North Carolina Department of Environmental Quality
Energy, Mineral and Land Resources

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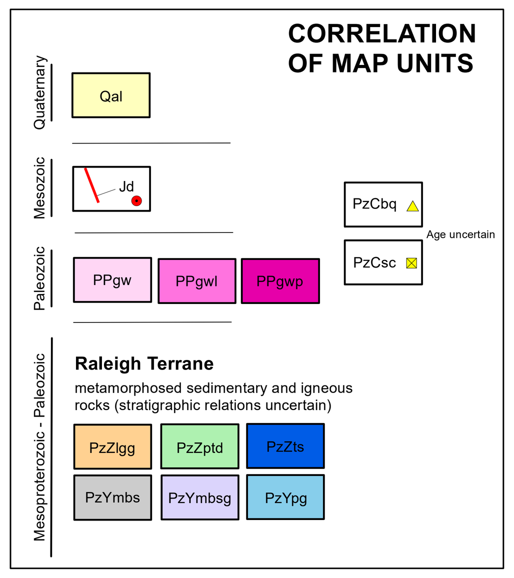
North Carolina Geological Survey
Open File Report 2018-09

CORRELATION OF MAP UNITS



INTRODUCTION

The Warrenton 1:24,000 Quadrangle lies in the northeastern North Carolina Piedmont entirely within rural Warren County. It is located 75 km northeast of Raleigh in the Henderson 1:100,000 sheet between the I-85 and I-95 urban corridors. Fishing Creek, the largest tributary to the Tar River, Possumquarter Creek, and the upper reaches of Reedy Creek incise the southeastern portion of the quadrangle, crossing it from northwest to southeast. Hawtree, Sawmill, and Malones Creeks and several large unnamed tributaries incise the northeastern portion of the quadrangle, crossing it from southwest to northeast towards the Roanoke River and Lake Gaston. The county seat of Warrenton occupies the high ground north and west of Fishing and Possumquarter Creeks, respectively. Natural exposures of crystalline rocks occur almost exclusively along these drainages and their numerous small unnamed tributaries. The higher areas above drainage divides constitute broad generally flat surfaces primarily underlain by unconsolidated Cenozoic sedimentary deposits and pavement of the Pennsylvanian-Permian Wise granite. The region between unincorporated crossroads communities of Snow Hill and Warren Plains just northwest of Warrenton and the region surrounding Norlina are the topographically highest portions of the eastern Warrenton Quadrangle.. The elevations in the map area range from about 450 feet above sea level in areas adjacent to the intersection of U.S. 158 and Warren Plains Road, to less than 250 feet along Possumquarter and Hawtree Creeks at the southeastern and northeastern corners of the quadrangle, respectively. U.S. Highway 401 and Business U.S. Highway 158 extend north-south and east-west, respectively, across the quadrangle and meet in downtown Warrenton. U.S. 401 and U.S. 158 continue northwest from Warrenton to Norlina where they intersect U.S. 1 on its way to South Hill, VA. U.S. 401 continues southwest of Warrenton to the county seat of Louisburg in Franklin County, while NC 58 starts in Warrenton and extends southeast to the county seat of Nashville in Nash County.

GEOLOGIC FRAMEWORK

Pre-Mesozoic crystalline rocks of eastern Warrenton Quadrangle are interpreted to lie within the Raleigh terrane or be parts of the Pennsylvanian-Permian Wise pluton. The eastern portion, and perhaps much of the Raleigh terrane is overprinted by the late Paleozoic and Alleghanian orogeny Macon fault zone (Farrar, 1985b; Sacks, 1999; Morrow, 2015). It is a northeast-southwest-oriented, dextral crystal-plastic and potentially normal brittle strand of the eastern Piedmont fault system (EPFS) in eastern North Carolina that separates the lithotectonic Raleigh and Spring Hope terranes (Hatcher et al. 1977; Bobyarchick, 1981; Sacks, 1999). In the Warrenton Quadrangle, some Raleigh terrane metamorphic rocks, interpreted to be either phyllonitic metasedimentary or highly transposed and mylonitic meta-igneous rocks achieved the garnet-sillimanite zone of the amphibolite facies during interpreted middle to late Paleozoic tectonothermal activity. Many exposures also record a chlorite zone of the greenschist facies retrograde overprint. In other localities, protomylonitic meta-igneous rocks record lower temperature dynamic recrystallization, sericitation and/or saussuritization of feldspars, and minor topotaxial replacement of biotite by chlorite zone, or little evidence of dynamic recrystallization. Unmetamorphosed granite of the Wise pluton underlies much of the mapped area. Post-Paleozoic Jurassic diabase dikes are also unmetamorphosed and generally oriented northwest-southeast across the eastern portion of the Warrenton Quadrangle.

