VIRGINIA DIVISION OF MINERAL RESOURCES

PUBLICATION 137

GEOLOGY AND MINERAL RESOURCES OF HENRY COUNTY AND THE CITY OF MARTINSVILLE, VIRGINIA

William S. Henika, James F. Conley, and Palmer C. Sweet

COMMONWEALTH OF VIRGINIA
DEPARTMENT OF MINES, MINERALS AND ENERGY
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Stanley S. Johnson, State Geologist
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GEOLOGY AND MINERAL RESOURCES OF HENRY COUNTY AND THE CITY OF MARTINSVILLE, VIRGINIA

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INTRODUCTION

Henry County, which surrounds the independent City of Martinsville, is located in the southwestern Piedmont of Virginia. The topography of the southeastern part of the county is marked by a hilly terrain that is typical of the Inner Piedmont (Fenneman, 1938, p 139-140). The northwestern part of the county contains low elongate ridges that are foothills to the Blue Ridge Mountains. In this report Henry County is divided into four major structural areas each of which is underlain by a distinctive sequence of rocks that is generally separated from the others either by thrust, reverse or normal faults (Geologic Map). These areas include, from northwest to southeast: the southeastern limb of the Blue Ridge anticlinorium (I), the Smith River allochthon (II), the Sauratown Mountains anticlinorium (III), and the Mesozoic-age Danville basin (IV).

Fifteen mineral resources are known to occur in Henry County (Mineral Resources Map). Crushed stone and sand and gravel are currently being produced in the county. Thirteen other mineral commodites or occurrences are described in the section on "Mineral Resources". These include iron ore, monazite, emery, sillimanite, kyanite, mica, talc, soapstone, kaolin, clay materials, gemstones, ornamental stones, and gold.

STRATIGRAPHY

AREA I: SOUTHEASTERN LIMB, BLUE RIDGE ANTICLINORIUM

The Alligator Back and Candler Formations are Late Proterozoic to Early Cambrian metasedimentary and metavolcanic rock units exposed in the Blue Ridge foothills of northwestern Henry County (Geologic Map). The Candler overlies the Alligator Back, which is the upper formation of the Lynchburg Group (Conley, 1985). The Alligator Back overlies the Ashe Formation (lower unit of the Lynchburg Group) and Middle Proterozoic basement rocks that form the core of the Blue Ridge anticlinorium in the area northwest of Henry County. These units have been traced from North Carolina northeast through Henry County to the type section of the Lynchburg Group along the James River at Lynchburg and the Candler type section east of Lynchburg (Henika, 1994).

Alligator Back Formation

In the northwestern part of the county the Alligator Back contains a heterogeneous assemblage of metasedimentary and interlayered metavolcanic rock types including mica schist and laminated metagraywacke, quartzite, and lithic metaconglomerate; actinolite schist (metabasalt and metagabbro); graphite-quartz-mica schist and phyllite, laminated calcareous gneiss, marble, and quartzite layers. These units dip consistently to the southeast beneath the overlying Candler Formation.

Mica Schist and Metagraywacke: Sparkling light-gray mica schist and phyllite with thin metagraywacke interlayers form the most common lithofacies within the Alligator Back Formation in the Blue Ridge foothills of northwestern Henry County. The schist is composed of muscovite, quartz, biotite, plagioclase, garnet, ilmenite and graphite. Muscovite occurs as fine-grained, pearly white sericite in the phyllite. Muscovite and biotite porphyroblasts up to 0.5 mm in diameter are dispersed along a well-developed mylonitic foliation in the schist.

Typical exposures of the mica schist and phyllite occur along the Norfolk Southern Railway south of Henry. The unit weathers to a reddish-brown to tan, well-foliated, micaceous saprolite and red, clay-rich soil containing partially weathered chips of phyllite or schist. A highly deformed talc-chlorite-dolomite schist interlayered in the unit east of Henry formerly was mined by the Blue Ridge Talc Company.

Metagraywacke and Quartzite: Metagraywacke units in the Alligator Back Formation contain medium-gray, muscovite-biotite gneiss and muscovite-biotite schist that are interbedded with light-gray to white, medium-grained, micaceous quartzite. The gneissic layers are generally composed of 0.5-3 mm clasts of quartz and feldspar in a finer grained, quartz-feldspar-mica matrix intergradational with mica schist layers. Quartzite interbeds up to 25 feet thick contain 75 percent or more relict detrital quartz grains, with lesser amounts of muscovite and biotite and accessory amounts of microcline, plagioclase, magnetite, sphene, ilmenite, zircon, and apatite. Quartz-rich layers are separated from each other by thin sericite layers. Graphite schist fragments and biotite films are concentrated along foliation surfaces.

The metagraywacke-quartzite units are commonly composed of upward-fining packages that contain laminar, fine-grained, cross-bedded sequences (Figure 1). A metaconglomerate bed with rock fragments up to 1 foot in length is well exposed within such a sequence in Town Creek, along State Road 606 about 0.5 mile north of the Franklin-Henry County line (Henika, 1971; Figure 2). Because of abundant quartz content these units are generally resistant to weathering

Figure 1. Laminated metagraywacke at the base of the Alligator Back Formation along U.S. Highway 220 in Franklin County, approximately 5 miles northeast of the Henry-Franklin County boundary.

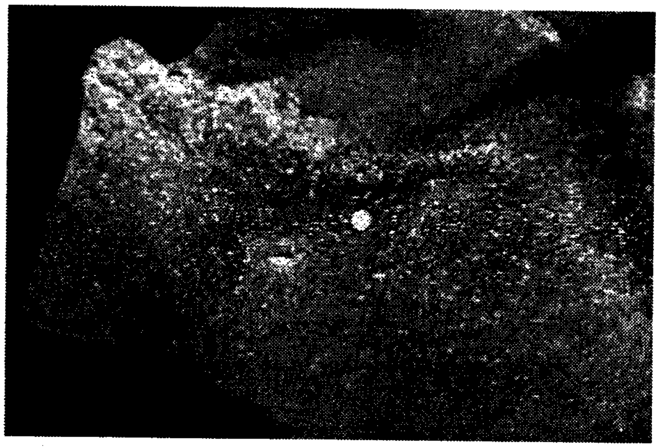

Figure 2. Coarse metagraywacke near the base of the Alligator Back Formation along Town Creek north of Henry, Franklin County. Conglomerate deposited on an erosional surface and grades upward into sandstone. Large clast near center of the photograph is clay.

and form steep slopes and linear ridges. The thin, sandy soils developed on these units are underlain by a structureless, tan to pink saprolite which is exposed in road cuts along State Road 605 east and west of the village of Henry.

Metabasalt: The Metabasalt is a dark-greenish-gray, fine-grained, schistose rock composed primarily of nematoblasts of actinolite and variable amounts of epidote, chlorite, albite and quartz. Some metabasalts locally contain small (1-2 mm) amygdaloidal masses filled with intergrown quartz and feldspar, and transposed flow banding. The area of metabasalt intruded by metagabbro along Town Creek in the northwestern corner of the county (Geologic Map) is a ten-mile-wide metavolcanic complex in the middle of the Alligator Back Formation. The complex wraps around the southwestern end of the Cooper Creek anticline to the west in Franklin County (Conley and Henika, 1970).

Because of its high iron and magnesium content the metabasalt tends to form deep red clay soils on rounded hills and gentle highland slopes. These soils often include areas of low permeability subsoils that may be unsuitable for septic tank drainfield systems.

Metagabbro: Metagabbro occurs as sills of medium- to coarse-grained schistose to granoblastic, dark-green to black amphibolite intruded along the base of the metavolcanic complex. The rock is composed of actinolite (in part uralitic amphibole altered from augite), intergrown with plagioclase, epidote, chlorite, and includes minor amounts of zircon, quartz, sphene, ilmenite, and magnetite. Some of the metagabbro sills are layered and generally coarser grained, lighter colored, and locally retain relict ophitic textures towards the centers of individual sills. The sills are generally sheared and altered to actinolite schist near contacts with metasedimentary and metavolcanic rocks.

The metagabbro sills commonly have dark gray to brown topsoils and may pass directly into highly impervious clay subsoils. Road cuts and ditches greater than three feet deep commonly expose dark-green weathered bedrock with boulders in the upper six feet of soil. Similar limitations to the use of septic tank and drainfield systems may apply to this unit as to the metabasalt.

Graphite-quartz-mica schist: The graphitic rocks are gray- to grayish-black and are composed of varying amounts of quartz, muscovite, chlorite, and graphite. The unit includes fine-grained, lustrous, sericitic phyllite locally interlayered with dark gray to black flaggy-bedded medium-grained, graphitic quartzite. The schist and quartzite units contain disseminated pyrite and thin calcareous interlayers.

In the northwestern corner of Henry County, the graphite-quartz-mica schist is laterally intergradational with metagraywacke at the top of the Alligator Back Formation to the west. (Conley and Henika, 1970; Geologic Map). Henika (1971, figure 6), emphasized the abrupt lateral facies changes and time transgressive relationships among lithologies in the upper Lynchburg Group beneath the chlorite phyllite (Candler).

The graphitic schist units commonly are overlain by thin, black, micaceous-silt soils. Pyrite disseminated in the bedrock can produce very acidic, iron-rich, groundwater with a strong sulfurous odor that may be difficult to treat in residental water wells.

Candler Formation

The Candler Formation was named for Candler Mountain near Lynchburg, Virginia (Brown, 1951, 1958). The Candler overlies the Alligator Back Formation and the lower contact of the Candler is drawn stratigraphically above the uppermost Alligator Back metabasalt, generally at the top of the uppermost pebbly metagraywacke interbed in the upper Alligator Back Formation (Figure 3). Thin beds, lenses, and pods of fine-grained feldspathic quartzite are found locally

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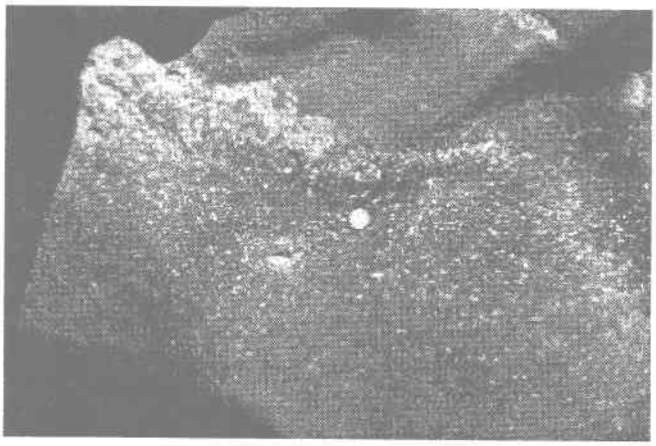

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The Candler Formation has developed complex mylonitic fabrics with rotated chloritoid porphroblasts, and "fish scale" schists along the Bowens Creek fault which separates the rocks on the southeastern limb of the Blue Ridge anticlinorium from rocks of similar ages in the Smith River allochthon. As a result of this faulting the top of the Candler is not preserved in this area.

Figure 3. Transitional contact between upper Alligator Back Formation and Candler Formation on Philpott Lake. The base of the Candler Formation is drawn to the right (stratigraphically above) the massive metagraywacke bed in front of the boat.

AREA II: SMITH RIVER ALLOCHTHON

The Smith River allochthon comprises a large synform which overlies Lynchburg Group and Grenville-age basement rocks (Geologic Map, cross section A-A'). The allochthonous rocks include a metavolcanic and metasedimentary sequence of Late Precambrian and Early Paleozoic age intruded by the Cambro-Ordovician-age Martinsville Igneous Complex. Three episodes of metamorphism are believed to affect this area: 1) a Barrovian-type regional metamorphism, 2) a later retrograde event, 3) contact metamorphism due to the igneous plutons (Conley and Henika, 1973).

Bassett Formation

The Bassett Formation, named for the town of Bassett located in northwestern Henry County, is exposed in the cores of a series of domes in the Smith River allochthon. The Bassett is composed of two metasedimentary-volcaniclastic lithofacies, a massive to layered granitic gneiss unit overlain by or interlayered with a banded amphibolite unit (Geologic Map).

Bassett gneiss: The gneiss is a generally homogeneous unit of equigranular, medium-grained, light- to medium-gray granitic gneiss. The gneiss is banded by 0.1 to 0.6 cm thick biotite or hornblende layers alternating with 1 to 3-cm-thick quartzofeldspathic layers (Figure 4). Light-gray, medium-grained, quartz-rich layers, and epidote quartzite beds also occur sparingly in the unit. A spectacular gneissic pavement exposure (Figure 5) along Blackberry Creek about two miles northeast of Sanville (Henika, *in* Bartholomew and others, 1994) is packed with well-rounded to oval-shaped felsitic clasts (3 - 6 cm). These clasts are white to light-gray, polycrystalline aggregates of fine-grained quartz and sillimanite surrounded by muscovite, fibrolite, microcline, and opaque minerals very similar to felsitic metavolcanic rocks mapped on the down-thrown side of the Chatham fault southeast of the Mesozoic-age Danville Basin in the Central Virginia volcanic and plutonic belt.

The Bassett Formation is cut by numerous quartz-feldspar and mica-quartz-feldspar dikes and sills (Geologic Map, Olg) in areas surrounding the Martinsville Igneous Complex. Granitic gneiss and amphibolite exposed in outcrops along State Highway 57 in the Bassett - Stanleytown area reached minimum melt conditions and locally contain microcline porphyroblasts, migmatite zones, and coarse mica-quartz-feldspar melt zones.

Bassett gneiss weathers to reddish brown saprolite and develops pale-orange pink, sandy soils. Topography of areas underlain by the gneiss consists of low rolling hills and broad uplands, much of which was once cleared as tobacco land and is now favored for suburban residential and industrial development.

Figure 4. Folded compositional banding in the Bassett gneiss along the Norfolk Southern Railway in north Bassett (block on keyring is 1 3/16 inch in diameter).

Ultramafic rock and metagabbro: Conformable pods and stringers of schistose ultramafic rock and thin metagabbro sills occur in the Bassett gneiss, especially along the boundaries of the allochthon. Microscopic petrography indicates that the ultramafic rocks in the Bassett were originally composed of clinopyroxene, orthopyroxene, olivine, garnet, hornblende, and plagioclase. These rocks above the basal contact throughout the Candler, but graphitic schist beds have not been identified in the Candler. In Henry County the dominant Candler lithology is medium- to dark-gray muscovite-chlorite-chloritoid schist and phyllite indicative of the upper greenschist facies of regional metamorphism (Conley and Henika, 1970).

