COMMONWEALTH OF VIRGINIA
DEPARTMENT OF CONSERVATION
AND ECONOMIC DEVELOPMENT
DIVISION OF MINERAL RESOURCES

GEOLOGY OF THE BASSETT QUADRANGLE, VIRGINIA

WILLIAM S. HENIKA

REPORT OF INVESTIGATIONS 26

VIRGINIA DIVISION OF MINERAL RESOURCES

James L. Calver
Commissioner of Mineral Resources and State Geologist

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GEOLOGY OF THE BASSETT QUADRANGLE, VIRGINIA

by

WILLIAM S. HENIKA

ABSTRACT

The Bassett quadrangle is located in southern Franklin and northern Henry counties in the southwestern Piedmont of Virginia. The southeastern and central parts of the quadrangle are largely underlain by schist, gneiss, amphibolite, and granitic and gabbroic intrusive rocks of uncertain age, which are equivalent to the high-rank metamorphic rocks of the inner Piedmont belt of the Carolinas. The northwestern part of the quadrangle is underlain mainly by Moneta gneiss and the Lynchburg Formation. The schist unit is composed of mica schist containing altered sillimanite, and mica schist containing altered staurolite and garnet. The Moneta gneiss is composed of plagioclase-mica gneiss that contains interbeds of augen gneiss, quartz diorite gneiss, actinolite gneiss and schist, and quartzite. The Lynchburg Formation unconformably overlies the Moneta gneiss and is composed of six lithologies; metagraywacke, mica schist and phyllite, metabasalt, graphite schist, talc-dolomite schist, and tremolite-chlorite schist. Additionally, the Lynchburg Formation has been intruded by gabbro sills that are now metamorphosed. The rocks of uncertain age have been intruded by porphyritic felsite dikes and Triassic diabase dikes.

Two major folds occur in the area: the Reed Creek syncline in the rocks of uncertain age in the southeastern part of the quadrangle, and the Cooper Creek anticline in the Moneta gneiss and Lynchburg Formation in the northwestern part of the quadrangle. Rocks in the Reed Creek syncline are separated from the Cooper Creek anticline by the Bowens Creek fault, which is a linear, high-angle thrust that may be part of a major wrench system.

Talc that is mined near Henry is the only mineral product presently being produced. Crushed stone, pegmatite minerals, and kaolin have been produced in the past.

INTRODUCTION

The Bassett 7.5-minute quadrangle is located in southern Franklin and northern Henry counties, Virginia, approximately 7 miles northwest of the City of Martinsville (Figure 1). It encompasses an area of

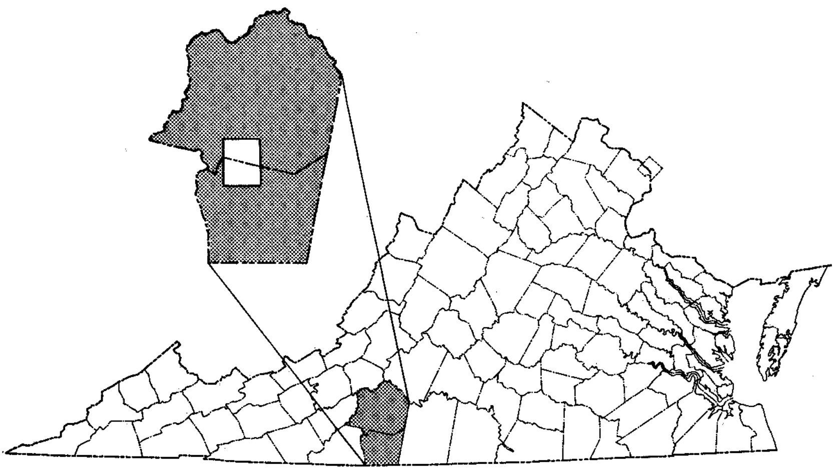

Figure 1. Index map showing location of the Bassett quadrangle.

approximately 60 square miles bounded by parallels 36° 45′ 00″ and 36° 52′ 30″ north latitude and meridians 79° 52′ 30″ and 80° 00′ 00″ west longitude. It lies within the Piedmont physiographic province approximately 15 miles southeast of the Blue Ridge Mountains. Topography in the quadrangle consists of a highly dissected upland surface and moderately steep-sided stream valleys that have a general dendritic drainage pattern. Elevations range from less than 740 feet in the flood plain of the Smith River in the southwest to 1961 feet at the summit of Skelt Mountain; local relief averages 230 feet.

The town of Bassett is located in the southwestern part of the quadrangle along State Highway 57, the community of Oak Level in the center of the quadrangle along U. S. High 220, and the town of Henry in the extreme western part of the quadrangle along the Norfolk and Western Railway.

Field work for the report was done during the summer and autumn of 1969 with the assistance of William E. Workman. Representative samples from various stratigraphic units in the quadrangle are indicated by numbers preceded by "R" (R-4110) which correspond to sample localities shown on Plate 1. These samples are on file in the repository of the Virginia Division of Mineral Resources where they are available for examination. Microscopic examination of thin sections, and X-ray diffraction analyses of rock samples and selected mineral concentrates were made by the writer.

STRATIGRAPHY

Rock units ranging in age from Precambrian to Triassic, and unconsolidated Quaternary alluvial and colluvial deposits, have been mapped in the Bassett quadrangle (Table 1). High-rank metasedimentary and associated igneous rocks are exposed in the central and southern parts of the quadrangle (Plate 1) and have been correlated by lithology, metamorphic rank, and regional structural position with rocks of the inner Piedmont belt (Conley and Toewe, 1968, p.3). In the northern part of the quadrangle the Precambrian Lynchburg Formation of low metamorphic rank lies unconformably upon older, Precambrian Moneta gneiss, a basement complex that is exposed in the center of the Cooper Creek anticline (Conley and Henika, 1970, p. 29). Porphyritic felsite dikes have intruded the schists along the Bowens Creek fault; Triassic diabase dikes have intruded the central and southern parts of the quadrangle (Plate 1).

Table 1.—Geologic units in the Bassett quadrangle.

Cenozoic (Tertiary and Quaternary)

Alluvium: gray silts and sands containing cobbles at base.

Alluvial terraces: rounded cobbles and boulders in red clay and silt matrix.

Colluvium: angular cobbles and boulders in red silt and sand matrix; talus boulder beds.

Mesozoic (Triassic)

Diabase: black dikes composed of fine- and medium-grained diabase.

Precambrian (?)

Felsite: white, fine- to medium-grained dikes of dacitic composition.

Schist: muscovite-chlorite phyllonite along the northwestern side of the Bowens Creek fault.

Metadiabase: dark-green, medium-grained dikes with relict igneous texture.

Metagabbro: dark-green and white, medium- and coarse-grained sills with relic igneous texture.

Precambrian

Lynchburg Formation: metasedimentary and metavolcanic rocks including muscovite-biotite, muscovite-sericite and graphite, schists and phyllites; epidote-actinolite, talc-chlorite-dolomite, tremolite-chlorite schist; metagraywacke, metagraywacke conglomerate, and micaceous quartzite.

Moneta gneiss: plagioclase-mica gneiss, quartz-diorite gneiss, quartzite, actinolite gneiss, and schist.

Rocks of uncertain age

Intrusive granitic rocks: light-colored dikes and sills of pegmatite, alaskite, and granite.

Hornblende metagabbro: medium- to coarse-grained, black and white metagabbro and amphibole gneiss; dark-green metapyroxenite and gray norite.
Tremolite-talc-chlorite schist: light-green to gray, fine-grained, metamorphosed dikes and sills; intrusive into granite gneiss.
Granite gneiss: light-gray, medium- to fine-grained, banded gneiss and amphibole gneiss.
Amphibolite: black and white amphibole gneiss with pyroxene granulite and veins of white granite.
Sillimanite-mica schist: fine- to medium-grained, bluish-gray, garnetiferous-mica schist containing relic fibrolite and including chloritoid-bearing facies characteristic of second prograde metamorphism.
Schist containing altered staurolite and garnet: fine- to medium-grained garnetiferous-mica schist containing megascopically visible sericite pseudomorphs after staurolite and including choritoid-bearing facies characteristic of second prograde metamorphism.
Biotite gneiss: medium- to coarse-grained, bluish-gray, garnetiferous-sillimanite biotite gneiss, stratigraphically equivalent to the schist units.

Unconsolidated Quaternary alluvium occurs in the flood plains along the main stream courses; several ancient (Tertiary-Quaternary?) alluvial terraces are present along stream valleys and on interfluvial areas. Quaternary colluvium covers the slopes of high ridges in the central part of the quadrangle. Bedrock units are deeply weathered throughout the area. Because of the extensive development of saprolite, some portions of formational contents are based on characteristics of saprolite, soil, and "float" developed on the bedrock between relatively unweathered exposures.

ROCKS OF UNCERTAIN AGE

BIOTITE GNEISS

Biotite gneiss (Conley and Toewe, 1968, p. 8) underlies the extreme southeastern portion of the quadrangle (Plate 1). Its contact with granite gneiss along Reed Creek is generally covered by alluvium; the contact with overlying schist that caps the hills seems to be gradational (Conley and Toewe, 1968, p. 3); and the contact with the hornblende metagabbro is generally sharp along State Highway 108, but is covered in the wooded areas to the west and east of the highway.