In several paleogeographic and lithotectonic reconstructions of the southern Appalachian orogen and the eastern Piedmont physiographic province, the Raleigh terrane, which underlies approximately one half of the southeastern Warrenton Quadrangle, is grouped with the 633-528 Ma Carolinia superterrane (Stoddard et al., 1991; Hibbard et al., 2002, 2006; Blake et al., 2012). Carolinia is one of several exotic, first-order peri-Gondwanan realm and circum-Atlantic island-arc systems that were amalgamated to eastern Laurentia during mid-Paleozoic arc-continent collision. It is a second-order lithotectonic domain that was dissected into third-order terranes by the EPFS during Laurentian-Gondwanan continent-continent collision in the late Paleozoic. The lithotectonic terranes differ in their proportions of magmatic and volcanogenic sedimentary rocks, environments of formation, major and trace element, isotopic and zircon U-Pb geochemical signatures, and crustal levels of tectonothermal overprinting. Both the EPFS and the terranes are now exposed across the Wake-Warren antiform, a regional-scale foliation arch in the eastern Piedmont. Carolinia suprastructural terranes remained at upper-crustal levels during Alleghanian orogenesis, recording greenschist facies metamorphism. Infrastructural terranes, including the Raleigh terrane, reached mid-crustal levels and were subjected to middle to upper amphibolite facies metamorphism. In contrast, Farrar (1985a, 1985b; Farrar and Owens, 2001; Hatcher, 2010) maintain that the Raleigh terrane is related to the Mesoproterozoic Goochland terrane in Virginia where Owens et al. (2010) obtained 1.1 Ga and 385 Ma zircon U-Pb ages on the State Farm and Maidens Gneisses, respectively. These terranes are interpreted to have a Laurentian rather than peri-Gondwanan affinity east of the continent-island arc suture zone (Hughes et al., 2014).

Recently, however, the second-order Carolinia affinity of the Raleigh terrane has come under question based upon new mapping and zircon U-Pb analyses. Peach et al. (2017) report new LA-ICP-MS U-Pb magmatic and detrital zircon ages for three mapped localities of amphibolite facies schist and gneiss from the northern Raleigh terrane in the Middleburg, Afton, and Littleton Quadrangles. The informal Soul City amphibolite gneiss from the eastern portion of the Middleburg Quadrangle yielded 60 ages from 2.9 Ga–336 Ma, arranged in three clusters ca. 2.0 –1.1 Ga, 1.6–1.3 Ga, and 1.2– 1.1 Ga. The maximum depositional age for the detrital zircon grains can be interpreted as ca. 1.1 Ga. The 336 Ma ages may be related to Pennsylvanian-Permian age granitic micro-diking from the Wise pluton. In the eastern portion of the Afton Quadrangle, the informal Parktown gneiss is interpreted to be meta-igneous based on a unimodal age distribution of 35 zircon grains. The weighted mean age is 410.5 ± 3.7 Ma corresponding with the Early Devonian period. An age range of 1.8 Ga – 410 Ma separated into two clusters ca. 650 – 540 Ma and 465 – 410 Ma and a maximum depositional age of ca. 410 Ma in the Early Devonian period characterize the Littleton schist in the western portion of the Littleton Quadrangle.

The restriction of detrital zircon ages to 2.0–1.0 Ga and a Mesoproterozoic depositional age in the Soul City amphibolite gneiss suggests a difference in provenance compared to other Raleigh terrane samples. The gneiss protolith may be a fragment of Goochland terrane or perhaps another peri-Laurentian or peri-Gondwanan lithotectonic domain displaced along the dextral crystal-plastic Nutbush Creek-Lake Gordon fault zone (Peach et al., 2017). The Parktown gneiss and Littleton schist have a youngest age and coeval mode at 415–410 Ma and an age spread from 450-350 Ma, similar to other meta-igneous rocks in the southern Appalachian orogen within and beyond Carolinia. The ca. 2.0–1.0 Ga and 650–540 Ma ages in the Littleton schist are also proposed to be consistent with both magmatic sources and sedimentary recycling of zircon grains into a syn- to post-Early Devonian Raleigh terrane depositional basin having a regional source area in Carolinia or perhaps other peri-Gondwanan domains. The results of Peach et al. (2017) suggest that portions of the eastern Piedmont mapped as a single Carolinia-related Raleigh terrane may in fact represent different structural blocks that have distinct and separable Laurentian versus Gondwanan domainal affinities.

New mapping in the Raleigh terrane has also yielded data on two and possibly three deformation events associated with the amphibolite facies metamorphism. Northwest- or southeast-plunging F1 folds and S1 foliation overprint mesoscale transposed compositional layers, S0, but are rarely observed. More commonly, northwest-to-southeast-plunging tight to isoclinal folds overprint compositional layering, S0, and have the dominant regional foliation, S2, as their axial surface. It is not clear if this foliation is a regional dextral phyllonitic or dextral mylonitic overprint associated with the Alleghanian orogeny Macon fault zone or a prior mid-to-late Paleozoic deformation. A stretching lineation is commonly oriented subparallel to the F2 fold hinges. The S2 regional phyllonitic or mylonitic foliation is refolded by generally north-northeast to south-southwest plunging, upright to east-vergent tight to chevron to open F3 folds. Lithologic correlations and magmatic and detrital zircon U-Pb analyses that may be able to elucidate the timing of structural events and contrasting tectonic models await future geologic mapping.

