U.S. Geological Survey Openfile 78-503

Expanded Explamation Greenville Quadrangle

Blue Ridge Rocks

Stratified Units

Cnt	Nantahala Slate, dark gray slate and mica schists, locally containing feldspathic quartzite
pCgs pCgss pCgsm	Great Smoky Group, largely feldspathic metasandstone, medium to thick bedded, with interbeds of feldspathic quartz - mica schist or gray phyllite, includes some beds of quartz - feldspar pebble conglomerate; pCgss, sericite schist with garnet and locally prominent biotite porphyroblasts; pCgsm, aluminous schist
pCge	Biotite gneiss, dark gray, fine to - medium grained, massive to indistinctly layered . Interlayered with massive to thin bedded ,fine-grained metagraywacke
pCgca	Amphibolite, dark gray to black, fine to medium grained, interlayered with gabbro, ultra mafic rocks and locally biotite gneiss
pCgcg	Biotite schist and gneiss, variably textured and layered, contains felsic and mafic segregations, consists mostly of quartz, oligoclase, biotite, sericite and chlorite
Cr Ccc Cp	Coweeta Group; Cr, Ridgepole Mountain Formation, light to medium gray quartzite, chlorite -muscovite quartzite and coarse biotite chlorite schist and metagraywacke; Ccc, Coleman River Formation ,medium to dark gray , thinly layered impure metasandstone, interlayered with muscovite biotite schist, and meta conglomerate; Cp, Persimmon Creek Gneiss, variably foliated oligoclase- quartz -epidote-biotite gneiss, interlayered with metagraywacke
qv	Quartzite, light gray medium -fine -grained ,locally muscovitic
mi	Migmatite, leucocratic granitic material injected into variable paragneisses
pCtf pCte pCtq pCta	Tallulah Falls Formation; pCtf Tallulah Falls Formation undivided , includes graywacke, quartzite, aluminous schist, amphibolite, and two mica schist; pCte, medium to dark epidote rich quartzite; pCta, aluminous two mica -quartz - plagioclase schist; pCtq, interlayered quartzite and schist, quartzite contains quartz, plagiaclase, muscovite, K spar, and biotite as principal minerals; schist contains muscovite, biotite, quartz and plagioclase
pCw	Wiley Gneiss, medium gray, coarse -grained K spar -plagioclase-quartz two mica augen gneiss
pCtx	Toxaway Gneiss, Medium gray to dark gray to coarse -grained, layered to massive gneiss containing plagioclase- microcline - quartz- biotite-epidote- magnetite; locally feldspar occurs as augen, pegmatites common

Blue Ridge contd. stratified rocks

pCgwa	Undivided metagraywacke, schist, quartzite and amphibolite
pCgms	Two mica schist, medium to coarse grained, scaly, locally containing felsic segregations, indistinctly layered
pCgas	Amphibolite , dark gray , fine-grained , interlayered with variably layered dark gray metagraywacke , and biotite -quartz -plagioclase-schist
pCgma	Two mica schist interlayered with generally thin layered amphibolite
a	Amphibolite , dark gray to black , generally medium-grained and variably bedded
ql	Quartzite mixed with mica schist
bgsa	Mixed biotite gneiss, mica schist, and amphibolite; variably interlayered

Blue Ridge contd. Plutonic Rocks

d Diabase dikes, fine - to medium -grained , dark gray to black unmetamorphosed diabase

r Rabun Gneiss, porphyroblastic plagioclase-microcline-quartz-biotite gneiss of granitic to granodioritic composition

m Mafic bodies, includes gabbro , ultramafic rocks and amphibolite

wc Wolf Creek Gneiss, light gray , fine-grained granitic to granodioritic gneiss

ggl Undivided granitic gneisses

Explanation contd.

Brevard zone and associated metamorphic rocks

bz Blastomylonite, blastomylonite gneiss , mylonite,phyllonitic mica schist, and gneiss,graphitic mica schist, feldspathic metasandstone, calcite marble

hn Henderson Gneiss, medium gray, medium -to coarse-grained, generally well foliated, locally fluorite bearing. Finer grained and more foliated near the Brevard zone; grades to coarser varieties away from fault zone

bms Button mica schist, dark grayish green to buff, strongly schistose with micaceous knots that weather out as buttons; contains quartz,muscovite, biotite,plagioclase, garnet and chlorite as principal minerals

fam Amphibolite, dark gray to black , fine grained, containing principally hornblende,plagioclase, quartz, and epidote; has strong compositional banding and flaggy outcrop appearance

ams Undivided schist and amphibolite, schist is dark gray well foliated and the amphibolite is dark gray to black; rock units interlayered in all proportions

bgn Fine grained biotite gneiss, medium to dark gray, banded, containing biotite, muscovite, quartz, plagioclase, microcline and epidote

qg Quartzite,light gray to buff, ranges from quartzite to feldspathic quartzite and is interlayered withbiotite granite gneiss

ssa Sericite schist and amphibolite; sericite schist is light gray to medium gray,fine grained to medium grained with strong schistosity; amphibolite is dark gray fine to medium grained and has flaggy appearance

msga Undivided schist,quartzite and amphibolite; rock units interlayered in varying proportions