The biotite gneiss is typically massive to banded, and it is weathered to saprolite where exposed in stream banks and road embankments along State Highway 108 south of Providence Church. The massive saprolite is generally pink and contains intermixed silt and clay with unweathered quartz veins and boudined quartzite beds; the banded saprolite is alternatively pink and brown with weathered flakes of biotite that are concentrated in the brown bands, and quartz and feldspar of silt- and sand-size are concentrated in the pink bands.

Biotite gneiss (R-4111) is exposed in roadcuts along State Highway 108 and State Road 609 north and south of Reed Creek (Plate 1). The rock is bluish gray, medium to coarse grained, irregularly banded, and is essentially composed of quartz, plagioclase, microcline, biotite, and garnet. Near the contact with the overlying sillimanite-mica schist, dark biotite layers within the gneiss contain "needle-like" crystals of sillimanite (Figure 2), and discontinuous quartz-epidote layers are

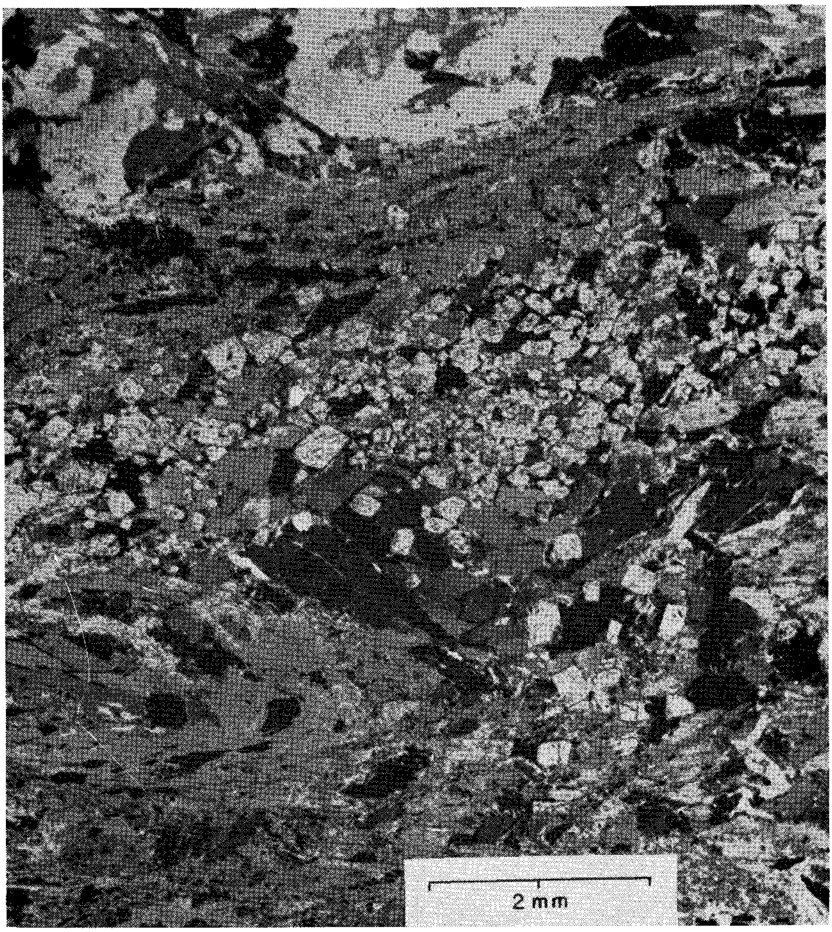

Figure 2. Photomicrograph of biotite gneiss from an outcrop on the east side of State Highway 108 about 0.5 mile south of Providence Church. The boundary between a quartzo-feldspathic layer and a biotite-rich layer occurs at the top of the photomicrograph from left to right. Euhedral sillimanite is concentrated in biotite-rich layers and post-dates the flowage deformation that has contorted biotite laths. Crossed nichols.

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common as boudins along the generally chaotic foliation throughout the rock.

GRANITE GNEISS

Granite gneiss forms a discontinuous band of rock that has been traced across the Martinsville West quadrangle, the Philpott Reservior quadrangle, and the southern part of the Bassett quadrangle. It is in contact with biotite gneiss and amphibolite along Reed Creek and with amphibolite and mica schist in the Bassett area. The contact with amphibolite is complex because the granite gneiss contains concordant amphibolite interlayers and the amphibolite contains granitic sills and dikes that resemble the granite gneiss.

Saprolite that was weathered from granite gneiss occurs along State Highway 57 in Bassett and along U. S. Highway 220 near Little Reed Creek. It is banded and granular, and ranges from tan to reddish-brown in color. The tan saprolite is generally found in well-drained roadcuts and along steep stream banks. It contains recognizable sand-size kaolinitized feldspar fragments, weathered biotite flakes, and quartz grains. The reddish-brown saprolite, generally occurring on poorly drained natural slopes, contains few recognizable relic mineral grains. Relatively fresh granite gneiss in an abandoned quarry beside Reed Creek, just north of State Road 657, consists of black and white, medium- to fine-grained, banded gneiss. Quartz, potassic feldspar, oligoclase, and muscovite comprise the light-colored bands; biotite, granular epidote, and magnetite, comprise the dark-colored bands (R-4108).

AMPHIBOLITE

Amphibolite and amphibole gneiss occur as large concordant bodies and discontinuous layers in the granite gneiss and schist map units. The unit is continuous and similar to the amphibolite described in adjacent quadrangles, but several granite, alaskite, and pegmatite dikes and sills are contained in the Bassett quadrangle. The main body of amphibolite lies along the northwestern contact with the granite gneiss and is complexly interfolded with the granite gneiss towards the southeast. Contacts between amphibolite and granite gneiss and between amphibolite and schist are generally sharp, but contacts between amphibolite and hornblende metagabbro are poorly exposed and seem to be gradational.

Rust-brown, clay-rich saprolite that has been derived from amphibolite is exposed along State Road 606 north and south of Reed Creek Church, and in the banks of Little Reed Creek along U. S. Highway 220. It is well foliated and is cut by light-tan to white, quartz-rich bands of kaolinitic saprolite that have weathered from alaskite and pegmatite dikes and sills. Fresh exposures of medium-grained, well-foliated amphibolite crops out south of the Smith River along the bluffs in Bassett and in an abandoned quarry (Plate 1, No. 3) along Reed Creek in the eastern part of the quadrangle. The rock consists of dark-colored layers that are rich in amphibole and sphene, alternating with light-colored layers containing plagioclase, quartz, and epidote.

The amphibolite is cut by veins or dikes of pyroxene granulite; dense, greenish-black boulders of this granulite also occur in the saprolite of the amphibolite (R-3970). The granulite is composed essentually of interlocking garnet, pyroxene, plagioclase, and quartz. It contains accessory sphene, epidote, perthite, zircon, apatite, and magnetite. The dike-like occurrence is suggestive of an intrusive origin; but, the rock fabric is distinctly metamorphic and appears to be completely recrystallized.

SCHIST

Sillimanite-Mica Schist

Mica schist containing relic sillimanite is exposed as erosional remnants capping ridges in the southeastern part of the quadrangle and trends northeastward across the central part of the quadrangle (Plate 1). This schist overlies biotite gneiss, amphibolite, and hornblende metagabbro in the southeastern part of the quadrangle and is in contact with amphibolite in the central part. Its contact with the biotite gneiss seems to be gradational, but the contact with the amphibolite is generally sharp.

Sillimanite-mica schist, north of Henry Memorial Park along U. S. Highway 220 (R-3982), is generally deeply weathered to a yellow-brown, micaceous saprolite that disintegrates to a red, micaceous, sandy soil containing weathered muscovite. The fresh rock is coarse grained and dark bluish gray, has a knotted texture, and contains tightly contorted, small-scale, flowage folds. It is cut by a secondary foliation that produces cleavage lentils or a button schist (Figures 3 and 4).

