NORTH CAROLINA DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES
DIVISION OF LAND RESOURCES
James D. Simons, Director and State Geologist

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NORTH CAROLINA GEOLOGICAL SURVEY
OPEN FILE MAP 2011-08 Revision-01 (2014)

MAP UNITS

QUATERNARY

- Qal — Alluvium

JURASSIC

- Jd — Diabase

NEOPROTEROZOIC

- Zdi — Diorite
- Za — Aaron Formation. Youngest detrital zircons of ca. 578 and 588 Ma (Samson et al., 2001 and Pollock, 2007, respectively)

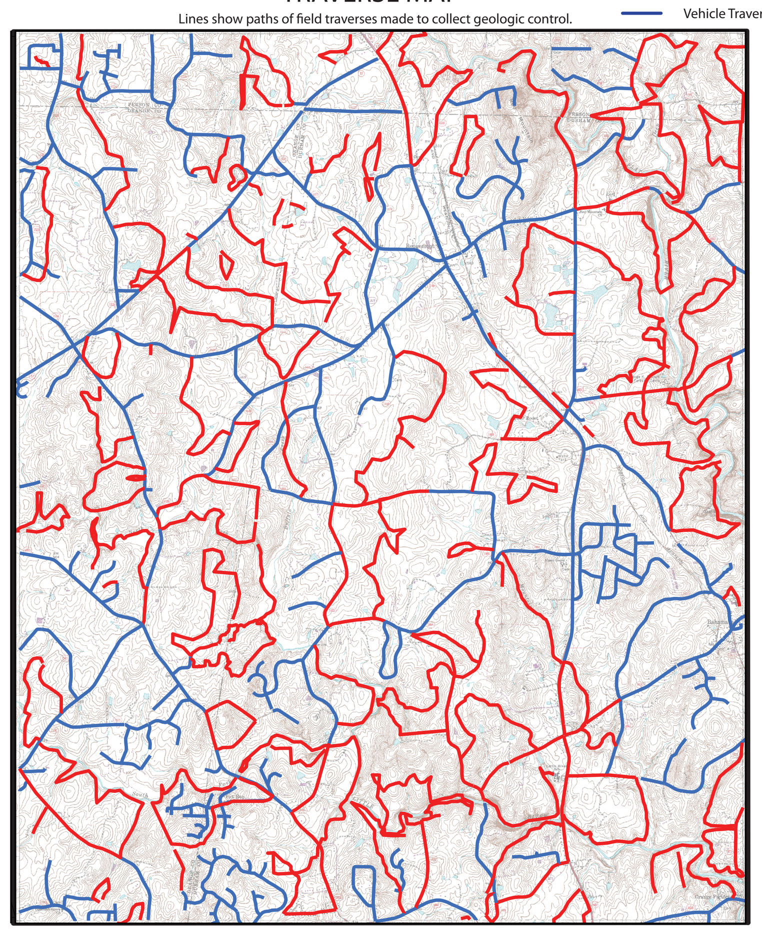
Hyco Formation Metaintrusive and Metavolcanic Units
ca. 615 to 633 ma (Wortman et. al, 2000; Bradley and Miller, 2011)