Explanation contd

Inner Piedmont Rock Units

Stratified Units

mgm Mostly paragneiss and schist containing 15 to 35 percent leucocratic granitic material of varied composition in sheets, lenses, and dikes an inch to a few feet wide

pgs Paragneiss and schist, a heterogeneous assemblage of interlayered biotite-quartz-feldspar gneiss, amphibolite, muscovitic or garnetiferous quartzite, and biotite- garnet-sillimanite schist

hhg Hornblende gneiss, black, dark gray to dark green, fine to coarse grained hornblende gneiss and schist, amphibolite and biotite - hornblende -oligoclase gneiss; dark gray to black, medium to coarse grained diorite, gabbro and pyroxenite; rare ultra mafic rocks and discontinuous layers of marble and calc- silicate rock; interlayered with granite gneiss, and biotite schist and gneiss

mps Biotite schist, gray to black, fine to coarse grained, scaly biotite oligoclase schist and biotite muscovite oligoclase schist, with thin layers of biotite gneiss, granitoid gneiss, quartz schist, quartzite marble, calc - silicate rocks, and hornblende schist; garnet and sillimanite common; many veins and small lenticular bodies of gneissic pegmatite of quartz monzonitic composition, contorted

ss Sillimanite schist; sillimanite prominent constituent in mica schist

q Quartzite, white to light to dark gray, fine grained quartzite, biotite and muscovite quartzite, and feldspathic quartzite; occurs as thin lenticular masses; may include quartz veins or quartz core zones from large pegmatites

mgr-ms Mixed granite and granite gneiss, mica schist and gneiss

a Amphibolite, dark greenish gray to black, fineto medium grained, strong foliation, locally mixed with biotite gneiss; thickness variable

mas Aluminous schist, medium gray, well developed schistosity, variably textured, generally coarse grained, muscovite and biotite contents vary widely also contains quartz, plagioclase, Kspar, garnet, sillimanite and kyanite

bpg Biotite gneiss, dark gray, variably textured generally coarse grained, interlayered with amphibolite and quartzite; is locally an augen gneiss

bg Undivided biotite gneiss, schist, amphibolite, and quartzite; interlayered in all proportions and variably textured

Explanation contd.

Stratified Units (Inner Piedmont)

ggna Undivided granitic gneiss and amphibolite; granitic gneiss is variably textured and foliated; it is interlayered with thinly layered amphibolite

hgn Amphibolite and hornblende gneiss; dark gray to greenish black, fine to medium grained, medium to coarsly banded, layering thicknesses variable; contains amphibole, plagioclase, quartz, epidote, and magnetite; is locally migmatitic

hg Hornblende gneiss, dark greenish gray to black, mostly medium grained, schistosity well developed, variably layered and has some interlayered biotite schist

bghg Mixed hornblende gneiss, biotite gneiss, and granitoid gneiss; layering thicknesses highly variable

bm Button schist, grayish green to buff, sericitic with good schistosity; micaceous knots weather out as buttons; contains two directions of cleavage

bgn }
bga } Undivided biotite gneiss and amphibolite

bgmsa Undivided biotitegneiss, biotite schist and amphibolite that together form an allochthon that rests on rocks of the Brevard zone

Explanation contd.

Plutonic Rocks (Inner Piedmont)

gre Equigranular biotite-quartz-plagioclase-Kspar granite

bgd Biotite-hornblende-quartz -plagioclase granodiorite

cqm Caesars Head Quartz Monzonite; massice gneissic biotite -quartz monzonite and granodiorite, medium to coarse grained, variably equigranular to porphyritic; gradational to and locally similar to the less foliated phase of the Henderson Gneiss. Locally contains very large tabular megacrysts of microcline

gr Undivided granitic rocks

gb Gabbro, dark gray to black , medium to coarse grained, containing mostly hornblende, plagioclase ,and some biotite; locally mixed with amphibolite

grp Coarse microcline crystals in otherwise equigranular groundmass of quarts, plagioclase and biotite

grc Coarse grained granite, light gray massive to weakly foliated biotite granite to biotite quartz monzonite

bggn Biotite granodiorite gneiss, medium gray, massive to weakly foliated, medium grained

ggn Undivided granitic gneisses, including granite gneiss , granodiorite gneiss, and dioritic gneiss

ogs Ultramafic rocks and gabbro

grb Granite and gneissic biotite granite

Explanation contd.