PREVIOUS GEOLOGIC MAPPING

Prior geologic investigations pertinent to the southeastern Warrenton Quadrangle include several regional and reconnaissance studies. Parker (1968) defined the structural framework of the North Carolina Eastern Piedmont. A multi-county map by McDaniel (1980) includes Warren County at the 1:100,000 scale. Farrar (1985a, 1985b) mapped the entire eastern Piedmont of North Carolina, defined map units, and proposed a regional stratigraphy and tectonic model. The 1:24,000-scale maps surrounding the southeastern Warrenton Quadrangle include a four-quadrangle area by Stoddard and others (2009) in the Gold Sand and Centerville Quadrangles to the south of Warrenton in the Raleigh and Spring Hope terranes. Peach and Blake (2016) have mapped the eastern portion of the Afton Quadrangle in the Raleigh terrane directly south of Warrenton. The Inez, Hollister, and Littleton Quadrangles (Boltin, 1985; Sacks and others, 2011; Stoddard et al., 2011; Morrow, 2015; Morrow et al., 2016) lie to the east and northeast of Warrenton and also include exposures of the Raleigh and Spring Hope terranes along the Macon and Hollister fault zones. Mapping by Sacks (1996a, 1996b, 1996c) include lithologies of the Raleigh terrane to the north and northeast of Warrenton as well in the Bracey, South Hill SE, and Gasburg Quadrangles. Buford et al. (2007) mapped the western portion of the Raleigh terrane along the Nutbush Creek-Lake Gordon fault zone in the Middleburg Quadrangle just to the west of Warrenton.

DESCRIPTION OF MAP UNITS

The pre-Mesozoic crystalline rocks of the southeastern portion of the Warrenton 1:24,000 Quadrangle appear to be units within the Raleigh terrane or granite of the Wise pluton. The late Paleozoic and Alleghanian orogeny Macon fault zone separating the Raleigh terrane from the Spring Hope terrane to its east (Farrar, 1985b; Sacks, 1999; Morrow, 2015) may overprint the Raleigh terrane here.

While subjected to a variable regional metamorphic overprint, most crystalline schist and gneiss have experienced some degree of dynamic recrystallization and locally display fracture, foliation, and lineation in protomylonite to ultramylonite and phyllonite. Local outcrops of highly silicified or silicified-epidotized cataclasite rock have unclear protolith affinity. Some localities preserve relict plutonic and possibly sedimentary textures, which when combined with bulk mineral assemblages provide criteria for potential protolith identification. The classification of igneous rocks uses the nomenclature of the International Union of Geological Sciences (IUGS) subcommission on the systematics of igneous rocks after Le Maitre (2002). All the Cenozoic-aged geologic materials identified on the map have a detrital origin involving mud- to gravel-sized clasts and occur as part of Tertiary upland sediment deposits or Quaternary stream and floodplain deposits.

SEDIMENTARY UNITS

Qal

Qal – alluvium: Tan-brown, unconsolidated, poorly sorted, angular to subrounded clay, silt, sand and gravel- to cobble sized clasts. Clasts derived from surrounding older metamorphic and plutonic units. Deposited within and along stream drainages as point bar, natural levee, and floodplain sediments.

HYDROTHERMAL UNITS

PzCbq

PzCbq – bull quartz: White to dark gray, gravel to boulder sized clasts of milky and smoky quartz. Outcrops range in size from isolated boulder piles to larger hilltop exposures. Linear ridges of quartz can be identified identified using regularly spaced outcrops. Occurrences of such ridges are possibly related to mineralization along tension gashes and brittle faults.

PzCsc

PzCsc – silicified cataclasite: Green-gray to white, finely crystalline quartz + epidote rock. Locally, this mineral assemblage completely replaces the host rock. Outcrops are generally massive and highly fractured. Its occurrence is suggested to be related to brittle faulting.

INTRUSIVE ROCKS

Jd

Jd – diabase: Melanocratic (CI greater than 80), dark gray to black, fine to medium aphyric to phyric, dense diabase consisting primarily of plagioclase, augite and locally olivine. May be plagioclase phyric. Crops out typically as spheroidally weathered stream and hillside boulders and cobbles. Weathered surfaces are generally tan gray, grayish or brownish in color. Forms vertically to steeply dipping dikes. Red dashed lines link individual station locations where stream outcrops or boulders of diabase are exposed. Red dots indicate isolated outcrops or float occurrences.

