DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES
DIVISION OF LAND RESOURCES
JAMES D. SIMONS, STATE GEOLOGIST

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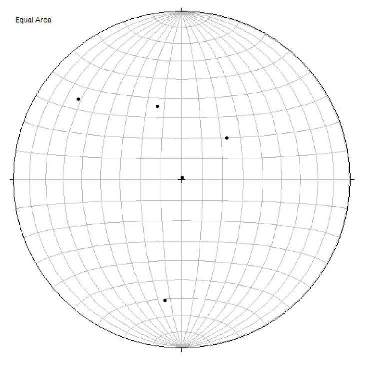
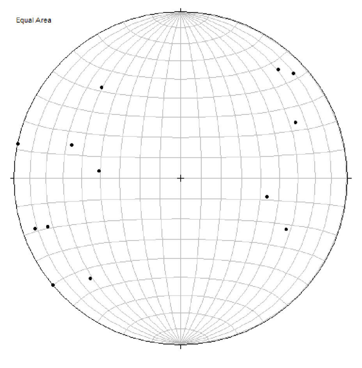
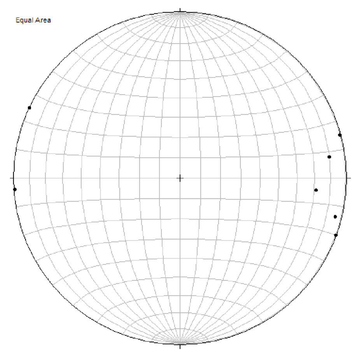
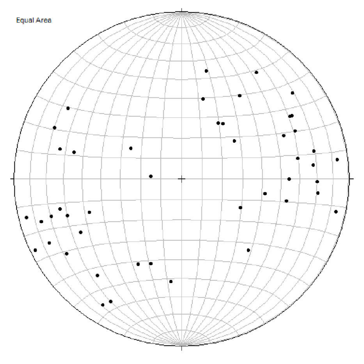
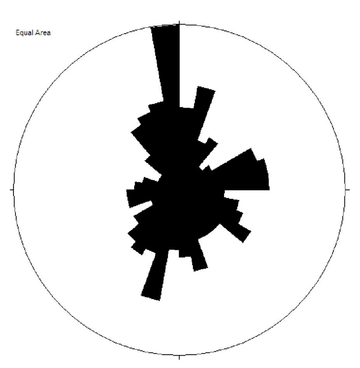
NORTH CAROLINA GEOLOGICAL SURVEY
OPEN FILE REPORT 2010-06

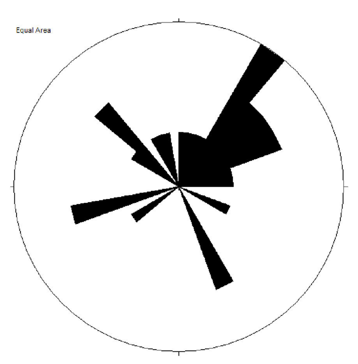

Equal Area Schmidt Net Projection of Lineations, includes fold hinges, crenulation lineations and stretching lineations
N = 6

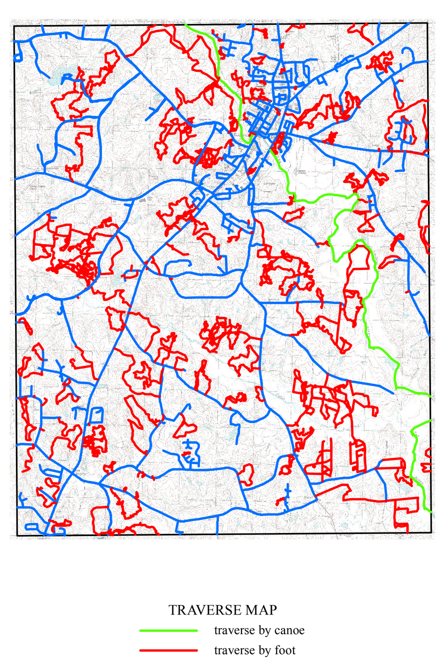

Equal Area Schmidt Net Projection of Primary Foliation of Country Rock Xenoliths in Granite.
N = 13