Lowndesville and Charlotte Belt Rock Units

Stratified Units

gs Quartzite and sericite schist; quartzite is white to medium gray, fine grained containing some muscovitic phases; sericite schist is light gray to dark gray, fine grained, schistose; units are irregularly interlayered.

mgs Mixed granitoid, biotite schist and amphibolite; rock units are variably banded from thin to thick layers

bgs Biotite gneiss and schist; gneiss is dark gray, variably textured fine to coarse grained containing mostly quartz, plagioclase, biotite, muscovite and microcline; schist is dark to medium gray highly schistose containing two micas quartz, plagioclase, and K spar

Cpv Sericite schist, phyllite, siliceous to intermediate volcanic tuffs or flows; sericite schist is light gray to brown, fine grained, laminated, protolith appears to have been fine grained argillite or fine tuff, interlayered with some coarser tuffaceous beds; sericite schist is light gray to medium bluish gray, fine grained and well laminated; volcanic rocks are generally medium gray, fine grained silic to intermediate flows and pyroclastic rocks, has phyllitic appearance with considerable sericite developed along cleavage planes; locally dark greenish gray mafic volcanic rocks present with distinctive slaty cleavage; rock units interlayered in thin to thick units and all have distinctive slaty cleavage; These rocks probably represent Slate Belt types

a Amphibolite, dark gray, variably layered, generally equigranular, containing hornblende -oligoclase- andesine- biotite and quartz

Explanation contd.

Plutonic Rocks (Lowndesville - Charlotte Belt)

gb Gabbro mixed with amphibolite; gabbro is dark green to black to brownish coarse grained and massive, may be layered; amphibolite is dark gray, fine grained and layered and is irregularly mixed with the gabbro

p Pyroxenite, brownish to dark green, massive, locally intruded by syenite

gbd Gabbro and diorite mixed, rocks range from dark gray to black, mediumgrained

gr Granite, light gray , red gray, fine grained , massive biotite granite and quartz monzonite, foliation ranges from indistinct to distinct

grv Mixed granitoid and felsic volcanic rocks; both rocks are light gray and fine grained , felsic volcanic rocks faintly layered

grcp Coarse grained grainit, light gray to grey, massive to weakly foliated biotite granite to biotite -quartz monzonite

Geologic Map Index for the Greenville Quadrangle
prepared by
Arthur E Nelson

1 Clarke, James W.,1978, Preliminary geologic mapping in eastern Greenville Quadrangle: unpublished data : scale 1:24000

2 Grant, W.H., 1958, The geology of Hart County, Georgia: Ga. Geol. Survey Bull. 67, 75p.: scale 1:48000

3 Griffin, Villard S., 1967, Geology of the Six Mile quadrangle, South Carolina: South Carolina Development Board, Div. of Geology, MS-14.: scale 1:24000

4 ________________ 1972, Progress report on a geologic study in Abbeville and McCormick Counties, South Carolina: S.C. State Development Board, Div. of Geology, Geologic Notes, v16 , no.3, p. 59-78 : scale approx 1: 225000

5 ________________ 1973, Geology of the Old Pickens quadrangle, Pickens and Ocon ee Counties, South Carolina: South Carolina State Development Board, Div. of Geology, MS- 18, 54p. : scale 1:24000

6 ________________ 1974, Analysis of the Piedmont in northwest South Carolina: Geol. Soc. America Bull .,v. 85, p, 1123-1138 : scale approx. 1: 400000

7 ________________ 1974, Progress report on a geologic study in Anderson County, South Carolina : S.S. State Development Board, Div. of Geology, Geologic Notes, v. 18, no. 1 ,p. 13-23 : scale 1 : 300000 (approx.)

8 ________________ 1974, Geology of the Walhalla quadrangle, Oconee County, South Carolina: S.C. State Development Board, Div. of Geology, MS-19, 53p : scale 1:24000

9 ________________ 1975, Geology of the Seneca, Westminster, and portions of the Avalon and Oakway quadrangles, South Carolina: S.C. State Development Board, Div. of Geology, MS-20 , 42p : scale 1: 24000

10 Hatcher, Robert D., 1969, Stratigraphy, petrology and structure of the low rank belt and part of the Blue Ridge of northwestern South Carolina: S.C. Development Board, Div. of Geology, Geol. Notes, v. 13, no.4, p. 105-141: scale approx. 1:200000

11 Hatcher, Robert D., 1974, An introduction to the Blue Ridge tectonic history of northeast Georgia: Ga. Geol. Survey Guidebook 13 - A, 60 p: scale 1:63360

12 ________________ 1976, Preliminary geologic map of the Alto Allochthon, unpublished material: scale 1: 250000

13 ________________ 1976, Introduction to the Geology of the Eastern Blue Ridge of the Carolinas and nearby Georgia: Carolina Geological Society Guidebook, p.1-53: scale 1:200000

14 Higgins, Michael W., and Zietz Isidore, 1975, Geologic Interpretation of Aeromagnetic and Aeroradioactivity Maps of northern Georgia: U.S.Geological Survey Miscellaneous Investigations Series, Map I-783 : scale 1: 500000

15 Nelson, A.E., 1977 Preliminary geologic mapping in southeastern Greenville quadrangle: unpublished data: scale 1:24000

16 ____________ 1977 Preliminary geologic mapping in northwestern Greenville quadrangle: unpublished data: scale 1: 24000

