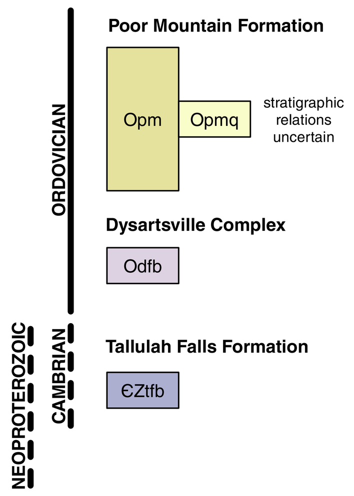
North Carolina Department of Environmental Quality
Division of Energy, Mineral and Land Resources
Kenneth B. Taylor, State Geologist

North Carolina Geological Survey
Open File Report 2018-12

This geologic map was funded in part by the USGS National Cooperative Geologic Mapping Program.

CORRELATION OF MAP UNITS



INTRODUCTION

The Shingle Hollow 7.5-minute quadrangle is in the southwestern portion of the Piedmont physiographic province in Polk and Rutherford counties, North Carolina. The quadrangle lies west of Rutherfordton, NC and northeast of Columbus, NC. It is located within the Rutherfordton-Spindale-Forest City metropolitan projected growth area. The major transportation corridor is U.S. Highway Alt 74. Total elevation relief is 1161 feet with a low of 774 feet on the Broad River and a high of 1935 feet on Toms Mountain. Major water features include the Broad River and its tributaries, Cove Creek and Mountain Creek.

GEOLOGIC OVERVIEW

Bedrock of the Shingle Hollow quadrangle comprises the following units of the Tugaloo terrane (Hatcher and others, 2007): Neoproterozoic to early Cambrian Tallulah Falls Formations (TFF); Neoproterozoic to Ordovician Dysartsville Complex (DC); and Ordovician Poor Mountain Formation (PMF). These units are interpreted to lie within the Six Mile Thrust Sheet of Griffin (1974).

The TFF consists of meta-sedimentary and meta-igneous rocks interpreted to have been deposited in a distal marine basin outboard of the Laurentian rifted margin (Hatcher and others, 2007). TFF rocks on the quadrangle have been metamorphosed to upper amphibolite facies and are migmatitic.

The DC is an undifferentiated unit composed of complexly interlayered felsic and biotite gneisses with minor interlayers of other lithologies commonly found in the TFF and PMF. These felsic and biotite gneisses are interpreted to be related to the Dysartsville gneiss, a tonalite mapped north of the quadrangle with a U-Pb crystallization age of 468 ± 8 Ma (Bream 1999, 2003). In its type area the Dysartsville gneiss is interpreted to intrude the TFF, but no sharp contacts have been observed on the Shingle Hollow quadrangle. Instead, locally observable transitions from felsic gneiss to biotite gneiss leaves the possibility that some components of the Dysartsville Complex are composed of diatexite migmatite and granitic magma formed through extensive anatexis of the TFF.

The PMF contains sillimanite-grade meta-sedimentary units interlayered with mafic and felsic meta-volcanic rocks. The PMF is interpreted to be unconformably deposited on the TFF and DC. Alternatively, it is possible that the contact with underlying units may be faulted in places as evidenced by shearing and mylonitization in PMF rocks. The PMF is generally more resistant to weathering and occupies topographic highs on much of the southern and eastern portions of the quadrangle.

The TFF, DC, and PMF are intruded by a younger, coarse-grained granitoid. This granitoid is unmappable at 1:24,000-scale.

In the NW section of the quadrangle, a ductile thrust fault places a composite thrust sheet of TFF/DC/PMF structurally on top of the PMF. This inverted stratigraphy differs from other sections of the quadrangle and surrounding quadrangles where the PMF is structurally and stratigraphically higher than the TFF.

Foliations generally strike NE-SW and most dip less than 35 degrees to the SE. Prominent ESE-WNW and WSW-ENE joint sets were identified on the quadrangle.

REFERENCES

Bream, B.R., 1999, Structural and Stratigraphic Relationships of Ortho- and Paragneisses Southwest of Marion, North Carolina [Master's Thesis]: Knoxville, University of Tennessee, 155 p.

Bream, B.R., 2003, Tectonic Implications of Para- and Orthogneiss: Geochronology and Geochemistry from the Southern Appalachian Crystalline Core [Ph.D. dissertation]: Knoxville, University of Tennessee, 296 p.

Griffin, V.S., 1974, Analysis of the Piedmont in Northwest South Carolina, Geological Society of America Bulletin, v.85, p. 1123-1138.

