DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES
DIVISION OF LAND RESOURCES
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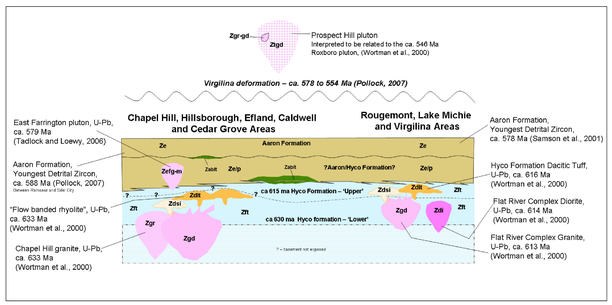
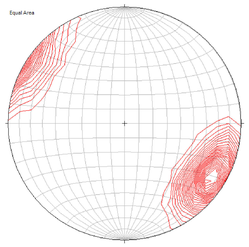
NORTH CAROLINA GEOLOGICAL SURVEY
OPEN FILE REPORT 2010-03

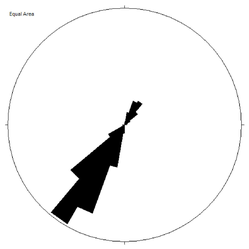
GEOLOGIC MAP OF THE CALDWELL 7.5-MINUTE QUADRANGLE, ORANGE AND PERSON COUNTIES, NORTH CAROLINA
NCGS OPEN FILE REPORT 2010-03



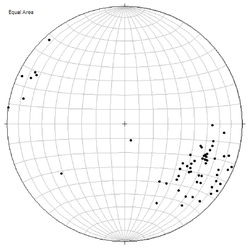
Schematic representation of relationships of geologic units in the Orange County, NC area. Includes geologic units from the Chapel Hill, White Cross, Hillsborough, Efland, Farrington and Northwest Durham geologic maps. Units are part of the Hyco and Aaron Formations of the Virgilina sequence of Harris and Glover (1988).



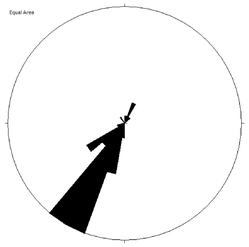
Equal Area Schmidt Net Projection of Contoured Poles to Foliation, and Cleavage
Contour Interval = 2 N = 427



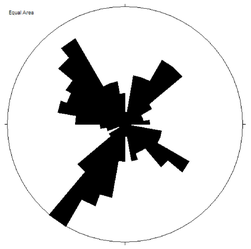
Unidirectional Rose Diagram of Foliations and Cleavage
N = 427 Outer Circle = 26%
Mean dir = 212



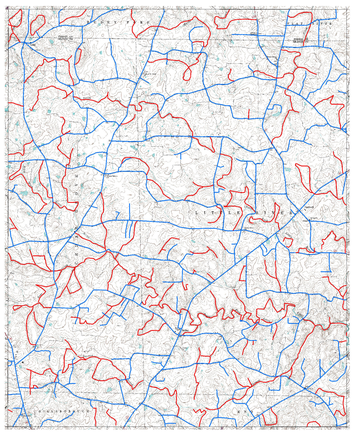
Equal Area Schmidt Net Projection of Poles to Primary Layering, Bedding, Welding/Compaction Foliation, and Flow Banding.
N = 61