The rock (R-3981, R-3982, R-3983) is essentially composed of quartz, white mica, and chlorite in approximately equal amounts. The quartz occurs along the crenulated foliation as lenticular segregation bands composed of interlocking grains that are intermixed with acces-

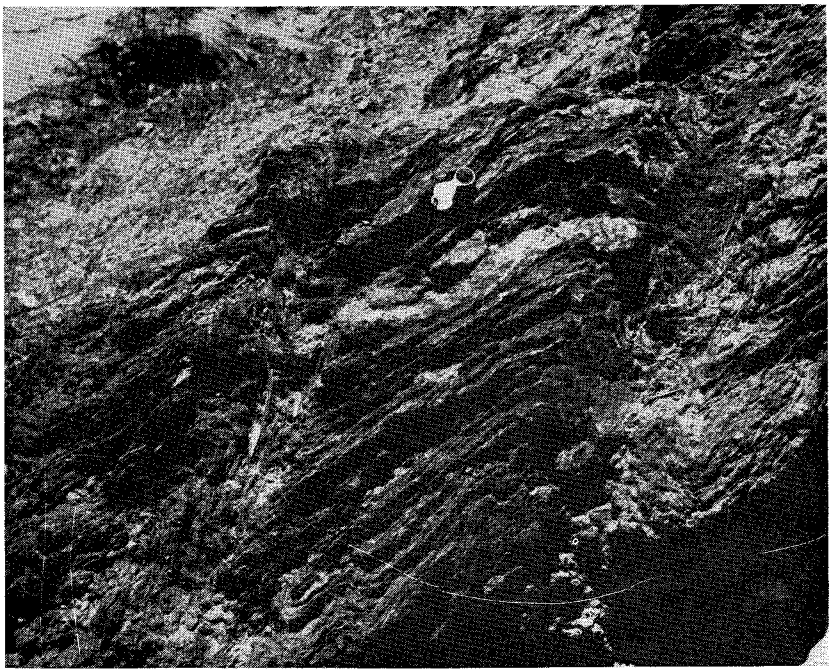


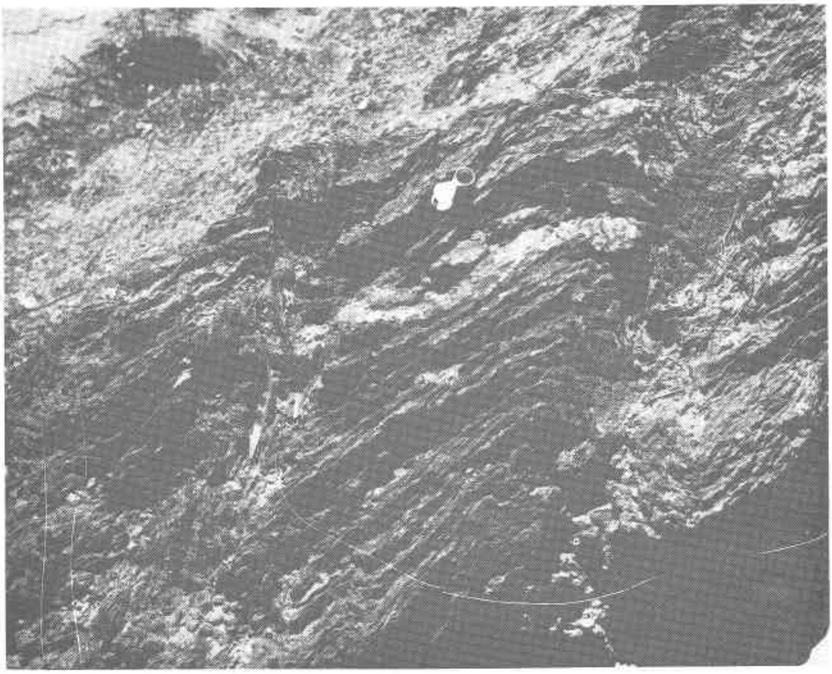
Figure 3. Photograph of an outcrop of folded sillimanite-mica schist along the west side of State Road 673 about 1.0 mile north of Bassett.

sory, non-twinned sodic plagioclase. Muscovite occurs as large, ragged porphyroblasts that have grown across the early foliation and are distributed throughout the rock. The white mica "buttons" visible in hand specimens are fibrous bundles of sericite intermixed with fibrolite and quartz, which generally contain a rounded, garnet porphyroblast in their centers (Figure 4).

Mica Schist containing altered Staurolite and Garnet

Mica schist containing altered staurolite and garnet occurs in narrow, northeastward-trending exposures; it is in contact with the sillimanite-mica schist to the southeast and is truncated at the Bowens Creek fault to the northwest (Plate 1). The southeastern contact is delineated by the appearance of large sericite pseudomorphs after cruciform-twinned staurolite crystals in saprolite and soil developed on the schist unit.

The color of saprolite formed from this unit depends on the degree of decomposition and ranges from mottled purple to dark-reddish brown. Fresh outcrops of this schist along State Road 606 (R-3984, R-3986, R-3987) are dark gray to silvery gray, medium to coarse



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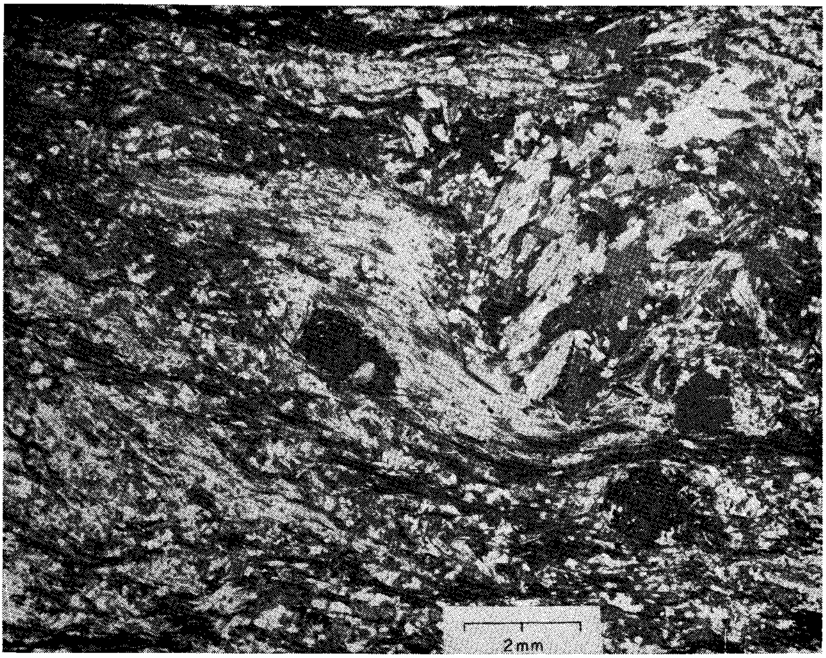

Figure 4. Photomicrograph of retrograde sillimanite-mica schist (R-3981) from the east side of State Road 608 about 1.3 miles south of Skelt Mountain. Fibrolite, which is generally replaced by sericite, is concentrated in the elongate, sigmoidal bundle partially surrounding an isotropic garnet porphyroblast in the central part of the figure. Crossed nichols.

grained, irregularly banded, well foliated, and porphyroblastic. The schist consists predominantly of white mica, quartz, and biotite. The white mica occurs as muscovite porphyroblasts and fine-grained sericite altered from staurolite, but retains the shape of the staurolite crystals (Figure 5); quartz occurs as a granular mosiac of grains along foliation and as inclusions in altered staurolite and garnet porphyroblasts; and biotite forms ragged porphyroblasts that are partially replaced by chlorite. Tourmaline, ilmenite, zircon, and sulfides occur as accessory minerals and are generally disseminated throughout the rock.

TREMOLITE-CHLORITE-TALC SCHIST

Fine-grained, well-foliated tremolite-chlorite-talc schist occurs as concordant and discordant pod-like masses within the granite gneiss unit. Several layers of tremolite-chlorite-talc schist, each less than 1 foot thick, are exposed along State Road 712 south of Bassett High School.

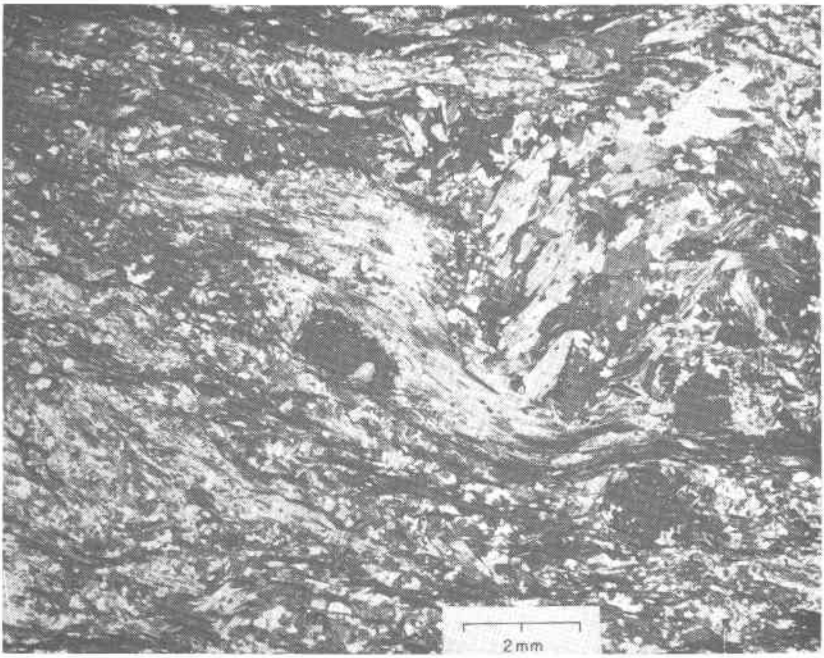

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Figure 5. Photomicrograph of retrograde staurolite-garnet-mica schist (R-3988) from east side of U. S. Highway 220 about 0.8 mile northeast of Oak Level. Euhedral staurolite porphyroblasts are partially replaced by sericite and chlorite. Crossed nichols.

A pod-like body at least 20 feet wide (R-4003) is exposed on a logging road south of State Road 665 in the eastern part of the quadrangle.