PPgw
PPgwl
PPgwp

PPgw – granite of the Wise pluton: Hololeucocratic (CI=5-7), tan to pink white to pink gray, phaneritic and medium crystalline, xenomorphic equigranular biotite granite. The primary mineral assemblage includes Na-plagioclase, microcline, quartz, biotite, and more minor muscovite and garnet. Locally, white mica can increase in abundance to be approximately equal to the biotite content. Mostly undeformed, although locally a very weak biotite foliation may be preserved. Commonly associated with hololeucocratic (CI less than 5) pegmatitic microcline, quartz, Na-plagioclase, and muscovite granite pods and dikes in outcrop. PPgwl is a hololeucratic and aplitic domain within the granite. PPgwp is a quartz white mica pegmatitic granite quarry. Near its eastern border and scattered throughout the pluton, small enclaves and larger pendants of amphibolite facies schist and gneiss are entrained within the biotite granite. Pavement outcrops and exfoliated stream bank outcrops are common.Numerous boulder fields and crosscutting tension fractures are located within the biotite granite.

METAMORPHIC ROCKS OF THE RALEIGH TERRANE

Note: Order of listed units does not imply a stratigraphic sequence, although units that clearly preserve meta-plutonic textures and relationships are listed first.

PzZlgg

PzZlgg – Liberia granodiorite and granodioritic gneiss: Hololeucocratic to leucocratic (CI=5-25), light tan to gray white brown, phaneritic medium-to-coarse-crystalline protomylonitic to mylonitic biotite muscovite granodiorite and locally biotite muscovite granite. Primary mineral assemblage includes relict phaneritic to crystalloblastic microcline, Na-plagioclase, quartz, muscovite, biotite, and locally garnet. May contain xenomorphic prisms or bleddy epidote, allanite, monazite, and apatite crystals. Minor occurrences of biotite are topotaxially replaced by chlorite. Growth of chlorite "rosettes" demonstrates the greenschist facies retrograde overprint of this unit.

Compositionally layered ribbon quartz and porphyritic to porphyroclastic K-feldspar crystals that range from 1 cm to more than 10 cm occur within granodiorite to granodioritic gneiss protomylonite that may transition into granodioritic mylonite and ultramylonite in high-strain zones. Muscovite and locally abundant biotite mark the penetrative mylonitic foliation that asymmetrically wrap winged K-feldspar porphyroclasts and consistently preserve a west-side north sense of fish flash regardless of the steep dip direction of the shear foliation. Recrystallized wings are commonly elongate in the direction of a locally penetrative mineral stretch lineation of quartz-feldspar rods and phyllosilicate aggregates. Locally, granodioritic gneiss is interlayered with mesocratic and porphyroclastic plagioclase biotite tonalite gneiss protomylonite to mylonite. This unit appears to be correlative to the CZmxg unit of Stoddard et al. (2009) and Sacks et al. (2011).

PzZptd

PzZptd – Possumquarter biotite tonalite, quartz diorite, and diorite and gneiss: Chiefly mesocratic (CI=25-50), brownish black to greenish black, phaneritic medium crystalline and commonly white spotted porphyritic to porphyroclastic plagioclase biotite tonalite and tonalite gneiss protomylonite. Primary mineral assemblage includes relict porphyritic plagioclase, biotite greater than hornblende, quartz, sphene, apatite, and opaque minerals. Large readily identifiable K-feldspar crystals were not observed, but may be present in the finer grained, relict igneous matrix. Locally, tonalite contains xenomorphic, and locally zoned epidote crystals and xenoblastic and skeletal garnet porphyroblasts up to 1 cm in diameter. Lower amounts of quartz and biotite mark quartz diorite while hornblende and plagioclase dominate local and less common exposures of diorite. Protomylonitic and mylonitic equivalents of these rocks are commonly observed. A white mica-biotite and quartz ribbon shear foliation as well as degree of crystalloblastic matrix and plagioclase porphyroclast development mark the transition into highly deformed gneissic equivalents. Local winged plagioclase porphyroclasts and asymmetric shear foliation indicate west-side north displacements regardless of the steep dip direction of the shear foliation. Chlorite topotaxially replaces biotite or infill fractures separating skeletal garnet porphyroblasts while plagioclase, especially in diorite, may be saussuritized and sericitized. Growth of chlorite "rosettes" demonstrates the greenschist facies retrograde overprint of this unit.

PzZts

PzZts – actinolite-bearing talc schist: White to tannish white float cobbles and massive to foliated chips of very fine-crystalline talc schist and soapstone are exposed between Possumquarter Creek and Baltimore Road on the southeastern side of Warrenton. Pale green to white, thin actinolite porphyroblasts are primarily visible microscopically as small elongate prisms. The porphyroblasts are randomly distributed in the fine talc matrix. The talc schist is similar to other bodies mapped within the Littleton Quadrangle (Stoddard et al., 2011). There talc schist occurs within biotite gneiss. Contact relationships with adjacent rock types were not readily observed here, and the schist lies along the contact between Possumquarter tonalitic gneiss and Mill Branch chlorite white mica schist described below.