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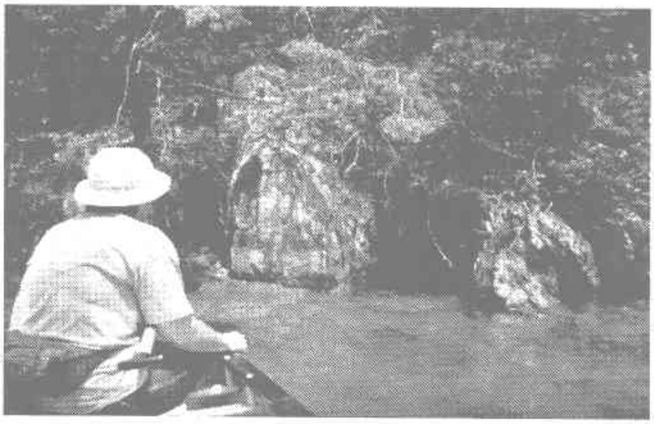

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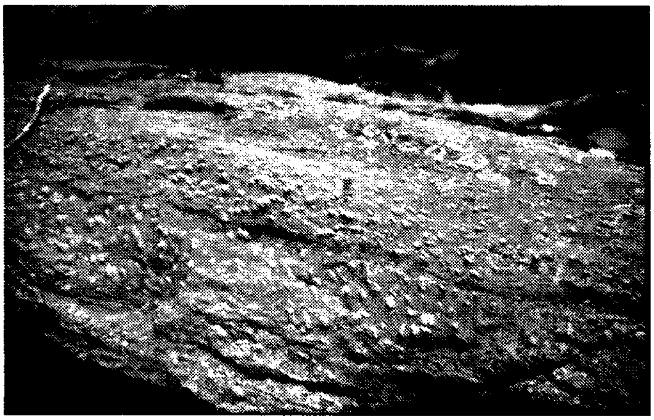

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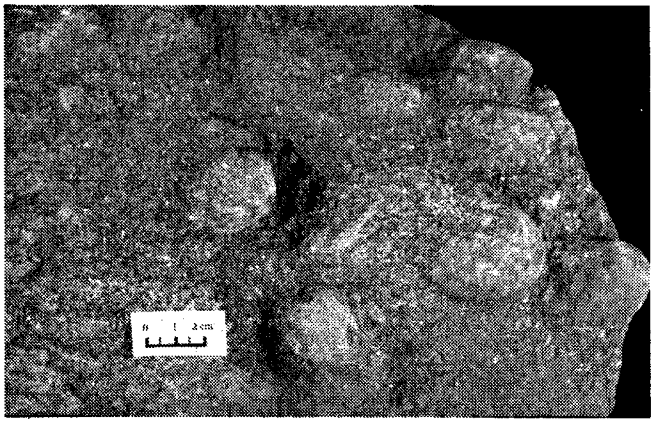

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Figure 5. Lithic metaconglomerate bed in the top of the Bassett biotite gneiss, exposed in a domal structure along Blackberry Creek, about 2 miles northeast of Sanville. **A.** Metaconglomerate outcrop. **B.** Detail of felsic metavolcanic rock clasts in biotite gneiss matrix.

locally contain large relict olivine and pyroxene phenocrysts but the rocks are now predominantly altered to talc-tremolite-chlorite schists with accessory serpentine, anthophyllite, opaque minerals and vermiculite.

The ultramafic rocks weather to a dark-brown, sticky clay a few feet thick. Clay subsoil is formed by the decomposition of minerals in the schist, and acts as a cap to protect the rock from further weathering. Areas underlain by this unit generally have highly variable subsoil conditions with narrow strips of thin clay and shallow bed rock that may influence construction and location of buildings, drainfields, pipelines, and septic tanks.

Bassett amphibolite: The top of the Bassett contains amphibolite (bimodal mafic to intermediate metavolcanic) layers that attain maximum thicknesses of several hundred feet in the northwestern part of the county (Geologic Map) and thin to the southeast. The amphibolite is a greenish-black and white-banded , medium- to coarse-grained, foliated rock (Figure 6). Some of the amphibole-rich layers are cut by thin, feldspar-rich dikes that outline ptygmatic folds. Massive units are composed of about 45 percent hornblende, 30 percent quartz and 15 percent plagioclase (An=30%) and 7 percent opaque minerals (Barbara Munn, personal communication, 1994). Titanite and biotite are found as accessory minerals in the rock. Ovoid masses that resemble flattened amygdules, composed of plagioclase, epidote, and quartz, occur in the unit southwest of the town of Bassett. Beds of epidosite, up to two feet thick, also occur in the amphibolite in this same area.

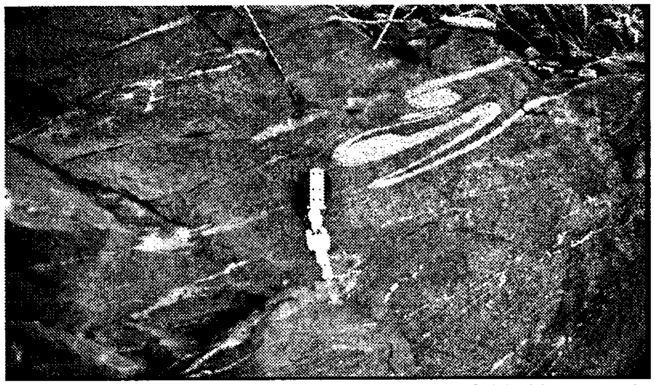


Figure 6. Bassett amphibolite with isoclinally folded leucocratic layers, outcrops along Alternate State Highway 57, on southwest side of Smith River in Bassett (block on keyring is 1 3/16 inch in diameter).

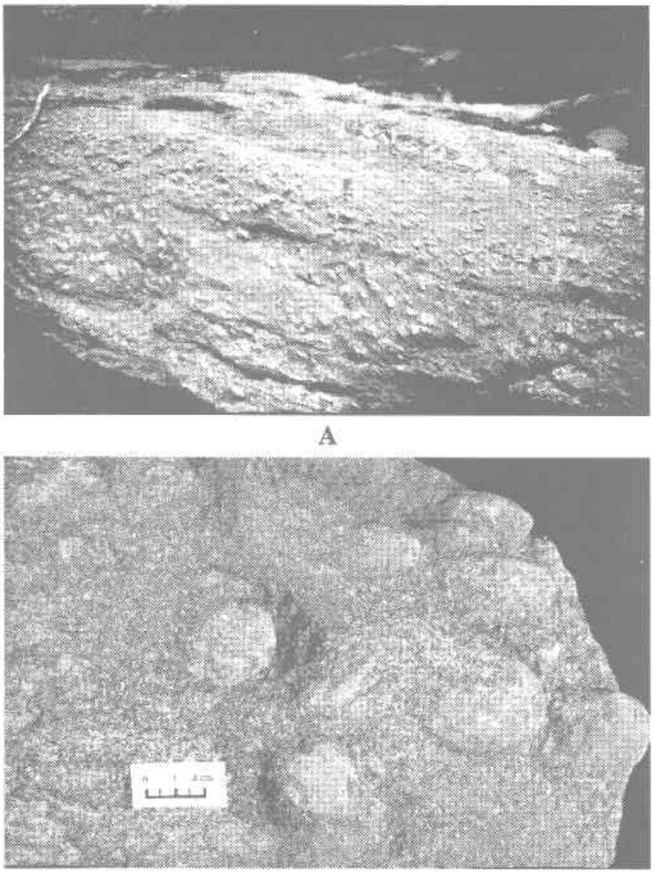
The amphibolite at the top of the Bassett Formation contains features that resemble graded bedding and cut-and-fill structures (Conley and Henika, 1970), which suggests a mixed volcanic-volcanoclastic protolith. In areas of relatively high metamorphic grade, such as exposures along State Highway 57 on the southwestern town limits of Bassett, it locally contains orthopyroxene and to the east near Figsboro it contains a distinctive garnet-plagioclase-pyroxene granofels assemblage.

In the central and southeastern part of this area, amphibolite occurs as thin, discontinuous stringers, interlayered with the upper part of the underlying granitic gneiss unit and farther to the southeast in the county it is locally absent. Similar metavolcanic rocks also occur as thin discontinuous layers in the overlying Fork Mountain Formation indicating that volcanism continued for some time after deposition of the Bassett Formation.

The amphibolite in the Bassett is not particularly resistant to weathering and upon exposure is reduced to massive red-brown to ocherous saprolite and plastic clay soil horizons. It holds up the crests of some low ridges in the northwestern part of the county, probably due to the development of this clay soil which is impervious to water and protects it from agents of chemical erosion. This characteristic may place severe restrictions on the development of septic tank - drainage field systems on some of the soils overlying amphibolites in the Bassett Formation.

Fork Mountain Formation

The Fork Mountain Formation is a mixed sedimentary and volcanic sequence that flanks the domes of Bassett



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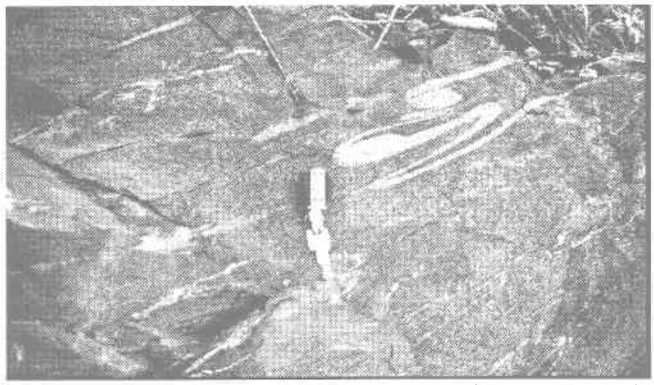

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The amphibolite in the Bassett is not particularly resistant to weathering and upon exposure is reduced to massive red-brown to ocherous saprolite and plastic clay soil horizons. It holds up the crests of some low ridges in the northwestern part of the county, probably due to the development of this clay soil which is impervious to water and protects it from agents of chemical erosion. This characteristic may place severe restrictions on the development of septic tank - drainage field systems on some of the soils overlying amphibolites in the Bassett Formation.

Fork Mountain Formation

The Fork Mountain Formation is a mixed sedimentary and volcanic sequence that flanks the domes of Bassett

Formation along the northwest side of the Smith River allochthon. Mica schist, predominant in the upper part of the formation, underlies northeastward-trending ridges along the northwestern edge of the allochthon whereas biotite gneiss is predominant to the southeast in the Martinsville area adjacent to or directly overlying the Martinsville Igneous Complex.

Mica schist: The mica schist is a light- to medium-gray, fine- to medium-grained rock with thin quartzose and calcareous layers transposed along a mylonitic foliation (Figure 7). Light-to dark-gray, fine-grained, equigranular quartzite (Geologic Map), in lenses a few hundred meters wide and generally a few meters thick, occurs locally in the mica schist. The schist is composed primarily of muscovite, biotite, quartz, garnet, and chlorite with accessory amounts of plagioclase, epidote, clinozoicite, magnetite, and titanium-bearing minerals. Chloritoid, staurolite, kyanite, and sillimanite porphyroblasts all show complex prograde and retrograde paragenesis (Conley and Henika, 1973; Conley, 1985). Andulusite has been recently confirmed in Fork Mountain schist by X-ray microprobe studies of poikiloblasts in the early-formed staurolite grade regional metamorphic assemblage zone. The mineral assemblage indicates that conditions of metamorphism reached 520 to 575 degrees C and 2 to 3.5 kb pressure (Barbara Munn, personal communication, 1994).

Figure 7. Fork Mountain mica schist outcrop along Alternate State Highway 57 along trace of tight synclinal fold in North Bassett.

Along the northwestern boundary of the allochthon to the southwest, Rankin, Espenshade, and Shaw (1973) mapped the contact between rocks containing relict staurolite and those containing relict sillimanite as a high angle reverse fault that has uplifted the sillimanite-bearing rocks westward over staurolite-bearing rocks. This fault has not been recognized to the northeast in Henry County where the boundary between the staurolite and sillimanite schists has been considered a relict metamorphic isograd (Henika, 1970, figure 7; Conley, 1985, figure 3). The staurolite crystals (Geologic Map, Ꞓfs unit) that formed during regional metamorphism northwest of the staurolite-sillimanite isograd (Henika, 1971, figure 7; Conley, 1985, figure 3) are large (1-7 cm), typically amber in color, generally twinned and partially to totally altered to sericite pseudomorphs ("fairystones"). Biotite occurs in the mica schist, but to the southeast of the relict sillimanite isograd it is almost universally altered to chlorite.

Euhedral garnets are ubiquitous in the schist but southeast of the relict sillimanite isograd they occur as globular-shaped aggregates, which may have grown together to form almost continuous garnet bands. Masses of fibrolite, partially altered to sericite, are diagnostic of the rocks southeast of the relict sillimanite isograd. Some of this sillimanite is pseudomorphous after staurolite and contains poikiloblastic inclusions of quartz and garnet.

Biotite gneiss: The Fork Mountain biotite gneiss is a medium-gray, compositionally banded rock consisting of quartzo-feldspathic layers and garnetiferous muscovite-biotite layers. The gneiss contains about equal amounts of quartz (commonly bright blue) and plagioclase and varying amounts of biotite, microcline, garnet, muscovite, and kyanite - sillimanite. Opaque minerals, garnet, and kyanite-sillimanite occur primarily in the biotite-rich layers; whereas, the quartzo-feldspathic layers are composed predominantly of quartz, plagioclase, microcline, and minor amounts of biotite and muscovite.

Clinozoisite-rich quartzite boudins a few centimeters thick are scattered throughout the unit, and probably represent original carbonate-rich sandstone or marl beds (Figure 8). Metamorphosed matrix- supported lithic breccias composed of gneiss, quartzite and amphibolite clasts up to 45 cm across are characteristic of the Fork Mountain biotite gneiss. The breccias can be recognized in most large fresh exposures of the unit. Large blocks of breccia are exposed in the Martinsville Stone Corporation quarry south of Fieldale. East of Fieldale large clasts are common in fresh rock exposures along State Road 609 near the access road to U. S. Highway 220 Bypass.

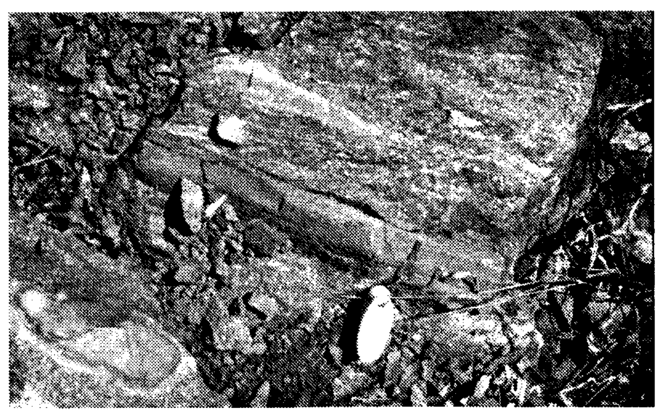

Figure 8. Fork Mountain biotite gneiss exposed in deep road cut along north side of State Road 609 about 0.1 mile east of U.S. Highway 220 Bypass. The gneiss at this locality contains angular fragments of calc-silicate rock and amphibolite (key is for scale).

Contact metamorphism, in aureoles surrounding the plutons of the Martinsville Igneous Complex, is discernible from mineralogical changes noted in the the Fork Mountain schist and gneiss over distances of two or three hundred feet

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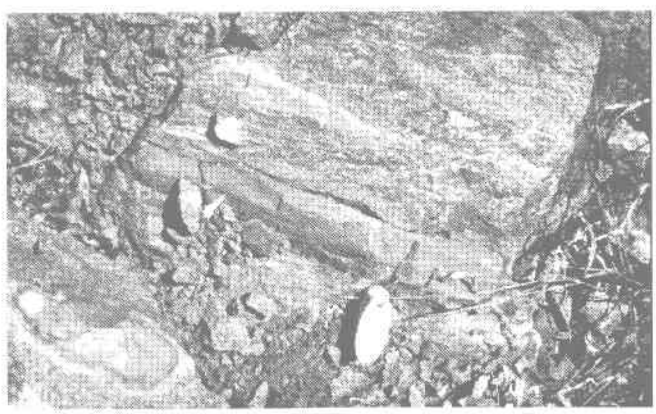

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Contact metamorphism, in aureoles surrounding the plutons of the Martinsville Igneous Complex, is discernible from mineralogical changes noted in the the Fork Mountain schist and gneiss over distances of two or three hundred feet from the contacts. Near Rich Acres Igneous Suite contacts, the metapelites have recrystallized under static metamorphic conditions causing widespread decussate growth of mica, kyanite and sillimanite porphyroblasts, especially in sites of large, previously retrograded staurolite or kyanite/sillimanite porphyroblasts (Conley and Henika, 1973). This younger granoblastic fabric and associated simplectite textures, mymekite and granophyre has locally overprinted or obliterated the older regional metamorphic fabric and largely eliminated distinctions between Fork Mountain schist and gneiss units (Barbara Munn, personal communication, 1994). Maximum metamorphic temperature and pressure ranges for rocks from the thermal aureole near Collinsville were estimated by the Virginia Tech Igneous and Metamorphic Petrology Laboratory to be approximately 4 to 8 kb of pressure and 635 to 725 degrees C temperature using a petrogenetic grid (Barbara Munn, personal communication, 1994).