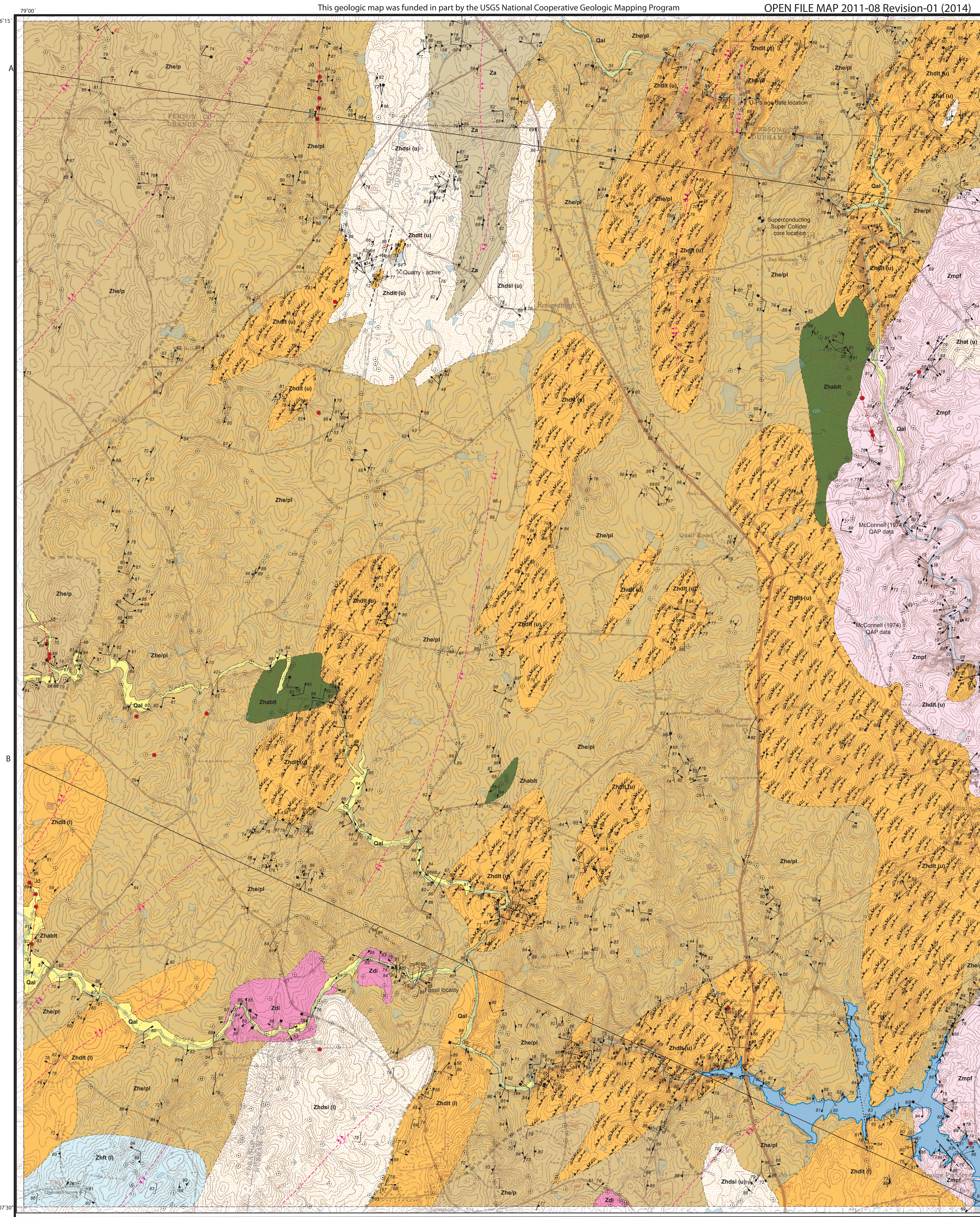
- Zmpf — Moriah Pluton granite to granodiorite
- Zhdsi (u) — Dacitic shallow intrusives
- Zhablt — Andesitic to basaltic lavas and tuffs
- Zhat (u) — Altered tuffs
- Zhe/pl — Mixed epiclastic-pyroclastic rocks and dacitic lavas
- Zhe/p — Mixed epiclastic-pyroclastic rocks
- Zhdlt (u) — Dacitic lavas and tuffs
- Zhdsi (l) — Dacitic shallow intrusives
- Zhdlt (l) — Dacitic lavas and tuffs
- Zhft (l) — Felsic tuffs

TRAVERSE MAP

Lines show paths of field traverses made to collect geologic control.