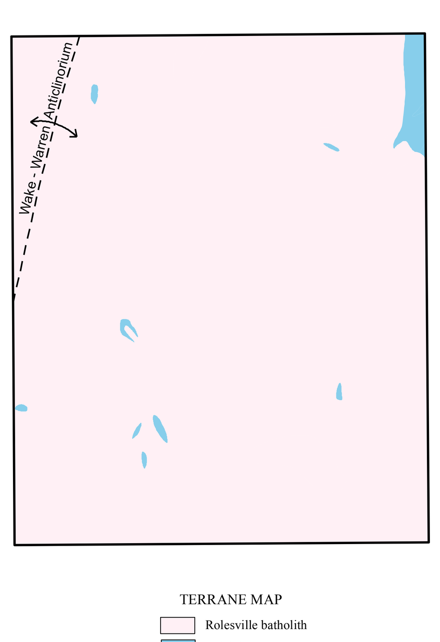

Equal Area Schmidt Net Projection of Regional Foliation (Gneissic Banding or Primary Schistosity)
N = 7

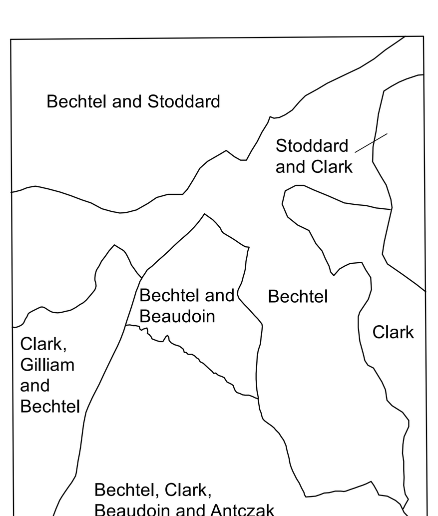

Equal Area Schmidt Net Projection of Biotite Schlieren, Biotite Foliation or Feldspar Foliation in Granite.
N = 47