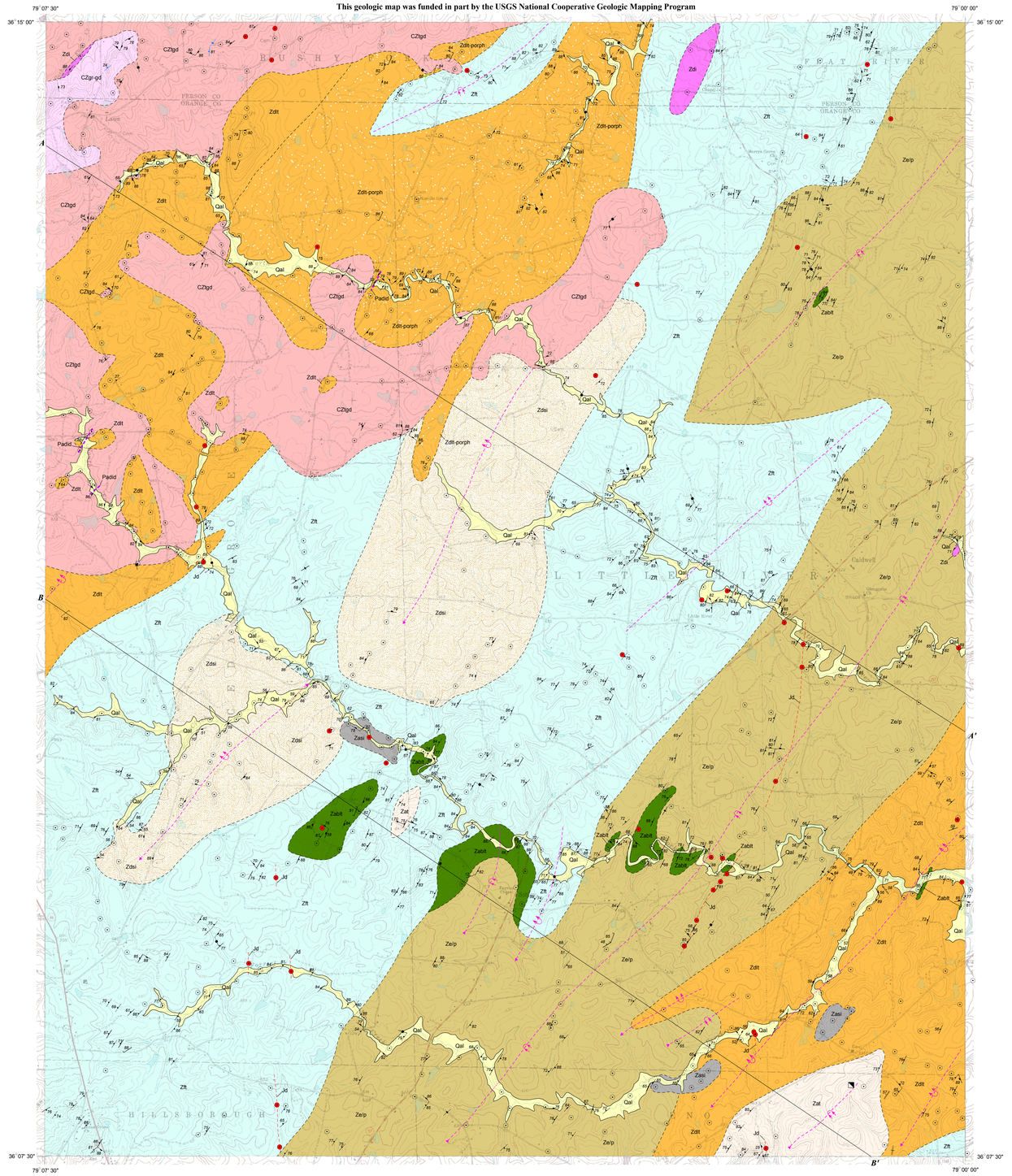
Unidirectional Rose Diagram of Primary Layering, Bedding, Welding/Compaction Foliation, and Flow Banding
N=61 Outer Circle = 26% Mean dir = 215



Unidirectional Rose Diagram of Joints N = 270
Outer Circle = 7% Mean dir = 280



TRAVERSE MAP
traverse by foot
traverse by car



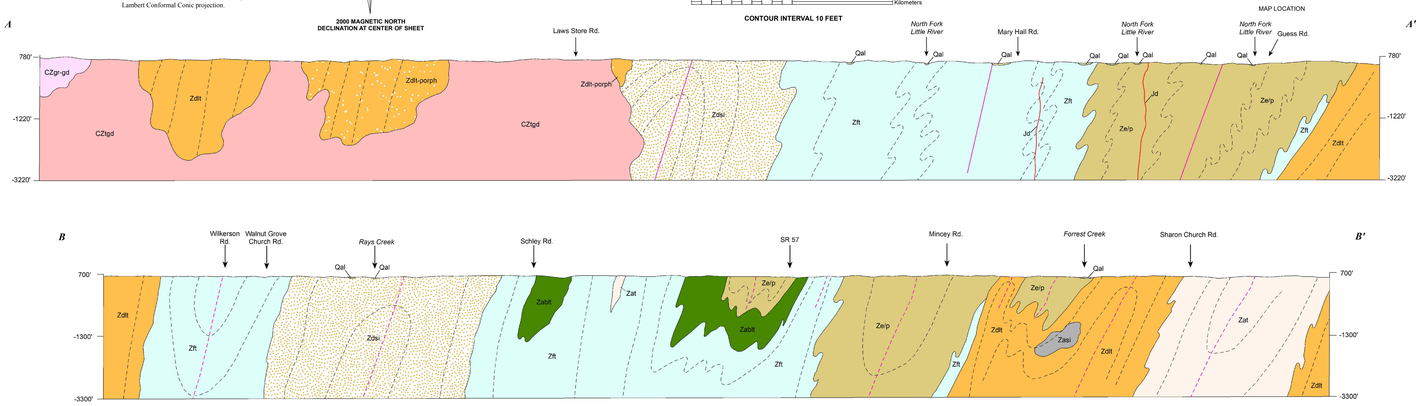
Base topographic map is digital raster graphic image of the Caldwell 7.5-minute quadrangle (1968), North Carolina State Plane NAD 83 meters coordinate system, Lambert Conformal Conic projection.