Foot Traverse
Vehicle Traverse





79°00′ 36°15′ 78°52′30″ 36°15′ 36°07′30″ 79°00′ 36°07′30″ 78°52′30″

Topography mapped, edited and published by the U.S. Geological Survey

Control by USGS and NOS/NOAA and North Carolina Geodetic Survey

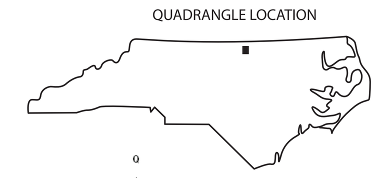
Topography by photogrammetric methods from aerial photographs taken 1974. Field checked 1974

2004 MAGNETIC NORTH DECLINATION FROM CENTER OF NEARBY CHAPEL HILL QUADRANGLE

SCALE 1:24000

CONTOUR INTERVAL 10 FEET

QUADRANGLE LOCATION



Rougemont, N.C.
1974
REVISED 1987

INTRODUCTION

Pre-Mesozoic crystalline rocks in the Rougemont Quadrangle are part of the Virgilina sequence of the Late Proterozoic to Cambrian Carolina terrane of the Carolina Zone (Hibbard et al., 2002). In the vicinity of the map area, the Virgilina sequence can be separated into two lithotectonic units: 1) the Hyco Formation and 2) the Aaron Formation. The Hyco Formation consists of ca. 615 to 633 Ma (Wortman et al., 2000; Bowman, 2010; Bradley and Miller, 2011.) layered volcaniclastic rocks and plutonic rocks. Available age dates (Wortman et al., 2000; Bradley and Miller, 2011) indicate the Hyco Formation in Orange and Durham Counties may be divided into lower (ca. 630 Ma) and upper (ca. 615 Ma) members (informal) with an apparent intervening hiatus of magmatism.

In southern Orange 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 layered volcaniclastic rocks with youngest detrital zircons of ca. 578 and 588 Ma (Samson et al., 2001 and Pollock, 2007, respectively).

The Virgilina sequence was folded and subjected to low grade metamorphism 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 Virgilina sequence lithologies are interpreted to range from shallowly to steeply dipping due to open to isoclinal folds that are locally overturned to the southeast. In the Roxboro, NC area, folded Virgilina sequence lithologies are intruded by the ca. 546 Ma Roxboro pluton (Wortman et al., 2000).

The Vermiforma antiqua fossil locality reported by Cloud et al. (1976) is present within the map area. Seilacher et al. (2000) indicates the fossil may be a tectograph and not a true fossil.

Unit descriptions common to Bradley and Hanna (2010) and Bradley et al. (2004) from Caldwell and Northwest Durham geologic maps, respectively, were used for conformity with on strike units in adjacent quadrangles. All pre-Mesozoic rocks of the Rougemont quadrangle 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 dikes are unmetamorphosed.

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 in adjacent areas (Allen and Wilson, 1968; McConnell, 1974; McConnell and Glover, 1982) 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 Schmincke (1984).

DESCRIPTION OF MAP 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.

Intrusive and Metaintrusive Units

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

Zdi – Diorite: Mesocratic (CI~50), greenish-gray to grayish-green, fine- to medium-grained, hypidiomorphic granular diorite. Major minerals include plagioclase and amphibole. Plagioclase crystals are typically sericitized and saussuritized. Amphiboles are typically altered to chlorite and actinolite masses. May be gabbroic locally.

Zmpf – Moriah Pluton felsic phase: Dominantly leucocratic (CI 10-30) light pinkish gray to gray, fine- to medium-grained equigranular to porphyritic granite to granodiroite. Major minerals include plagioclase, actinolitic amphiboles, alkali feldspar, and quartz. Outcrops locally contains enclaves of fine-grained and darker colored granodiorite to diorite. Locally, melanocratic (CI 40-50), grayish-green, fine- to medium-grained quartz diorite to diorite present. Wortman et al. (2000) report a 613.4 +2.8/-2 Ma U-Pb zircon date from a granite and a 613.9 +1.6/-1.5 Ma U-Pb zircon date from a diorite in the pluton sampled from the adjacent Lake Michie quadrangle. The Moriah Pluton is part of the Flat River Complex (Glover and Sinha, 1973; McConnell, 1974 and McConnell and Glover, 1982).

Metavolcanic Units

Za – Aaron formation: Brown, gray to grayish green or light gray; typically foliated, arkosic sandstones, silty sandstones and phyllitic siltstones.