The rocks of the Fork Mountain in contact with the Martinsville Igneous Complex commonly contain zones of incipient melting, mica-quartz-microcline migmatite layers, and cross-cutting granitic to granodioritic dikes. Coarse sillimanite porphyroblasts occur in the migmatite zone. Away from this zone they are progressively replaced in order by fibrolite sprays, finer-grained kyanite, and microscopic, untwinned staurolite porphyroblasts (Conley and Henika, 1973; Barbara Munn, personal communication, 1994).

The Fork Mountain sillimanite-mica schist is relatively resistant to erosion when compared to the other rock types in the area because the minerals composing the schist are extremely stable and resistant to chemical erosion. It generally forms the highest and most rugged topography in Henry County, including Turkeycock Mountain, Nantes Mountain, Blue Knob, and Chestnut Knob. The rock weathers to a deep red and gray saprolite. Weathered bedrock resistant to removal by ripping with heavy machinery may be encountered locally at depths less than 10 feet on the top of knobs and narrow ridges and along steam valleys, but it is generally covered by more than 30 feet of soil and saprolite.

Martinsville Igneous Complex

The Martinsville Igneous Complex (Ragland, 1974) is composed of two formations: the Leatherwood Granite (Jonas, 1928) and the Rich Acres Igneous Suite (Conley, 1985; Conley and Henika, 1973). The igneous complex underlies a large area around Martinsville (Geologic Map); isolated plutons also occur to the east of the main outcrop area. Radiometric dates from the Leatherwood Granite (U/Pb, zircons, and Rb/Sr whole-rock analyses) show that it is either Middle Ordovician in age (450 Ma, Rankin,1975; 464 ± 20 Ma, Odom and Russell, 1975) or Cambrian in age (516 Ma, Sinha and others, 1989).

Rich Acres Igneous Suite

The Rich Acres makes up the major part of the Martinsville Igneous Complex. It generally occurs in concordant to slightly discordant plutons, intrusive into the Fork Mountain and Bassett Formations. The Ora map unit (Geologic Map) has compositions ranging from syenodiorite to norite; chemical compositions show that most of the suite is diorite (Paul C. Ragland, personal communication, 1994). The syenodiorite and gabbro are commonly dark-greenish-gray, medium-grained rocks that have ophitic to subophitic textures. They are locally porphyritic and contain stubby plagioclase phenocrysts that range up to 1.5 cm in length. They are composed of the minerals plagioclase, green hornblende, reddish-brown biotite, pale-green clinopyroxene, uralite, and quartz as vermicular intergrowths in hornblende and plagioclase. The outer parts of some plutons are injected with thin hornblende diorite or hornblende gabbro veins and quartz-microcline-oligoclase pegmatites.

Norite occurs as small, irregular-shaped masses and possibly as dikes. The exact shape of these masses is hard to discern in saprolite and because of similar weathering characteristics of the syenodiorite-gabbro units, the norites can not be mapped separately. Norite is dark-gray, porphyritic to ophitic-textured with large (1-4 cm) pyroxene and elongate plagioclase crystals up to 1 cm in length. The rock is composed of plagioclase (bytownite-labradorite), orthopyroxene (predominantly hypersthene), clinopyroxene, brown pargasite, brown biotite, green hornblende (uralite), and olivine.

The Oru map unit (Geologic Map) includes altered ultramafic rock associated with the Rich Acres Igneous Suite, mostly in folded and deformed stratiform layers localized along the complexly sheared southeastern boundary (bottom ?) of the main body of the Martinsville Igneous Complex. The sills are several hundred feet thick and up to six miles long. They have two predominant lithologies: light green to light gray schist and dark greenish gray granular rock. Both lithologies may occur in the same body and intergrade with each other. A thin section from the schist body along the north-bound lane of U.S. Highway 220 about one mile southwest of Ridgeway contains approximately 35 percent cummingtonite, 20 percent talc, 10 percent chlorite, and 5 percent opaque minerals (Conley and Henika, 1973, p. 35). Granular rock from the same body sampled near the Ridgeway Sportsman Club Lake west of U. S. Highway 220, contains about 50 percent subhedral olivine phenocrysts with intersecting veins of yellow-green serpentine and dolomite. Tremolite and talc occur intergrown in about equal amounts in the matrix and some is pseudomorphous after pyroxene (Conley and Henika, 1973, p. 36).

Areas underlain by rocks in the Rich Acres Igneous Suite are generally lowlands that have a gentle rolling topography. Because of centuries of erosion of the topsoil, extensive areas are underlain by light-yellowish-brown to brown, deep, structureless saprolite. Where the soil profile is preserved, Rich Acres soils are commonly distinguished by a surface gravel of dark-brown iron oxide concretions in the topsoil layers. Thick, dark-brown to dusky-red, high-shrink-swell clay soils overlie the saprolite. These typical mafic soils may be subject to severe restrictions for development of drainage field treatment systems and moderate to severe restrictions for dwelling basements. In wet weather they are heavy, sticky, and very plastic, making grading difficult, and after exposure they have a tendency to dry and crack because of their moderate to high shrink-swell potential. The bedrock generally crops out as spheroidal boulders in saprolite, but unexpected bedrock pinicles that required blasting have been encountered in foundation excavations developed in the unit along stream valleys east of Martinsville.

Leatherwood Granite

The Leatherwood Granite occurs as dikes, sill-like bodies, and irregularly-shaped plutons. The major part of the Leatherwood in Henry County occurs as thin sheets on top of the large plutons of Rich Acres. The Leatherwood (Geologic Map, Olw unit) is medium-grained to coarse-porphyritic, light-gray granite (Figure 9) that generally shows rapakivi texture. However, sheets of fine-to coarse-grained equigranular, leucocratic granite and alaskite (Geologic Map, Olg unit) are at the surface in some of the larger Rich Acres plutons. Microcline phenocrysts range from 2 to 5 cm and are generally white but locally may be pink. Some specimens contain oligoclase as well as microcline phenocrysts. The phenocrysts are set in a medium-grained xenomorphic-granular matrix composed of microcline, quartz, plagioclase, biotite, and muscovite.

Figure 9. Injection breccia of the Rich Acres metagabbro in the Leatherwood Granite. Outcrop is behind the Winn Dixie store at the intersection of U.S. Highway 58 and State Highway 57 about 0.6 mile east of Martinsville.

The granite locally shows mylonitic textures. Large quartz grains occur as unstrained, recrystallized polygonal aggregates that show well defined triple points. Microcline phenocrysts are rimmed by fine grained, recrystallized quartz and feldspar that has been shown experimentally to indicate ductile deformation at temperatures above 700 degrees C (Tullis and Lund, 1987; Tullis, personal communication, 1994).

The Leatherwood weathers to a pinkish,granular saprolite and brown to yellowish-red, well-drained, gravelly, sandy soil. It is expressed topographically as low convex hills and v-shaped valleys. Bedrock is not commonly exposed on the upland surface but large boulders and granite pavements are commonly developed along the v-shaped valleys. Upland areas underlain by sheets of Leatherwood granite have been intensively farmed for tobacco in the area to the east of Martinsville. These areas are now increasingly favored for industrial and residential development because the sandy, well-drained soils and gentle slopes have been less expensive to develop than some of the other units in the area.

AREA III: SAURATOWN MOUNTAINS ANTICLINORIUM

The Sauratown Mountains anticlinorium (Geologic Map) is bounded on the north and northwest by the Ridgeway fault, the basal detachment fault of the Smith River allochthon, and on the southeast by the Chatham fault, the border fault of the Mesozoic Danville basin. In the Sauratown Mountains anticlinorium Grenville-age crystalline rocks are overlain by Late Precambrian metasedimentary rocks correlated with the Lynchburg Group of the Blue Ridge anticlinorium (Conley, 1985).

Stuart Creek Gneiss

The Stuart Creek Gneiss is a coarse granitic rock that occupies the cores of four structural domes in the Sauratown Mountains anticlinorium in Henry County (Conley, 1985). The Stuart Creek contains euhedral and subhedral phenocrysts of microcline and perthite in a hypidiomorphic to granoblastic-elongate quartz-feldspar-biotite matrix. The rock ranges in texture from protomylonite (Figure 10) containing relict phenocrysts to mylonite or flaser gneiss. Flaser gneiss is generally in the sheared, upper part of the unit, near and at its contact with overlying, younger metasedimentary rocks. Thin amphibole schist and biotite schist layers have been observed to cut the Stuart Creek Gneiss saprolite; these may represent intermediate to mafic igneous intrusions or feeder dikes related to the overlying Ashe metavolcanic suite.

The Stuart Creek Gneiss was correlated with the Grenville-age Elk Park Group of southwestern Virginia and north central North Carolina by Espenshade and others (1975). Compositionally layered granitic rocks from a quarry in the core of the Sauratown Mountains anticlinorium about 25 miles to the southwest of the Virginia-North Carolina boundary were dated at 1192 m.y. (Rankin and others, 1971).

The area of Stuart Creek Gneiss in the southeastern part of the county is a broad, gently rolling upland with moderate to gentle slopes except for incised meanders along the Smith River, such as "The Bend" near the confluence of Drag Creek. Thick to very thick, well drained, red, clay rich soils have developed on the rolling upland surface; thinner, more granular, brown-colored soils and saprolite are exposed on clay soils overlie the saprolite. These typical mafic soils may be subject to severe restrictions for development of drainage field treatment systems and moderate to severe restrictions for dwelling basements. In wet weather they are heavy, sticky, and very plastic, making grading difficult, and after exposure they have a tendency to dry and crack because of their moderate to high shrink-swell potential. The bedrock generally crops out as spheroidal boulders in saprolite, but unexpected bedrock pinicles that required blasting have been encountered in foundation excavations developed in the unit along stream valleys east of Martinsville.

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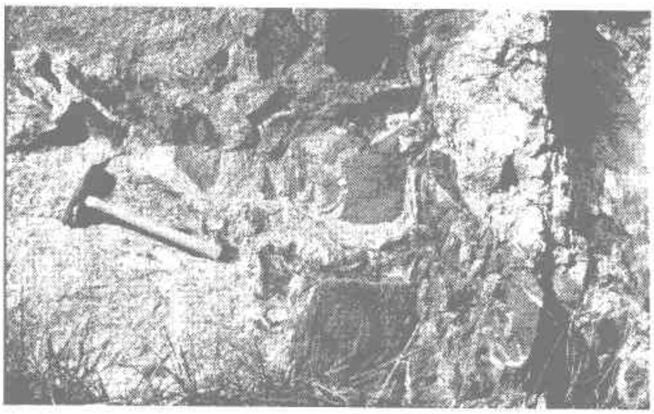

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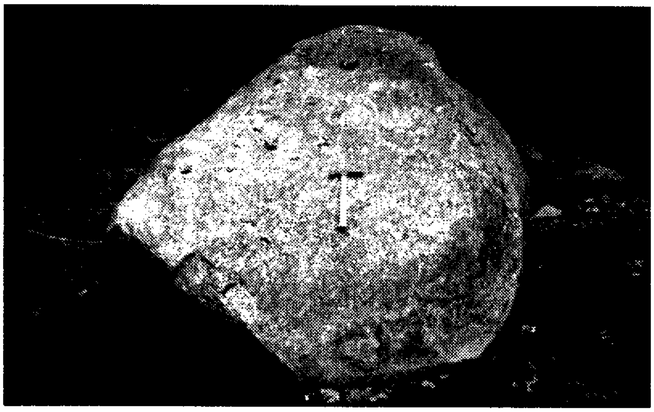

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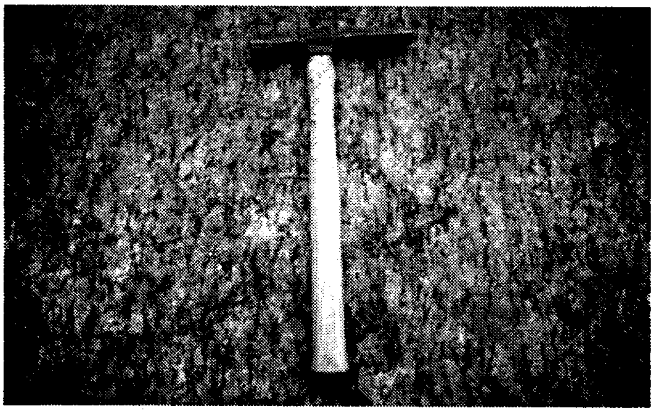

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Figure 10. A. Boulder of biotite augen gneiss in Stuart Creek, approximately 0.1 mile northeast of State Roads 632 and 884 in the southeastern part of Henry County. B. Detail photograph of coarse fabric in boulder described in Figure 10 A. Dark brown mineral that outlines crude foliation is biotite.

Lynchburg Group

The Stuart Creek Gneiss is unconformably overlain by a sequence of metasedimentary and metavolcanic rocks of probable Late Precambrian age. These rocks are subdivided into two major units, The Ashe Formation, and the overlying Alligator Back Formation (Espenshade and others, 1975; Conley, 1985).

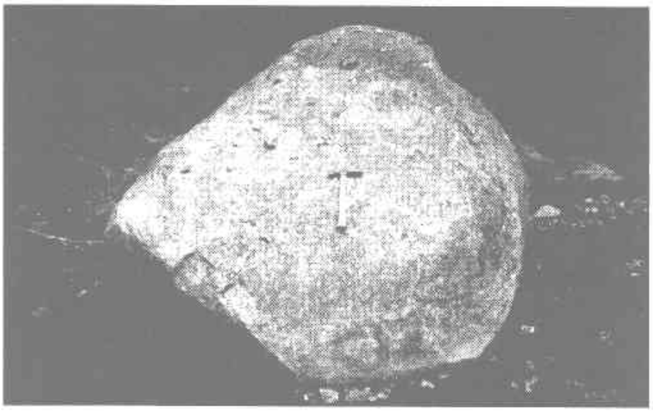
Ashe Formation

The Ashe Formation is well exposed along Turkeycock Creek southeast of the intersection of State Roads 635 and 634 about three miles east of Ridgeway. Discontinuous garnetiferous amphibolite layers are intercalated with layers of calcareous gneiss, micaceous quartzite, mica gneiss, and mica schist in the lower part of the Ashe (Geologic Map, Zaa unit). The amphibolite layers are dark-green to black and white laminated , medium- to coarse-grained and commonly are spotted with orange to red garnet porphyroblasts. Gneissic laminated amphibolite in some outcrops breaks into regular flaggy slabs that have a silky sheen on fresh surfaces because of many parallel hornblende prisms. Hornblende content ranges from 20 to 75 percent, quartz 10 to almost 50 percent, plagioclase feldspar from 0 to 20percent,either as interlocking grains in the matrix or distinct quartz-plagioclase-epidote laminations (Conley and Henika, 1973, p. 35). Garnet porphyroblasts up to 10 mm in diameter comprise from 5 to 15 percent of the Ashe amphibolite. Titanite, epidote, and opaques are common accessory minerals.

Calcareous gneiss and micaceous quartzite form massive, dark-brown to gray ledges which show faint laminations on smooth joint surfaces. Calcareous gneiss contains up to 25 percent calcite as polycrystalline grains (5 mm dia.) that are easily recognized in hand specimens. Micaceous quartzite contains up to 70 percent coarse, abrasion-resistant, blue quartz grains as well as rounded lithic clasts that stand out in relief on waterworn foliation surfaces in the Ashe Formation ledges along Turkeycock Creek.