8 1/2° 191 MILS — MN GN — 1° 9' 20 MILS
2000 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

SCALE 1:24 000
1 0.5 0 1 Miles
1,000 500 0 1,000 2,000 3,000 4,000 5,000 6,000 7,000 Feet
1 0.5 0 1 Kilometers
CONTOUR INTERVAL 10 FEET

Geology mapped from August 2008 through June 2009 and September 2009 through May 2010.

NORTH CAROLINA
MAP LOCATION



GEOLOGIC MAP OF THE CALDWELL 7.5-MINUTE QUADRANGLE, ORANGE AND PERSON COUNTIES, NORTH CAROLINA

By
Philip J. Bradley and Heather D. Hanna

Digital representation by Michael A. Medina, Philip J. Bradley and Heather D. Hanna

2010

DESCRIPTION OF MAP UNITS

All pre-Mesozoic rocks of the Caldwell 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.

The nomenclature of the International Union of Geological Sciences subcommission on igneous and volcanic rocks (IUGS) after Streckeisen (1973 and 1979) 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 the Caldwell quadrangle and adjacent areas (Allen and Wilson, 1968 and Newton, 1983) have used various nomenclature systems for the igneous rocks. The raw data 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).

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 Meta-Intrusive 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.

Padid – Andesite to diorite dikes: Melanocratic to Mesocratic (CI ~50 to greater than 50), dark green to green gray, aphanitic to medium-grained, metamorphosed andesite to diorite. Andesites and diorites are locally plagioclase porphyritic. Typically occur in map area as resistant spheroidal boulders. Locally maybe basaltic to gabbroic. Dike trend lines indicated were strike of dike measured in outcrop or interpreted from adjacent stations. Occur as infestation in Ztgd unit and are present in many more locations than displayed on map.

CZtgd – Prospect Hill tonalitic granodiorite pluton: Unfoliated to locally very weakly foliated, leucocratic (CI less than 10), very light gray to yellowish gray, medium- to coarse-grained, hypidiomorphic granular, metamorphosed tonalitic granodiorite to tonalite. Mafic minerals present in rock are most commonly biotite intergrown with chlorite and/or hornblende intergrown with actinolite. Biotite books (± magnetite intergrowths) up to 2 cm commonly occur in north of Cedar Grove Quadrangle. Locally muscovite bearing. Cross cutting pegmatitic dikes of similar mineralogy present in some areas. Locally biotite forms (magmatic?) foliation. Weathering of rock produces distinctive coarse quartz sand grains in soil. Andesite to diorite dikes (Zadd) are common throughout the pluton and typically occur as resistant spheroidal boulders. Pluton map pattern truncates Virgilina sequence volcanics and pluton contains foliated xenoliths of volcanic rocks; as such, the pluton is interpreted to be related to the Ca. 546 ma Roxboro pluton (Wortman et al., 2000).

CZgr-gd – Granite to granodiorite of the Prospect Hill pluton: Unfoliated, leucocratic (CI less than 10), pinkish gray hued, very light gray to yellowish gray, fine- to medium-grained, equigranular to locally plagioclase porphyritic, hypidiomorphic granular, metamorphosed granite to granodiorite. Major minerals include white feldspars, quartz and ± pink feldspars. Mafic minerals consist of fine-grained biotite/chlorite intergrowths that occur as amorphous masses and acicular shaped zones that resemble amphiboles in hand sample. Mafic mineral clots locally are aligned forming a weak (magmatic?) foliation.

Zdl – Diorite: Mesocratic (CI~50), medium gray, fine- to medium-grained, hypidiomorphic granular diorite. Major minerals include plagioclase and hornblende. Plagioclase crystals are typically sericitized and saussuritized and can occur as phenocryst up to 2 cm diameter. Hornblende is typically altered to chlorite and actinolite masses. Locally hornblende forms (magmatic?) foliation. Includes minor green, fine-grained microdiorite to andesite. Dikes attributed to CZtgd unit intrude diorite bodies locally.