Unidirectional Rose Diagram of Joints
N = 314 Outer Circle = 7%
Mean dir = 60

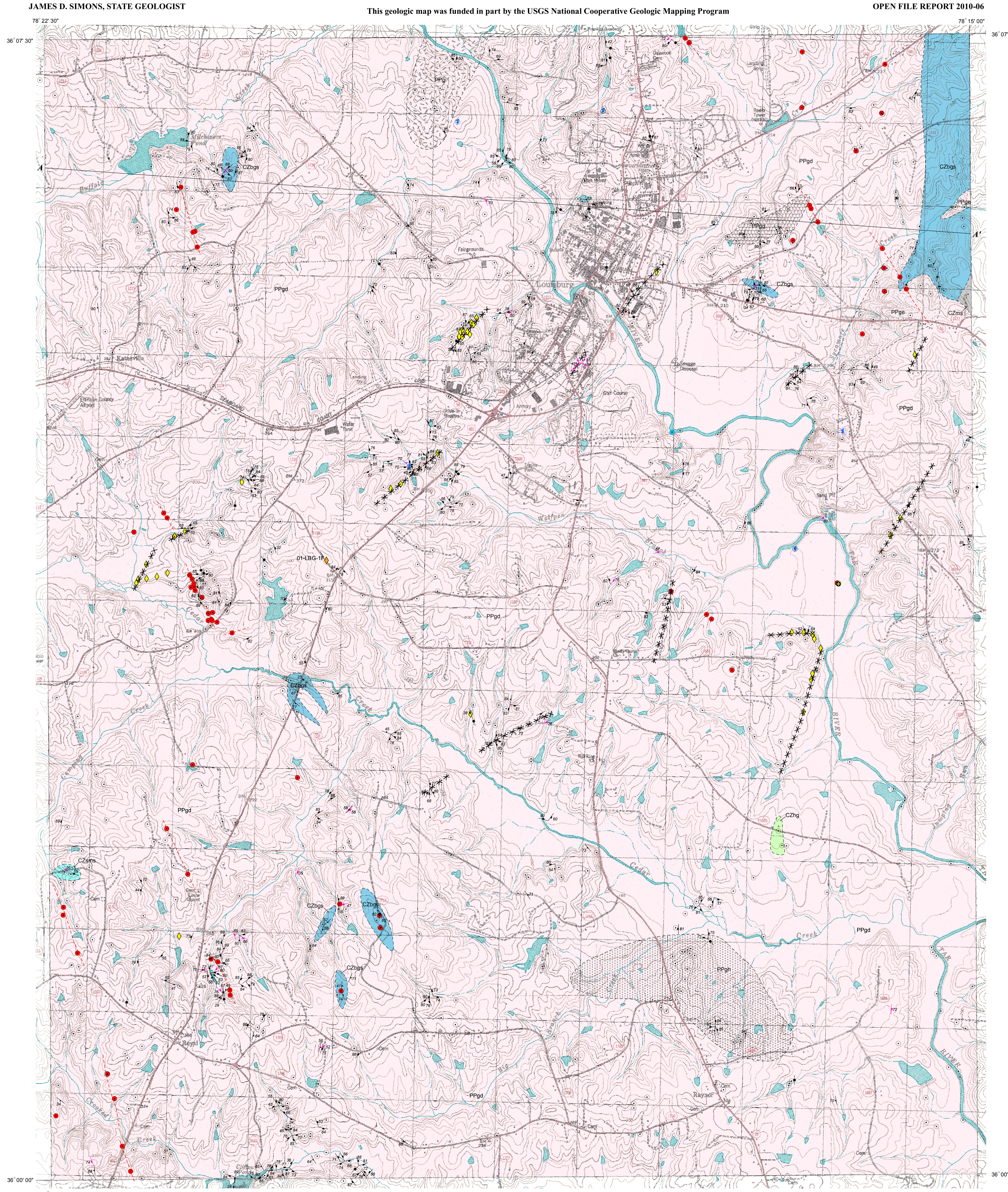

Unidirectional Rose Diagram of Pegmatite Dikes and Quartz Veins
N = 25 Outer Circle = 12%
Mean dir = 27


TRAVERSE MAP
traverse by canoe
traverse by foot
traverse by car

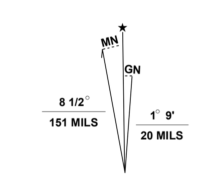

TERRANE MAP
Rolesville batholith
Raleigh terrane



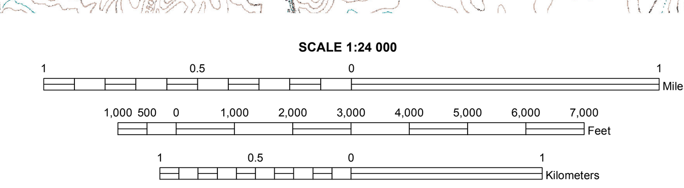
INDEX TO GEOLOGIC MAPPING



Base topographic map is digital raster graphic image of the Louisburg 7.5-minute quadrangle (1970). North Carolina State Plane NAD 83 meters coordinate system, Lambert Conformal Conic projection.

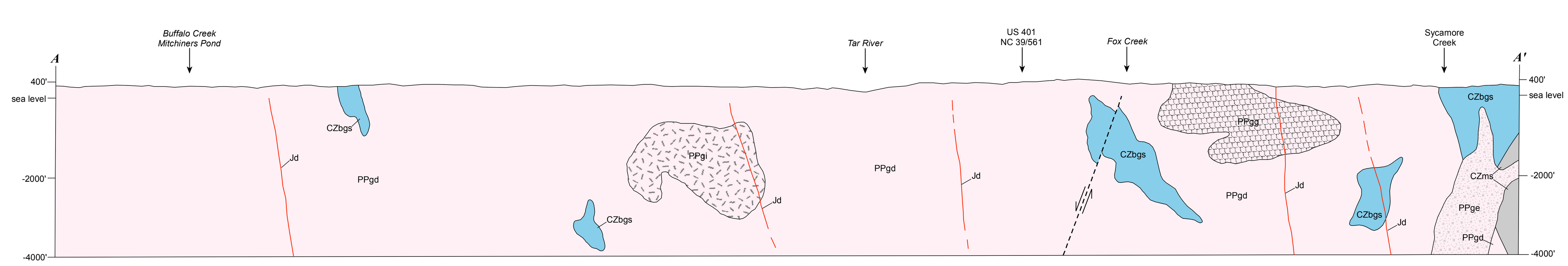


2000 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET



CONTOUR INTERVAL 10 FEET

MAP LOCATION



cross section scale 1:24 000
no vertical exaggeration

BEDROCK GEOLOGIC MAP OF THE LOUISBURG 7.5-MINUTE QUADRANGLE, FRANKLIN COUNTY, NORTH CAROLINA

By
Randy Bechtel, Edward F. Stoddard, Timothy W. Clark, Amanda L. P. Beaudoin, Chris Gilliam and George Antczak

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

2010

INTRODUCTION AND PREVIOUS MAPPING

The Louisburg 7.5-minute quadrangle is in central Franklin County, North Carolina. Louisburg, the county seat, lies along the Tar River in the north-central part of the quad. A number of highways converge from all directions at Louisburg: US Highway 401 and NC Highways 39, 56, 581, and 561. In addition to Louisburg, the quad contains the unincorporated communities of Katesville, Royal, and Raynor.