Hyco Formation – Upper Portion

Zhe/p - Mixed epiclastic-pyroclastic rocks: Grayish-green to greenish-gray, tuffaceous sandstones, conglomeratic sandstones, siltstones and minor phyllite. The siltstones typically are weakly phyllitic. Contains lesser amounts of fine- to coarse tuff and lapilli tuff. Tuffs are differentiated from other volcaniclastic rocks by the presence of zones of cryptocrystalline texture that exhibit conchoidal-like fractures in between foliation domains. Minor andesitic to basaltic lavas and tuffs present. Silicified and/or sericitized altered rock similar to Zhat unit are locally present. Unit is interpreted to grade into Zhe/pl unit. Contact with Zhe/pl designated at first occurrence of dacitic lavas.

Zhe/pl - Mixed epiclastic-pyroclastic rocks with interlayered dacitic lavas: Grayish-green to greenish-gray, locally with distinctive reddish-gray or maroon to lavender coloration; 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. Minor andesitic to basaltic lavas and tuffs present. Silicified and/or sericitized altered rock similar to Zhat unit are locally present. Conglomerates and conglomeratic sandstones typically contain subrounded to angular clasts of dacite in a clastic matrix. Zhe/pl distinguished from Zhe/p by presence of dacites and is interpreted to represent a facies change to an area more proximal to the active volcanic centers compared to Ze/p. Cloud et al. (1976) fossil locality from this unit.

Zhat (u) – Altered tuffs: Very light gray to light greenish gray (whitish in areas) with red and yellow mottling, altered volcaniclastic rocks. Alteration consists of silicified, sericitized and pyrophyllitized rock. Sericite phyllite, pods of pyrophyllite, and quartz + phyrophyllite rock all with <1 mm to 2 mm diameter weathered sulfides are common. Relict lithic clasts and kaolinitized feldspar crystal shards are visible in some exposures. Relict structures are obliterated in heavily altered rocks. Map area contains boulders (up to several feet in diameter) and outcrop of massive milky quartz and quartz + sericite rock.

Zhdlt (u) – Dacitic lavas and tuffs of the upper portion of the Hyco Formation: Greenish-gray to dark gray, siliceous, aphanitic dacite, porphyritic dacite with plagioclase phenocrysts, and flow banded dacite. 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 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 episodic pyroclastic flow deposits, air fall tuffs or reworked tuffs generated during formation of dacite domes. The unit occurs as map scale pods surrounded by clastic rocks of Zhe/pl unit. 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. Red Mountain, a prominent topographic feature of the quadrangle is underlain by this unit.

Zhdsi (u) – Dacitic shallow intrusive of the upper portion of the Hyco Formation: Gray-green, light green to green, greenish-gray to light gray; dacite, plagioclase porphyritic dacite with a granular-textured groundmass to micro-granodiorite (intrusive texture visible with 7x hand lens). Locally fine- to medium grained granodiorite present. Plagioclase phenocrysts , when present, range from < 1 mm to 4 mm. Black colored amphibole, when visible, occurs as phenocrysts (<1 mm to 1 mm) and as intergrowths with plagioclase. Amphibole intergrowths distinguish rock from fine-grained tuffs. Rock from the active quarry includes greenish-gray to light gray; aphanitic to weakly plagioclase porphyritic dacite to micro-granodiorite. Relict plagioclase phenocrysts are sausseritized in a matrix of recrystallized feldspar and quartz with dark colored clots (<1 mm to 4 mm) interpreted in hand sample as chlorite(?) masses and/or relict enclaves of dark gray dacite. Contains lesser amounts of dark gray, aphanitic dacite. Interpreted as shallowly emplaced dacite probably co-magmatic with Zdlt (u) unit.

Zhablt – Andesitic to basaltic lavas and tuffs: Green, gray-green, gray, dark gray and black; typically unfoliated, amygdaloidal, plagioclase porphyritic, amphibole/pyroxene porphyritic and aphanitic; andesitic to basaltic lavas and shallow intrusions. Hyaloclastic texture is common and imparts a fragmental texture similar to a lithic tuff on some outcrops. Locally interlayered with meta-sediments identical to the Zhe/pl and Zhe/p unit.