Zasi – Andesitic shallow intrusive: Grayish-green to light green, plagioclase porphyritic andesite with a granular-textured groundmass to very fine-grained diorite (with intrusive texture visible with 7x hand lens). Contains lesser amounts of fine- to medium grained diorite. Plagioclase phenocrysts typically range from 1 mm to 4 mm. Dark green to black colored amphibole, when present, occurs as phenocrysts (less than 1 mm to 1 mm) and as intergrowths with plagioclase. Screens of volcaniclastic rocks are commonly present.

Zdsi – Dacitic shallow intrusive: Grayish-green to light green, plagioclase porphyritic dacite with a granular-textured groundmass to very fine-grained granodiorite (with 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 (less than 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. Locally andesite to diorite and xenoliths of tuffs are present.

Metavolcanic Units

Zat – Altered tuffs: Very light gray to light greenish gray (whitish in areas) with red and yellow mottling. Alteration consists of silicified, sericitized and pyrophyllitized rock. Sericite phyllite, pods of pyrophyllite, and quartz ± phyopyllite rock all with less than 1 mm to 2 mm diameter weathered sulfides are common. Fine-grained chloritoid porphyroblasts (less than 1 mm) are present in some pyrophyllite bearing rocks. Relict lithic clasts and kaolinitized feldspar crystal shards are visible in some exposures. Relict structures are obliterated in heavily altered rocks.

Ze/p - Mixed epiclastic-pyroclastic rocks: Green, 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. Silicified and/or sericitized altered rock similar to Zat unit are present near contacts with other units. Minor andesitic to basaltic lavas and tuffs. Distinctive plagioclase + quartz crystal tuff present in lower zones of unit near contact with Zft unit.

Zablt – Andesitic to basaltic lavas and tuffs: Typically unfoliated, grayish-green, dark gray and black; 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. Weakly foliated to foliated, green to gray to silvery-gray, coarse to lapilli tuffs are associated with the lavas.

Zft - Felsic tuffs: Grayish- green to greenish-gray, silvery-gray, and gray, massive to foliated, volcaniclastic pyroclastic rocks consisting of fine- to coarse tuffs, lapilli tuffs and minor welded tuffs. Layering ranges from massive to thinly bedded. Contains lesser amounts of volcaniclastic sedimentary rocks consisting of volcanic sandstones, and greywackes with minor siltstones and phyllite. Minor andesitic to basaltic lavas and tuffs. Distinctive plagioclase + quartz crystal tuff present in unit in higher stratigraphic zones near the Ze/p unit.

Zdlt - Dacitic lavas and tuffs: Distinctive dark-gray to black, siliceous, cryptocrystalline dacite, porphyritic dacite with plagioclase ± quartz 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 magma that were extrusive 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.

Zdlt-porph – Porphyritic dacite associated with Zdlt: Dominantly light gray to medium dark gray, porphyritic dacite. Acicular shaped zones of mafic mineral phenocrysts resemble amphiboles in hand sample and consist of fine-grained actinolite/chlorite(?) intergrowths under 20 X magnification. Dacites are locally siliceous and flow banded. Unit may contain tuffs and is interpreted as a very shallow intrusive closely associated with Zdlt domes.

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EXPLANATION OF MAP SYMBOLS

CONTACTS

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

- contact - location inferred
- contact - location concealed
- diabase dike - location inferred
- in cross section, interpreted fold form lines of non-cylindrical asymmetric folds
- A — A' cross section line
- inferred fold hinge of plunging overturned anticline, dotted where concealed
- inferred fold hinge of plunging overturned syncline, dotted where concealed
- inferred fold hinge of doubly plunging overturned anticline, dotted where concealed
- in cross section, inferred axial trace of large-scale fold

LINEAR FEATURE

70 Bearing and plunge of mineral lineation

PLANAR FEATURES

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

- 66 strike and dip of primary bedding and layering
- 81 strike and dip of overturned primary bedding and layering
- 75 strike and dip of primary volcanic compaction and/or welding foliation
- vertical primary volcanic compaction and/or welding foliation
- 52 strike and dip of primary flow banding
- 88 strike and dip of foliation
- vertical foliation
- 81 strike and dip of cleavage
- 72 strike and dip of spaced cleavage
- vertical spaced cleavage
- 87 strike and dip of high strain foliation
- vertical high strain foliation
- 86 strike and dip of magmatic (?) foliation defined by aligned biotite or amphibole within the Prospect Hill pluton
- 42 strike and dip of foliation of xenolith within Prospect Hill pluton
- 84 strike and dip of joint
- vertical joint
- approximate location of the Murray pyrophyllite prospect (Allen and Wilson, 1968)
- diabase station location
- observation station location

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GEOLOGICAL SURVEY N.C. 1823

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