The Tar River enters the north-central edge of the quad, flowing SSE through Louisburg and exiting the quadrangle's southeastern corner, draining toward the southeast. Significant creeks in the quad, all tributaries to the Tar River, are Cedar, Fox, Sycamore, Buffalo, Camping, Crooked, and Big Branch Creeks, plus Wolfpen Branch and Jumping Run. Total relief in the quad is just over 200 feet, with elevations above sea level ranging from about 386 feet at Royal to approximately 168 feet where the Tar River leaves the quad at the southeast corner. The Tar River and the lower portions of many of its tributaries, notably Cedar Creek, have broad well-developed floodplains (not mapped).

The Louisburg quadrangle is almost entirely underlain by granitoid rocks belonging to the late Paleozoic (Alleghanian) Rolesville batholith. The granites are intrusive into gneisses and schists of the Raleigh terrane, interpreted as an infrastructural component of a Neoproterozoic volcanic arc (Hibbard and others, 2002). Just to the northeast of Louisburg, the Macon fault separates the Raleigh terrane from the suprastructural Spring Hope terrane (Fuemmeler, 2004; Stoddard and others, 2009). Two Raleigh terrane map-units (CZbgs and CZms), lying just west of the Macon fault, enter the extreme northeastern corner of the quadrangle, and exhibit features indicating ductile deformation. Other than in the northeastern corner, metamorphic rocks occur in the quad only as xenoliths within granite. In addition, Jurassic dikes of olivine diabase are common in the area, most trending north-northwest, as are linear zones of siliceous breccia, mostly northeast-trending, which are thought to represent brittle faulting of Mesozoic age (cf. Heller and others, 1998).

Prior to this investigation, little geologic mapping had been undertaken in the quadrangle, although it has been included in a number of regional and reconnaissance studies. Parker (1968) defined the structural framework of the region. McDaniel (1980) mapped a multi-county region, including Franklin County, at a scale of 1:100,000, and first identified siliceous breccia zones in the area. Farrar (1985a, b) mapped the entire eastern Piedmont of North Carolina, defined map units for the region, and proposed a model for the tectonic evolution of the region. As part of a regional radon assessment, Speer (unpublished) undertook reconnaissance mapping of the Rolesville batholith. He (Speer, 1994) also presented a map showing some granitoid plutons of the batholith, and describing some of their constituent facies. Sacks (1996a, b, c, d) mapped a strip of four 7.5-minute quadrangles along the Virginia-North Carolina border, along strike to the north-northeast.

Adjacent to the field area, 1:24,000-scale mapping has been done for the Justice quadrangle to the east (Stoddard and others, 2009), the Ingleside quadrangle to the north (Stoddard, 2010) and the Franklinton quadrangle to the west (Phillips and others, 2002). To the south, the Rolesville quadrangle has been mapped at the 1:100,000 scale as part of the Raleigh sheet (Clark and others, 2004).

DESCRIPTION OF MAP UNITS

HYDROTHERMAL UNIT

qrx

qrx - quartz rock and quartz breccia: Sizable accumulations of massive, milky quartz, commonly with vuggy crystals of clear, milky, or smoky quartz ranging from 1 mm to 5 cm. Locally includes brecciated and silicified granitoid rock having networks of thin quartz veins. Likely the result of quartz mineralization along brittle fracture zones or faults. Probable fault-surface features, including slickenlines, observed rarely in float. On the basis of linear arrays of such quartz occurrences, several fault segments are inferred and are depicted on the map as linear quartz breccia zones with trends typically NE-SW. Several good exposures occur near downtown Louisburg. One is along the northeast-trending ridge located just west of US Highway 401, south of its intersection with NC Highway 56; another is in the abandoned excavations just west of several businesses on US 401 South (South Bickett Blvd.); another at several businesses just east of North Bickett Blvd., just north of the Tar River bridge. At one location in the Ingleside quad (Stoddard, 2010), a fault is inferred to pre-date diabase dike (Jd) intrusion. Because the opposite relationship has been observed in the Middleburg quad to the northwest, it appears that diabase intrusion and brittle faulting in the eastern Piedmont were more or less contemporaneous in the Jurassic. On the map, yellow diamonds not associated with mapped breccia zones indicate isolated outcrops or major float occurrences of qrx.