Hatcher, R.D., Jr., Bream, B.R., and Merschat, A.J., 2007, Tectonic map of the southern and central Appalachians: A tale of three orogens and a complete Wilson cycle, in Hatcher, R.D., Jr., Carlson, M.P., McBride, J.H., and Martínez Catalán, J.R., eds., 4-D Framework of Continental Crust: Geological Society of America Memoir 200, p. 595–632.

DESCRIPTION OF MAP UNITS

Poor Mountain Formation (PMF)

Opm — **Undivided** — Heterogeneous unit of metagraywacke, schist, amphibolite, quartzite, metasandstone, meta-arkose, quartzo-feldspathic gneiss, and calc-silicate.

Metagraywacke — medium-light-gray to medium-dark-gray; medium- to coarse-grained; foliated; locally mylonitic; equigranular to inequigranular; granoblastic to lepidoblastic; locally migmatitic; consists of quartz, plagioclase feldspar, biotite, muscovite, potassium feldspar, garnet, minor sericite and accessory minerals, and trace opaque minerals.

Schist — silvery-gray to light-reddish-gray; fine- to medium-grained; inequigranular; lepidoblastic and porphyroblastic; typically has a sheared (S-C) fabric; locally migmatitic; consists of muscovite, sillimanite, biotite, garnet, quartz, feldspar, and trace opaque minerals, tourmaline, and apatite.

Calc-silicate — light-gray; medium- to coarse-grained; weakly foliated; consists of quartz, feldspar, epidote group minerals, garnet, biotite, and trace chlorite. Locally interlayered with amphibolite.

Amphibolite — locally present structurally beneath metasandstone, quartzite, and meta-arkose layers and as a minor rock type throughout other map units of the Poor Mountain Formation. Amphibolite is typically mottled white to dark-green to black; fine- to coarse-grained; foliated; equigranular to nematoblastic; consists of hornblende, plagioclase, biotite, epidote group minerals, quartz, and minor garnet, chlorite, pyroxene, titanite, and opaque minerals. Locally interlayered with calc-silicate.

Opmq — **Metasandstone/Quartzite/Meta-arkose** — Very pale-orange to grayish-orange to grayish-purple; dusky-yellowish-brown on weathered surfaces; fine- to medium-grained; foliated; equigranular; granoblastic; consists of quartz, potassium feldspar, plagioclase feldspar, garnet, biotite, muscovite, epidote, sillimanite, and opaque minerals. Interlayered with lesser amounts of metagraywacke, schist, quartzo-feldspathic gneiss, and amphibolite.

Dysartsville Complex (DC)

Odfb — **Felsic and biotite gneisses** — Undifferentiated unit composed of complexly interlayered felsic gneiss and biotite gneiss with minor interlayers of amphibolite, pelitic schist, metagraywacke, and metasandstone of the TFF, as well as hornblende gneiss of uncertain affinity. Felsic gneiss — light-tan to light-gray; fine- to coarse-grained; semi-massive to foliated; consists of quartz, plagioclase, potassium feldspar, biotite, white mica, epidote group minerals, hornblende, minor chlorite, and trace opaque minerals. Biotite gneiss — typically gray to grayish-black; medium- to coarse-grained; well foliated; compositionally layered; locally protomylonitic; inequigranular; locally porphyroblastic to lepidoblastic; migmatitic; consists of plagioclase, quartz, biotite, potassium feldspar, muscovite, garnet, epidote group minerals, chlorite, and opaque minerals.

Hornblende gneiss — mottled white to greenish-black on fresh surfaces; weathered surfaces are mottled white to dark-reddish-brown; medium- to coarse-grained; foliated; massive to well-layered; equigranular; migmatitic; consists of hornblende, plagioclase, quartz, biotite, epidote group minerals, titanite, actinolite, magnetite, minor muscovite and opaque minerals, and trace apatite, monazite, chlorite, and zircon. Biotite granitic gneiss layers within hornblende gneiss are gray to grayish-black; medium- to coarse-grained; foliated; migmatitic; consists of plagioclase, quartz, biotite, muscovite, hornblende, minor epidote group minerals, sericite, and trace apatite.

Tallulah Falls Formation (TFF)

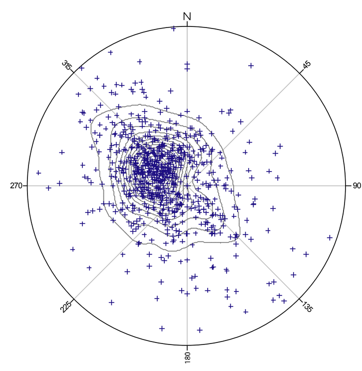
€Ztfb — **Biotite gneiss** — Heterogeneous unit consisting of biotite gneiss interlayered with lesser amounts of metagraywacke, schistose metagraywacke, mica schist, metasandstone, amphibolite, felsic gneiss, and hornblende-biotite gneiss. Biotite gneiss is typically gray to grayish-black; medium- to coarse-grained; well foliated; compositionally layered; locally protomylonitic; inequigranular; locally porphyroblastic to lepidoblastic; migmatitic; consists of plagioclase, quartz, biotite, potassium feldspar, muscovite, garnet, epidote group minerals, chlorite, and opaque minerals. Commonly interlayered with other TFF and DC lithologies.