The rock is variable in composition and color, ranging from dark grayish green to light gray (R-4003), and contains tremolite, chlorite, talc, magnetite, and apatite. Mineralogically, the tremolite-chlorite-talc

Figure 5. Photomicrograph of retrograde staurolite-garnet-mica schist (R-3988) from east side of U. S. Highway 220 about 0.8 mile northeast of Oak Level. Euhedral staurolite porphyroblasts are partially replaced by sericite and chlorite. Crossed nichols.

A pod-like body at least 20 feet wide (R-4003) is exposed on a logging road south of State Road 665 in the eastern part of the quadrangle.

The rock is variable in composition and color, ranging from dark grayish green to light gray (R-4003), and contains tremolite, chlorite, talc, magnetite, and apatite. Mineralogically, the tremolite-chlorite-talc schist is similar to the metapyroxenite phase of the metagabbro unit but lacks a relict igneous texture; a similar schist from granite gneiss in the adjacent Martinsville West quadrangle that had relict igneous minerals characteristic of a metapyroxenite has been reported (Conley and Toewe, 1968, p. 13).

HORNBLENDE METAGABBRO, METAPYROXENITE, AND NORITE

Two intrusive bodies composed predominantly of hornblende metagabboro occur in the south-central and the southeastern parts of the quadrangle. The pluton in the south-central part cuts across the foliation and compositional banding of the amphibolite and granite gneiss. It contains some norite that is continuous with a body of mafic rocks predominantly composed of Rich Acres norite in the Martinsville West quadrangle (Conley and Toewe, 1968, Plate 1). The pluton exposed in the southeastern part of the quadrangle has poorly definable contacts. Large blocks of amphibole gneiss occur within the pluton and some are nearly indistinguishable from the metagabbro in weathered exposures. The largest blocks occur north of Providence Church (Plate 1) and are adequately exposed to map as a separate unit. Along strike to the west of Reed Creek and to the east of State Highway 108, the hornblende metagabbro grades into amphibole gneiss.

Saprolite and weathered fragments of the metagabbro are exposed west of Little Town Creek. The saprolite that occurs on well-drained, steep slopes and on stream banks is dark green to brown; that on poorly drained, gentle slopes is dark reddish brown. Saprolite and weathered rock fragments of norite are exposed on the north side of State Road 669 under the power transmission line. At this locality a gray to brown, granular saprolite surrounds spheroidal boulders of weathered norite. The saprolite is slightly foliated and contains rust-colored, clay pseudomorphs after pyroxene.

Fresh specimens of the hornblende metagabbro (R-3972) are dark green and white, coarse grained and have an equigranular texture. The predominant dark mineral is dark green, prismatic hornblende that is intergrown with epidotized plagioclase (labradorite to oligoclase) and quartz; it contains the accessory minerals ilmenite, magnetite, apatite, and sphene.

A metapyroxenite phase of the metagabbro occurs along Reed Creek northeast of State Road 609. It is composed predominantly of fibrous amphiboles that form pseudomorphs after pyroxene and contain talc inclusions that are pseudomorphous after olivine (R-3971).

Norite (R-3976) is coarse grained and has little alteration as compared to the metagabbro that is generally extensively altered. The rock is dark gray and has a porphyritic texture. It consists of large, reddish-brown, hyperstene phenocrysts that enclose yellow-green olivine (chrysolite) and black augite crystals. Dark-gray labradorite and tiny, stout augite crystals are intergrown among the larger orthopyroxenes. Accessory minerals include spinel, biotite, ilmenite, and magnetite that are concentrated in interstices between the primary mineral grains.

INTRUSIVE GRANITIC ROCKS

Intrusive granitic rocks occur predominantly as subconcordant masses of granite within the granite gneiss and are generally gradational into alaskite; the alaskite, however, constitues a small percentage of the masses. It generally consists of steeply dipping dikes and gently dipping sheets that have been injected into the granite gneiss and the schist units Pegmatites occur as relatively small, steeply-dipping dikes that cut the high-rank paragneisses and schists.

The granite (R-3974) is generally weathered to a granular, gray to tan, massive saprolite; some cataclastic texture is visible in hand specimens. Fresh exposures of the granite are present along Carver Lane (State Road 753) in Bassett; along State Road 671 in a stream bed parallel to and north of it; and along the abandoned "dragstrip" west of State Road 606. The rock is coarse grained, has an equigranular texture, and is composed predominantly of quartz, microperthite, microcline, and biotite. Muscovite, plagioclase, clinozoisite, zircon, and apatite are present as accessory minerals.

The alaskite is generally deeply weathered and typical exposures consist of white, kaolinitic saprolites such as those along U. S. Highway 220 in the south-central part of the quadrangle. The fresh rock occurs in a stream valley east of where State Road 657 crosses the boundary between Franklin and Henry counties (R-3973). It is leucocratic, medium to coarse grained, intensely fractured, and consists of approximately equal amounts of quartz and microcline intergrown with muscovite, and the accessory minerals biotite, microperthite, plagioclase, and zoned clinozoisite.

Pegmatite dikes ranging from less than one foot to 20 feet in thickness are abundant in the sillimanite-mica schist and biotite gneiss units. They are generally similar in mineralogy to the alaskite, but contain abundant coarse-grained muscovite, tourmaline, and accessory beryl. Zonation in the pegmatites is common and generally consists of perthitic intermediate zones, plagioclase-rich wall zones, and thin, discontinuous, border zones (Brown, 1962, p. 147).

PRECAMBRIAN ROCKS

MONETA GNEISS

The Moneta gneiss is exposed in the northern part of the quadrangle where it is overlain by the Lynchburg Formation (Plate 1). The predominant lithology of the Moneta is a plagioclase-mica gneiss that contains interlayers of actinolite gneiss and schist. Isolated, lenticular bodies of augen gneiss, quartz diorite gneiss, and quartzite sporadically occur. Plagioclase-mica gneiss, which is decomposed to a yellow-brown, micaceous saprolite containing numerous coarse-grained, biotite schist bands, is typically exposed along State Road 606 about one mile north of Henry. The fresh rock is coarse grained, black and white, indistinctly banded, and is primarily composed of muscovite, biotite, plagioclase, and quartz with accessory ilmenite, microcline, magnetite, sphene, and epidote. Augen gneiss (R-4002) is exposed along State Roads 766 and 764 in the extreme northern part of the quadrangle. It is similar in overall mineralogic composition to the plagioclase-mica gneiss, but it has a texture that seems to be transitional between the strongly foliated mica gneiss and the more massive quartz diorite gneiss. The augen consist of antiperthite that is a complex intergrowth of sodic plagioclase and microcline.

The quartz diorite gneiss is more feldspathic than the plagioclase-mica gneiss and generally has decomposed to a more granular, gray-colored saprolite such as that exposed along State Road 764 northeast of Henry (R-4001). The fresh rock is coarse grained; has an equigranular texture; and is composed essentially of quartz, biotite, muscovite, plagioclase, and microcline. Allanite, clinozoisite, zircon, sphene, and apatite are present as accessory minerals.

Actinolite gneiss and schist is typically exposed along State Road 764, 0.3 mile northwest of the intersection of that road and State Road 606, where it is overlain by a deep-red, clay-rich, foliated saprolite. The fresh rock is dark green to black and contains white segregation bands in the gneiss. Grain size is variable and ranges from coarse in the gneiss to fine in the schist. The gneiss is composed predominantly of actinolite, quartz, and plagioclase; the schist, however, contains actinolite, epidote, and quartz with chlorite and magnetite (R-3995, R-4000).

Gray, granular quartzite is exposed within the Moneta along State Road 766 and caps a small elongate ridge that is parallel to the strike of the enclosing gneiss. The rock may represent a relict sedimentary layer within the Moneta.

LYNCHBURG FORMATION

The lower part of the Lynchburg Formation consists of lenticular metagraywacke units at the base which grade upward into pelitic schist units. These basal units pinch out along strike against the Moneta from southwest to northeast across the quadrangle (Plate 1, Figure 6). Dis-

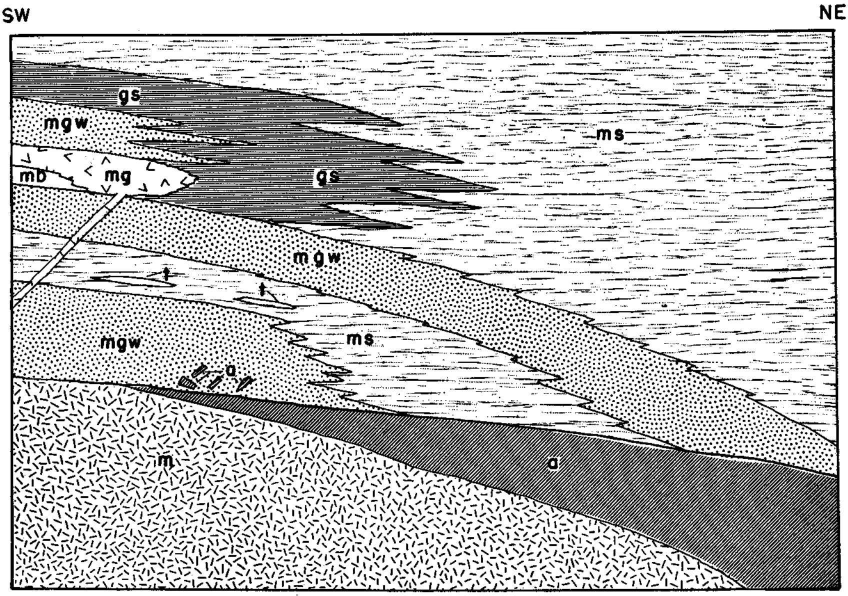

Figure 6. Diagramatic cross section showing lateral distributon of metasedimentary facies in the Lynchburg Formation.

continuous metagabbro sills have intruded the Lynchburg Formation along stratigraphic contacts in the lower part.