INTRUSIVE UNITS

Jd

Jd – diabase: Fine to medium-grained, equigranular to locally plagioclase porphyritic diabase, typically olivine-bearing. Commonly weathers to black to tan-gray, spheroidal boulders and cobbles. Occurs in vertical to steeply dipping dikes. The traces of the larger dikes correlate with and may be partly inferred on the basis of linear magnetic highs. In the Louisburg quad, nearly all diabase dikes trend NW to NNW; one large NNW-trending dike, possibly 50 m in width, crosses US Highway 401 just south of Crooked Creek in the southwestern corner of the quad. A dike with similar trend can be seen just north of Cedar Creek just west of SR 1109 (Timberlake Rd.); an ENE-trending dike segment is mapped just east of SR 1109 (Timberlake Rd.) in the same vicinity. On the map, red dots indicate isolated outcrops or float occurrences of diabase.

Granitoid rocks of the Rolesville batholith

The Rolesville batholith is a large, composite granitoid intrusive complex in the Piedmont of North Carolina. It is elongate parallel to the typical north-northeast regional strike, and generally lies along the axial trace of the Wake – Warren anticlinorium, which passes through the Louisburg quad. Field evidence indicates that the Rolesville plutons intruded during or after the peak of regional metamorphism, and very limited radio-metric age-dates indicate that they crystallized and cooled during the Pennsylvanian and Permian periods (Fullagar and Butler, 1979; Horton and Stern, 1994; Schneider and Samson, 2001). Previous studies dealing with the Rolesville batholith in the area covered by this map include those of Parker (1968), Becker and Farrar (1977), Farrar (1985a, b), Speer (1994), Speer and others (1994), and Speer and Hoff (1997). Two related granitoid plutons, the Castalia and the Gupton, dominate the Justice quadrangle immediately east of the Louisburg quad (Stoddard and others, 2009).

The Rolesville batholith as mapped in the Louisburg quadrangle includes five mapped facies detailed below. The dominant facies, PPgd, underlies over 90% of the map. Leucogranite PPge lies in the northeast. Granitic pegmatite bodies are associated with all of the mapped granitoids.

PPge

PPge – granitoid facies e: Fine to medium-grained, non-porphyritic, locally foliated muscovite +/- garnet +/- biotite leucogranite. CI less than 5. Occurs in the northeastern Louisburg quadrangle and the adjacent Justice quadrangle; it is exposed in a roadcut on NC Highway 56/581 just east of Sycamore Creek in the northeast Louisburg quad (LB694).

PPgd

PPgd – granitoid facies d: Fine to coarse-grained, but primarily medium-grained equigranular to moderately porphyritic (very rarely megacrystic), rarely foliated, pink or salmon and white biotite monzogranite. Commonly has an almost idiomorphic fabric with well-formed alkali feldspar and plagioclase grains. CI = 5 - 12. Contains common biotite schlieren and local biotite crystal clots. Pegmatite dikes and pods are extremely common; locally, isolated xenocrysts of alkali feldspar 1 - 4 cm in length also occur. Unit also contains relatively common xenoliths of Raleigh terrane country rocks. Less commonly contains autoliths of fine granodiorite or tonalite and may display igneous layering between biotite-rich and biotite-poor phases. Weathered surfaces are commonly nubbly, friable and/or cavernous. Chemical analysis from station 01-LBG-1F from the west-central Louisburg quad along SR 1110 (E. F. Cottrell Rd.) has 70.55 wt% SiO_2, normative Q:A:P of 28:29:43 and normative 20.1% An. Likely equivalent to the Rolesville main phase of Speer (1994) but generally lacks muscovite.

PPgh

PPgh – granitoid facies h: White to tan, fine to medium grained, equigranular to weakly K-feldspar porphyritic, biotite +/- muscovite syenogranite to monzogranite. Locally carries a weak foliation of robust biotite flakes. Occurs in the southeastern Louisburg quad, south of Cedar Creek west of its confluence with the Tar River, and elsewhere as unmapped pods (autoliths?) associated with PPgd. Locally, dikes of PPgd cut rocks similar to PPgh, PPgg, and Ppgi. CI = 8 – 18.

PPgg

PPgg – granitoid facies g: Fine to medium-grained, white to pale gray biotite monzogranite to granodiorite. Locally carries a weak biotite foliation. Rare anhedral to subhedral garnet less than 1mm. May be cut by thin pegmatite dikes having beige to white-colored alkali feldspar. Displays gray to white weathering surfaces, but is distinctively more resistant to weathering when compared to the other granitoid phases. CI = 8 – 14. Occurs in the northeastern Louisburg quad; good examples near Terrell Lane Middle School, located between NC Highway 561 and NC Highway 56.