17 Overstreet, William C. and Bell , Henry, 111, 1965, Geologic map of the crystalline rocks of South Carolina: U, S. Geol. Survey, Map 1 -413. Scale 1:250000

18 Pickering, S.M., and Murray, J.B., 1976, Geologic Map of Georgia: Georgia Geol. Survey : scale 1:500000

19 Roper, P.J., and Dunn, D.E. 1970, Geology of the Tamassee, Satolah and Cashiers quadrangles, Oconee County, S.C.: South Carolina Development Board, Div. of Geology, MS-16, 55p : scale 1:24000

Annotated Bibliography of the Greenville 2-degree Sheet, South Carolina

U.S. Geological Survey Open File Report 78-503

Butler, J. R., 1972, Age of Paleozoic regional metamorphism in the Carolinas, Georgia and Tennessee southern Appalachian: Am. Jour. Sci., v. 272, p. 319-333.

The peak of regional metamorphism in the Blue Ridge was attained at least 430 m.y. ago; it is probably a bit older and within the Taconic orogeny. The Inner Piedmont yields ages of 380-420 m.y. and 450 m.y. in the Elberton area. Regional metamorphism in the Charlotte belt is bracked by ages of 520 and 300 m.y.

Caldwell, Dabney W. and White, Amos M., 1973, Fluvial monazite deposits in the drainage basins of the Savannah and Saluda Rivers, South Carolina: S. C. State Development Board, Div. Geology, Min. Res. Ser. 2, 75 p.

Streams tributary to the Savannah and Saluda Rivers drain the southern part of the western monazite belt in the Piedmont of South Carolina. Monazite is widely but inconsistently distributed in alluvial sediments in the area, and has accumulated in fluvial deposits in 14 drainage basins. Resources of monazite in basins tributary to the Savannah River are estimated to be 58 thousand short tons, and resources in basins tributary to the Saluda River are estimated to be 75 thousand short tons.

Cazeau, C. J., 1966, Geology of the LaFrance quadrangle, South Carolina: South Carolina State Devel. Board, Div. of Geology Map Ser. MS-10, scale 1:24,000.

The major rock types present within the quadrangle are biotite gneiss, hornblende gneiss, mica schist, muscovite-sillimanite schist, and granite gneiss. The structure is dominated by a gentle syncline in the northwest part of the quadrangle and an anticline in the central part; these trend northeast.

Clarke, James W., 1957, Contact Metamorphism in Laurens County, South Carolina: S. C. State Development Board, Div. of Geology, Monthly Bull., Dec. p. 2-7.

In an abandoned quarry 10 miles southwest of Laurens, S.C., a biotite granite is intrusive into marble. At the contacts a pale lavandar vitreous scapolite forms a zone next to the granite, and green diopside forms a zone next to the marble.

Crickmay, Geoffrey W., 1952, Geology of the crystalline rocks of Georgia: Ga. Geol. Survey Bull., no. 58, 56 p.

The rock units that compose the crystalline rocks of Georgia are described briefly. Belts of these rocks that extend through the Greenville 2-degree sheet are from northwest to southeast the Amicablola, Wedowee-Ashland, Tallulah, Brevard, and Dadeville.

Cuppels, Norman P. and White, Amos M., 1973, Fluvial monazite deposits in the drainage basins of the Enoree, Tyger, and Pacolet Rivers, South Carolina: S.C. State Development Board, Div. of Geology, Min. Res. Ser. 2, 74 p.

Five monazite placers are recognized in the drainage basin of the Enoree River. Average tenor of the Alluvium here is 0.7 pounds of monazite per cubic yard, and resources are estimated at 41,000 short tons. Five placers are recognized in the Tyger River drainage area, and resources are estimated at 44,000 short tons. Six placers are present in the eastern part of the Pacolet River drainage area, and resources are estimated at 80,000 short tons.

Finney, Vernon L., 1971, Geologic application to a damsite in Laurens County, South Carolina: S. C. State Development Board, Div. of Geology, Geologic Notes, v. 15, no. 3-4, p. 39-48.

The area is underlain by biotite gneiss and schist. Topography reflects trends in foliation and folding of these rocks. The most uniform foundation for purposes of laying a massive conduit is parallel to the strike of foliation.

Furcron, A. S. and Teague, Kefton, H., 1943, Mica-bearing pegmatites of Georgia: Ga. Geol. Survey Bull., no. 48, 193 p.

Three of the five mica districts of Georgia lie within the Greenville 2-degree sheet; these are the Hart-Elbert County area, the Rabun County area, and the Lumpkin-Union-Towns County area. Most of the pegmatites are not near large granite intrusions; they occur in genisses and schists.

Grant, W. H., 1958, The geology of Hart County, Georgia: Ga. Geol. Survey Bull. 67, 75 p.

Most of the rocks present here are metasedimentary schists and gneisses and granitic rocks. Most are in the amphibolite facies, although some are retrograded. Earlier structure consists of folding. Superposed on this is a later northeast-trending shearing.