Quartz-plagiocase-mica gneiss and mica schist (Geologic Map, Zau unit) makes up the major part of the Ashe Formation in southeastern Henry County. Gneissic layers range from 2 to 10 feet thick and the intervening schist layers are generally less than a foot thick. The gneiss is medium-grained, light-gray and composed of mica plates interspersed with elongate grains of quartz and feldspar. The rock is composed of approximately 60 percent feldspar, and plagioclase is dominant over microcline. Quartz ranges from 20 to 30 percent and biotite ranges from 10 to 20 percent of the rock. Muscovite is variable and ranges from trace amounts to 10 percent in the gneissic layers and composes almost all of the mica schist layers. The rock also contains minor amounts of tourmaline, zircon, sphene, rutile, epidote, and opaque minerals.

There is almost no contrast in geomorphology and soils between the the Ashe Formation and the underlying Stuart Creek Gneiss. The resultant upland surface is characterized by moderate to gentle slopes except for steep cut banks in incised meanders along the Smith River. The Ashe crops out only in these areas of steep slopes and in the major stream channels. On moderate slopes it has developed a characteristic gneissic saprolite that consists of light-gray to pinkish-gray granular bands rich in quartz and kaolinitic feldspar fragments alternating with dark-gray to dark reddish-gray micaceous bands that stand out in relief. Garnetiferous amphibolite interlayers decompose to punky, red clayey streaks. Soils are similar to the underlying unit except for strips of red clay residuum associated with the mafic rocks in slopes and near bedrock outcrops. Outcrops are most common as resistant ledges along major streams. Most of the bedrock is hard and will require blasting and removal of boulders with heavy machinery. Large areas of the unit are covered by ancient river gravels. Some of these deposits remain as distinct terrace deposits with internal structure (Geologic Map, td unit) whereas others have been partly reworked by sheet wash and only the coarse quartz cobbles are left intermixed with the typical light brown, sandy, clay soils developed on the eroded slopes in this unit.



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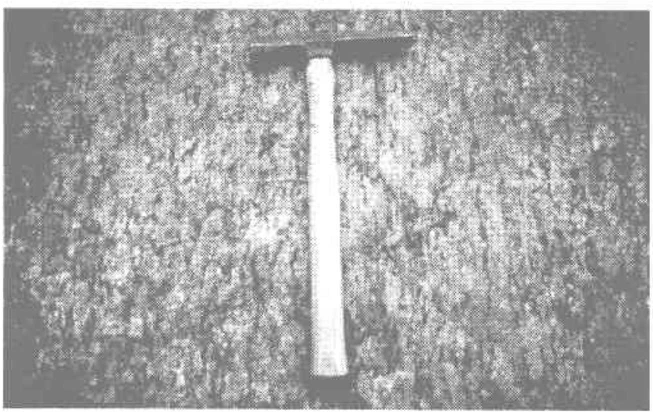

B

Figure 10. A. Boulder of biotite augen gneiss in Stuart Creek, approximately 0.1 mile northeast of State Roads 632 and 884 in the southeastern part of Henry County. B. Detail photograph of coarse fabric in boulder described in Figure 10 A. Dark brown mineral that outlines crude foliation is biotite.

Lynchburg Group

The Stuart Creek Gneiss is unconformably overlain by a sequence of metasedimentary and metavolcanic rocks of probable Late Precambrian age. These rocks are subdivided into two major units, The Ashe Formation, and the overlying Alligator Back Formation (Espenshade and others, 1975; Conley, 1985).

Ashe Formation

The Ashe Formation is well exposed along Turkeycock Creek southeast of the intersection of State Roads 635 and 634 about three miles east of Ridgeway. Discontinuous garnetiferous amphibolite layers are intercalated with layers of calcareous gneiss, micaceous quartzite, mica gneiss, and mica schist in the lower part of the Ashe (Geologic Map, Zaa unit). The amphibolite layers are dark-green to black and white laminated , medium- to coarse-grained and commonly are spotted with orange to red garnet porphyroblasts. Gneissic laminated amphibolite in some outcrops breaks into regular flaggy slabs that have a silky sheen on fresh surfaces because of many parallel hornblende prisms. Hornblende content ranges from 20 to 75 percent, quartz 10 to almost 50 percent, plagioclase feldspar from 0 to 20percent,either as interlocking grains in the matrix or distinct quartz-plagioclase-epidote laminations (Conley and Henika, 1973, p. 35). Garnet porphyroblasts up to 10 mm in diameter comprise from 5 to 15 percent of the Ashe amphibolite. Titanite, epidote, and opaques are common accessory minerals.

Calcareous gneiss and micaceous quartzite form massive, dark-brown to gray ledges which show faint laminations on smooth joint surfaces. Calcareous gneiss contains up to 25 percent calcite as polycrystalline grains (5 mm dia.) that are easily recognized in hand specimens. Micaceous quartzite contains up to 70 percent coarse, abrasion-resistant, blue quartz grains as well as rounded lithic clasts that stand out in relief on waterworn foliation surfaces in the Ashe Formation ledges along Turkeycock Creek.

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Alligator Back Formation

The Alligator Back Formation is present as relatively narrow, arcuate belts infolded with the upper part of the Ashe Formation in the Sauratown Mountains anticlinorium. Garnetiferous amphibole schist (Geologic Map, ЄZaba unit) interlayered with mica schist and gneiss is a discontinuous marker horizon that separates the Alligator Back from the underlying Ashe Formation. This unit is schistose to conspicuously banded greenish black "salt and pepper" rock. The major mineral constituent is bluish-green hornblende with lesser amounts of garnet, plagioclase, and quartz. The amphibole schist locally contains oval shaped masses of epidote and epidote-quartz up to 7mm long that resemble flattened amygdules. Lenses of light gray, fine- to medium-grained granitic gneiss composed of microcline, oligoclase, and quartz with accessory hornblende, garnet, sphene, and zircon occur interbedded in the base of the unit.

Sill-like lenses of altered ultramafic rock (Geologic Map, ЄZabu unit) occur intercalated with gneiss, amphibolite, and mica schist at the base of the Alligator Back. These are dark-green, fine-grained schistose rocks composed of chlorite and hornblende with variable amounts of carbonate, talc, anthophyllite, cummingtonite and opaque minerals. They are generally similar in texture and mineralogy to the ultramafic dikes and sills that cut the underlying Ashe Formation and form concordant layers in Alligator Back metavolcanic complexes in the Blue Ridge anticlinorium to the northwest.

Mica schist (Geologic Map, ЄZab unit) which makes up most of the Alligator Back Formation is well exposed in deep cuts along State Highway 86 about two miles southeast of Ridgeway. This unit is a sparkling light-bluish gray muscovite-biotite schist (Figure 11) containing abundant pink to red garnet porphyroblasts, less abundant bluish-gray kyanite and black, untwinned, prismatic staurolite porphyroblasts. It commonly contains thin quartz and plagioclase segregations as well as discontinuous graphite schist layers.

The Alligator Back has a subdued ridge and valley topographic expression in the Sauratown Mountains anticlinorium. Elongate arcuate ridges are formed on the relatively resistant mica schist units whereas elongate parallel valleys are formed along the trend of less resistant mafic and alaskitic units and along the Ridgeway fault trace. Dodecahedral garnet porphyroblasts (1mm to 5mm dia) are commonly accumulated as "garnet gravel" concentrates in the thin, well-drained, micaceous and quartz-rich soils developed on this unit. Lath-shaped kyanite porphyroblasts and black staurolite prisms up to two cm long also are common as a concentrate in soils overlying the unit, especially along the southwestern side of State Highway 86 about two miles southeast of Ridgeway.

Figure 11. Coarse-grained, garnetiferous, staurolite-mica schist in the Alligator Back Formation exposed along State Highway 87, 1.5 miles southeast of Ridgeway.

Alaskite and Pegmatite

Dikes, and sills of leucocratic alaskite, tonalite, and pegmatitic granite are common in metamorphic and igneous rocks of the Smith River allochthon and the Sauratown Mountains anticlinorium (Geologic Map, Olg and ak units). Leucocratic dikes and sills are concentrated in two areas, the Fork Mountain-Chestnut Mountain mica mining district and the Ridgeway mica mining district (Brown, 1962, p. 118-134). Relatively unweathered outcrops are massive, light-gray to white and consist of medium- to coarse-grained aggregates of perthitic microcline, plagioclase, and greenish books of muscovite with accessory garnet, tourmaline, and beryl (Griffitts, Jahns, and Lemke, 1953, p. 191). Pegmatitic dikes that cut the aluminous schists of the Fork Mountain Formation contain a high percentage of muscovite but may also contain kyanite, sillimanite, or staurolite depending on the mineralogy and metamorphic grade of the host rocks. Leucocratic intrusions noted in the Bassett Formation are commonly quartz tonalites containing as much as 35 percent plagioclase, 35 percent quartz, 10 percent potassic feldspar, 7 percent biotite, 5 percent epidote, and traces of zircon (Conley and Henika, 1973, p. 36).

Alaskite and pegmatites in the Ridgeway area consist primarily of foliated quartz monzonite to quartz diorite (Griffitts, Jahns, and Lemke, 1953, p. 144.). A thin section from one of the larger sills in the Ashe Formation adjacent to the Ridgeway fault zone along Smith River contains approximately 40 percent potassic feldspar phenocrysts, 30 percent plagioclase, 20 percent quartz, and 10 percent muscovite with traces of epidote and rose colored garnet dodecahedra scattered through the rock (Conley and Henika, 1973, p. 37). Along the South Mayo River in the western part of the area, alaskite dikes and sills are so interlayered with the country rock as to form injection gneisses that have locally obliterated traces of the Ridgeway fault. At other localities along the fault, the alaskite and pegmatite have been intensely sheared and recrystallized. Feldspar phenocrysts are partially crushed to form augen up to 4 cm across and large books of the Ashe. These may be up to 500 feet wide and several miles long following a broad arc around the anticlinal nose east of Ridgeway.

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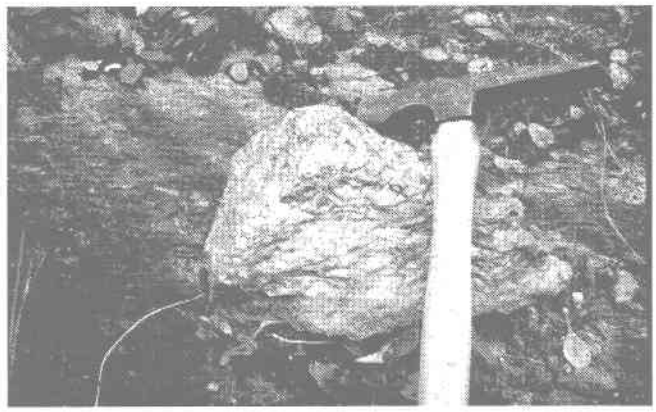

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The leucogranitoid rocks are deeply weathered to white kaolinitic saprolite that generally forms narrow strips of highly plastic clay-rich soil in sharp contact with sandy micaceous soils formed on the host rocks. These areas may require special planning for stabilization, grading, and development of roadways, foundations, and septic tank-drain field systems. In addition some of the major prospects and abandoned mines may remain as debris-filled open pits and partially collapsed adits in wooded and undeveloped areas.

AREA IV: MESOZOIC-AGE DANVILLE BASIN

In Henry County, the Mesozoic basin contains a sandstone lithofacies and a conglomerate lithofacies of the Stoneville Formation. These are continent-derived, clastic sedimentary rocks (Thayer, *in* Price and others, 1980) that are correlated with early Late Triassic rocks of the Lockatong Formation of the Newark Super-group in Connecticut based on fossil fish and phytosaurs (Olsen and others, 1978). The conglomeratic unit is crushed and intergradational with the microbreccia and cataclasite along the western border of the basin. Most of these Mesozoic rocks are covered by ancient river gravel deposits and the bedrock units are found as narrow strips along stream courses east of the Smith River.

Stoneville Formation - sandstone facies

The Stoneville Formation sandstone facies is the major Mesozoic-age sedimentary unit exposed in Henry County. It is composed chiefly of light-gray, grayish-orange, and pale-yellowish-brown, poorly sorted, medium- to very coarse-grained arkose and lithic arkose. It contains thin, irregular lenses of poorly sorted, pebble and cobble lithic conglomerate and about 25 percent mudrock. Sandstone is medium- to very thick-bedded, composed of angular and subangular quartz and feldspar grains and siltstone intraclasts. Sedimentary structures include medium- and large-scale trough cross stratification, ripple-drift cross lamination, and rib-and-furrow structures. There is some carbonized plant debris. The reddish-brown and pale-reddish-brown mudrocks have parallel, even, uniformly thin and medium stratification.

Stoneville Formation - conglomeratic facies

Thick- to very thick-bedded, poorly sorted, sandy, pebble- to boulder lithic conglomerate occurs along the western border of the Danville basin in Henry County. The conglomerate contains multicolored, rounded to subrounded clasts in a litharenite matrix interbedded with subordinate, crudely bedded, poorly sorted, pebbly, coarse- and very coarse-grained lithic arkose, arkose, and feldspathic litharenite interbeds. Clasts are composed dominantly of augen gneiss, biotite gneiss, mica schist, amphibole, and pegmatite with subordinate potassic feldspar, quartz, and quartz-feldspar gneiss. Some interbedded sandstones contain thick and very thick trough cross-bedding. The conglomerates are intensely sheared and silicified and are cut by quartz veins near the border fault.

LATE PALEOZOIC-MESOZOIC (?) IGNEOUS ROCKS

Felsite dikes

Northeast-trending, vertical felsite dikes have intruded the Alligator Back and the Candler Formation along the northwest side of the Bowens Creek fault in Fairy Stone Park. Similar dikes have intruded the Fork Mountain Formation along the southeastern side of the fault about two miles west of Oak Level. The dikes are nonfoliated, undeformed, very-pale-orange to light-gray with a porphyritic texture. Phenocrysts consist of euhedral biotite and dipyramidal (beta quartz) pseudomorphs.

Petrographic studies (Conley and Henika, 1970, p. 26; Henika, 1971, p. 18) indicate quartz constitutes 38.5 to 63 percent of the rocks; plagioclase makes up 14.8 to 38 percent and ranges from oligoclase-andesine to albite composition. Accessory minerals are biotite, orthoclase (generally perthite) and muscovite. Titanite, apatite, and zircon are generally present in trace amounts. Some of the pseudomorphs of beta quartz have been embayed and corroded by reaction with the original magma and secondary minerals include zoisite and sericite typical of late stage, deuteric alterations. The felsite dike rocks are thought to have been emplaced during the latest Paleozoic or early Mesozoic Era because they are structurally similar to the Mesozoic diabase dikes that are also nearly vertical, undeformed, and virtually unmetamorphosed on both sides of the Bowens Creek fault zone in Henry County.

Mesozoic-age diabase dikes

Swarms of diabase dikes are found along two fracture trends in Henry County. One trend is northwest oriented whereas the other is closer to north-south oriented. The dikes are medium-gray to greenish-black, have ophitic to subophitic textures, and range from basalt at the chilled margins to olivine gabbro in the centers of larger bodies. The diabase and basalts are composed of about 50 percent calcic plagioclase (An content up to 56%) and about 30 percent augite. Magnetite is commonly an accessory mineral. A typical olivine gabbro from one of the wider dikes contains approximately 40 percent plagioclase, 40 percent augite, 10 percent olivine, 5 percent hypersthene and 2 percent biotite (Conley and Henika, 1973, p. 39). Partial replacement of plagioclase by sericite, biotite by chlorite, and olivine by serpentine indicates these dikes were subjected to some deuteric alteration. The diabase dikes are probably of Jurassic age as indicated by the Ar/Ar date of 190 my on the Palisades sill that cuts Triassic sedimentary beds of the Newark Group in New Jersey (Dallmeyer, 1975), by paleomagnetic data (DeBoer 1967), and by the occurrence of lava flows (fed by similar dikes) interlayered with early Jurassic sedimentary rocks in northern Virginia (Lindholm, 1979; Cornet,1977). Ragland and others (1983) propose that emplacement of the north-south trending dikes postdates the emplacement of the northwest trending dikes.