The upper part of the Lynchburg consists of graphite schist in the western portion of the quadrangle and of muscovite-sericite and muscovite-biotite schist and phyllite that are stratigraphically equivalent to it along strike in the eastern portion of the quadrangle. The graphite schist contains tongues of metabasalt and metagraywacke and is intruded at the base by a metagabbro sill that has been traced eastward from the Philpott Reservoir quadrangle. The upper phyllite and schist units (Figure 6) are lithologically similar to schist and phyllite that occur in the lower part of the Lynchburg and contain regularly spaced metagraywacke interbeds and minor graphitic layers. The upper units are terminated along the Bowens Creek fault and have gradational contacts with the zone of phyllonite along the fault.

Metagraywacke

Three metagraywacke units, consisting of interlayered metagraywacke conglomerate, metagraywacke, and micaceous quartzite, have been delineated (Plate 1, Figure 6). Because of their abundant quartz content, these units are generally resistant to weathering and form uplands with thin sandy soils that are underlain by a massive, tan to pink saprolite, which is exposed in road cuts along State Road 605 (Plate 1). A rarely preserved clastic texture in the massive saprolite is visible where large blocks of actinolite gneiss, probably derived from the Moneta, are exposed in metagraywacke saprolite along State Road 606 approximately one mile north of Henry.

Coarse-grained, dark-gray, weakly foliated, massive metagraywacke is exposed in ledges along Town Creek about 0.8 mile north of Henry and is typical of the unweathered rock found in the lower unit. A sample from this locality (R-3993) contains subangular to rounded clasts as much as 2mm in diameter which are composed of quartz, microcline, and plagioclase. These clasts are surrounded by a weakly foliated matrix consisting of muscovite and biotite plates with fine-grained quartz and accessory sphene, ilmenite, chlorite, and calcite concentrated in the interstices.

Coarse-grained, light bluish-gray metaconglomerate (R-3992) interbeds in the lower unit are exposed in Town Creek about 0.5 mile north of Henry. The rock contains graded beds with the basal laminae consisting of rounded, blue quartz granules and cobble- and pebble-size rock fragments as much as 1 foot long, that are oriented with their long dimension parallel to bedding. Microcline, perthite, plagioclase, muscovite, biotite, secondary epidote, chlorite, and sphene occur in the matrix and accessory zircon is concentrated in the interstices between the larger clastic particles.

Micaceous quartzite constitutes a major part of the lower metagraywacke unit and is commonly interbedded in the other units (Figure 6). The rock is light gray, medium to coarse grained, and well foliated. Silvery sericite layers, graphite schist fragments, and tiny biotite porphyroblasts are concentrated along foliation surfaces. A rock sample (R-3991) representative of fresh exposures along State Road 605, 0.8 mile east of Henry is composed predominantly of sand-size, sutured quartz grains. Biotite and muscovite are oriented parallel to foliation and accessory plagioclase, microcline, magnetite, ilmenite, zircon, and apatite are present.

Muscovite-Sericite and Muscovite-Biotite Schist and Phyllite

Schist and phyllite occur as thin, irregularly spaced interbeds in the metagraywacke units and are separate, mappable units that weather to reddish-brown and tan, well-foliated, micaceous saprolites and red, clay-rich soils containing partly weathered chips of phyllite. Typical exposures of the schist and phyllite occur along State Road 607, 0.5 mile south of its intersection with State Road 605 (R-4110) where the unit contains silver-gray, crenulated phyllite with regularly spaced interbeds of graphite schist and metagraywacke. A sample of fresh phyllite from this locality has a microscopic lamination that is cut by fracture cleavage. The laminae consist of flattened quartz sand grains alternating with bent mica folia. Fine, dust-like trains of opaque minerals are concentrated between mica laths and fine-grained, euhedral tourmaline is disseminated throughout the rock.

Graphite Schist and Phyllite

Dark-gray to black, well-foliated and lineated, lustrous phyllite that is exposed along Town Creek, 1.5 miles south of Henry, is continuous with the graphite schist unit in the Philpott Reservoir quadrangle (Conley and Henika, 1970). A sample of the unit (R-3989) that was collected north of Grassy Fork at 1.8 miles east of Henry contains well-developed fracture cleavage along which granulated quartz layers are displaced. It is extremely fine grained and consists of sericite, quartz, finely disseminated graphite, sphene, magnetite, and ilmenite.

Talc-Chlorite-Dolomite and Tremolite-Chlorite Schist

Talc-chlorite-dolomite schist and tremolite-chlorite schist occur as lenses interlayered in the schist and phyllite unit east of Henry. These magnesian rocks are well exposed in the Blue Ridge Talc Company Inc. quarry (Plate 1, No. 1) where the talc-chlorite dolomite schist is mined for talc and the tremolite-chlorite schist is present in the hanging wall and footwall of the mine. Fresh specimens of the talc-chlorite-dolomite schist are dark gray, fine grained, and well foliated; they characteristically contain rhombic dolomite porphyroblasts as much as 4mm in diameter that replace rather than distend the folia. The rock (R-3990) contains in progressive order of abundance: talc, chlorite, dolomite, pyrite, ilmenite, and magnetite. The tremolite-chlorite schist has a rough-textured surface that is easily distinguished from the "soapy feel" of the talc-chlorite-dolomite schist. Fresh exposures are light green and contain a regular crinkle lamination along which dark-green chlorite porphyroblasts are concentrated. A rock sample (R-4112) from the footwall of the mine contains tremolite, chlorite, magnetite, ilmenite, and stains of limonite.

Metabasalt

Fine-grained actinolite schist that is continuous with actinolite schist in the Philpott Reservoir quadrangle (Conley and Henika, 1970), having relic volcanic texture and structure, is exposed on the side of a hill south of Town Creek at 0.3 mile east of the intersection of State Roads 606 and 604. The rock is dark-greenish black, well foliated, and consists of parallel-oriented, elongate actinolite, epidote, chlorite, quartz, and albite. The metabasalt unit could not be delineated northeast of its contact with the metagabbro because of its strong resemblance to cataclastically deformed metagabbro that occurs at the same horizon east of Town Creek.

Metagabbro

Coarse-grained, equigranular, dark-green and white metagabbro is exposed along the Norfolk and Western Railway about 0.75 mile southwest of Henry (Plate 1). Due to the cataclasis and recrystallization the same unit has been altered to a green actinolite schist along State Road 606 near Kitson Church (R-3995). The equigranular metagabbro is composed essentially of large, subhedral, uralitic actinolite porphyroblasts, plagioclase and epidote; the schist is composed essentially of fibrous actinolite, clinozoisite, chorite, and quartz. Sheared, epidotized plagioclase porphyroblasts, visible only in specimens broken across the foliation, are the only textural relics of the originally coarse-grained rock. Several such cataclastically deformed metagabbro bodies occur along the upper contact of the second metagraywacke unit (Plate 1, Figure 6) and may represent an originally continuous sill that has been stretched into boudins during movement along the adjacent Bowens Creek fault.

PRECAMBRIAN (?) ROCKS

MUSCOVITE-CHLORITE SCHIST AND PHYLLITE

A narrow band of phyllonite averaging about 0.3 mile wide, is developed in the Bowens Creek fault zone and has been traced across the southeastern parts of the Philpott Reservoir and Bassett quadrangles. Along its southeastern contact, it is overlain by schists of high metamorphic rank (Rocks of uncertain age, Plate 1). Along its northwestern contact the phyllonite grades downward into schist and phyllite of the Lynchburg Formation by the gradual appearance of recognizable metasedimentary structures; this is augmented by the gradual dissipation of shear fabric and cataclasis towards the northwest. It is remarkably homogenous in lithology throughout its length in the Bassett quadrangle, and the contacts of several stratigraphic horizons in the Lynchburg are truncated against the phyllonite. The unit is typically exposed along State Road 606, approximately one mile southeast of Henry where it consists of fine-grained, greenish-gray, crenulated phyllite that is composed predominantly of chlorite, sericite, and quartz with accessory sphene and epidote. The unit also contains thin, graphitic layers that may represent relics of graphite schist in the Lynchburg (R-4105).

METADIABASE DIKE

Actinolite schist and gneiss that is continuous with a metadiabase dike mapped in Philpott Reservoir quadrangle (Conley and Henika, 1970, p. 18) crops out along the west bank of Town Creek (Plate 1). The rock is similar in texture and mineralogy to actinolite schist within the Moneta gneiss exposed along State Road 767 (R-3999) north of the intersection of State Roads 606 and 767.