Griffin, Villard S., Jr., [1967], Geology of the Six Mile quadrangle, South Carolina: South Carolina State Development Board, Div. of Geology, MS-14.

The quadrangle is in the Inner Piedmont about 15 miles southeast of the Blue Ridge Front. The suggested stratigraphic sequence from older to younger is hornblende gneiss, biotite gneiss and schist, and then muscovite-biotite schist. The major structural feature appears to be a shallow synclinorium-anticlinorium complex; axial trends are northeast.

Griffin, Villard S., Jr., 1969, Migmatitic Inner Piedmont belt of northwestern South Carolina: S.C. State Development Board, Div. of Geology, Geol. Notes, v. 13, no. 4, p. 87-104.

The migmatitic Inner Piedmont belt is separated from the northwestern part of the Inner Piedmont belt by the sole of the Walhalla nappe. The Six Mile nappe overlies the Walhalla nappe to the southeast. The nappes were emplaced during middle to late Paleozoic orogenesis.

Griffin, Villard S., Jr., 1969, Inner Piedmont tectonics in the vicinity of Walhalla, South Carolina: S. C. State Development Board, Div. of Geology, Geol. Notes, v. 14, no. 1, p. 15-28.

The Inner Piedmont belt in the Walhalla area consists of two belts. One is bounded on the northwest by the Brevard zone and is composed of medium-rank metasediments. Immediately to the southeast is a migmatized and granitized terrane typical of the Inner Piedmont belt. Recumbent isoclines are present in both belts.

Griffin, Villard S., Jr., 1970, A probabel pre-Triassic mafic intrusive in the Anderson 15-minute quadrangle, South Carolina: S. C. State Development Board, Div. of Geology, Geologic Notes, v. 14, no. 4, p. 97-104.

A north-northeast trending amphibolite body is present in the Inner Piedmont belt north of Anderson, South Carolina; it is 22.5 km long and 5 km wide. Massive phases having gabbroic texture are widespread but sporadic throughout the body; also, amphibolite and amphibole gneiss textures are widely prevalent. Biotite gneiss and schist and pegmatite occur in small quantities widely throughout the mafic body.

Griffin, V. S., 1971, Inner Piedmont belt of the southern crystalline Appalachians: Geol. Soc. America Bull., v. 82, p. 1885-1898.

The Inner Piedmont in the Greenville sheet is probably the migmatitic infrastructural core of the southern crystalline Appalachians. A central belt is sillimanite-grade schists and granitic gneiss; this is flanked on the northwest and southeast by kyanite-grade rocks of similar character. Nappe overturned to the northwest are probably present in the core and on the northwest flank.

Griffin, Villard S., Jr., 1971, Stockwork tectonics in the Appalachian Piedmont of South Carolina and Georgia: Geol. Rundschau, v. 60, p. 868-886.

The inner portion of the Piedmont, which is characterized by recumbent isoclinal folds and nappes containing migmatitic sillimanite mica schist and gneiss, amphibolite, and granite gneiss, comprises the infrastructure of the Appalachian orogen. Lower grade zones flanking both sides are considered the detachment zone.

Griffin, Villard S., Jr., 1972, Progress report on a geologic study in Abbeville and McCormick Counties, South Carolina: S.C. State Development Board, Div. of Geology, Geologic Notes, v. 16, no. 3, p. 59-78.

Present within the study area from northwest to southeast are the core of the Inner Piedmont belt, southeast flank of the Inner Piedmont belt, Lowndesville (Kings Mountain) belt, Charlotte belt, and Carolina Slate belt. Dips of foliation in the Inner Piedmont are gentle, whereas in the belts to the southeast they are steep.

Griffin, V. S., 1973, Geology of the Old Pickens quadrangle, Pickens and Oconee Counties, South Carolina: South Carolina State Development Board, Div. of Geology, MS-18, 54 p.

The Walhalla nappe composed of rocks of the northwest flank of the Inner Piedmont occupies most of the Old Pickens quadrangle. On the northwest is a small area of the Non-migmatite belt, and on the southeast is a small area of the core of the Inner Piedmont belt.

Griffin, Villard S., Jr., 1974, Analysis of the Piedmont in northwest South Carolina: Geol. Soc. America Bull., v. 85, p. 1123-1138.

Three major tectonic units are present in northwest South Carolina southeast of the Brevard zone; these are the non-mignatitic belt, the Walhalla nappe, and the Six Mile nappe. Each has distinctive structural and lithologic characteristics.

Griffin, Villard S., 1974, Progress report on a geologic study in Anderson County, South Carolina: S. C. State Development Board, Div. of Geology, Geologic Notes, v. 18, no. 1, p. 13-23.

Three nappes are recognized within the map area of the Inner Piedmont belt: Six Mile nappe, Anderson nappe, and Starr nappe. The predominant rock types present are biotite gneiss, mica schist, granitoid gneiss, and amphibolite. Steeply dipping zones of microbreccia cut all other structures.