The diabase dikes are moderately resistant to chemical weathering, which begins along joint surfaces and proceeds inwardly into the rock. This produces spheroidally weathered boulders (Figure 12) in ocherous, granular saprolite or heavy red clay. Some of the wider dikes are overlain by significantly large areas of poorly drained, high shrink-swell clay soils. Large and heavy bed rock boulders may be encountered when excavating these areas.

Figure 12. Mesozoic-age diabase dike (boulder) cutting weathered outcrop of Stuart Creek Gneiss. Large boulders above the hammer are dike rocks. Outcrop located along State Road 632 about 0.1 mile north of intersection with State Road 884.

STRUCTURE

FOLDS

Blue Ridge anticlinorium

The Ashe Formation is exposed northwest of Henry County in a large domal structure (Cooper Creek anticline of Conley, 1985) superimposed on the southeastern limb of the Blue Ridge anticlinorium. The Alligator Back Formation dips southeastwards away from the major axis of the dome along the northwestern boundary of the county. The multiple axes that define the Cooper Creek anticline probably formed by interference between large folds formed in the Blue Ridge during early Paleozoic (Taconic?) thrusting and folding associated with late Paleozoic (Alleghanian?) wrench faulting along the Bowens Creek fault (Conley and Henika, 1970; Gates, 1986).

Smith River allochthon

The Smith River allochthon is preserved in a long northeast-trending, synformal structure located between the Blue Ridge anticlinorium and the Sauratown Mountains anticlinorium (Conley and Henika, 1973; Conley, 1985, figure 2). The down-fold is continuous from Buckingham County, Virginia, southwestward to an area of closure in North Carolina delineated by Espenshade and others (1975). Cross section A-A' (Geologic Map) shows the generalized structural configuration of the allochthon. Upright northeast trending antiforms and synforms involving the Fork Mountain and Bassett Formations along the northwest side of the allochthon (Henika, 1971, figures 3 and 7) belong to northeastward-trending (F_2 and F_3) fold systems that modify recumbant (F_1) isoclinal folds in the central part of the allochthon. The major F_2 folds in the allochthon are long and narrow structures with gently plunging hinges, some of which can be traced for tens of miles between abrupt culminations. F_3 folds in the allochthon are shorter, more open, and more steeply plunging folds than the earlier structures (Figure 13). The F_3 fold hinges have more northerly trends at acute angles to major formational boundaries indicating a dextral shear symmetry (Gates,1986, figure 22a). The F_3 folds produce hook-shaped interference patterns where they cross the F_2 folds.

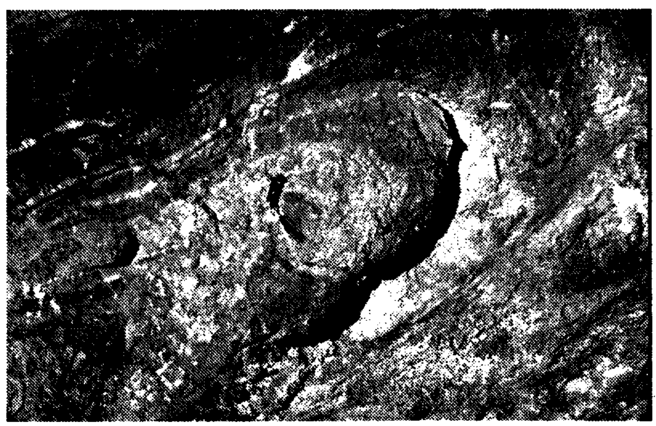

Figure 13. Detail of F_3 fold in Bassett gneiss showing tight, similar fold pattern and steep southwest plunge. Same location as Figure 4 along Norfolk Southern Railway in North Bassett.

Nappe-like F_1 isoclinal folds within the allochthon (Henika, 1971, Figures 10 and 11) have subhorizontal axial planes. These structures were probably formed during Taconic or Pre-Taconic collisional tectonism and Barrovian regional metamorphism dated at 534 my (Gates,and others, 1994). Later sets of more upright folds (F_2 and F_3) have refolded the subhorizontal folds in type 2 interferance (Ramsey, 1967) and deformed the regional metamorphic rock fabrics in the allochthon (Henika, 1971, figures 3, 4, and 7; Conley and Henika 1973, figure 25; Ramsey, 1967). The long, persistant downfold that preserved the allochthon was probably produced during the initial stages of Alleghanian serpentine indicates these dikes were subjected to some deuteric alteration. The diabase dikes are probably of Jurassic age as indicated by the Ar/Ar date of 190 my on the Palisades sill that cuts Triassic sedimentary beds of the Newark Group in New Jersey (Dallmeyer, 1975), by paleomagnetic data (DeBoer 1967), and by the occurrence of lava flows (fed by similar dikes) interlayered with early Jurassic sedimentary rocks in northern Virginia (Lindholm, 1979; Cornet,1977). Ragland and others (1983) propose that emplacement of the north-south trending dikes postdates the emplacement of the northwest trending dikes.

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Nappe-like F_1 isoclinal folds within the allochthon (Henika, 1971, Figures 10 and 11) have subhorizontal axial planes. These structures were probably formed during Taconic or Pre-Taconic collisional tectonism and Barrovian regional metamorphism dated at 534 my (Gates,and others, 1994). Later sets of more upright folds (F_2 and F_3) have refolded the subhorizontal folds in type 2 interferance (Ramsey, 1967) and deformed the regional metamorphic rock fabrics in the allochthon (Henika, 1971, figures 3, 4, and 7; Conley and Henika 1973, figure 25; Ramsey, 1967). The long, persistant downfold that preserved the allochthon was probably produced during the initial stages of Alleghanian thrusting (F_2). The relict isogradic boundary between the Ꞓfm and Ꞓfs units of the Fork Mountain Formation (Henika, 1971, p. 26, figure 7) was probably deformed by dextral shearing along the Bowens Creek fault during a later (F_3) phase of tectonism that was coincident with the late Paleozoic (350 to 275 my Rb/Sr whole rock and mineral) ages reported from rocks along the Bowens Creek fault (Gates, 1986, p. 70; Fullagar and Deitrich, 1976).

Sauratown Mountains anticlinorium

The Sauratown Mountains anticlinorium is a broad dome located in the southern and southeastern part of the area. The core of the structure is composed of the Stuart Creek Gneiss, which is overlain unconformably by the Ashe and Alligator Back Formations. A series of detached (F_1) recumbent isoclines, some containing basement cores were mapped in the extreme southeastern part of Henry County. These structures have been refolded by upright (F_2 and F_4) folds and produce type 2 and type 3 interference patterns (Ramsey, 1967) analogous to the larger Smith River allochthon in the central part of the area.

A consistent northwestward-trending lineation (L_1), that pervades both basement and overlying metavolcanic and metasedimentary rocks is thought to have formed parallel to the direction of tectonic transport on the footwall beneath the Ridgeway fault. Both the fault trace and the lineations developed in the footwall are deflected by younger northeastward (F_2) and northwestward (F_4) trending folds.

The F_2 folds in the Sauratown Mountains anticlinorium are similar in geometry to the F_2 folds previously described in the Smith River allochthon. They are gently plunging structures delineated by the long and narrow outcrop belts of the Ashe and Alligator Back Formations. Some of the F_2 folds can be traced for several miles between abrupt culminations where they either terminate or wrap around north to northwest trending F_4 axes.

The F_4 folds are open north to northwestward trending shear structures associated with steeply dipping northwest trending cleavage. They were first noted in the metavolcanic rocks southeast of the Danville basin (Henika, 1977, p. 17). The north to northwestward trending folds may be associated with Triassic or later block movements along northward to northwestward trending faults associated with prominent offsets in the trend of the Danville basin.

Danville basin

The Danville basin is a northeast-trending structure that is about 123 miles long (Conley, 1985, figure 2). The basin is bounded on its northwestern margin by the Chatham fault (Myertons, 1963). The sedimentary rocks on the southeastern margin of the basin may be either in unconformable or fault contact with the older metamorphic rocks (Myertons, 1963). Strike of bedding within the basin generally is parallel to the trend of the Chatham fault zone and the rocks have a rather consistent north 44 degrees west dip, except near the Chatham fault, where dips are steeper (Thayer, *in* Henika, 1977). Estimated thickness of strata in the Danville basin, calculated from outcrop width and average dips, ranges from 3600 feet in the narrowest part of the basin to 13,300 feet in the widest part (Henika and Thayer, 1980).

FAULTS

Bowens Creek fault

The Bowens Creek fault, named by Conley and Henika (1970), has been traced in a northeasterly direction across the extreme northwestern part of the county. The fault is marked by a band of tectonic schist and phyllonite that ranges from 2,000 to 3,000 feet wide that have a dip to the southeast at angles ranging from 55 degrees to vertical. The rocks of the shear zone are cut by gently southeast dipping fracture cleavage (C-tectonite) that is oriented generally more east of north than the foliation (S-tectonite). Just below the contact with the Fork Mountain Formation, phyllonitic Candler chlorite mica schist contains clockwise rotated chloritoid porphyroblasts (Conley and Henika, 1970, figure 14, p. 23). These rotated porphyroblasts, winged porphyroclasts, kink folds, S/C fabrics, and sub-horizontal mineral stretching lineations are common all along the southeastern border of the Candler outcrop belt. Analysis of strain indicators measured along the fault (Henika, 1971b; Henika *in* Bartholomew and others, 1994, figure 12, p. 196) shows that the Bowens Creek fault marks a continuous, right lateral convergent wrench (dextral-transpressional) zone across which rocks of the Inner Piedmont (Smith River allochthon) have overridden the southeastern limb of the Blue Ridge anticlinorium.

Mesozoic and younger extensional structures southeast of the Bowens Creek fault

Additional strain indicators noted along the Bowens Creek fault (Henika *in* Bartholomew and others, 1994, figure 12, p. 196,) and several minor faults noted within the allochthon to the southeast during previous mapping indicate late down-to-the-southeast extension. A minor fault that offsets alluvial terrace deposits along the Smith River near Stanleytown (Conley and Toewe 1968, p. 24) appears to lie along a well-defined topographic linement interpreted as an older northeasterly-trending fault trace marked by deletion of stratigraphic units along the Bassett and Fork Mountain formational contacts near Rangely. Minor faults, broad fold warps and roll-over structures depicted on Cross Section A-A' (Geologic Map) within the Smith River allochthon are thought to be have developed more or less at the same time as the Danville basin.

Ridgeway fault

The Ridgeway fault, named by Conley and Henika (1970) for the town located in the southwestern part of the county, is the fault along which the Smith River allochthon was emplaced. The fault has been folded and has a sinuous surface trace that wraps around fold structures producing indentations and embayments in the overlying allochthon. The Ridgeway fault has a dip to the northwest along the southeastern side of the allochthon in Henry County and is truncated against the Bowens Creek fault on the surface at the northeastern end of Chestnut Mountain in Pittsylvania County (Conley, 1985). The Ridgeway is probably truncated by the Bowens Creek fault in the subsurface beneath the Smith River allochthon in the northwestern part of Henry County (Conley and Henika, 1973, p. 43, figure 25) and is truncated along the Chatham fault to the southeast. As previously noted the Ridgeway fault zone is extensively intruded by alaskite and mica-bearing pegmatites in some areas and these intrusions have obscured the actual location of the fault line within the Ridgeway mica mining district in the southwestern part of the county.

Chatham fault

The Chatham fault occurs in the southeastern corner of Henry County where it separates rocks of the Sauratown Mountains anticlinorium from Mesozoic rocks of the Danville basin. The fault is a northeast trending normal fault along which the (Mesozoic) movement was down to the southeast extension. The fault zone contains a belt of mylonitic and cataclastic rocks as much as 0.5 mile wide that includes rocks derived from intense shearing of metamorphic rocks located northwest of the Danville basin and Mesozoic-age sedimentary rocks from within the basin (Henika and Thayer, 1977; Price and others, 1980a, 1980b) .

The consistency of trend and dip of the Mesozoic rocks that fill the Danville basin indicates that little movement occurred along the Chatham fault during deposition in the basin. The latest movement along the Chatham fault postdates deposition of the sedimentary rocks and was down to the east extension that rotated the strata within the basin so that they now have dip angles ranging from 30 to 45 degrees to the northwest.

The rocks in the Chatham fault zone may record more than one period of movement including a change from early ductile to later brittle deformation. Robinson (1979) reported undeformed pegmatite intruding mylonitic rocks of the Sauratown Mountains anticlinorium along the Chatham fault zone. Pegmatite in the Sauratown Mountains anticlinorium (Ridgeway mica mininng district) to the southwest has been dated by the Rb-Sr method at 321 Ma (Deuzer and Herzog, 1962). This early ductile movement may be associated with the Brookneal shear zone described by Gates (1981) along strike to the northeast or with the Stoney Ridge branch of the Brevard fault described by Butler and Dunn (1968) along strike to the southwest of the Chatham fault in North Carolina. Samples of silicified microbreccia characteristic of the later brittle deformation in North Carolina have been dated as Early Jurassic age (180±3 Ma) by Fullagar and Butler (1980).

MINERAL RESOURCES

Active mineral resource localities, sample locations of minerals of potential resource value, as well as many abandoned mines and prospects of historical interest in Henry County and the City of Martinsville have been digitized and updated by the Division of Mineral Resources. The most recent update of the mineral resources data base is summarized as a separate mineral resources map, folded in the pocket inside the back cover.

CRUSHED STONE

Gneissic parts of the Fork Mountain Formation and gneiss in the Bassett Formation, Leatherwood Granite, and some lithologic units in the Rich Acres Igneous Suite are proven sources of aggregate (crushed stone). The major source of crushed stone in the Henry County area has been the garnetiferous biotite gneiss in the Fork Mountain Formation, which has been quarried at several localities in the county (Conley and Toewe, 1968). An abandoned quarry in Fork Mountain biotite gneiss is located 1.25 miles southeast of the intersection of U. S. Highway 220 and State Highway 57 at Bassett Forks (Geologic Map Locality 7). The Martinsville Stone Corporation quarry south of Fieldale (Figure 14) and the Wilson quarry located north of Horse Pasture (Map Localities 14 and 17 respectively) produce stone from the Fork Mountain biotite gneiss. Initial production at the Martinsville Stone Company quarry at map locality 14 was from a rock face developed east of the U. S. Highway 220 Bypass near the crushing plant. Later expansion developed the large open pit mine west of the Bypass.

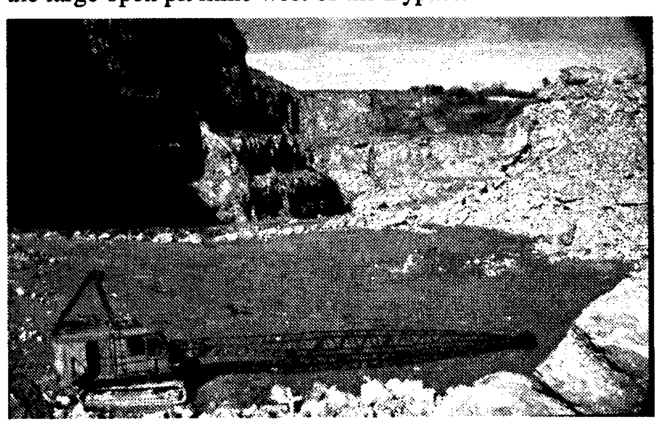

Figure 14. Northeast facing photograph showing garnetiferous biotite gneiss highwall and quarry. The Martinsville Stone Corporation is located of the west side of State Road 684 about 1 mile south of Fieldale.

