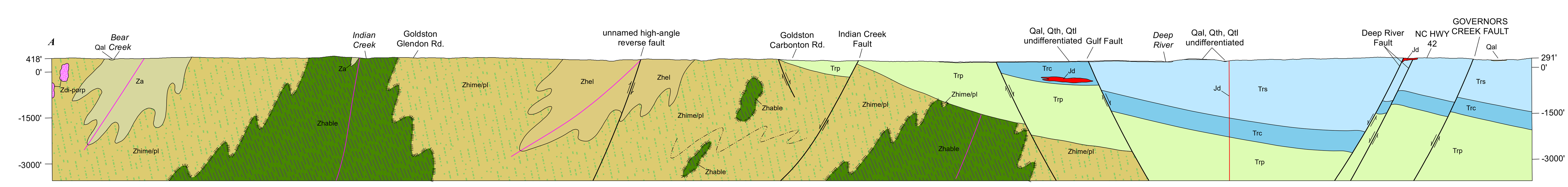
Altered by the North Carolina Geological Survey for use with map.
Produced by the United States Geological Survey
North American Datum of 1983 (NAD83)
World Geodetic System of 1984 (WGS84). Projection and 1 000-meter grid:Universal Transverse Mercator, Zone 17S

SCALE 1:24 000

CONTOUR INTERVAL 10 FEET
NORTH AMERICAN VERTICAL DATUM OF 1988

This map was produced to conform with the National Geospatial Program US Topo Product Standard, 2011. A metadata file associated with this product is draft version 0.6.18

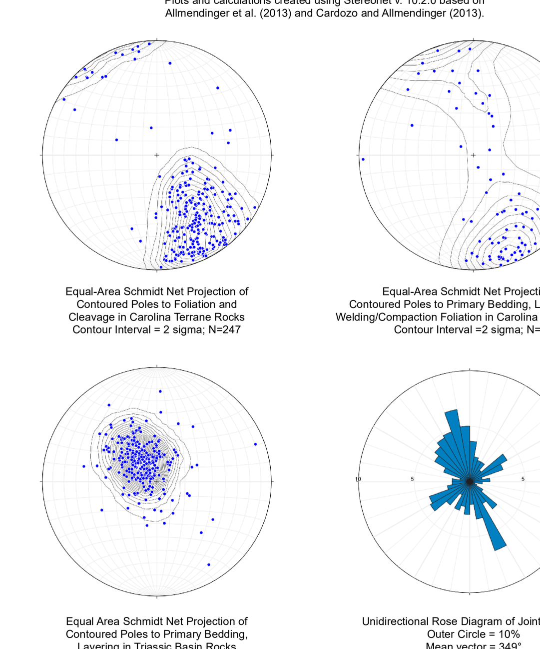
GOLDSTON, NC
2019



no vertical exaggeration for bedrock units
Qal, Qth and Qtl thickness exaggerated to be visible
Qth and Qtl not differentiated

Equal-Area Schmidt Net Projections and Rose Diagram

Plots and calculations created using Stereonet v. 10.2.0 based on Allmendinger et al. (2013) and Cardozo and Allmendinger (2013).



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This is an Open File Map. It has been reviewed internally for conformity with North Carolina Geological Survey mapping standards and with the North American Stratigraphic Code. Further revisions or corrections to this Open File map may occur.

Acknowledgments: This work was supported in part by the Illinois State Geological Survey, University of Illinois (with contributions to terrace mapping by David A. Grimley). Field data collection assistance by James Chapman (NCGS) and Dwain Veach (NCGS).

Goldston Base Map Information:
Base map is from USGS 2019 GeoPDF of the Goldston 7.5-minute quadrangle. Air photo, map collar and select features removed. Bounds of GeoPDF based on 7.5-minute grid projection in UTM 17S; North American Datum of 1983 (NAD83).

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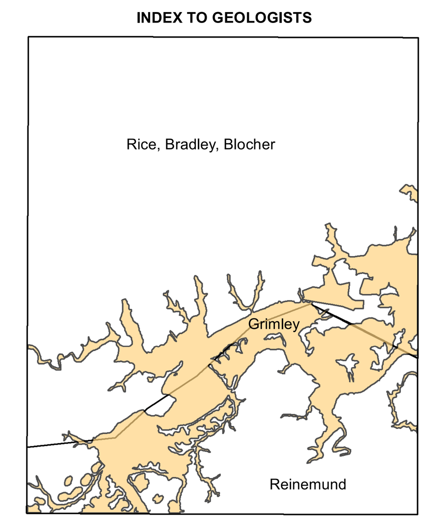
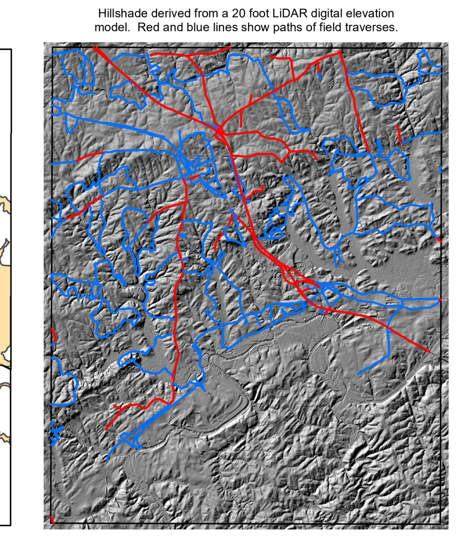


TRAVERSE MAP

Hillshade derived from a 20 foot LiDAR digital elevation model. Red and blue lines show paths of field traverses.



Geologic Map of the Goldston 7.5-Minute Quadrangle, Chatham, Lee and Moore Counties, North Carolina

By
Aaron K. Rice, Philip J. Bradley, David A. Grimley and William B. Blocher

Geologic data collected in June 2019 through May 2020.

Map preparation, digital cartography and editing by
Michael A. Medina, Aaron K. Rice and Philip J. Bradley

2020