Hyco Formation – Lower Portion

Zhft (l) - Felsic tuffs: Grayish-green to greenish-gray and silvery-gray; massive to foliated volcaniclastic pyroclastic rocks consisting of fine- to coarse tuffs, lapilli tuffs and minor welded tuffs. Tuffs are differentiated from other volcaniclastic rocks by the presence of zones of cryptocrystalline texture that exhibit conchoidal-like fractures in between foliation domains. Layering ranges from massive to thinly bedded. Contains lesser amounts of volcaniclatic sedimentary rocks consisting of volcanic sandstones, and greywackes with minor siltstones and phyllite.

Zhdlt (l) – Dacitic lavas and tuffs of the lower portion of the Hyco Formation: Distinctive gray to dark gray, siliceous, cryptocrystalline dacite, porphyritic dacite with plagioclase phenocrysts, and flow banded dacite. Welded and non-welded tuffs associated with the lavas include: greenish-gray to grayish-green, fine tuff, coarse plagioclase crystal tuff; lapilli tuff; and tuff breccia. The dacites are interpreted to have been coherent extrusives or very shallow intrusions associated with dome formation. The tuffs are interpreted as episodic pyroclastic flow deposits, air fall tuffs or reworked tuffs generated during formation of dacite domes. Wortman et al. (2000) report a 632.9 +2.6/-1.9 Ma zircon date from a sample within the unit in the Chapel Hill quadrangle.

Zhdsi (l) – Dacitic shallow intrusive of the lower portion of the Hyco Formation: Gray-green, light green to green; plagioclase porphyritic dacite with a granular-textured groundmass to micro-granodiorite (intrusive texture visible with 7x hand lens). Contains lesser amounts of fine- to medium grained granodiorite. Plagioclase phenocrysts typically range from 1 mm to 4 mm. Black colored amphibole, when visible, occurs as phenocrysts (<1 mm to 1 mm) and as intergrowths with plagioclase. Amphibole intergrowths distinguish rock from fine-grained tuffs. Enclaves of dark gray, plagioclase porphyritic dacite are common and at times give rock a psuedo-clastic appearance. Bradley and Miller (2011) report an age of 628.5 ±1 Ma for a dacite from this unit in southern Orange County.

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EXPLANATION OF MAP SYMBOLS

Lithologic contacts - Distribution and concentration of station and structural symbols indicates degree of reliability

- Contact - location inferred
- Contact - location concealed
- Contact - gradational
- Qal Contact - location inferred
- Jd Dike - location inferred
- Inferred fold hinge of overturned anticline, plunging and non-plunging, dotted where concealed
- Inferred fold hinge of overturned syncline, plunging and non-plunging, dotted where concealed

STRIKE AND DIP OF PLANAR FEATURES

Observation sites are centered on the strike bar, or at the intersection point of multiple symbols.

- Strike and dip of primary bedding and layering
- Strike and dip of primary bedding and layering (mutiple observations at one locality)
- Strike and dip of overturned primary bedding and layering (mutiple observations at one locality)
- Strike and dip of foliation
- Strike and dip of foliation (mutiple observations at one locality)
- Strike of vertical foliation
- Strike of vertical foliation (mutiple observations at one locality)
- Strike and dip of primary volcanic compaction and/or welding foliation
- Strike and dip of cleavage
- Strike and dip of cleavage (mutiple observations at one locality)
- Strike of vertical cleavage
- Strike of vertical cleavage (mutiple observations at one locality)
- Strike and dip of joint
- Strike and dip of joint (mutiple observations at one locality)
- Strike of vertical joint
- Strike of vertical joint (mutiple observations at one locality)
- Strike and dip of cataclastic cleavage
- Strike and dip of cataclastic cleavage (mutiple observations at one locality)
- Strike and dip of crenulation cleavage
- Strike and dip of andesite dike trend
- Strike and dip of andesite dike trend (mutiple observations at one locality)
- Strike and dip of fault plane
- Strike and dip of quartz vein
- Strike and dip of slickenside