Rock production from Wilson Quarries (Map Locality 17) began in May, 1961 and has continued since that date. Results of physical tests on the rock from this quarry are tabulated in Table 1 (Virginia Department of Highways, 1963).

Samples of Fork Mountain biotite gneiss from three prospects within Henry County have also been tested by the Virginia Department of Highways for use as coarse aggregate the fault along which the Smith River allochthon was emplaced. The fault has been folded and has a sinuous surface trace that wraps around fold structures producing indentations and embayments in the overlying allochthon. The Ridgeway fault has a dip to the northwest along the southeastern side of the allochthon in Henry County and is truncated against the Bowens Creek fault on the surface at the northeastern end of Chestnut Mountain in Pittsylvania County (Conley, 1985). The Ridgeway is probably truncated by the Bowens Creek fault in the subsurface beneath the Smith River allochthon in the northwestern part of Henry County (Conley and Henika, 1973, p. 43, figure 25) and is truncated along the Chatham fault to the southeast. As previously noted the Ridgeway fault zone is extensively intruded by alaskite and mica-bearing pegmatites in some areas and these intrusions have obscured the actual location of the fault line within the Ridgeway mica mining district in the southwestern part of the county.

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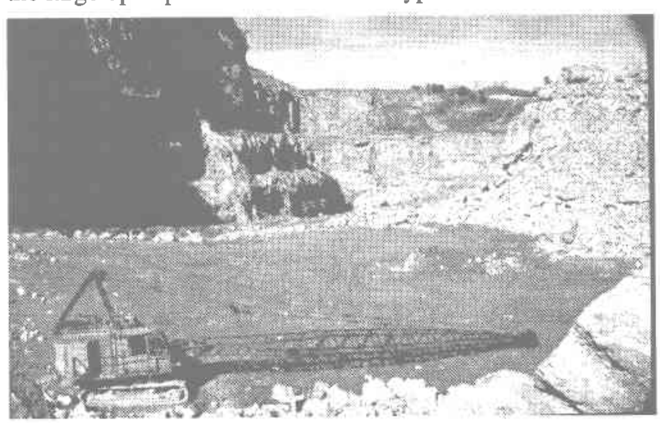

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(Virginia Department of Highways, 1954). One is located just west of State Highway 108, about 4 miles north of Martinsville. Physical test data from rocks at this site are listed as "prospect 108" in Table 1. A second prospect is located just north of State Road 609, 0.9 mile east of Rangeley, and 0.5 mile west of Fieldale. Physical test data from rocks at this site are listed as "prospect 609" in Table 1. Another prospect is located 0.1 mile east of State Road 876 and 0.25 mile southeast of the junction of State Road 876 with U. S. Highway 58. Physical test data from rocks at this site are listed as "prospect 876" in Table 1.

Table 1. Physical test results of Fork Mountain gneiss samples.

Prospect or Quarry	L. A. Loss	Absorption	Spec. Gravity
Wilson # 1	(Grade B) 32.2	0.21	2.91
Prospect 108	(Grade A) 52.0	0.91	2.68
Prospect 609	(Grade A) 64.8	0.46	2.60
Prospect 876	(Grade A) 37.7	0.38	2.78

An abandoned crushed stone quarry that was operated by Sydner Stone Company from 1949 until 1967 was developed at the contact between Bassett Formation biotite gneiss and amphibolite in the northern part of the county. The old quarry is just north of State Road 657 along Reed Creek at Map Locality 2. Bassett biotite gneiss at the upper level was the main source for crushed stone. A sample from the quarry was tested by the Virginia Department of Highways (Gooch, Wood, and Parrott, 1960) and is listed in Table 2 under "Snyder Stone".

The Leatherwood Granite has been quarried at two localities west of Martinsville near Horse Pasture. One abandoned quarry is north of U. S. Highway 58 (Conley and Toewe, 1968) and the other that was adjacent to Highway 58, 1.5 miles southwest of its intersection with State Road 687 at Horse Pasture was filled in during construction of the new west-bound lane of U. S. Highway 58. Test results (Virginia Department of Highways, 1954) of a granite sample taken from the abandoned quarry (Map Locality 18) are listed in Table 2.

Another granite test sample was collected from a Leatherwood prospect north of Martinsville. This prospect is located on the east flank of a north-south ridge, 0.6 mile west southwest of the junction of State Highway 108 and State Road 882, about 3 miles north of Martinsville. Physical test data for rock from this prospect are listed in Table 2 under "882 prospect".

The Leatherwood Granite was also quarried for crushed stone in the area east of Martinsville at Map Locations 11, 12, and 13. In this area the granite commonly contains large xenoliths of country rock, because it occurs principally as dikes and sills that cut other rocks near the top of the Martinsville Igneous Complex. Many of the bodies shown on the map may be too thin or may contain large xenoliths that might cause problems in this area for operations producing quality controlled aggregate products .

Table 2: Physical test results of Bassett gneiss and Leatherwood Granite samples.

Prospect or Quarry	L. A. Loss	Absorption	Spec. Gravity
Snyder Stone	(Grade A) 34.2	0.60	2.74
882 Prospect	(Grade A) 40.3	0.75	2.99
Horse Pasture Quarry	(Grade A) 60,5	0.75	2.64

The mica schist of the Fork Mountain Formation has been quarried for road stone at the Franklin-Henry County boundary on Turkeycock Mountain in the Snow Creek quadrangle (Conley and Henika, 1973). It is unlikely that this material would pass current highway aggregate test specifications for use in asphalt and concrete.

SAND AND GRAVEL

Sand and gravel resources are and have been produced from several locations in the county. Sand in Leatherwood Creek, east of Martinsville derived from weathered Leatherwood Granite and rocks of the Rich Acres Igneous Suite, has been produced since 1910, when J. W. Cheshire and Sons was active. Subsequently Kendell Sand Works and Prillaman and Pace, Inc. produced sand from the creek. In 1995, Prillaman and Pace was dredging sand from the creek, screening it, and using is as a back-fill sand for pipes and tanks. Other markets include sand for golf courses, abrasive material for traction on icy roadways, and base material for concrete and asphalt pavements.

Weathering of Bassett Formation has produced good quality sand that has accumulated along streams in southwestern Henry County. Sand has been produced intermittently from the flood plain of the Mayo River since the 1970s. McCarty Sand Works is currently dredging in the river channel southwest of Spencer and markets their product for fill material, abrasive material for winter traction control as well as asphalt and concrete.

IRON ORE

Localized concentrations of magnetite occur in the Fork Mountain Formation in the Smith River allochthon. A magnetite prospect described by Nitze (1892) was rediscovered on a ridge east of State Road 663,approximately one mile northeast of the Martinsville city limits during geologic mapping of the county. The debris filled pit was sunk into saprolite of the mica schist wall rock of the ore vein. During the early 1970s magnetite was exposed in a prospect trench in the Fork Mountain Formation southwest of Geologic Map locality 20, about 0.3 mile northwest of Fishers Dam in the southwestern part of the county. The vein contained lenticular blebs of magnetite in a sheared kyanite-quartz hornfels. Weathered garnet dodecahedra up to 8 cm in diameter were found in the saprolite walls of the trench. A sawed rock sample contains approximately 40 percent massive magnetite (Conley and Henika, 1973). A thin section prepared from the matrix of this sample contains approximately 30 percent kyanite, 30 percent potassic feldspar, 20 percent quartz, 10 percent muscovite, 5 percent staurolite, and 5 percent disseminated magnetite.

Local concentrations of magnetite were also noted in the Rich Acres Igneous Suite. Several prospect pits, were sunk into deep residual soil along a farm road at a point one mile, north 42 degrees east of the Chestnut Knob Lookout Tower. Magnetite was found in the small dump adjacent to the pits.

MONAZITE

Monazite may be a minor but important relict mineral constituent of magnetite deposits noted in the Fork Mountain Formation on the eastern slopes of Chestnut Knob southwest of Martinsville. Conley and Henika (1973) described a stratiform body less than 2 feet thick interlayered with mica schist and quartzite. A prospect pit in the deposit was noted 1200 feet south of the outcrop on State Road 687. A thin section contains approximately 60 percent magnetite (intergrown with other opaque minerals), 25 percent quartz, 10 percent kyanite, 2 percent monazite, and trace amounts of corundum, sillimanite, zircon, and hematite. The rock has a granoblastic texture owing to coarse irregular shaped magnetite grains that have crystallized around quartz, euhedral sillimanite, and monazite. The monazite is rounded and embayed by magnetite. Mertie (1955) described this deposit as a fossil monazite placer and considered the monazite to be of detrital origin. Kyanite and garnet have formed reaction rims that completely mantle quartz inclusions in the magnetite. Corundum is concentrated in the magnetite as microscopic intergrowths similar to those associated with the emery deposits in the area.

EMERY

Emery deposits have been developed in the contact aureole between the Rich Acres Igneous Suite and the Fork Mountain Formation (Conley and Toewe, 1968; Conley and Henika, 1973). Coarse granular emery occurs as isolated boulders in the residual soil at this contact. The emery is a dark-gray, non-foliated rock composed of interlocking green spinel (pleonaste or hercynite) and magnetite crystals, which envelop crystals of corundum (Conley and Henika, 1973). The dark-green hercynite is rimmed by brown hoegbomite apparently formed by deuteric alteration of spinel (Watson, 1925).

Corundum-magnetite-spinel emery was mined at Map Locality 20 southeast of Martinsville along the Fork Mountain-Rich Acres contact about 0.5 mile west of Fishers Dam (Conley and Henika, 1973). Alumina (Al_2O_3) content of samples analyzed from this locality was 44.3 percent (Sweet and Giannini,1990). Similar deposits were noted on the northern end of Sheffield Hill near Ridgeway (Conley and Henika, 1973) and along the contact between the Fork Mountain Formation and the Rich Acres Igneous Suite west of Koger Creek in the southwestern part of the county. Emery, composed of corundum and magnetite, is present northeast of Martinsville, approximately 1.4 miles south 25 degrees west of Blue Knob (Conley and Henika, 1973).

The percentages of constituent minerals are variable from locality to locality. Hercynite ranges from 0 to 70 percent, corundum 10 to 40 percent, magnetite 5 to 40 percent, and kyanite from trace amounts to 10 percent. Staurolite and garnet are present in minor amounts in the emery deposit near Blue Knob. Pale-green chlorite is a common alteration mineral in samples from all localities. The composition of emery from the area of this report is similar to that from Pittsylvania County, Virginia (Watson, 1925) and from the Cortland Complex, New York (Friedman, 1956).

SILLIMANITE AND KYANITE

Fibrolite is disseminated in the sillimanite mica schist of the Fork Mountain Formation. It is generally replaced by sericite, except on the southeastern end of Turkeycock Mountain. A thin section of rock from this area contains approximately 20 percent sillimanite, principally fibrolite, that is intermingled with biotite folia along compositional foliation planes (Conley and Henika, 1973).

The major concentrations of kyanite and sillimanite occur in the Fork Mountain Formation in the contact metamorphic aureole developed adjacent to rocks of the Martinsville Igneous Complex. The aureole is several hundred feet thick above the gently undulose contact with the rocks of the igneous complex. Because of the elevation and the gentle dip of the upper surface of the complex , contact metamorphism is widespread and the kyanite and sillimanite- rich rocks underlie a large part of the Smith River allochthon. At higher levels in the contact auriole, kyanite is generally more abundant in the mica schist , whereas coarse sillimanite is more abundant in the gneissic hornfels zone nearer the contact with the igneous rocks (Conley and Henika, 1973; Barbara Munn, personal communication, 1994).

A high concentration of kyanite and sillimanite occurs in an area centered around a small knob located approximately 0.2 mile south of Woodland Heights Church, 0.6 mile east of the Martinsville city limits. At this knob, a vertical section of contact metamorphosed pelitic rocks, approximately 300 feet thick, is exposed from the top of the highest exposure of schist in the area to the level of the intrusive rocks in the valleys surrounding the knob. Seven thin sections of rocks collected within a 0.5 mile radius of the knob contain an average of 18 percent kyanite and 8 percent sillimanite (Conley and Henika, 1973).

Chestnut Knob is a central ridge in the southwestern part of the county that is underlain by the Fork Mountain Formation and is flanked on both the east and the west by broad valleys underlain by the Leatherwood Granite and the Rich Acres Igneous Suite. At this locality, over 500 feet of vertical section is exposed containing thermally altered rocks. Thirteen thin sections collected within a one-mile radius of Chestnut Knob contain an average of 17 percent kyanite and 5 percent sillimanite. Concentrations of magnetite (up to 20 percent) are locally associated with contact mineral assemblages throughout the area. As a result, the rocks with anomalous concentrations of kyanite, sillimanite and andalusite also have higher magnetic susceptibility. This relationship may prove valuable as an aid to prospecting for alumino-silicate polymorphs.

The Fork Mountain mica schist unit exposed along State Highway 57 just west of the Patrick-Henry County line was analyzed as a potential non-bauxitic alumina resource (Sweet and Giannini, 1990). The schist from Patrick County has an alumina content of 31 percent.

Kyanite occurs in the Alligator Back Formation of the Sauratown Mountains anticlinorium. It has spotty distribution within the unit and no major concentrations were found in the formation. Kyanite is also reported as part of the regional metamorphic assemblage in schists of the Sauratown Mountains anticlinorium in Stokes and Surry Counties, North Carolina (Butler and Dunn, 1968; Espenshade and Potter, 1960). A concordant kyanite-rich zone occurs in the schist unit at the Virginia-North Carolina boundary southwest of Whites Chapel in the south-central part of the county and is traceable for a few hundred yards northward from the boundary into Virginia.

MICA

Muscovite was mined continuously in the Chestnut Mountain area from before World War I to after the end of World War II. Mining in the Ridgeway area also occurred discontinuously during the same period (Jahns and Griffitts, 1953; Brown, 1962). The abandoned mines and prospect pits are now generally filled with debris and are overgrown by vegetation. Some pits in the Ridgeway area have been completely covered by relatively recent construction. In the Chestnut Mountain area, scrap and electrical-grade sheet mica were produced. Scrap mica, sheet mica, and some feldspar were produced in the Ridgeway area. Griffitts, Jahns, and Lemke (1953) visited the mines in the Ridgeway area while the workings were accessible and state that many of the deposits were not exhausted when the mines closed. Some of the larger dumps in the area are also a possible source of scrap mica. The Merriman and Greer mines (Map Locality 6) in the northwestern part of the county were the largest producers of mica in the area. Brown (1962) described large perthite-rich zones in the Merriman mine that might be a commercial source of potassic feldspar.

As it is now feasible to make wet-ground mica from mica schist (Lewis, Bundy and Wiener, 1971), mica schist in the Ashe and the Alligator Back Formations of the Sauratown Mountains anticlinorium in the south-central part of the county is a potential source of ground mica. A thin section from one of these schist beds contains over 99 percent muscovite. The muscovite occurs as sparkling light-gray porphyroblasts 3 to 10 millimeters in diameter that enclose less than 1 percent opaque-mineral inclusions (Conley and Henika, 1973) .

TALC AND SOAPSTONE

Altered ultramafic rocks that contain talc are present in the Blue Ridge anticlinorium, the Smith River allochthon, and the Sauratown Mountains anticlinorium. The talc in these rocks is generally impure and occurs in granular bodies and schistose bands. Some of the talc-chlorite schist bands are large enough to be of potential economic interest. Talc was exploited from the Alligator Back Formation in the Blue Ridge anticlinorium by the Blue Ridge Talc Company near Henry, north of the Henry-Franklin County line (Henika, 1971).