Griffin, V. S., 1974, Geology of the Walhalla quadrangle, Oconee County, South Carolina: South Carolina State Development Board, Div. of Geology, MS-19, 53 p.

The northwestern half of the Walhalla quadrangle is underlain by rocks of the Non-migmatite belt which is bordered on the northwest by the Brevard Zone, just within the quadrangle. The rest of the quadrangle to the southeast is underlain by the Walhalla nappe. All rocks are metaigneous or metasedimentary.

Griffin, Villard S., Jr., 1975 Geology of the Seneca, Westminster, and portions of the Avalon and Oakway quadrangles, South Carolina: S. C. State Development Board, Div. of Geology, MS-20, 42 p.

Most of the northwest part of the area mapped is in the Walhalla nappe of the northwest flank of the Inner Piedmont belt. The area to the southeast is largely part of the Six Mile nappe of the core of the Inner Piedmont belt. Rock types present are medium to high rank metaigneous and metasedimentary.

Griffin, Villard S., Jr., 1977, Geologic zones and gravity anomalies in the Inner Piedmont belt of South Carolina: South Carolina Geol. Survey, Geologic Notes, v. 21, no. 2, p. 50-56.

The recent gravity map of South Carolina (Talwani, et al, 1975) correlates especially well in detail with a reconnaissance geologic map. For example, south of Greenville deflection in the trend of the contact between the core of the Inner Piedmont belt and its southeast flank is associated with a gravity low.

Griffitts, W. R., 1953, Mica deposits of the southeastern Piedmont - Part 7, Hartwell district, Georgia and South Carolina: Prof. Paper 248-E, p. 293-325.

Eight mica mines were mapped, and 17 others were examined in the Hartwell district of Georgia and South Carolina. Sills and dikes of pegmatite are scattered unevenly through a belt 28 miles long and 2-10 miles wide. They range from 3 to 25 feet in maximum thickness and 200 to 900 feet in length. The country rock is largely mica schist and gneiss; some hornblende gneiss is present.

Hartley, Marvin E., 1973, Ultramafic and related rocks in the vicinity of Lake Chatuge: Ga. Geol. Survey Bull. 85, 61 p.

Ultramafic and related rocks in the vicinity of Lake Chatuge in Towns County, Georgia, occur as a sill between a biotite gneiss sequence and a garnet muscovite schist sequence. The area is located in the Blue Ridge thrust sheet in the sillimanite zone of mid-Paleozoic metamorphism.

Hatcher, R. D., Jr., 1969, Stratigraphy, petrology and structure of the low rank belt and part of the Blue Ridge of northwestern South Carolina: S.C. Development Board, Div. of Geology, Geol. Notes, v. 13, no. 4, p. 105-141.

The stratigraphic succession in northwestern South Carolina is earlier Precambrian basement rocks, late Precambrian Whetstone Group (metasediments), Cambrian or Precambrian Chauga River - Poor Mountain Group (metasediments), and the Cambrian or Precambrian Henderson Gneiss (metaquartzite-arkose). Two deformations are recognized.

Hatcher, R. D., Jr., 1971, Structural, petrologic and stratigraphic evidence favoring a thrust solution to the Brevard problem: Am. Jour. Sci., v. 270, p. 177-202.

The Brevard zone in South Carolina consists of a uniformly unbroken stratigraphic succession (Chauga River Formation overlain by Henderson Gneiss). Faulting persists within the same stratigraphic units. Presence of exotic slices of Shady Dolomite and basement suggests thrust faulting as the main fault mechanism. A medium-scale geologic map of 32 sq. mi. within the Greenville sheet is included.

Hatcher, R. P., Jr., 1971 , Geology of Rabun and Habersham counties, Georgia: a reconnaissance study: Ga. Geol. Survey Bull. 83, 48 p.

An earlier Precambrian basement of biotite and granitic gneisses is overlain nonconformably by the Tallulah Falls Formation, within which four lithologic members are recognized. This terrane is dominated by the Tallulah Falls dome. To the southeast is the Bevard Zone where the Chauga River and Poor Mountain Formations have been mapped, and to the southeast of this zone is the Inner Piedmont belt. Two and possibly three metamorphic event have affected the area.

Hatcher, Robert D., Jr., 1972, Developmental model for the Southern Appalachians: Geol. Soc. America Bull., vo. 83, p. 2735-2760.

The Blue Ridge anticlinorium, Inner Piedmont belt, and Charlotte belt are interpreted as anticlinoria composed of middle Precambrian basement and later Precambrian metasediments and metavolcanics and mobilized to greater or lesser degree. The Murphy, Chauga, Kings Mountain, and Carolina Slate belts are inferred to be synclinoria composed of younger (late Precambrian to early and middle Paleozoic) metasediments and metavolcanics. Three orogenic phases are recognized.

Hatcher, Robert D., Jr., 1973, Basement versus cover rocks in the Blue Ridge of northeast Georgia, northwest South Carolina, and adjacent North Carolina: Am. Jour. Science, v. 273, p. 671-685.