BEARING AND PLUNGE OF LINEAR FEATURES

- Bearing and plunge of fold axis
- Bearing and plunge of slickenline
- Bearing and plunge of mineral lineation
- Bearing and plunge of crenulation

NON-STRUCTURAL FEATURES

- Observation station location
- Diabase station location
- Superconducting Super Collider core location (Wilson and Carpenter, 1997)
- McConnell (1974) sample location
- Quarry - active
- Fossil locality (Cloud et al., 1976)
- U-Pb age date location (Wortman et al., 2000)

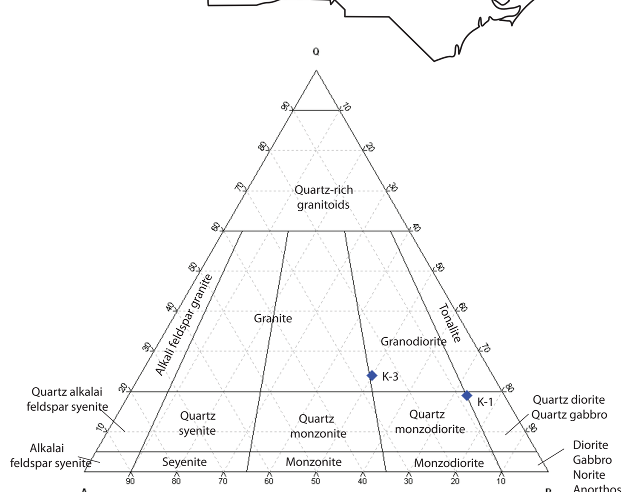
EXPLANATION OF CROSS SECTION SYMBOLS

- In cross section, gradational contact
- In cross section, Jd Dike - location inferred
- In cross section, inferred axial trace of large-scale fold
- In cross section, interpreted fold form lines of non-cylindrical asymmetric folds

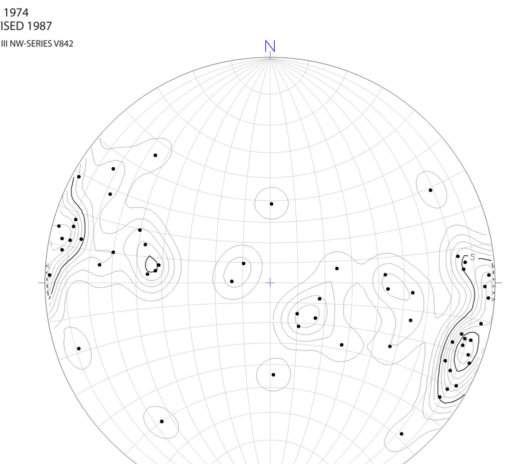
Research supported by the U.S. Geological Survey, National Cooperative Geologic Mapping Program, under USGS award number G10AC00425. The views and conclusions contained in this document are those of the authors and should not be interpreted as necessarily representing the official policies, either express or implied, of the U.S. Government.

The Orange County portion and adjacent areas of this quadrangle were mapped as part of a larger multi-year project to provide detailed geologic data to Orange County.

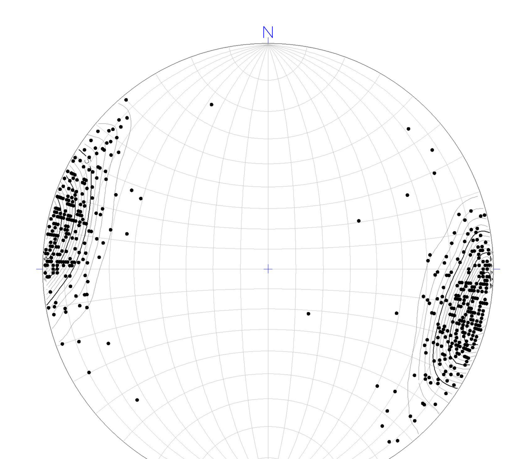
This Open-File Map is preliminary. It has been internally reviewed for conformity with the North Carolina Geological Survey editorial standards. Further revisions or corrections to this Open File map may occur.