A 2,000 feet-wide ultramafic body is exposed in the saddle between the two ridges that make up Fork Mountain in the Smith River allochthon (Conley and Henika, 1973). It contains olivine-chlorite-tremolite rock, talc-tremolite schist, and uralitic gabbro. The overall talc content is low and talc is localized within the body. Small talc bodies are found in amphibolite on the southern fork of Fork Mountain, and on Blue Mountain.

A sill-like body of talc is present in the biotite gneiss of the Bassett Formation along State Road 890, 1.7 miles northeast of Figsboro. It is poorly exposed at the southern terminus, near Camp Branch Church on State Road 657 and along State Road 922 south of the Henry-Franklin County boundary. A pod-shaped ultramafic body occurs at the contact between the Bassett and Fork Mountain Formations along the gas pipeline about 1.2 miles southeast of Figsboro. It contains talc-chlorite-cummingtonite schist and pyroxene-amphibole schist. A thin section from this locality contains about 10 percent talc (Conley and Henika, 1973). A smaller body occurs along State Road 654, just south of Dyers Store.

Altered ultramafic rocks, talcose schists, and soapstone are exposed as tabular zones that are generally associated with leucocratic granite dikes and sills that cut the Rich Acres Igneous Suite. Some are distinct plutons with fairly sharp contacts, others could be zones of alteration of the gabbroic rocks. A large zone is located about 0.5 mile east of the Martinsville Reservoir. It is discontinuously exposed for approximately 2,000 feet along a northwestward-trending ridge and is mantled by a deep residual soil that contains concentrations of magnetite. A soapstone deposit, possibly of economic value, crops out in the middle of a meander of the Smith River, about 1.5 miles east of the Martinsville Speedway. Several thin, elongate bodies are present to the northeast along strike, in the area around the Patrick Henry monument.

Large bodies of ultramafic rocks occur in the Rich Acres Igneous Suite in the Ridgeway area along the Ridgeway fault. Large green boulders of massive, talc-chlorite-amphibole rock are present in the hillside east of U.S. Highway 220 at the northern town line of Ridgeway. A similar rock is exposed along Surry Martin Branch, south of the Ridgeway town line. A large ultramafic body is exposed on Sheffield Hill east of, and is generally parallel to, the Norfolk Southern Railway. It has a trend to the northeast, and is interlayered with schists of the Fork Mountain Formation . Relatively unweathered, altered ultramafic rocks crop out in a stream valley 0.4 mile southwest of the intersection of U.S. Highways 220 and 220 Bypass at the northern town limits of Ridgeway. Ultramafic rocks in the Ridgeway area generally contain more than 15 percent talc (Conley and Henika, 1973) and locally contain schistose zones that have much higher concentrations of talc.

In the south-central part of the county, thin continuous layers of altered ultramafic rock also occur in the gneiss and mica schist of the Sauratown Mountains anticlinorium . These layers are generally less than 20 feet thick and may contain greater concentrations of talc than some of the larger bodies in the Smith River allochthon. A talc schist layer in the Alligator Back Formation was traced for more than a mile along State Road 646. A thin section from this layer (Conley and Henika, 1973) contains approximately 80 percent talc. A chlorite schist layer in the Ashe Formation was apparently quarried either for flagstone or dimension stone at an abandoned quarry along the Henry-Pittsylvania County boundary southeast of Axton.

KAOLIN

Kaolin-rich saprolites overlie several of the larger pegmatite and alaskite dikes along the northwestern boundary of the Smith River allochthon. One such saprolite kaolin deposit (Map Location 1), about two miles west of Oak Level, was mined for kaolin in the early 1900s by John Sant and Company (Watson, 1907; Figure 15). Several circular pits, as much as 150 feet across and 20 feet deep, are all that remain of the original, extensive mining complex (Watson, 1907). The kaolinite in the walls of the abandoned pits is white and sandy, and contains much admixed white mica and quartz and weathered feldspar that were washed out of the kaolin during processing. Four channel samples of pale yellowish-pink to white residual clay were taken from open pits in the old mining complex (Sweet, 1982). The samples were tested for their potential uses as lightweight aggregate, refractories, inert fillers and structural clay products by the U. S. Bureau of Mines, Tuscaloosa Research Center. One sample contained materials suitible for use in making medium-duty refractories (Sweet, 1982). Alumina content of a split of this sample was tested to be 20.84 percent, while two additional samples taken from alaskite saprolite (300 feet to the south) averaged more than 31 percent alumina (Sweet and Giannini, 1990).

A similar occurrence in a road embankment along State Roads 608 and 609 about two miles east of Oak Level is exposed laterally for approximately 600 feet. The kaolin is white and has a granular texture due to fine-grained quartz and white mica. The kaolin has developed on a large, folded, sheet-like body of alaskite. The exposures in the road cuts are altered to kaolin to 15 feet or more below the topographic surface, a possible indication of the weathering profile of the body. One channel sample, collected at this localty and tested by the U.S. Bureau of Mines, contained material suitable for making low-duty refractories (Sweet, 1982). Similar kaolin-rich saprolite outcrops are present over smaller areas on most alaskite and pegmatite intrusions shown on the Geologic Map of Henry County.

Figure 15. Debris filled kaolin pit at Map Locality 1, 2 miles southwest of Oak Level. Fragments of scrap mica, quartz, and feldspar are still visible beneath the debris in these pits.

CLAY MATERIALS

Local clay-material resources have been utilized for brick and tile for many years. Production figures for Henry County, combined with other counties is documented for 1908.

Two samples of kaolin-rich saprolite were evaluated by the Tuscaloosa Research Center, U.S. Bureau of Mines and found suitable for refractories. These are noted in the section on kaolin. Two other samples have been evaluated by the Bureau and were found to have a potential as a nonplastic component in the manufacture of brick and tile. One sample is a yellow-orange plastic clay in terrace deposits south of Sandy Level in the southeastern part of the county; the other sample is from residuum over the Fork Mountain Formation about 4 miles north of Martinsville (Sweet, 1973).

GEMSTONES AND ORNAMENTAL STONES

Abundant sericite pseudomorphs after twinned-staurolite crystals are found in the residuum overlying the Fork Mountain schists along the northwestern border of the Smith River allochthon. These cross-shaped pseudomorphs are polished and sold as "Virginia Fairystones".

Brown (1945) reported an occurrence of beryl from a pegmatite dike located west of Grassy Creek, 0.5 mile north of U. S. Highway 58 and about 2.5 miles west of the intersection of U. S. Highways 58 and 220. He stated that the beryl is rock are present in the hillside east of U.S. Highway 220 at the northern town line of Ridgeway. A similar rock is exposed along Surry Martin Branch, south of the Ridgeway town line. A large ultramafic body is exposed on Sheffield Hill east of, and is generally parallel to, the Norfolk Southern Railway. It has a trend to the northeast, and is interlayered with schists of the Fork Mountain Formation . Relatively unweathered, altered ultramafic rocks crop out in a stream valley 0.4 mile southwest of the intersection of U.S. Highways 220 and 220 Bypass at the northern town limits of Ridgeway. Ultramafic rocks in the Ridgeway area generally contain more than 15 percent talc (Conley and Henika, 1973) and locally contain schistose zones that have much higher concentrations of talc.

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Although no production of building stone has been reported from the rocks of Henry County, diabase, norite of the Rich Acres Igneous Suite, gneisses in the Bassett and Fork Mountain Formations, and the Leatherwood Granite would make attractive ornamental stone. Because of the chatoyancy of its feldspars and the metalloidal schiller of its orthopyroxenes, the Rich Acres gabbro and norite exposed in the area south of Martinsville Reservoir, the Chatmoss area, and along Marrowbone Creek southwest of Chestnut Knob, should make an attractive polished stone for decorative purposes that would be very similar in appearence to the popular "African Black Granite" used in ornamental facings, sills and counter tops.

GOLD

The S. C. Taylor gold mine, opened in the early 1920s, was reported to be south of Spencer along State Road 695 (Sweet and Lovett, 1985). A field visit to the location along State Road 695, just to the east of the intersection with State Road 629, in the early 1980s found no trace of a 60-foot shaft which had been described by a local land owner. The site is underlain by a deep residual soil and saprolite developed on the Bassett Formation, very probably near the upper contact with the Fork Mountain Formation. A synclinal body of the overlying Fork Mountain mica schist cut by quartz veins is preserved on a small hill along the extension of State Road 695 about 2000 feet to the southwest of the reported locality.

Gold mineralization at this locality could be derived from stratified mafic and felsic volcanic and volcaniclastic rocks near the top of the Bassett and the base of the overlying Fork Mountain schist. Low concentrations of precious metals are common in volcanic rocks and samples of amphibolite cobbles from stony surface soil at the reported Taylor mine site. Samples assayed for Sweet and Lovett (1985) showed trace amounts of silver (0.12 oz Ag/ton) in one sample and gold and silver in the other (0.001 oz Au/ton, 0.01 oz Ag/ton). Trace amounts of precious metals found in volcanics commonly may be concentrated by hydrothermal fluids during periods of igneous intrusion and metamorphism and redeposited as vein quartz deposits cutting the surrounding rocks as noted for the Porkypine-Timmons gold deposits of Ontario (Guilbert and Park, 1985).

It is interesting to note that such a vein deposit has been prospected for gold in the Fork Mountain schist near Hopewell, Pittsylvania County, about ten miles to the east of Henry County (Henika, 1977). Coincidently, both the Taylor and the Hopewell sites are located within an area of extensional fracturing between north-northwest trending en-echelon diabase dikes related to major northwest trending Mesozoic diabase dike swarms. Gravel that was panned in the stream below Hopewell prospect by W. S. Henika and Van Price yielded very small particles of gold in 1974. Gravels along tributary streams to the Mayo River that drains the uplands, north, south, east, and west of the Taylor mine site may be indicators of potential gold mineralization in the Spencer area as well.

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ERRATA FOR GEOLOGIC MAP

Active quarries should be labeled as follows:

14. Martinsville Stone Corporation
17. Wilson Quarries

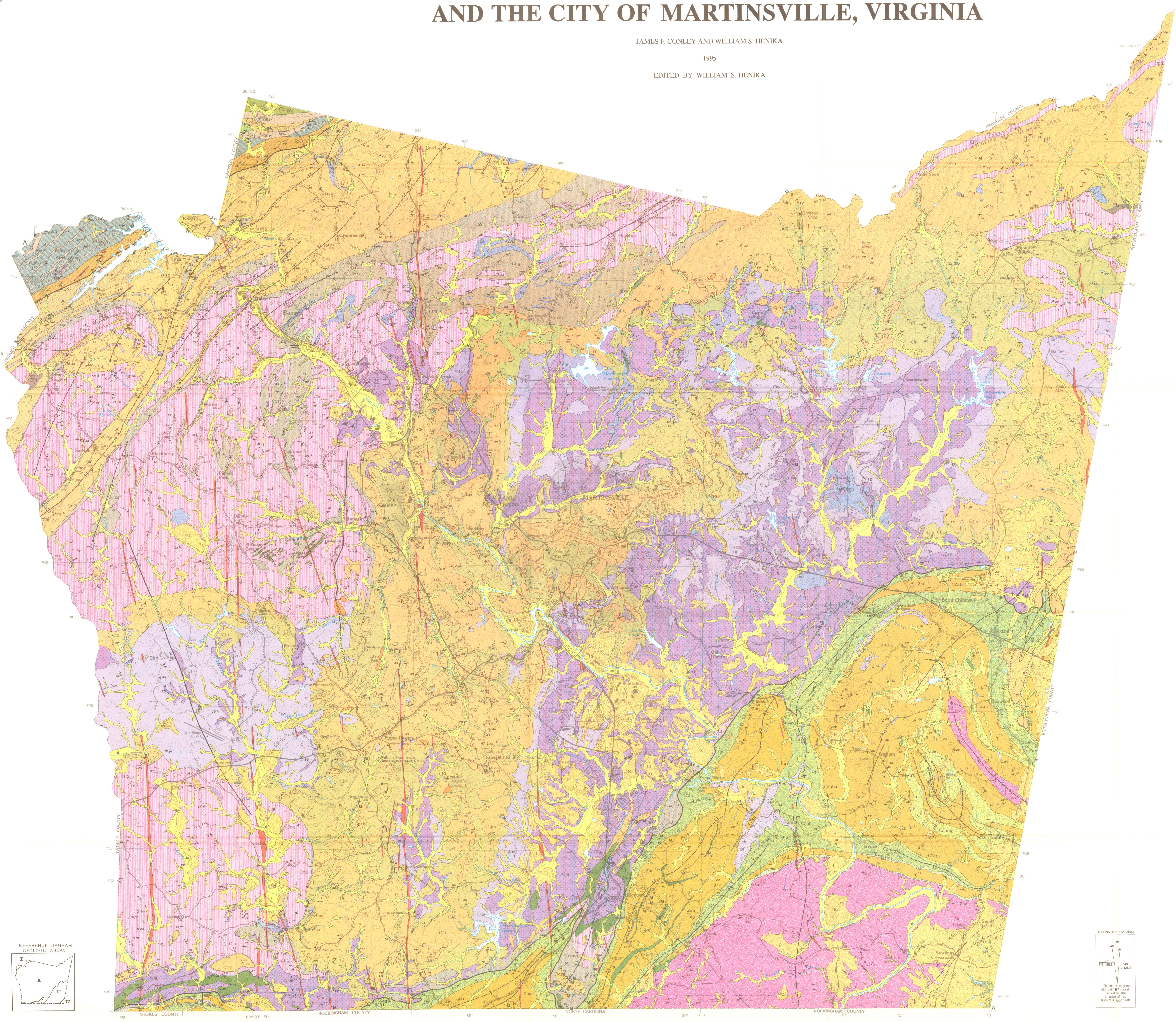
COMMONWEALTH OF VIRGINIA
DEPARTMENT OF MINES, MINERALS, AND ENERGY
DIVISION OF MINERAL RESOURCES

GEOLOGY AND MINERAL RESOURCES OF HENRY COUNTY AND THE CITY OF MARTINSVILLE, VIRGINIA

JAMES F. CONLEY AND WILLIAM S. HENIKA

1995

EDITED BY WILLIAM S. HENIKA



EXPLANATION

CENOZOIC — QUATERNARY

al — Alluvium
Gray and brown silt and sand, contains cobbles at the base, and gray clays, locally.

td — Alluvial terrace deposits
Rounded cobbles and boulders in a red silt and clay matrix; some white sand layers along Smith River.

c — Colluvium
Angular quartz and lithic cobbles and boulders in red silt and clay matrix.

MESOZOIC — JURASSIC

d — Diabase dike
Fine-to coarsely-crystalline, ophitic, subaphanitic, or porphyritic with aphanitic margins; dark-gray mosaic of plagioclase laths and clinopyroxene, some dikes contain olivine or bronzite, others granophyric.

AREA I
BLUE RIDGE ANTICLINORIUM

MESOZOIC?

f — Felsite dike
Very pale-orange to light-gray, porphyritic, phenocrysts consist of euhedral biotite, beta quartz pseudodomorphs, subhedral clear feldspar, and large anhedral tan feldspar; matrix is light colored and granular.

PALEOZOIC — CAMBRIAN

Ꞓca — Candler Formation
Medium- to dark-gray and greenish-gray, sericite-chlorite schist and phyllite; weathers to a moderate-pink and pale-reddish-purple saprolite; contains quartzite layers; magnetite, chloritoid, and chlorite porphyroblasts occur locally; some porphyroblasts have grown across cleavage planes.