PzYmbs

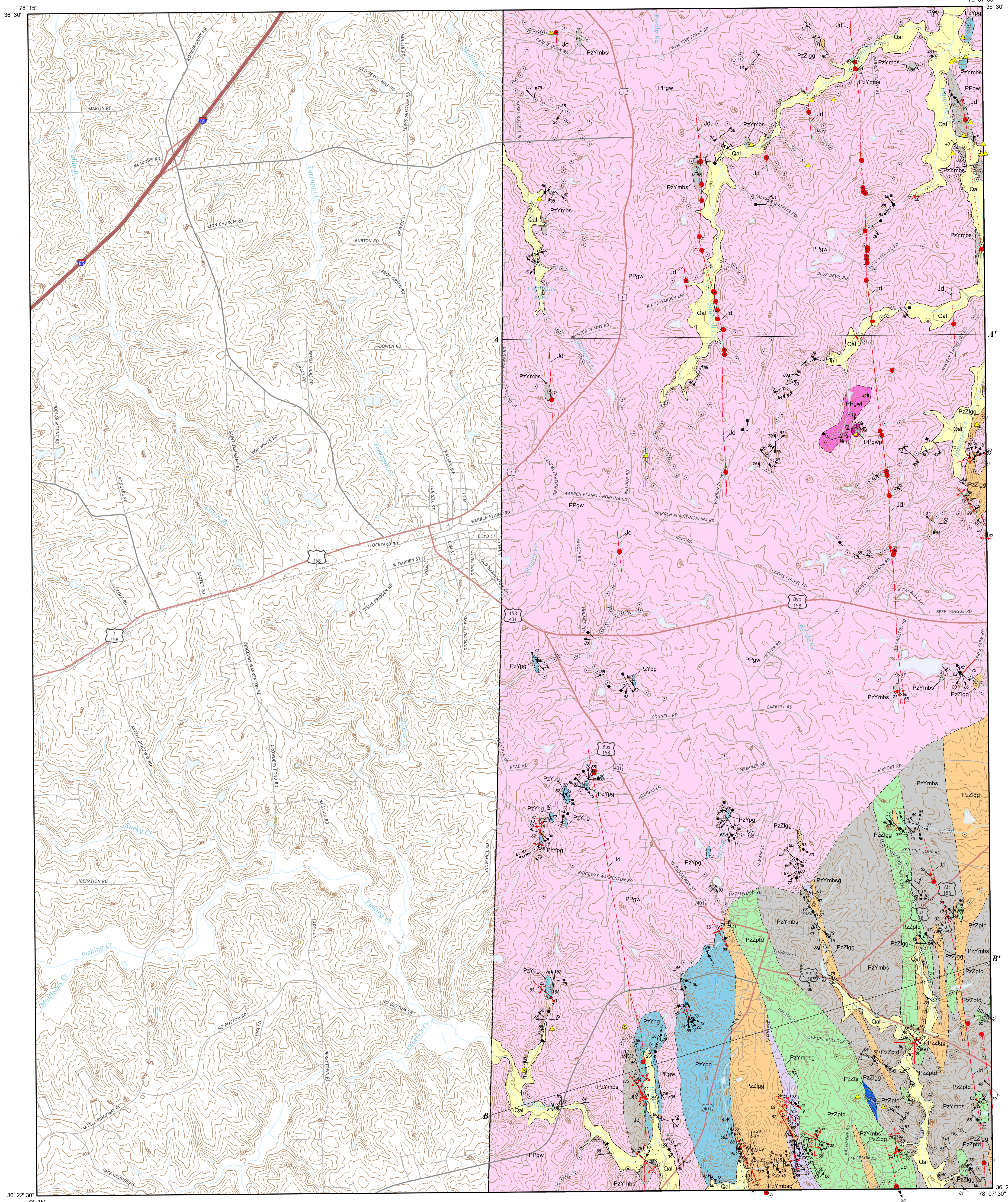
PzYmbs – Mill Branch schist: Leucocratic (CI=20-30) silver green gray to reddish green gray to gray and orange brown, fine-to-medium-crystalline and crystalloblastic quartz white mica schist. White mica, likely muscovite, in any given sample may be large randomly ordered to rosettes of plates between clusters of other minerals, or defines random plates and rosettes between shear foliation domains in phyllonite. Fish flash typically indicates west-side north displacement in a steeply dipping foliation. Quartz ribbons, local foxy red biotite plates, elongate crystals and aggregates of opaque minerals, and very minor epidote contribute to the shear foliation in phyllonite. Domains of quartz-rich versus white mica-rich mineralization appear to be a relict compositional layering, although it is not clear if is a preserved primary sedimentary or shear layering. In some white mica-rich domains, sillimanite prisms up to several cm long as well as fibrolitic sillimanite reside in the white mica matrix. In some samples, optically continuous, but disaggregated prisms of sillimanite appear to be cross cut and replaced by white mica. Small prismatic chloritoid porphyroblasts were identified in one sample. Some felsic clumps in highly deformed and weathered schist appear to be K-feldspar and quartz leucosomes(?). Garnet porphyroblasts are locally developed as small xenoblastic and sometimes sieved porphyroblasts or xenoblastic skeletal or fractured crystals that look like large individual porphyroblasts at the mesoscale. Chlorite replaces garnet along these fractures. Chlorite plates also topotaxially replace biotite and are aggregates in the shear foliation. Growth of chlorite "rosettes" demonstrates the greenschist facies retrograde overprint of this unit. The schist commonly weathers to a rusty red color due to Fe-oxide or Fe-hydroxide and may be a consequence of the breakdown of abundant chlorite, as well as biotite and garnet. The protolith of the schist as a metasedimentary or meta-igneous rock is still not clear, but hydrothermal metasomatism and breakdown of relict feldspars may be a factor in the muscovite as well as schist development. Because of the Mesoproterozoic detrital zircon dates obtained from the Soul City amphibolitic gneiss (Peach et al., 2017) and the unclear protolith relationships in the Mill Branch schist, it is currently inferred to range from the Mesoproterozoic to Paleozoic, hence the PzYmbs unit age notation.