Metagraywacke — medium-light-gray to medium-dark-gray; medium- to coarse-grained; foliated (ranges from massive to gneissic); equigranular to inequigranular; granoblastic to lepidoblastic; migmatitic; consists of quartz, plagioclase, biotite, muscovite, potassium feldspar, garnet, and minor garnet, and opaque minerals, thickness of layering ranges from decimeters to meters. Interlayered at all scales with other TFF and DC lithologies.

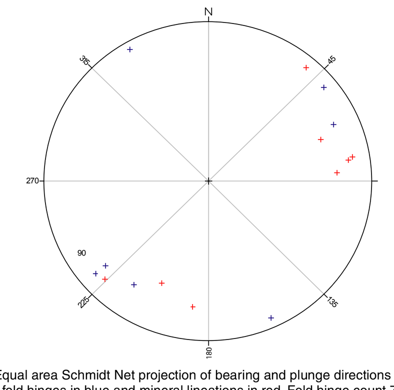
Amphibolite — amphibolite is typically mottled white to dark-green to black; fine- to coarse-grained; foliated; equigranular to nematoblastic; consists of hornblende, plagioclase, biotite, epidote group minerals, quartz, and minor garnet, chlorite, pyroxene, titanite, and opaque minerals. Commonly interlayered with other TFF and DC lithologies.

Mineral abundances are listed in decreasing order of abundance based upon visual estimates of hand samples and thin sections.

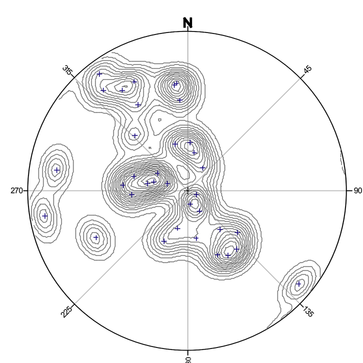
SCHMIDT EQUAL AREA STEREONET DATA



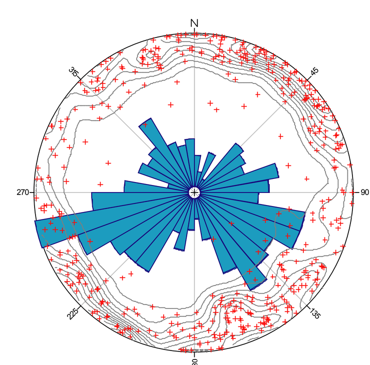
Equal area Schmidt Net projection of contoured poles to foliation. Foliation count 769.



Equal area Schmidt Net projection of bearing and plunge directions of fold hinges in blue and mineral lineations in red. Fold hinge count 7. Mineral lineation count 8.



Equal area Schmidt Net projection of contoured poles to mylonitic foliation. Foliation count 35.



Equal area Schmidt Net projection of contoured poles to joints and unidirectional rose-diagram inset. Joint count 471.

STREAM SEDIMENT HEAVY MINERAL ANALYSIS

Stream sediment heavy mineral analysis was conducted from March 2017 through April 2017 to aid geologic mapping, better define conditions of metamorphism, and inventory minerals of potential economic significance. Procedure: In the field, approximately 13.6 kg of stream sediment material was panned to approximately 300 g of heavy mineral concentrate at each sample locality. In the laboratory, concentrate was washed and passed through heavy liquid separation using tetrabromoethane, and scanned with short- and long-wave ultraviolet illumination using an Ultra-violet Products Inc. Model UVGL-48 Mineralight Lamp. Magnetite was removed with a hand magnet. A sample split was grain mounted on a standard 27x46 mm glass slide and approximately 300 grains are identified and counted with the aid of a petrographic microscope and 1.67 index of refraction oil. Results of stream sediment heavy mineral analysis are tabulated below.

Mineral abbreviations used in table: Mg-magnetite; Gt-garnet; Zr-zircon; Bt-biotite; Rt-rutile; Czo- clinozoisite; Ep-epidote; St-staurolite; Sil-sillimanite; Hbl-hornblende; Ttn-titanite; Tur-tourmaline; Ilm-ilmenite and other black opaque minerals; Hem-hematite and other red opaque minerals; Lx-leucoxene; Ud-unidentified.