Extensive areas of the Blue Ridge that had previously been regarded as basement rocks are actually high-grade mobilized equivalents of lower grade (Ocoee equivalent) metasedimentary and metavolcanic rocks. The remaining middle Precambrian basement rocks consist primarily of plutonic gneisses. These occur in the hinge and axial zone of the Tallulah Falls nappe and in the core of the Toxaway dome.

Hatcher, Robert D., 1974, An introduction to the Blue Ridge tectonic history of northeast Georgia: Ga. Geol. Survey Guidebook 13-A, 60 p.

The major rock units of the Blue Ridge tectonic province of northeast Georgia are the Rabun and Wiley gneisses, which are probably old continental basement rocks; the Tallulah Falls Formation, which includes quartzite and other metasediments; and the Coweeta group, which are metasediments and are highest in the section. A geologic map at 1:63,360 covers about 545 sq. mi. of northwest Georgia.

Hatcher, Robert D., Jr., 1977, Tectonics of the western Piedmont and Blue Ridge, Southern Appalachians: Review and speculation: Amer. Jour. Sci., vol. 278, p. 276-304.

The tectonic history of the Southern Appalachians including the entire area of the Greenville 2-degree sheet is synthesized on a basis of 100 literature references as well as the extensive experience of the investigator and colleagues.

Hurst, Vernon J., 1970, The Piedmont in Georgia, in Studies of Appalachian Geology: Central and Southern: New York, Interscience Publishers, p. 383-396.

Several lithologic belts extend across the Georgia Piedmont in a northeast direction. From northwest to southeast within the area of the Greenville 2-degree sheet is belt 3, a terrane of metagraywacke and phyllite of the Great Smoky Group; belt 5, which consists of schists, metavolcanics, and lesser quartzites; belt 6, the Brevard zone; and belt 7, where gneisses predominate.

King, P. B., 1955, A geologic section across the southern Appalachians - An outline of the geology in the segment in Tennessee, North Carolina, and South Carolina, in Russell, R. J., ed., Guides to Southeastern Geology: New York, Geol. Soc. America, p. 332-373.

The crystalline area consists of belts of dominately metamorphic and plutonic rocks whose sequences and ages are poorly established, and much of whose structure is undeciphered. "Dejective zones," or long narrow strips of metasedimentary rocks are deeply infolded within the igneo-metamorphic terrane.

McCauley, Camilla K. and Butler, J. Robert, 1966, Gold resources of South Carolina: S. C. State Development Board, Div. of Geology, Bull. 32, 78 p.

Of the 130 gold localities that are known in South Carolina, 21 are within the Greenville 2-degree sheet. Each is described briefly.

McConnell, Keith I. and Griffin, Villard S., Jr., 1973, Petrology of the Anderson metagabbro: S.C. State Development Board, Div. of Geology, Geologic Notes, v. 17, no. 3, p. 68-82.

The Anderson metagabbro occurs within the sillimanitic Inner Piedmont belt. The body is 14 miles long and 0.5-2.5 miles wide. Metagabbro and amphibolite are present, the latter predominating. Transitional rock intermediate between these two types is present also.

Olson, Jerry C. and Griffitts, Wallace R., 1953, Mica deposits of the southeastern Piedmont - Part 8, Outlying deposits in South Carolina: Prof. Paper 248E, p. 317-325.

The mica deposits occur in quartz-muscovite schist and muscovite-biotite gneiss. Sillimanite is locally abundant. The pegmatites are present in two broad area, one southwest of Greenville and the other southwest of Pickens. Most of the pegmatite bodies cut across the foliation of the host rock.

Overstreet, William C., 1970, The Piedmont in South Carolina, <u>in</u> Studies of Appalachian Geology: Central and Southern: New York, Interscience Publishers, p. 369-382.

The complex geology of the crystalline rocks of the Piedmont of South Carolina is poorly known owing to deep weathering and also to scarcity of detailed worked. Maps are presented here that show geologic belts across the Piedmont, the main stratigraphic units and major unconformities, the larger intrusive masses, and the major metamorphic facies.

Overstreet, W. C., 1967, The geologic occurrence of monazite: U.S. Geol. Survey, Prof. Paper 530, 327 p.

The distribution of monazite throughout the world is reviewed. Occurrences in the crystalline rocks and stream sediments of the Piedmont and Blue Ridge of Georgia (p. 133-136) and South Carolina (p. 232-251) are described in moderate detail.

Overstreet, W. C. and Bell, Henry, III, 1960 Notes on the Kings Mountain belt in Laurens County, South Carolina: S. C. State Development Board, Div. of Geology, Geologic Notes, vol. 4, no. 4, p. 27-30.

Mica schists are present in a northeast-trending belt to the southeast of Laurens, South Carolina. One rock type in this section is a manganese garnet muscovite schist, which resembles the manganese schist member of the Battleground Schist of the Kings Mountain belt in Cherokee and York Counties, South Carolina. The Kings Mountain belt can be traced through successive levels of metamorphism.