PzYmbsg

PzYmbsg – garnet-rich muscovite biotite schist: Mesocratic (CI=25-50) silver brown to black brown, fine-to-medium-crystalline tourmaline-bearing garnet white mica biotite schist. The abundance of plagioclase, biotite, garnet, and tourmaline prisms mark this unit. Plagioclase commonly occurs as large relict igneous phenocrysts now porphyroclasts similar to those in the Possumquarter tonalite. Foxy red-brown biotite and white mica form a shear foliation that wraps the porphyroclasts and typically yields a west-side north sense of displacement where observed. Small segments and larger ribbons of polygonized quartz also contribute to the shear foliation. Biotite and white mica wrap abundant rounded to elongate xenoblastic to subidioblastic garnet porphyroblasts. They are generally up to 5 mm in diameter and distinctly purple red. Microscopically, their cores are imbedded with fine sieve inclusions, some oriented parallel to the external foliation. Tourmaline prisms are trigonal and black at the mesoscale and are zoned at the microscale. Some prisms have inclusion trails oriented at a high angle to the external shear foliation, and locally biotite and tourmaline are included in plagioclase. Apatite and zircon are common accessory minerals. Chlorite may impart a pale green coloration to some samples. It topotaxially replaces biotite and joins white mica in the shear foliation. Locally it may partially surround some xenoblastic garnet. Growth of chlorite "rosettes" demonstrates the greenschist facies retrograde overprint of this unit. The protolith of the schist as a metasedimentary or meta-igneous rock is still not clear. Relict plagioclase textures suggest that some of the unit may be deformed biotite tonalite, perhaps contaminated with a metasedimentary country rock to produce the garnet. Because of the Mesoproterozoic detrital zircon dates obtained from the Soul City amphibolitic gneiss and the unclear protolith relationships in the garnet-rich muscovite biotite schist unit, it is currently inferred to range from the Mesoproterozoic to Paleozoic, hence the PzYmbsg unit age notation.

PzYpg

PzYpg – Parktown gneiss: Compositionally diverse intermediate and felsic gneiss. Strongly layered mesocratic (CI=35-65) black green to black blue, fine-to-medium crystalline hornblende biotite tonalitic, biotite quartz dioritic, and dioritic gneiss. Their mineralogy includes plagioclase, hornblende, biotite, quartz, local clinopyroxene, magnetite, epidote, garnet, chlorite and opaque minerals. Biotite and white mica are compositionally layered with crystalloblastic quartz and plagioclase and produce a well-developed gneissosity that varies from a few cm to 10s of cm in thickness. Plagioclase porphyroclasts and leucosome stringers of feldspar and quartz are commonly interlayered with more mesocratic gneiss and define trains of porphyroclasts oriented parallel to the shear foliation. Hololeucocratic to leucocratic (CI=5-35) medium gray to gray white to tan white, fine-to-medium crystalline biotite granodioritic to granitic gneiss interlayers are common as well. Locally leucocratic layers contain small relict garnet phenocrysts suggesting a peraluminous composition. Quartz and quartz-epidote veins locally crosscut the foliation and range in thicknes from 1-10mm. White mica, likely muscovite, and biotite contribute to the shear foliation that overprints felsic gneiss. Quartz-feldspar rods and elongate feldspar porphyroclasts combine with phyllosilicates to mark a mineral stretch lineation. Some pink white layers are coarser quartz-feldspar granitic gneiss and are commonly open to ptygmatically folded. The gneissic layering is strongly transposed due to strong mylonitization to ultramylonitization. It is unclear whether any of the layers had a sedimentary origin. Mesoproterozoic detrital zircon dates from the Soul City amphibolitic gneiss to the west of the Parktown gneiss suggest a sedimentary protolith for that layered gneiss. However, numerous layers preserve relict igneous assemblages and features. The Early Devonian magmatic zircon dates from the Parktown gneiss may support the hypothesis that at least some layers are plutonic (Peach et al., 2017). Due to the unclear protolith relationships in the Parktown gneiss, it is currently inferred to range from the Mesoproterozoic to Paleozoic, hence the PzYpg unit age notation.