SAMPLE[1]	COORDINATES (State Plane, NAD 83 m)	MAP UNITS DRAINED[2]	% TOTAL HM IN SAMPLE[3]	PERCENT HEAVY MINERALS IN SAMPLE[4]															
				Mg	Gt	Zr	Bt	Rt	Czo	Ep	St	Sil	Hbl	Ttn	Tur	Ilm	Hem	Lx	Ud
NB218	185,484N; 330,790E	Opm, €Ztfb	0.21	9.50	3.17	1.81	0.91	-	-	4.53	3.17	0.91	40.73	0.91	-	25.34	6.79	2.26	-
NB219	189,761N; 330,621E	Odfb	0.38	51.72	1.69	3.14	0.48	0.24	5.55	5.79	0.48	-	8.93	1.21	-	19.31	1.21	-	0.24
NB220	190,319N; 334,711E	€Ztfb, Odfb	0.40	9.48	-	19.01	1.36	0.91	2.72	6.79	-	1.81	1.36	13.58	0.45	40.28	1.81	-	0.45
NB221	188,214N; 327,852E	Odfb	0.56	71.57	2.56	3.41	0.43	-	0.57	5.12	-	0.14	10.66	1.56	-	2.27	1.00	0.71	-
NB225	185,620N; 336,059E	Opm	0.73	1.64	2.46	2.46	1.48	0.98	2.95	3.93	2.46	0.98	62.95	2.95	0.98	13.28	-	-	0.49

[1]Sample numbers correspond to stream sediment heavy mineral sample localities shown on geologic map.
[2]Up to three most dominant map units contributing to the drainage basin, listed in decending order of map area.
[3]Percentage of heavy minerals in 13.6 kg stream sediment sample.
[4]Point count percentages of heavy minerals from processed samples.

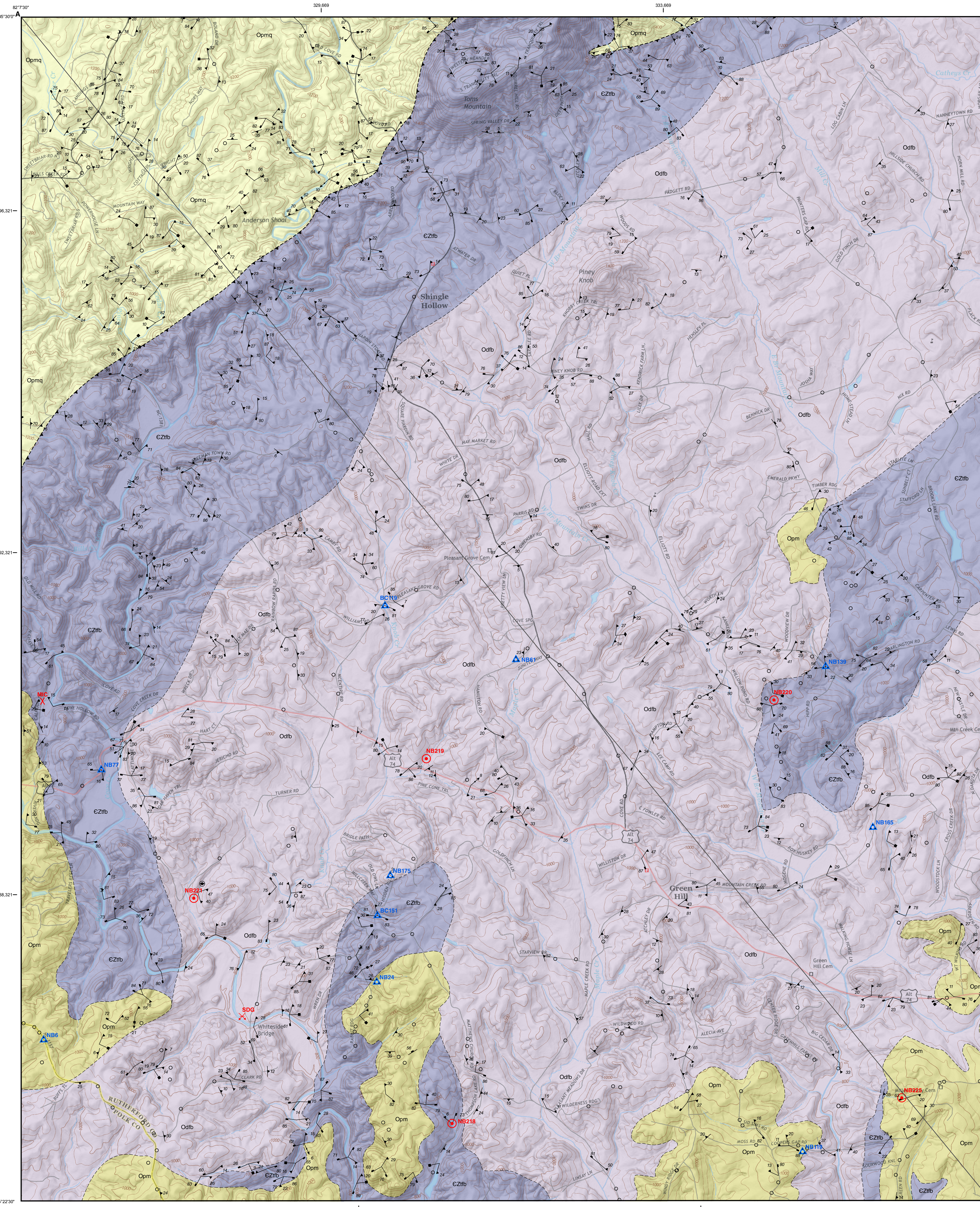
WHOLE ROCK ICP ANALYSIS[1] OF SELECTED SAMPLES