PRECAMBRIAN Z

Alligator Back Formation
ꞒZabs, graphite-quartz-mica schist; ꞒZabq, metagraywacke and quartzite; ꞒZabm, mica schist and metagraywacke; ꞒZabg, metagabbro; ꞒZaba, actinolite schist (metabasalt).

AREA II
SMITH RIVER ALLOCHTHON

Martinsville igneous complex

ORDOVICIAN

Olg, Olw — Leatherwood Granite
Olg: sheared and foliated, generally conformable, leucocratic granite, alaskite, and pegmatite. Olw: light-gray, medium- to coarse-grained, porphyritic, biotite granite to syenodiorite, commonly shows rapkivi texture.

Ora, Oru — Rich Acres Igneous Suite
Ora: predominantly medium- to dark-gray, medium- to coarse-grained syenodiorite with locally lesser amounts of dark-gray, coarse-grained to porphyritic, locally ophitic, olivine norite and fine- to medium-grained hornblende gabbro. Oru: altered ultramafic rocks.

PALEOZOIC — CAMBRIAN

Ꞓfs, Ꞓfm, Ꞓfg, Ꞓfq, Ꞓfa — Fork Mountain Formation
Ꞓfs: gray, garnetiferous chloritoid-mica schist containing sericite pseudomorphs after staurolite and relic partially altered staurolite porphyroblasts; Ꞓfm: light- to medium-gray, quartz-mica schist composed of muscovite, quartz, garnet, high-alumina minerals (chloritoid and partially to totally altered sillimanite-kyanite-andalusite), magnetite, ilmenite, and biotite, biotite partially to totally altered to chlorite. Ꞓfg: compositionally banded biotite gneiss, composed of quartz (in part blue quartz), plagioclase, biotite, muscovite, microcline, garnet, and high alumina minerals, locally contains epidote-quartz boundins and diamictite beds. Ꞓfq: thin layers of quartzite composed of quartz and epidote. Ꞓfa: gneissic to schistose, dark-green to black amphibolite, contains epidote-rich layers.

unconformity ?

Ꞓba, Ꞓbu, Ꞓbg — Bassett Formation
Ꞓba: gneissic to schistose, dark-green to black amphibolite; contains epidote-rich layers and pyroxene granofels bodies. Ꞓbg: medium- to fine-grained, leucocratic, segregation banded biotite gneiss; contains some minor amphibolite layers. Ꞓbu: tremolite-chlorite-talc schist (altered ultramafic rock).

AREA III
SAURATOWN MOUNTAINS ANTICLINORIUM

PALEOZOIC — CAMBRIAN/ORDOVICIAN ?

ak — Alaskite
Coarse-grained to pegmatitic sills and dikes of white plagioclase-quartz-microcline granite. Two ages of alaskites, earlier alaskites sheared and foliated, later ones only slightly sheared around grain boundaries.

LYNCHBURG GROUP

PRECAMBRIAN Z

ꞒZab, ꞒZabu, ꞒZaba, Zau, Zaa — Alligator Back Formation
ꞒZab: light-bluish- to silver-gray schist, composed of up to 20 percent muscovite and sericite with varying amounts of staurolite, kyanite, plagioclase, garnet, and quartz with accessory chlorite, chloritoid, biotite, zircon, rutile, epidote, sphene, and opaque minerals; garnet, kyanite, and staurolite porphyroblasts in a quartz-mica matrix; foliation wraps around rotated garnets indicative of deformation after crystallization; locally contains thin layers or lenses of garnetiferous quartzite. ꞒZaba: garnetiferous amphibolite, dark-green to black, slightly foliated to well-foliated, medium- to coarse-grained garnet-plagioclase-hornblende amphibolite with salt and pepper appearance; accessory sphene, epidote, and opaque minerals; occurs at top of mica gneiss unit and contains flattened, lensoidal masses of quartz-feldspar-epidote and feldspar-garnet-quartz that resemble flattened amygdules. ꞒZabu: chlorite-amphibole schist, dark-green, schistose to granular rock composed of chlorite and hornblende with variable amounts of carbonate, talc, anthopyllite, cummingtonite, and opaque minerals; sporadic distribution within and along the borders of the amphibolite unit (ꞒZaba); probably an altered mafic to ultramafic rock.

unconformity ?

Ashe Formation
Zau: quartz-plagioclase-mica gneiss and mica schist, with varying amounts of muscovite and biotite and accessory microcline, sphene, epidote, hornblende, garnet, and opaque minerals. Contains bands 1.5 to 10 feet (0.5-3 m) thick of medium-grained, layered, light-gray gneiss interlayered with biotite-rich, mica gneiss and garnet-mica schist; also contains mica schist bands and rare amphibolite layers. Zaa: garnetiferous amphibolite; dark-green to black, slightly to well-foliated, medium- to coarse-grained, garnetiferous, hornblende-plagioclase amphibolite with accessory garnet, sphene, epidote, and opaque minerals; basal part contains calcite-rich gneiss and quartzitic layers.

unconformity

PRECAMBRIAN Y

Ysc — Stuart Creek Gneiss
Light- to medium-gray, irregularly layered to massive augen gneiss composed of microcline, plagioclase, and perthite porphyroblasts up to 1.6 inches (4 cm) across in matrix of plagioclase, quartz, and biotite with accessory sphene, epidote, amphibole, and opaque minerals; in areas of high shear strain, it consists of segregation-banded gneiss composed of quartz-feldspar-rich layers and muscovite-biotite-rich layers with muscovite-biotite mica schist interlayers; augen locally partially destroyed by shearing, some attenuated, flattened, and bent by crinkle folds; locally contains relict microcline phenocrysts.

AREA IV
DANVILLE BASIN

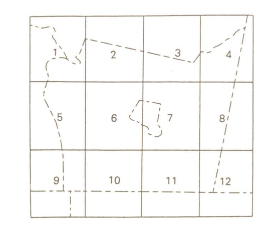
MESOZOIC — TRIASSIC

cg, Ꞅs — Triassic sedimentary rocks
Ꞅs: Stoneville Formation, sandstone facies; chiefly light-gray, grayish-orange, and pale-yellowish-brown, poorly sorted, medium- to very coarse-grained arkose and lithic sandstone; contains lenses of pebble and cobble lithic conglomerate and mudrock; sandstones very thick-bedded. cg: thick- and very thick-bedded, poorly sorted, sandy, pebble to boulder lithic conglomerate, multicolored, rounded to subrounded clasts in a litharenite matrix; contains thick- and very-thick, trough cross-beds; the unit is intensely sheared and silicified and cut by quartz veins near the Chatham fault.

TECTONIC UNIT

m — Microbeccia and cataclasite
Microbreccia: hard, medium-light-gray rock composed chiefly of unoriented, angular fragments composed of intergrowths of strained quartz and microcline, dark-gray to opaque aphanitic material, and silt-sized and angular fragments of quartz and feldspar. Cataclasite: aphanitic, structureless, with angular quartz and feldspar porphyroclasts; forms less than twenty percent of the unit. Microbeccia and cataclasite derived from metamorphic rocks that lie along the western border of the Danville basin.

CREDIT FOR GEOLOGIC MAPPING



1. J. F. Conley and W. S. Henika
2. W. S. Henika
3. J. F. Conley and W. S. Henika
4. J. F. Conley, R. G. Piepul, G. R. Robinson, Jr., E. M. Lemon, Jr., and C. R. Berquist, Jr.
5. W. S. Henika and J. F. Conley
6. J. F. Conley and E. C. Toewe
7. J. F. Conley, W. S. Henika, and J. R. Algor
8. J. F. Conley, R. G. Piepul, G. R. Robinson, Jr., and E. M. Lemon, Jr.
9. W. S. Henika and J. F. Conley
10. W. S. Henika and J. R. Algor
11. W. S. Henika and J. R. Algor
12. Van Price, J. F. Conley, R. G. Piepul, G. R. Robinson, Jr.,; Triassic System by P. A. Thayer

KEY

CONTACTS
exposed
covered or inferred

FAULTS
T - overthrust side; u - upthrown side, d - down thrown side; arrows give transpressional shear sense; dotted line where covered or inferred.

FOLDS
Antiform, drawn on foliation, cleavage, or bedding. Arrow denotes plunge direction.
Synform, drawn on foliation, cleavage, or bedding.
Overturned anticline showing trace of crestal plane drawn on foliation, cleavage, or bedding. Arrow denotes plunge direction.
Overturned syncline showing trace of crestal plane drawn on foliation, cleavage, or bedding. Arrow denotes plunge direction.
Refolded isoclinal fold showing trace of fold axis drawn on foliation, repetition of stratigraphic markers, and symmetry of exposed fold hinge.

LINEAR FEATURES
Minor anticline showing direction of plunge.
Minor syncline showing direction of plunge.
Minor fold crenulation showing plunge of axes.
Bearing, plunge and symmetry of minor fold crenulation.
Bearing and plunge of mineral lineation.
Bearing and plunge of rodding, boudinage, and crinkle folds.
Bearing of horizontal rodding, boudinage, and crinkle folds.

ATTITUDE OF ROCKS
Strike and dip of bedding

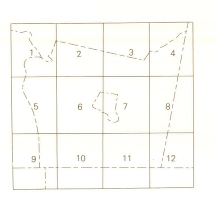
Foliation and Schistosity
Strike and dip of schistosity
Strike of vertical schistosity
Horizontal schistosity
Strike and dip of compositional (gneissic) layering
Strike and dip of vertical compositional (gneissic) layering
Strike of vertical quartz veins

QUARRIES, MINES, AND PROSPECTS
Active Quarry
1 Martinsville Stone Corporation
2 Wilson Quarry

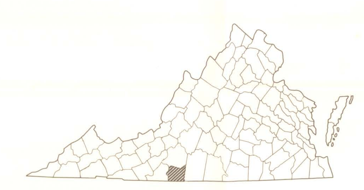
Inactive or Abandoned Quarry or Mine
Numbers are referenced in text.
MT = magnetite
K = kaolinite
GR = granite
GN = gneiss
M = mica

Prospect
M = mica; clustered symbols with M represent multiple prospects
MT = magnetite
MZ = monazite
K = kaolinite

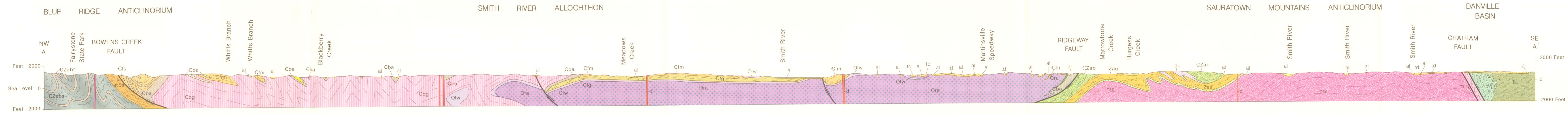
INDEX TO 1:24 000-SCALE MAPS



SCALE 1:50 000
1 CENTIMETER ON THE MAP REPRESENTS 500 METERS ON THE GROUND
CONTOUR INTERVAL 40 FEET



LOCATION DIAGRAM



INTERPRETIVE CROSS SECTION
1. Surficial deposits diagrammatic, no thickness implied.
2. No vertical exaggeration.
3. Subsurface units and structures interpreted from surface data.

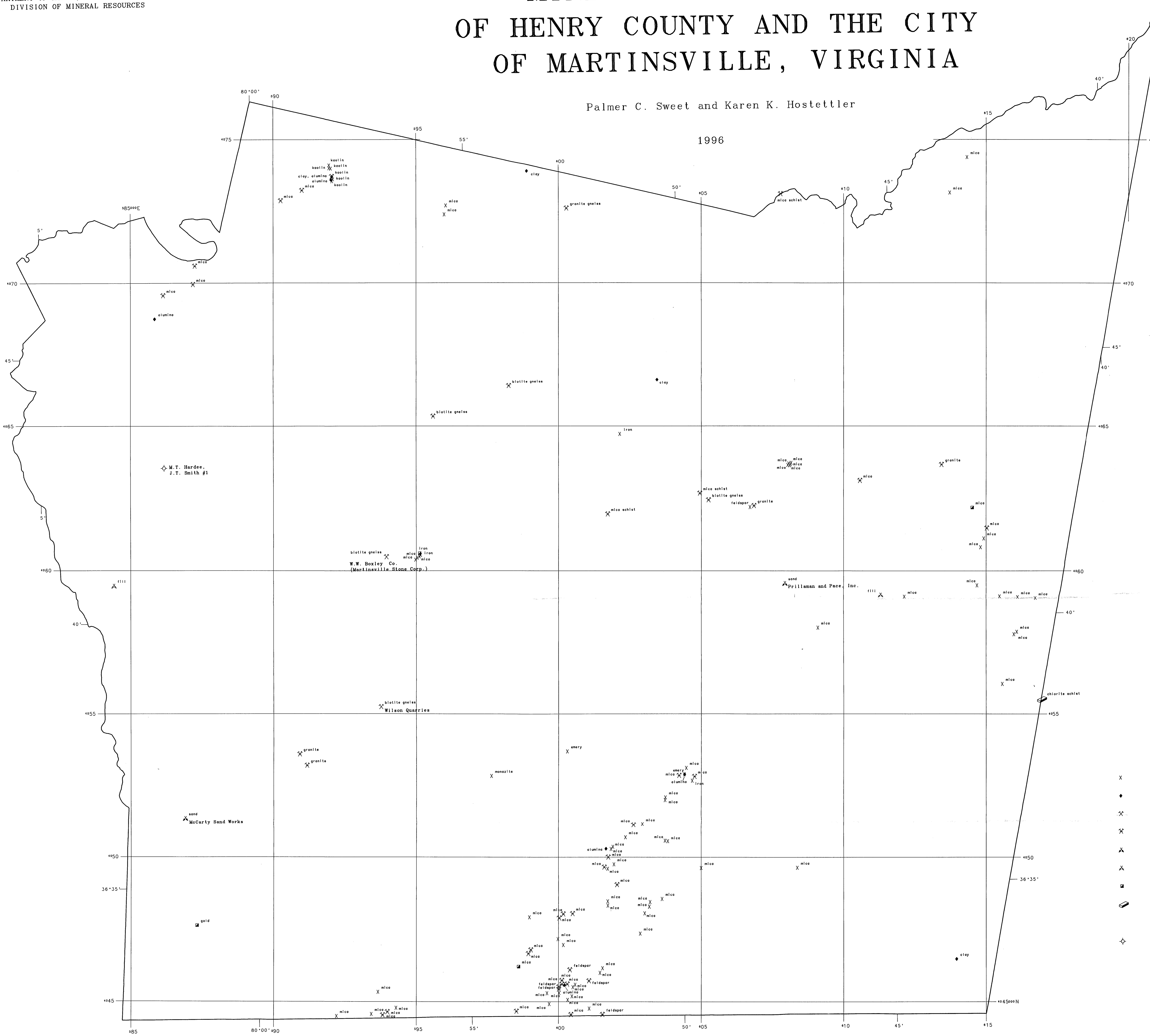
COMMONWEALTH OF VIRGINIA
DEPARTMENT OF MINES, MINERALS AND ENERGY
DIVISION OF MINERAL RESOURCES

PUBLICATION 137
MINERAL RESOURCE MAP OF HENRY COUNTY
AND THE CITY OF MARTINSVILLE, VIRGINIA

MINERAL RESOURCE MAP OF HENRY COUNTY AND THE CITY OF MARTINSVILLE, VIRGINIA

Palmer C. Sweet and Karen K. Hostettler

1996



KEY

- Prospect
- Sample location with potential use
- Active quarry
- Inactive or abandoned quarry
- Active pit
- Inactive or abandoned pit
- Inactive or abandoned shaft
- Inactive or abandoned dimension stone quarry
- Dry hole

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