Produced by the United States Geological Survey.
Altered by the North Carolina Geological Survey for use with map.
North American Datum of 1983 (NAD83)
World Geodetic System of 1984 (WGS84). Projection and 1 000-meter grid: Universal Transverse Mercator, Zone 17S
10 000-foot ticks: North Carolina Coordinate System of 1983

This map is not a legal document. Boundaries may be generalized for this map scale. Private lands within government reservations may not be shown. Obtain permission before entering private lands.

Imagery....NAIP, June 2014
Roads....U.S. Census Bureau, 2015 - 2016
Names....GNIS, 2016
Hydrography....National Hydrography Dataset, 2014
Contours....National Elevation Dataset, 2008
Boundaries....Multiple sources; see metadata file 1972 - 2016

Wetlands....FWS National Wetlands Inventory 1977 - 2014

MN
GN
9° 35´ 171 MILS
1° 40´ 30 MILS
UTM GRID AND 2016 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

U.S. National Grid
100,000-m Square ID
QA
Grid Zone Designation
17S

SCALE 1:24 000

KILOMETERS 1 0.5 0 1 2
METERS 1000 500 0 1000 2000
MILES 1 0.5 0 1
FEET 1000 0 1000 2000 3000 4000 5000 6000 7000 8000 9000 10000

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 0.6.19

NORTH CAROLINA
QUADRANGLE LOCATION

1	2	3
4		5
6	7	8

1 John H Kerr Dam
2 Bracey
3 South Hill SE
4 Middleburg
5 Macon
6 Vicksboro
7 Afton
8 Inez

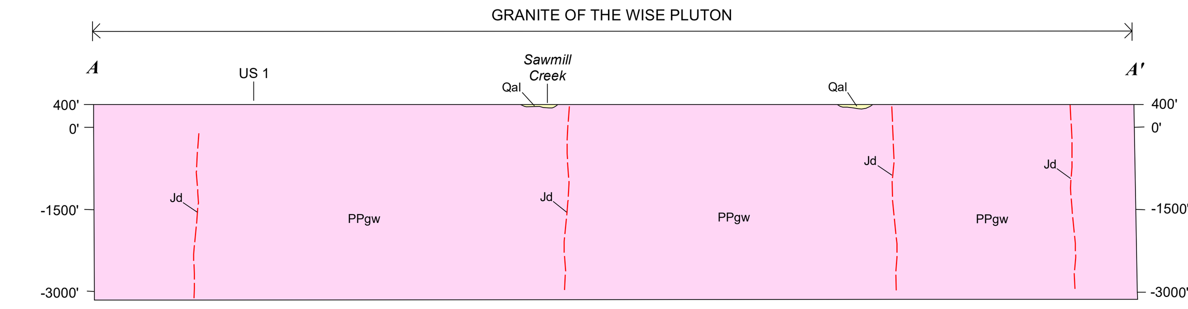
ADJOINING QUADRANGLES

ROAD CLASSIFICATION

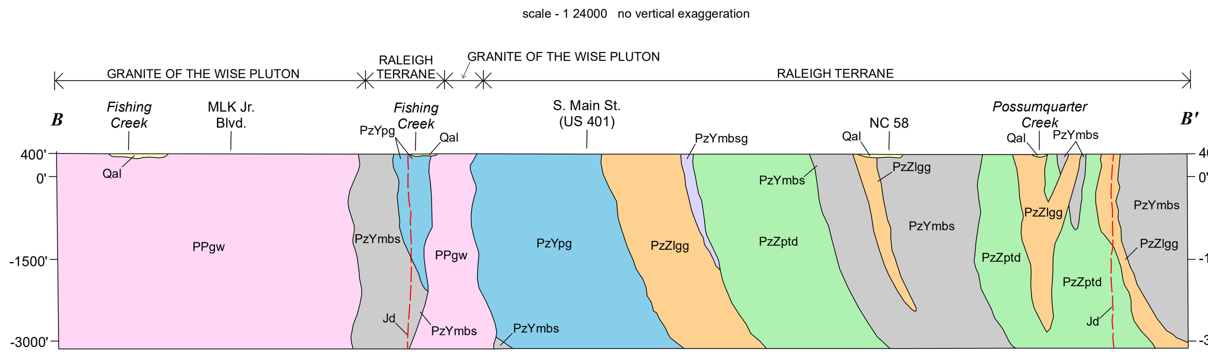
Expressway — Local Connector
Secondary Hwy — Local Road
Ramp — 4WD
Interstate Route — US Route — State Route