SAMPLE[2]	COORDINATES (State Plane, NAD 83 m)	ROCK TYPE[3]	MAP UNIT	OXIDES IN PERCENT: SiO_2	Al_2O_3	Fe_2O_3	MgO	CaO	Na_2O	K_2O	TiO_2	P_2O_5	MnO	Cr_2O_3	LOI[4]	Sum[5]
NB6	186,612N; 326,045E	metagraywacke	Opm	65.95	16.5	5.12	1.62	1.34	2.72	1.56	0.4	0.07	0.07	0.003	4.5	99.88
NB24	187,165N; 329,961E	bt-hbl-epi-quartzo-feldspathic gneiss	Opm	67.79	14.77	5.86	0.55	4.4	3.75	0.79	0.49	0.1	0.09	0.003	1.2	99.86
NB119	185,024N; 334,878E	amphibolite & hbl-epi calc-silicate gneiss	Opm	61.86	14.4	6.03	4.06	8.2	2.6	0.71	0.34	0.05	0.14	0.004	1.5	99.88
BC151	187,943N; 329,993E	hbl-epi-calc-silicate gneiss	€Ztfb	66.64	13.38	6.15	1.14	9.3	1.21	0.14	0.77	0.38	0.14	<0.002	0.7	99.9
NB139	190,691N; 335,327E	ms-bt-quartzo-feldspathic gneiss	€Ztfb	65.6	15.23	6.88	1.75	1.89	2.35	3.61	0.95	0.17	0.11	0.008	1.2	99.83
NB77	189,749N; 326,818E	biotite granitic gneiss	€Ztfb	76.14	12.53	2.02	0.32	1.5	2.66	3.31	0.12	0.02	0.04	<0.002	1.2	99.93
NB61	190,886N; 331,709E	meta-arkose	Odfb	87.61	5.72	1.73	0.13	1.08	0.38	0.08	0.34	0.05	0.03	<0.002	2.8	99.91
NB165	188,793N; 335,822E	biotite granitic gneiss	Odfb	73.27	13.51	2.5	0.65	1.45	2.24	1.81	0.23	0.06	0.04	0.002	4.1	99.91
NB175	188,405N; 330,158E	bt-hbl-quartzo-felspathic gneiss	Odfb	74.33	13.57	2.14	0.45	2.64	3.08	0.26	0.25	0.04	0.03	<0.002	3.1	99.92
BC119	191,564N; 330,197E	amphibolite	Odfb	48.76	14.88	12.16	8.24	9.51	3.66	0.74	0.5	0.06	0.19	0.091	1.1	99.89

SAMPLE	ELEMENTS IN PPM[6]: Ba	Ni	Sc	Be	Co	Cs	Ga	Hf	Nb	Rb	Sn	Sr	Ta	Th	U	V	W	Zr	Y	La	Ce	Pr
NB6	132	<20	20	2	8.5	2.1	18.5	5.1	11.3	74.7	3	64	0.7	6.2	1.7	64	<0.5	183.9	16.3	23.8	44.5	5.67
NB24	244	<20	23	<1	13.3	<0.1	16.9	4.2	8.6	14.6	1	233	0.6	5.4	1.7	117	<0.5	144.8	22.5	19.5	40	4.99
NB119	150	26	20	2	18.5	<0.1	14.9	3.2	4.7	18.7	1	187	0.4	6.5	2.3	121	<0.5	112.4	20.5	14.3	31.5	3.94
BC151	46	<20	22	<1	4.3	<0.1	23.3	1.5	1.8	<0.1	2	276.7	0.1	1.3	0.9	57	1.4	51.7	27.8	6.5	16.3	2.43
NB139	665	22	14	3	12.8	1.4	23.8	8.6	18.9	126.7	2	194.6	1	8.4	2.5	83	0.8	321.4	39	33.6	66.6	8.55
NB77	777	<20	5	1	2.6	0.5	13.5	2.9	1.9	73.2	<1	57.1	<0.1	6.7	1	12	<0.5	88	2.4	1.9	15.6	0.49
NB61	21	<20	13	1	1.7	<0.1	6.8	5	5.3	<0.1	<1	34	0.3	2.8	1.5	16	<0.5	193.7	15.2	7.1	16.4	2.12
NB165	544	<20	4	2	6.1	0.1	15.8	3.5	4.5	48.1	<1	112.5	0.1	7.3	0.6	27	<0.5	112.4	5.1	17.4	68.9	3.49
NB175	85	<20	12	3	2.6	<0.1	14.5	3.1	3.2	2.3	1	146.6	0.3	2.6	1.3	9	<0.5	100.7	17.2	4.4	31.9	1.39
BC119	54	157	42	<1	50.6	<0.1	15.4	1.1	0.8	9.7	<1	82.2	<0.1	1	0.2	261	<0.5	35.9	13.7	2.9	7.3	1.05