FELSITE DIKES

Northeasterly-trending, vertical felsite and felsite porpryry dikes have intruded the staurolite-garnet-mica schist unit along the Bowens Creek fault in the western part of the quadrangle. Dikes exposed along the Norfolk and Western Railway in Town Creek have been deformed presumably by movement along the fault, but dikes to the southwest in the Philpott Reservoir quadrangle and to the northeast along strike are relatively undeformed. The dikes range from less than 5 to as much as 50 feet wide and are not traceable for significant distances along strike because of lack of exposures. They are generally porphyritic and light cream to light-gray. Phenocrysts of plagioclase, bipyramidal quartz, and muscovite are common. In the deformed dikes, the feldspar phenocrysts have been crushed and granulated, thus producing a mortar gneiss. The rock samples (R-3997 and R-3998) are dacitic in composition and contain quartz, andesine, microcline, and muscovite phenocrysts enclosed by a fine-grained matrix of quartz, sericite, and feldspar.

TRIASSIC SYSTEM

DIABASE DIKES

North and northwestward-trending diabase dikes have intruded rocks in the southeastern part of the quadrangle (Plate 1). The largest dike is as much as 200 feet in outcrop width and can be traced continuously for more than three miles. It is exposed on the east side of the north bound lane of U. S. Highway 220, 0.2 mile south of the intersection with State Road 657. In highway cuts of the southbound lane at this locality, a deeply weathered red clay-rich saprolite containing spheroidally weathered masses developed between intersecting joint sets. The fresh rock is dark gray to black, medium grained, and generally well jointed. It has well-developed ophitic texture (R-3975) and is composed predominantly of plagioclase and augite. The occurrence of interstitial micropegmatitic masses generally associated with plagioclase and the replacement of biotite by chlorite indicate that the rock was subjected to hydrothermal alteration during crystallization. The diabase dikes are of Triassic age.

CENOZOIC ROCKS

COLLUVIUM

Colluvial deposits, consisting of angular blocks, boulders, and cobbles of local derivation in a red silty clay matrix, cover the slopes of Skelt Mountain and smaller ridges in the southern part of the quadrangle. The matrix, however, closely resembles saprolite which is common throughout the quadrangle. Thus, colluvium may also be present in areas of lower relief.

ALLUVIAL TERRACES

Erosional remnants of fluvial deposits are preserved as terraces on hilltops and slopes at many places in the quadrangle, but especially on hills underlain by Moneta gneiss in the northern part. The deposits on hilltops generally consist of bleached white boulders, cobbles, and pebbles that have a rough-textured surface with or without a dark-red matrix of sand and silt. Deposits along slopes are generally so deeply weathered that even coarse lithic boulders are saprolite or "ghost fragments" in the clay matrix.

ALLUVIUM

The streams in the quadrangle flow on bedrock, saprolite, or valley fill, and their channels are bordered by extensive Quaternary alluvial deposits. These deposits are irregularly stratified with a basal layer consisting of either poorly sorted cobbles and boulders with intermixed sand and clay or gray silt and fine, pebble-sand. The basal layer grades upward into brown interlayered fine-pebbly sands, overlain by organic silts and silty clays.

METAMORPHISM

The Moneta gneiss, the Lynchburg Formation and the rocks of uncertain age have been regionally metamorphosed. Rocks in the southeastern corner of the quadrangle may have been affected by later retrograde metamorphism, contact metamorphism, and metasomatism.

MONETA GNEISS

The Moneta gneiss is a polymetamorphic rock that contains mineral assemblages generally characteristic of the greenschist facies, although plagioclase that is characteristic of the amphibolite facies persists in some of the plagioclase-mica gneiss (Table 2). The feldspathic and the amphibole gneisses of the Moneta contain mineralogic and textural evidence of prograde and retrograde recrystallization listed in tables 3 and 4.

Table 2. — Characteristic mineral assemblages of the Moneta gneiss.

	Quartzo-feldspathic gneiss				Actinolite gneiss		
	R-4001	R-4002	R-3764*	R-3763*	R-4000	R-4109*	R-3766*
Quartz	X	X	X	X	X	X	X
Plagioclase	X		X	X			
Albite		X				X	X
Microcline	X	X					
Biotite	X	X	X	X			
Muscovite	X	X	X	X			
Actinolite					X	X	X
Epidote	X	X	X	X	X	X	X
Allanite	X		X				
Chlorite	X	X	X		X	X	X
Garnet			X	X			
Sphene			X	X	X	X	
Ilmenite	X	X	X	X	X		X

X Present, relatively unaltered

* Locality not shown on Plate 1.

R-4001: quartz diorite gneiss, along State Road 764, 0.8 mile east of the intersection of State Roads 605 and 764.

R-4002: plagioclase-mica gneiss, along State Road 606, 1.5 miles north of the intersection of State Roads 606 and 764.

R-3764*: plagioclase-mica gneiss, Philpott Reservoir quadrangle, on the left bank of Smith River, 1.3 miles N. 50° W. of Dodson.

R-3763*: plagioclase-mica gneiss, Philpott Reservoir quadrangle, 0.6 mile south of the confluence of Otter Creek and Rennet Bag Creek.

R-4000: actinolite schist, 0.4 mile N. 10° E. of the intersection of State Roads 606 and 764.

R-4109*: actinolite gneiss, roadcut along side of State Road 607, 0.5 mile north of the intersection of State Roads 607 and 605.

R-3766*: actinolite gneiss, Philpott Reservoir quadrangle, 0.5 mile south of Prilliman on left bank of Town Creek.

Table 3. — Features interpreted as representing prograde metamorphism in the Moneta gneiss.

Plagioclase-mica gneiss	Amphibole gneiss
1. Growth of large, sub-parallel laths of muscovite and biotite, and interstitial quartz and feldspar.	1. Growth of elongate sub-parallel amphibole prisms, lenticular quartz, plagioclase, and epidote that produced segregation banding.
2. Growth of feldspar augen.	
3. Continued growth of feldspar in matrix that produced granoblastic texture.	

Table 4. — Features interpreted as representing retrograde metamorphism in Moneta gneiss.

Plagioclase-mica gneiss	Actinolite gneiss and schist
1. Partial replacement of biotite by chlorite and muscovite.	1. Selective replacement of plagioclase by epidote and intergrowth of epidote in light-colored, plagioclase-rich bands.
2. Partial replacement of plagioclase by epidote and sericite.	2. Partial replacement of amphibole by chlorite and epidote in dark-colored bands.
3. Recrystallization of augen to granoblastic aggregates of antiperthite and microcline.	

LYNCHBURG FORMATION

Rocks of the Lynchburg Formation contain mineral assemblages that are characteristic of lower greenschist facies. The quartzo-feldspathic rocks generally have a weak foliation and retain many sedimentary structures and textures. Relict feldspar clasts and rock fragments in the metaconglomerate are generally sericitized internally but have no reaction relationships with the matrix of the rock. Ragged biotite laths in the matrix have been partially replaced by chlorite and muscovite.

The pelitic rocks (Plate 1, *gs* and *ms*) of the Lynchburg have a well-developed schistosity that is generally cut by later fracture cleavage near the Bowens Creek fault. They contain rather simple greenschist-facies mineral assemblages (Table 5) that are mostly uniform throughout the formation, except for the local concentration of fine dust-like graphite layers and porphyroblastic muscovite.

Table 5. — Characteristic mineral assemblages of the Lynchburg Formation.

	Quartzo-feldspathic rocks				Pelitic Rocks		Mafic Rocks		
	R-3993	R-3992	R-3996	R-3991	R-3989	R-4110*	R-4112*	R-3990	R-3995
Quartz	X	X	X	X	X	X			X
Microcline	X	X		X					
Albite	X	X	X	X					X
Biotite	X		X	X					X
Muscovite	X	X	X	X	X	X			
Graphite					X				
Chlorite	X	X				X	X	X	X
Actinolite								X	X
Tremolite							X		
Talc								X	
Epidote		X							X
Calcite	X								
Dolomite								X	
Sphene	X		X		X	X			X
Ilmenite	X		X	X	X	X	X	X	X
Magnetite			X	X			X	X	X

X Present, relatively unaltered.

* Locality not shown on Plate 1.

R-3993: metagraywacke, along Norfolk and Western Railway, 1.0 mile north of Henry passenger station.

R-3992: metagraywacke conglomerate, in the bed of Town Creek along State Road 606, 0.5 mile north of Henry.

R-3996: metagraywacke conglomerate, along State Road 608, 0.1 mile north of its intersection with U. S. Highway 220.

R-3991: metagraywacke, along State Road 605, 1.2 miles east of Henry.

R-3989: graphite-quartz-sericite phyllite, along farm road 1.8 miles east of Henry and 1.5 miles SW of the junction of State Roads 605 and 607.

R-4110*: quartz-sericite phyllite, along east side of State Road 606, 0.9 mile SE of Henry.

R-4112*: tremolite-chlorite schist, north wall of quarry (Plate 1, No. 1).

R-3990: Blue Ridge Talc Company Incorporated quarry, 0.5 mile east of Henry (Plate 1, No. 1).

R-3995: along State Road 606, 1.4 miles NW of the junction of State Roads 606 and 656.