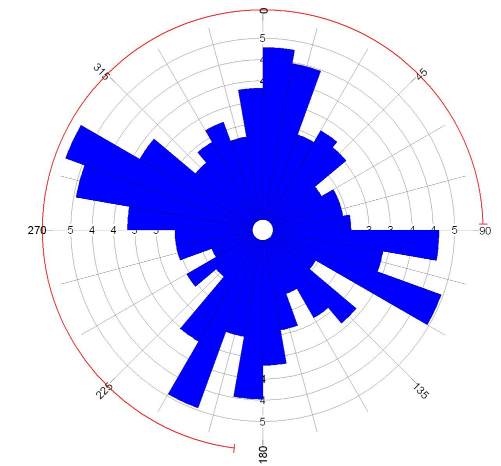
QAP data from McConnell (1974) represent modes from point counts of mineral grains in thin section. Refer to McConnell (1974) for details on methodology.



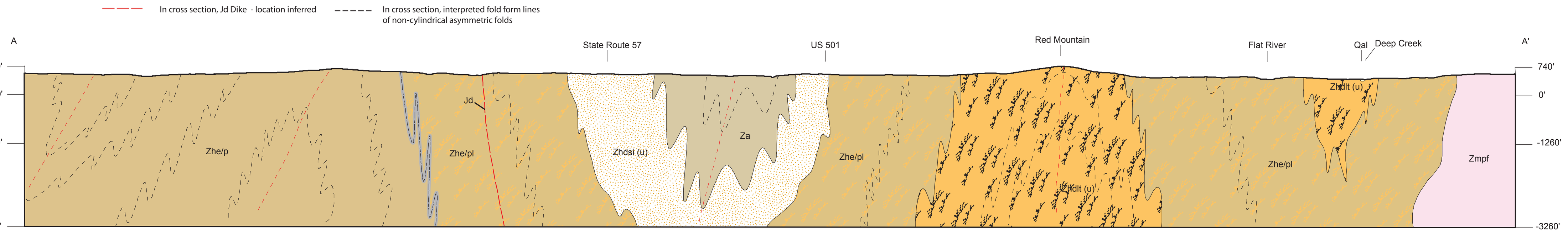
Equal Area Schmidt Net Projection of Contoured Poles to Primary Layering, Bedding and Welding/Compaction Foliation.
Contour Interval = 1 N = 58

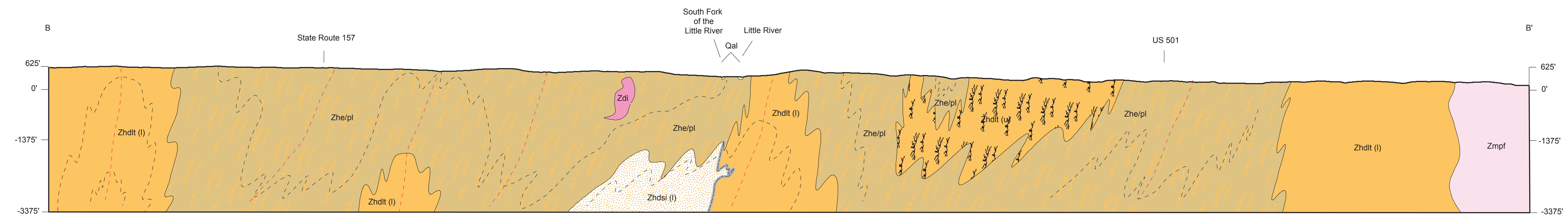


Equal Area Schmidt Net Projection of Contoured Poles to Foliation and Cleavage
Contour Interval = 1 N = 582



Unidirectional Rose Diagram of Joints N = 630
Outer Circle = 9%
Mean direction = 88





Geologic Map of the Rougemont 7.5-Minute Quadrangle, Orange, Durham and Person Counties, North Carolina

By
Philip J. Bradley, Heather D. Hanna and Randy Bechtel

Geologic data collected in August 2010 through July 2011. Map preparation, digital cartography and editing by Heather D. Hanna, Michael A. Medina and Philip J. Bradley.
2011