SAMPLE	Nd	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu	Mo	Cu	Pb	Zn	Ni	As	Cd	Sb	Bi	Ag	Au	Hg	Tl	Se
NB6	21.3	4.1	0.72	3.78	0.54	3.22	0.62	1.81	0.27	1.92	0.3	2.6	27	15.6	84	11.3	<0.5	<0.1	<0.1	<0.1	<0.1	<0.5	<0.01	0.4	<0.5
NB24	19.8	4.13	0.93	4.02	0.66	3.92	0.87	2.46	0.38	2.55	0.4	1.1	7	3.4	47	3.7	0.5	<0.1	0.1	<0.1	<0.1	<0.5	<0.01	<0.1	<0.5
NB119	15	3.25	0.71	3.22	0.58	3.52	0.76	2.4	0.36	2.36	0.39	0.6	5.9	5.7	19	8.9	<0.5	<0.1	<0.1	<0.1	<0.1	1.5	<0.01	<0.1	<0.5
BC151	11.6	3.63	1.05	4.3	0.75	4.63	1.06	3.04	0.47	3.17	0.49	1.3	2.6	1.5	11	2	0.8	<0.1	<0.1	0.4	<0.1	<0.5	<0.01	<0.1	<0.5
NB139	32.6	6.73	1.37	6.57	1.06	6.59	1.47	4.23	0.64	4.07	0.64	2.1	16.9	4.5	89	19.7	<0.5	<0.1	<0.1	<0.1	<0.1	1.4	<0.01	0.5	<0.5
NB77	1.7	0.3	0.13	0.36	0.06	0.48	0.1	0.34	0.06	0.55	0.1	1.1	5	4.1	20	2	<0.5	<0.1	<0.1	<0.1	<0.1	<0.5	<0.01	<0.1	<0.5
NB61	9	2.27	0.38	2.46	0.42	3.01	0.68	2.15	0.36	2.63	0.46	1.1	4.4	1.8	4	3.6	<0.5	<0.1	<0.1	<0.1	<0.1	<0.5	0.01	<0.1	<0.5
NB165	12.8	2.37	0.56	2.01	0.26	1.38	0.24	0.66	0.09	0.76	0.11	1.1	5.7	3.9	32	3.5	<0.5	<0.1	<0.1	<0.1	<0.1	<0.5	<0.01	0.2	<0.5
NB175	6.4	2.13	0.57	2.94	0.58	3.71	0.82	2.73	0.44	3.56	0.6	1.4	5	2.5	11	2.2	<0.5	<0.1	<0.1	<0.1	<0.1	1.8	<0.01	<0.1	<0.5
BC119	4.9	1.43	0.55	1.92	0.35	2.39	0.53	1.73	0.24	1.71	0.25	0.8	17.2	1.6	26	51.7	<0.5	<0.1	<0.1	<0.1	<0.1	<0.5	<0.01	<0.1	<0.5

[1]Whole Rock Inductively Coupled Plasma - Atomic Emission/Mass Spectrometer analysis conducted by Bureau Veritas, 9050 Shaughnessy St, Vancouver, BC Canada V6P 6E5.
[2]Sample numbers correspond to thin section and whole rock sample localities shown on geologic map.
[3]Mineral abbreviations used in table: bt-biotite; epi-epidote; hbl-hornblende; ms-muscovite.
[4]LOI = loss on ignition in percent.
[5]SUM = Sum total in percent.
[6]PPM = parts per million. Ni analyzed by Bureau Veritas LF200 and AQ200 procedures.



Topographic base produced by the United States Geological Survey. Altered by the North Carolina Geological Survey for use with this map.