WARRENTON, NC

GRANITE OF THE WISE PLUTON



scale - 1 24000 no vertical exaggeration



Geologic Map of the Eastern Half of the Warrenton 7.5-Minute Quadrangle, Warren County, North Carolina

By David E. Blake, Patrick C. Finnerty, Aaron K. Rice, and Jack T. Nolan

Geology mapped under STATEMAP between January and May, 2017 and January and May, 2018.

Digital representation by Michael A. Medina and Philip J. Bradley

2018

EXPLANATION OF MAP SYMBOLS

CONTACTS

- contact
- concealed
- diabase
- diabase concealed
- A — A' cross section

STRUCTURAL SYMBOLS

Observation sites are centered on the strike bar or are at the intersection point of multiple symbols. Planar feature symbols may be comined with linear features.

- 58 strike and dip of foliation
- 70 86 strike and dip of foliation (multiple observations at one location)
- strike of vertical foliation (multiple observations at one location)
- 65 strike and dip of crenulation cleavage
- 25 strike and dip of spaced cleavage (multiple observations at one location)
- 49 strike and dip of shear foliation
- strike of vertical shear foliation
- 53 61 strike and dip of shear foliation (multiple observations at one location)
- strike of vertical shear foliation (multiple observations at one location)
- 46 strike and dip of gneissic layering
- 20 strike and dip of diabase dike trend
- strike of vertical diabase dike trend
- 88 strike and dip of fracture or joint set
- strike of vertical fracture or joint set
- 65 86 strike and dip of fracture or joint set (multiple observations at one location)
- strike of vertical fracture or joint set (multiple observations at one location)
- 62 strike and dip of compositional layering
- 78 strike and dip of fault plane
- 55 strike and dip of axial surface of fold
- strike of vertical axial surface of fold
- 38 strike and dip of slickenside surface
- 26 bearing and plunge of mineral lineation
- 33 bearing and plunge of slickenline lineation
- 12 bearing and plunge of crenulation lineation
- 23 bearing and plunge of fold hinge
- abandoned quarry
- observation station location
- diabase station location
- bull quartz vein station location
- quartz cataclasite station location

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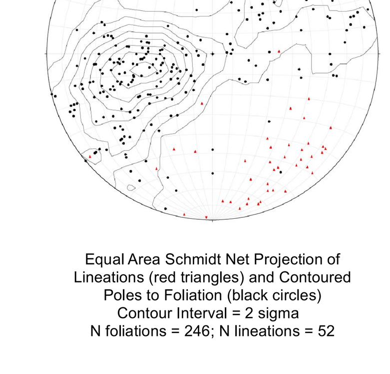
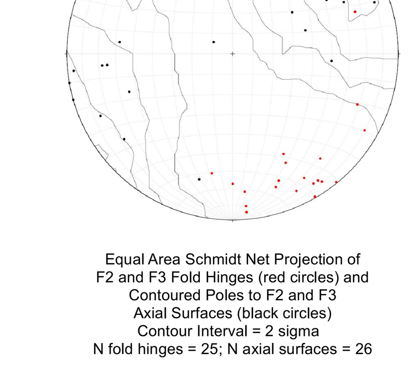
Equal Area Schmidt Net Projections and Rose Diagram

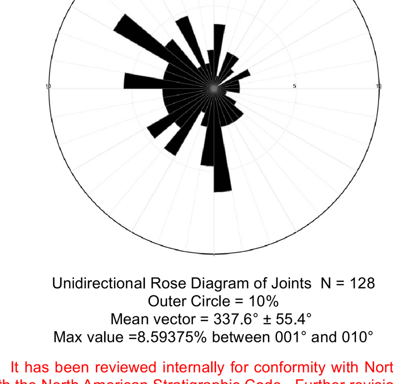
Plots and calculations created using Stereonet v. 8.6.0 based on Allmendinger et al. (2013) and Cardozo and Allmendinger (2013)



Equal Area Schmidt Net Projection of Lineations (red triangles) and Contoured Poles to Foliation (black circles)
Contour Interval = 2 sigma
N foliations = 246; N lineations = 52



Equal Area Schmidt Net Projection of F2 and F3 Fold Hinges (red circles) and Contoured Poles to F2 and F3 Axial Surfaces (black circles)
Contour Interval = 2 sigma
N fold hinges = 25; N axial surfaces = 26



Unidirectional Rose Diagram of Joints N = 128
Outer Circle = 10%
Mean vector = 337.6° ± 55.4°
Max value =8.59375% between 001° and 010°

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.

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