PPgi

PPgi – granitoid facies i: Fine-grained to medium-grained white, light gray, or tan, equigranular to weakly porphyritic biotite +/- muscovite granite, locally with pink alkali feldspar. Locally contains alkali feldspar xenocrysts up to 8 mm in length, but does not contain schlieren or xenoliths and contains fewer pegmatite dikes than most other granitoid phases. CI = 5 – 12. Extends from north-central Louisburg quad into south-central Ingleside quad.

METAMORPHIC ROCKS OF THE RALEIGH TERRANE

CZsms

CZsms - muscovite-biotite sillimanite schist: Gray to golden or white, fine to coarse-grained, well foliated schist with abundant sillimanite; may also contain pyrite and/or garnet. Locally strongly and chaotically crenulated and/or rusty or maroon weathering. Contains both prismatic and fibrous varieties of sillimanite, with mats of sillimanite overgrown by coarse muscovite. Occurs in the southwest Louisburg quad along SR 1111 (Cooke Rd.), as an apparent xenolith associated with granite, pegmatite, and leucogranite.

CZbgs

CZbgs - biotite gneiss and schist: Medium to dark gray, fine to medium grained, moderately to well foliated biotite-quartz-plagioclase+/-alkali feldspar gneiss and schist. Varies from non-banded biotite granitoid gneiss to variably banded biotite gneiss to schistose biotite gneiss and biotite schist. Rarely includes zones of hornblende-biotite schist, hornblende gneiss, or quartzofeldspathic gneiss with or without biotite and/or muscovite. Locally carries garnet, epidote, or sulfide minerals. Locally associated with dikes and/or sills of pegmatite and/or leucogranite. In the northeastern corner of the Louisburg quad, the unit extends into the neighboring quads; it also occurs as xenoliths within granitoid bodies, as in the excellent exposures on Cedar Creek at the US Highway 401 bridge and along the access road to the Franklin County airport (SR 1798 or Airport Dr.). It also occurs in extensive saprolitic exposures at Pruitt Lumber Company just north of US Highway 56/581, east of Louisburg between Fox and Sycamore Creeks. Smaller xenoliths are indicated by point symbols within granitoid rock.

CZms

CZms - muscovite schist: Silvery gray to dark greenish gray, medium grained, well-foliated schist commonly with well developed button foliation interpreted as an S-C shear fabric indicating subhorizontal right-lateral shear related to the Macon fault zone. Varies from muscovite schist to chlorite-muscovite schist. Extends into the neighboring Justice quad from a very small area at the extreme eastern edge of the Louisburg quad, just north of the intersection between US Highway 56/581 and SR 1421 (Hickory Rock Rd.).

CZhg

CZhg - hornblende gneiss: Grayish green to greenish black, fine to medium grained, poorly to moderately foliated hornblende-plagioclase gneiss and amphibolite. May contain biotite or epidote. May be conspicuously banded or massive; locally contains hornblende porphyroblasts to one cm. Where biotite content is high may be somewhat schistose. Occurs as xenoliths within granitoid bodies. A single larger body is mapped as a pod along SR 1605 (Julie Pearce Rd.) in the south-central Louisburg quad, while smaller xenoliths are indicated by point symbols within granitoid rock.

ACKNOWLEDGMENTS

We wish to thank Phil Bradley and Heather Hanna, who assisted with office work and logistics, as well as Jonathan Leidheiser-Stoddard, Karen Clark, and Jim Hibbard, who assisted with canoe traverses on the Tar River. We gratefully acknowledge Steve Stadelman for his help in the field and Novozymes for access to their property, as well as the many private landowners who graciously permitted access to their property. We also thank Allen DeHart for giving a tour of DeHart Botanical Gardens.

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EXPLANATION OF MAP SYMBOLS

CONTACTS

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

contact - location inferred

quartz breccia zone - location inferred

diabase dike - location inferred

LINEAR FEATURE

Bearing and plunge of feldspar lineation in granite

Bearing and plunge of crenulation 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.

strike and dip of foliation
strike of vertical foliation
strike and dip of foliation of xenolith
strike of vertical foliation of xenolith
strike and dip of joint
strike and dip of vertical joint
strike and dip of quartz vein and/or pegmatite dike
diabase station location
01-LBG-1F geochemical station location
biotite gneiss xenolith with granite
biotite schist xenolith with granite
hornblende gneiss xenolith with granite
observation station location

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