Overstreet, William C. and Bell, Henry, III, 1965, Geologic map of the crystalline rocks of South Carolina: U.S. Geol. Survey, Map I-413.

Lithologic units of the crystalline rocks of the South Carolina Piedmont and Blue Ridge provinces are mapped at 1:250,000. Areal extent of the various units was determined largely from soils maps.

Overstreet, William C. and Bell, Henry, III, 1965, The crystalline rocks of South Carolina: U.S. Geol. Survey Prof. Paper 1183, 126 p.

The lithologic units depicted on the geologic map of the crystalline rocks of South Carolina (U.S. Geol. Survey, MI-413) are described. Six northeast-trending lithologic belts are recognized; these are interpreted as zones of different grade of regional metamorphism.

Pickering, S. M., Jr., and Murray, J. B., 1976, Geologic map of Georgia: Georgia Geol. Survey, scale 1:500,000.

The units recognized within the Blue Ridge and Piedmont provinces are lithologic; no unit is assigned to a formal formation name. Major faults and shear zones are depicted and named. Radiometric age-date localities are also plotted.

Roper, P. J., and Dunn, D. E., 1970, Geology of the Tamassee, Satolah, and Cashiers quadrangles, Oconee County, South Carolina: South Carolina State Development Board, Div. of Geology, MS-16, 55 p.

Metasedimentary rocks such as mica schist, gneiss, amphibolite, and felsic gneiss underlie the map area. Cataclasis increases in intensity from the Blue Ridge on the northwest to the Brevard Zone on the southeast. The Brevard Zone here is a large refolded isocline that is cored by cataclastic gneiss.

Sloan, Earle, 1908, Catalogue of the mineral localities of South Carolina: S. C. Geol. Survey Bull. 2, 505 p.

All known mining prospects and quarries within the state are described. These are divided into metallics, non-metallics, and structural material. Thirteen belts are recognized in the crystalline rocks of the Piedmont.

Smith, James W., Wampler, J. M., and Green, Martha A., 1968, Isotopic dating and metamorphic isograds of the crystalline rocks of Georgia, in Precambrian-Paleozoic problems: Ga. Geol. Survey Bull., no. 80, p. 121-139.

Four zircon ages are given for one sample of the Elberton Granite: 450 m.y. (U-Pb), 455 (U-Pb), 465 (Pb-Pb), and 375 (Th-Pb). A K-Ar age on biotite from another sample gives 247 m.y.

Talwani, Pradeep; Long, Timothy L.; and Bridges, S. R., 1975, Simple Bouguer anomaly map of South Carolina: S. C. State Development Board, Div. of Geology, MS-21, 27 p.

The gravity map of South Carolina is plotted on a geologic map. The geology of the crystalline areas is taken from Overstreet and Bell (1965).

Theobald, P. K., Jr., Overstreet, W. C., and Thompson, C. E., 1967, Minor elements in alluvial magnetite from the Inner Piedmont belt, North and South Carolina: U.S. Geol. Survey Prof. Paper 554-A, p. A1-A34.

Chemical and spectrographic analyses were made for 15 minor elements in 291 samples of detrital magnetite from the Inner Piedmont belt of North and South Carolina. Greater abundances of Mn, Ti, Cr, and Cu in the magnetite appear to reflect greater metamorphic grade and regional variation in bulk composition of the metamorphic rocks, which compose 85 percent of the region.

Wagener, H. D., 1977, The granitic stone resources of South Carolina: S.C. Geological Survey, Mineral Resources Series 5, 65 pages.

All granitic and gneissic granitic bodies in South Carolina large enough to be outlined on maps at a scale of 1:125,000 are described and evaluated relative to their potential as sources of crushed stone and dimension stone. The areas underlain by 41 such bodies are plotted on 22 county road maps.

Watson, Thomas Leonard, 1910, Granites of the southeastern Atlantic States: U.S. Geol. Survey Bull. 426, 282 p.

Granitic rocks of the Piedmont from Maryland to Alabama are described with emphasis on quarry sites. Twenty-one quarries are cited within the Greenville two-degree sheet.

Wetmore, Clinton C. and Griffin, Villard S., Jr., 1977, An outcrop perspective on the tectonics of the Walhalla nappe, northwest South Carolina: S. C. State Development Board, Div. of Geology, Geologic Notes, v. 20, no. 4, p. 116-132.

The geometric fold styles in two road cuts within the Inner Piedmont Walhalla nappe are the same as those previously inferred from regional geologic map patterns. The combined orientation of fold axes at the two localities is nearly identical with the pattern of mesocopic fold axes for the nappe as a whole.

Yeates, W. S., and McCallie, S. W., and King, Francis P., 1896, A preliminary report on a part of the gold deposits of Georgia: Ga. Geol. Survey Bull. 1-A, 542 p.

Two gold belts, the Dahlonega and the Hall County, traverse the western part of the Greenville 2-degree sheet in a northwest direction. All known mining properties are described in moderate detail.