Roads....©2006-2012 TomTom
Names....GNIS, 2013
Hydrography....National Hydrography Dataset, 2012
Contours....National Elevation Dataset, 2008
Boundaries....Census, IBWC, IBC, USGS, 1972 - 2012

UTM GRID AND 2013 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

U.S. National Grid
100,000-m Square ID
LV | MV
Grid Zone Designation
17S

SCALE 1:24 000

CONTOUR INTERVAL 40 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 0.6.11

ADJOINING 7.5' QUADRANGLES

Moffitt Hill	Sugar Hill	Glenwood
Lake Lure	Shingle Hollow	Rutherfordton North
Mill Spring	Pea Ridge	Rutherfordton South

SHINGLE HOLLOW, NC
2013

EXPLANATION OF MAP SYMBOLS

CONTACTS

Contact—Identity and existence certain, location inferred

Thrust fault—Identity and existence certain, location inferred. Sawteeth on upper (tectonically higher) plate.

PLANAR FEATURES

(For multiple observations at one locality, symbols are joined at the "tail" ends of the strike lines)

- Inclined metamorphic or tectonic foliation—Showing strike and dip
- Inclined metamorphic or tectonic foliation, for multiple observations at one locality—Showing strike and dip
- Vertical metamorphic or tectonic foliation—Showing strike
- Vertical metamorphic or tectonic foliation, for multiple observations at one locality—Showing strike
- Inclined mylonitic foliation—Showing strike and dip
- Inclined mylonitic foliation, for multiple observations at one locality—Showing strike and dip
- Horizontal metamorphic or tectonic foliation
- Small, minor inclined joint—Showing strike and dip
- Small, minor inclined joint, for multiple observations at one locality—Showing strike and dip
- Small, minor vertical or near-vertical joint, for multiple observations at one locality—Showing strike

LINEAR FEATURES

- Inclined aligned-mineral lineation—Showing bearing and plunge
- Inclined lineation at intersection of two foliations—Showing bearing and plunge
- Inclined fold hinge of generic (type or orientation unspecified) small, minor fold—Showing bearing and plunge

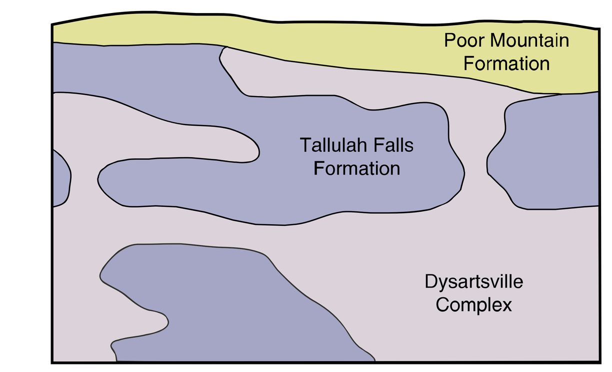
OTHER FEATURES

- Float station
- NB206 Thin section and whole rock analysis sample location
- NB392 Heavy mineral sample location
- Prospect (pit or small open cut)
- Abandoned sand, gravel, clay, or placer pit

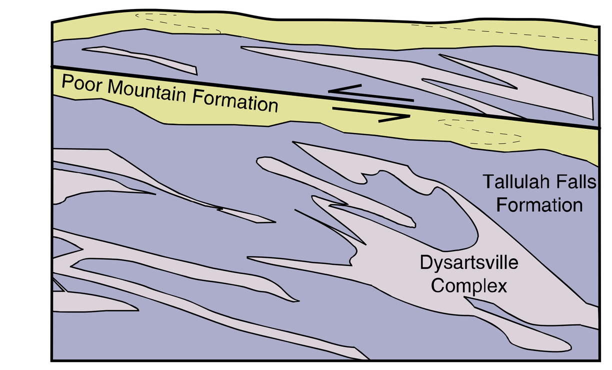
NATURAL RESOURCES

SDG - Sand and gravel MIC - Mica

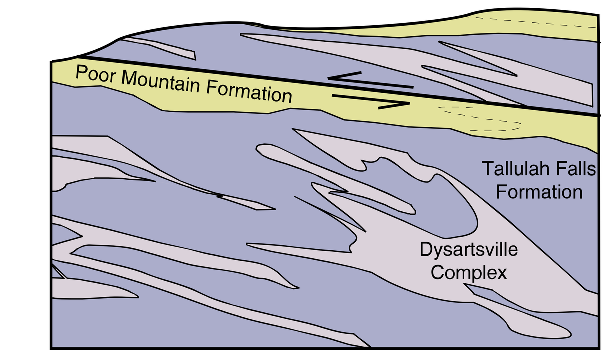
GENERALIZED STRATIGRAPHY AND SEQUENCE OF TECTONIC EVENTS IN CROSS-SECTIONAL VIEW



Ordovician
Intrusion(?)/formation of Dysartsville Complex synchronous with deformation and metamorphism of Tallulah Falls Formation. Followed by deposition of Poor Mountain Formation