Typical mineral assemblages from mafic rocks that are intrusive into, or interlayered with, the Lynchburg metasedimentary rocks are also summarized in Table 5. The metagabbro (R-3995) has relict igneous (equigranular to subophitic) texture in the southwestern part of the quadrangle and in the Philpott Reservoir quadrangle. The equigranular metagabbro contains large, uralitic pseudomorphs after either pyroxene or igneous hornblende and relict, primary plagioclase. The relict igneous texture has been destroyed by cataclasis and total recrystallization along the Bowens Creek fault toward the northeast. The development of foliation in the cataclastic metagabbro has taken place by transformation of non-alligned uralite grains to elongate, subparallel-oriented actinolite that was accompanied by replacement of relict plagioclase by fine-grained masses of albite, epidote, quartz, and chlorite.

Talc-chlorite-dolomite schist and tremolite-chlorite schist that are exposed in the talc quarry near Henry seem to be more closely related to the metasedimentary rocks in which they are interlayered than to the metagabbro. These schists have the same phyllitic texture and fracture cleavage as the pelitic rocks except for the megascopic development of rhombic dolomite porphyroblasts and a smooth talcose feel. These two characteristic mineral assemblages (Table 5, R-3990 and R-4112) indicate greenschist-facies metamorphism, but they are not unique to rocks of sedimentary origin.

ROCKS OF UNCERTAIN AGE

Generally complex mineral assemblages occur in the rocks of uncertain age. The pelitic schists (sillimanite-mica schist and mica schist containing altered staurolite and garnet), being extremely aluminous in composition, are the most sensitive indicators of metamorphic conditions. As Table 6 indicates, the mineral assemblages that delineate an early regional isograd between the mica schist containing altered staurolite and garnet and the sillimanite-mica schist, have generally been replaced by quartz, albite, sericite, and chlorite during a subsequent retrograde event. A choritoid isograd that formed as an overprint across the earlier sillimanite zone has been delineated in the schist of the eastern part of the quadrangle (Figures 7 and 8). This isograd marks the first widespread occurrance of the mineral assemblage of quartz + chloritoid + chlorite ± paragonite in the matrix of the schist. The isograd trends northeastward across the strike of the schist belt from the amphibolite contact in the southwestern part of the quadrangle to the earlier staurolite-sillimanite boundary south of Juggs Gap. The later chloritoid isograd must cross the relict staurolite-sillimanite bound-

Table 6. — Characteristic mineral assemblages of aluminous pelitic schists.

	stg, Plate 1						s, Plate 1								
	R-4387*	R-3985	R-3984*	R-3986	R-3987	R-3988	R-4385*	R-4386*	R-3977	R-3978*	R-3979	R-3980	R-3981	R-3982	R-3983
Quartz	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Muscovite	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Paragonite									X	X					
Plagioclase	X		X	ol		ol			al	al	al	al	X	al	
Chlorite	X	X	X		X	X	X	X	X		X	X	X	X	X
Biotite	rc	rc	rc	X		rc	rc	rc				rc	rc	rc	rc
Chloritoid							X		X	X		X			
Garnet	rc	X	rc	X	rc	rc	rc	rc	X	X	rc	rc	rc	rc	rc
Staurolite	rs	rs	rs	X	rs	rs				X					
Sillimanite							rs	rs	rs	rs	rs	rs	rs	rs	rs
Potassic feldspar			X		X										
Tourmaline		X					X	X					X		X
Sphene	X				X										
Ilmenite	X	X	X	X	X	X	X		X	X		X	X	X	X
Magnetite	X			X	X		X	X	X	X	X	X	X	X	X
Rutile										X					

X Present, relatively unaltered.

rs relict, in part replaced by sericite.

rc relict, in part replaced by chlorite.

ol predominantly oligoclase.

al predominantly albite.

* Locality not shown on Plate 1.

R-4387*: at base of culvert on the south side of State Road 719, 0.25 mile west of the intersection of State Roads 608 and 619.

R-3985: on hillside above Grassy Fork, 0.6 mile upstream from bridge of State Road 606.

R-3984*: on the east side of State Road 606, just south of Grassy Fork, 0.3 mile west of R-3986.

R-3986: along State Road 605, 0.4 mile NW of the intersection of State Roads 605 and 656.

R-3987: along State Road 605, 0.2 mile NW of the intersection of State Roads 605 and 656.

R-3988: along U. S. Highway 220, 0.1 mile south of the intersection with State Road 609.

R-4385*: on the west side of State Road 657, 0.1 mile north of R-3980.

R-4386*: on the east side of State Road 606, 1.0 mile south of the intersection of State Roads 609 and 674.

R-3977: along Reed Creek, 1.1 miles upstream from bridge of State Road 609.
R-3978* on a hilltop, 0.9 mile west of Providence Church midway between R-3977 and R-3979.
R-3979: on hilltop, 0.7 mile west of Providence Church, 1.5 miles SSW of bridge of State Road 665 over Reed Creek.
R-3980: along State Road 657, 0.8 mile NW of bridge of State Road 657 over Reed Creek.
R-3981: along State Road 608, 0.7 mile north of the intersection of State Roads 608 and 609.
R-3982: along U. S. Highway 220, 0.3 mile south of its intersection with State Road 606.
R-3983: along State Road 606, 0.4 mile NW of its intersection with State Road 674.

ary near the eastern edge of the quadrangle because euhedral chloritoid has replaced chlorite and sericite in the matrix of the schist on Fork Mountain in the adjacent Snow Creek quadrangle.

Schist in the southeastern corner of the quadrangle (Plate 1, *s*) contains microscopic, unaltered, euhedral staurolite in addition to the characteristic assemblage of quartz + chloritoid + chlorite ± paragonite. The staurolite as well as the chloritoid in this area have grown across the earlier regional metamorphic fabric of the rock and seem to be related to a late thermal event that also produced euhedral, unaltered, sillimanite porphyroblasts (Figure 2) in layers of the underlying biotite gneiss (Table 7). This thermal event is characterized by a vertical thermal gradient, which produced diminutive porphyroblasts characteristic of rapid growth under low-stress conditions and was probably associated with the widespread granitization of the biotite gneiss unit (Conley and Toewe, 1968, p. 29) in the Martinsville West quadrangle. The increase of intensity downward of the thermal gradient may be attributed to igneous activity which produced gabbroic plutons exposed to the south in the Martinsville West quadrangle.

The quartzo-feldspathic, mafic, and untramafic rocks do not seem to have been indicators as sensitive of metamorphic conditions as the pelitic schist. Mineral assemblages that occur in the biotite and the granite gneiss (Table 7) are characteristic of metamorphosed graywackes and arkosic sandstones and imply moderately high-rank almandine amphibolite facies (Winkler, 1967, p. 56). Chaotic structures within the biotite gneiss and granite bodies within the granite gneiss may indicate localized zones of melting that developed during intense thermal metamorphism.

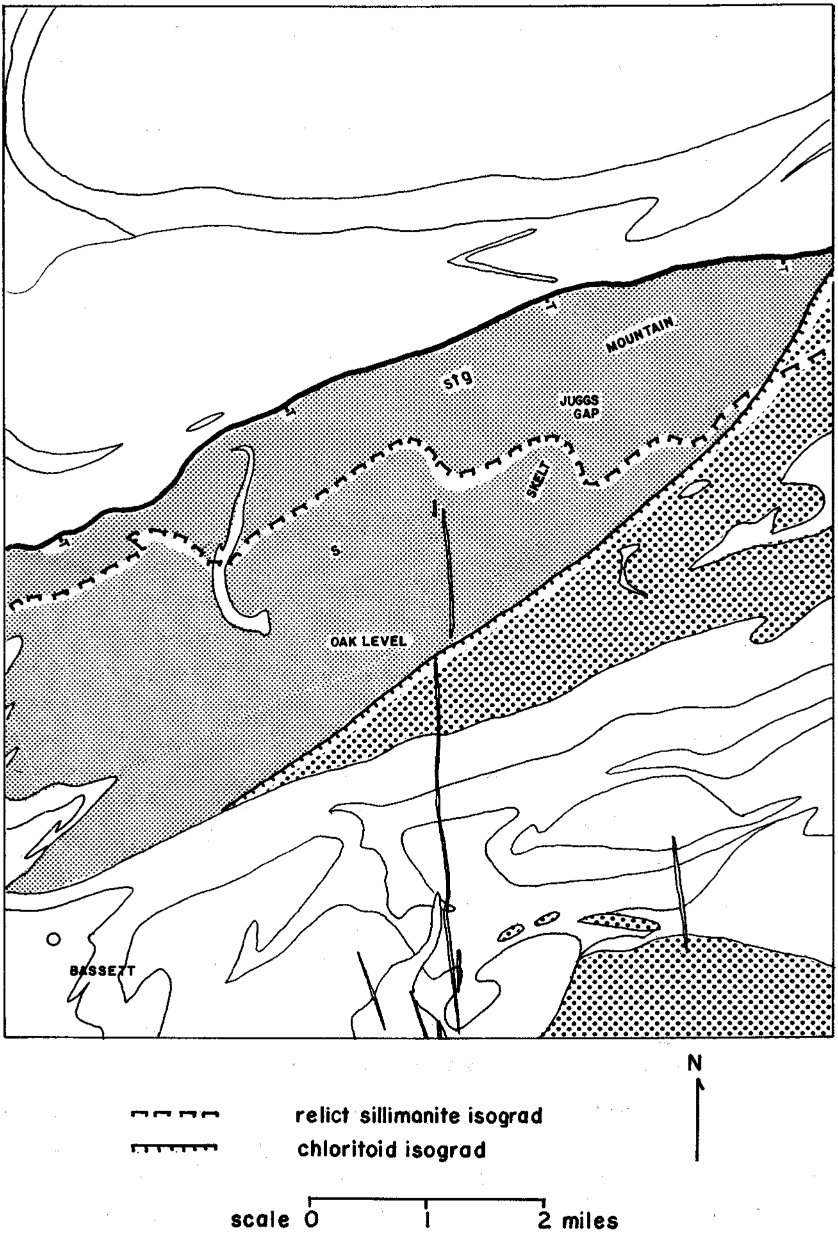

Figure 7. Sketch map showing configuration of metamorphic isograds delineated in the schist unit of "Rocks of uncertain age". Lightly stippled area denotes schist containing relict staurolite and sillimanite porphyroblasts but generally characterized by quartz, chlorite, and sericite. Heavily stippled area denotes schist containing the characteristic quartz + chloritoid + chlorite ± paragonite assemblage that occurs southeast of the chloritoid isograd.