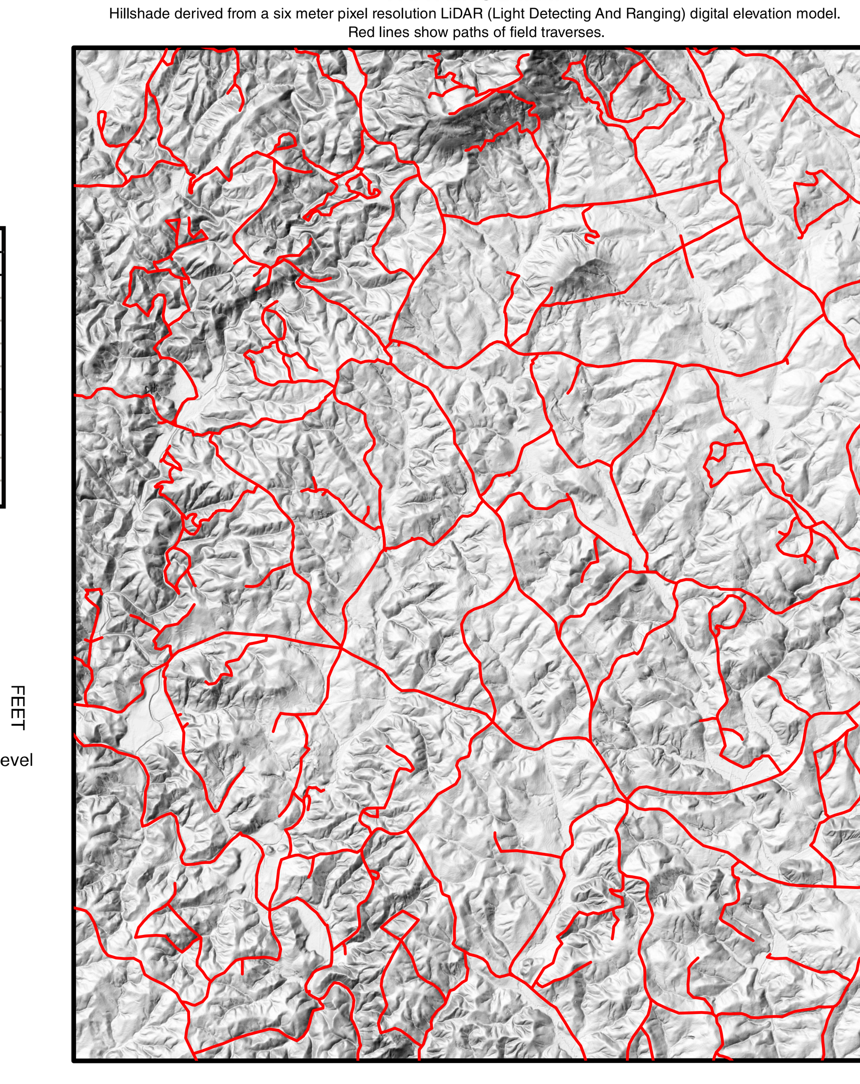
Devonian - Mississippian
Peak metamorphism, deformation, & faulting



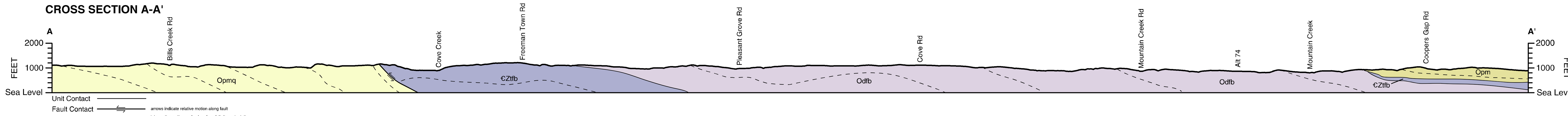
Mesozoic - present
Uplift & erosion

TRAVERSE MAP

Hillshade derived from a six meter pixel resolution LiDAR (Light Detecting And Ranging) digital elevation model. Red lines show paths of field traverses.



CROSS SECTION A-A'



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Bedrock Geologic Map of the Shingle Hollow 7.5-minute Quadrangle, Rutherford and Polk Counties, North Carolina

By
Bart L. Cattanach, G. Nicholas Bozdog, Sierra J. Isard, and Richard M. Wooten

Geology mapped from August 2016 to June 2018.
Map preparation, digital cartography and editing by G. Nicholas Bozdog, Bart L. Cattanach, and Sierra J. Isard
2018

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. Some station data omitted from map to improve readability. Please contact the North Carolina Geological Survey for complete observation and thin-section data.

Environmental Quality

GEOLOGICAL SURVEY N.C. 1823