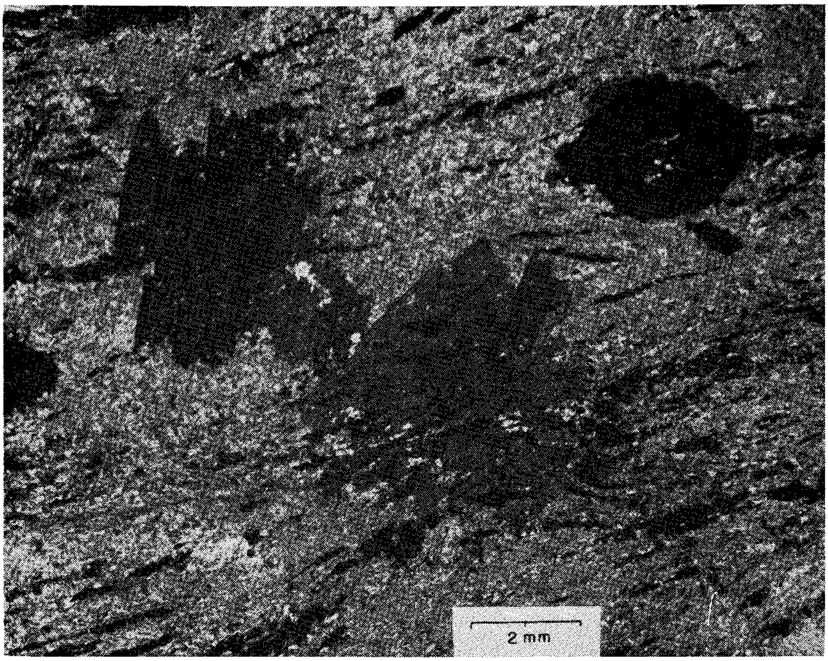

Figure 8. Photomicrograph of mica schist (R-3979) from exposure 0.7 mile west of Providence Church. Large, subhedral, twinned chloritoid porphyroblasts in the center have grown across the regional metamorphic fabric, characteristic of the sillimanite-mica schist. Crossed nichols.

The mafic and ultramafic rocks contain mineral assemblages (Table 8) that seem to conform to the trend of the later metamorphic events that are recorded in the pelitic schist. Pyroxene becomes more abundant and plagioclase more calcic in mafic rocks toward the southeast, thus indicating higher grade metamorphism in that direction. Following a similar trend, cummingtonite, a magnesian amphibole generally assigned to the amphibolite facies, occurs with talc, tremolite, and chlorite in metamorphosed ultramafic rocks southeast of Reed Creek.

STRUCTURE

The structural framework of much of the area northwest and southwest of Martinsville has been outlined by detailed geological mapping in the Martinsville West quadrangle (Conley and Toewe, 1968), the Philpott Reservoir quadrangle (Conley and Henika, 1970), and the

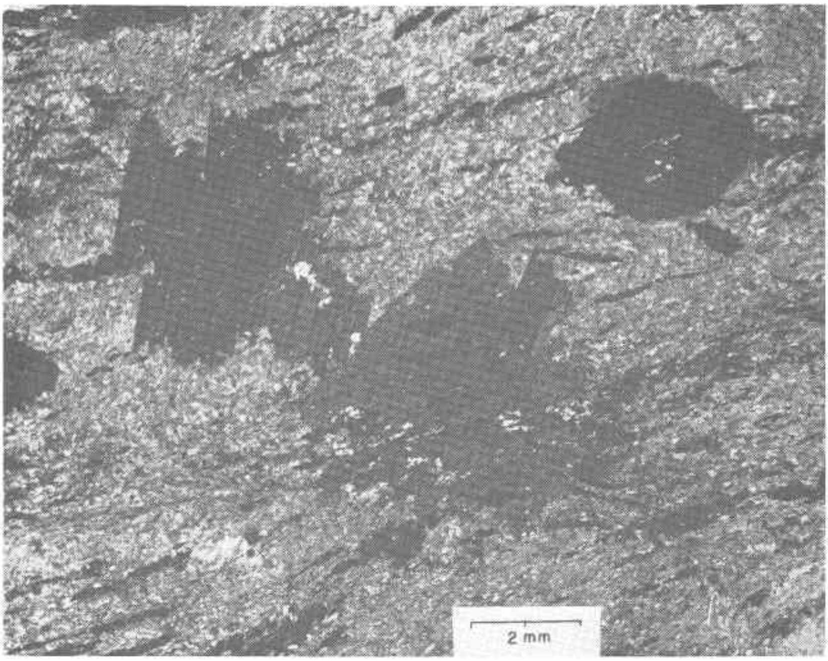

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Table 7. — Characteristic mineral assemblages of quartzo-feldspathic gneisses.

	R-4111*	R-4107*	R-4108*	R-3968
Quartz	X	X	X	X
Plagioclase	X	X	X	X
Potassic feldspar	X	X	X	X
Muscovite		X	X	X
Biotite	X	X	X	X
Sillimanite		X		
Hornblende	X			
Epidote	X		X	X
Ilmenite	X	X		
Magnetite		X		
Garnet		X		
Sphene			X	
Tourmaline			X	
Kyanite		X	X	

X Present, relatively unaltered

* Locality not shown on Plate 1.

R-4111*: biotite gneiss, along east side of State Highway 108, 0.5 mile south of Providence Church.

R-4107*: biotite gneiss, along east side of State Highway 108, 0.6 mile south of Providence Church.

R-4108*: granite gneiss, abandoned stone quarry (Plate 1, No. 3) along Reed Creek just upstream from bridge of State Road 657 over the creek.

R-3968: granite gneiss, along State Road 606, 0.2 mile north of Reed Creek Church.

Bassett quadrangle (this report). Igneous and high-rank, partly retrograde, metamorphic rocks shown on the legend of Plate 1 as "Rocks of uncertain age" are contained within an allocthonous block that has been thrust over the Lynchburg Formation along the steeply dipping, northeastward-trending Bowens Creek fault. Three major structural features are present in the Bassett quadrangle: the Cooper Creek anticline, the Bowens Creek fault, and the Reed Creek syncline.

COOPER CREEK ANTICLINE

The Cooper Creek anticline (Conley and Henika, 1970) is a broad, northeastward-trending fold that extends from the southwest across the Philpott Reservoir at Cooper Creek into the Bassett quadrangle. Parts

Table 8. — Characteristic mineral assemblages of mafic and ultramafic rocks of uncertain age.

	Mafic Rocks			Ultramafic Rocks	
	R-3967	R-3969	R-3971	R-3972	R-4003
Quartz	X	X	X	X	
Plagioclase	X	X	X		
Potassic feldspar	X				
Pyroxene		X			
Actinolite-hornblende	X	X			
Tremolite				X	X
Cummingtonite				X	
Biotite			X		
Chlorite				X	X
Talc				X	X
Epidote	X	X	X		
Garnet		X			
Sphene		X	X		
Picotite			X		
Magnetite	X	X	X	X	X
Ilmenite				X	

X Present, relatively unaltered

R-3967: abandoned stone quarry (Plate 1, No. 3) along Reed Creek just upstream from bridge of State Road 657 over the creek.

R-3969: 0.7 mile NW of Providence Church, 1.0 mile south of bridge of State Road 665 over Reed Creek.

R-3971: 1.0 mile west of Providence Church, 0.7 mile east of bridge of State Road 670 over Reed Creek.

R-3972: 0.5 mile west of Providence Church.

R-4003: 0.7 mile east of bridge of State Road 665 that crosses Reed Creek, 1.6 miles NE of Providence Church.

of the southeast limb and the southwestward-plunging nose of the structure are exposed in the Bassett quadrangle (Figure 9) where the Moneta gneiss is present in the axial portion and is surrounded by the Lynchburg Formation. In the northwestern part of the quadrangle, minor folds are exposed around the nose of the anticline. They are asymmetrical, similar folds with their axes overturned away from the axis of the major anticline toward the northwest. Mylonite stringers along Town Creek and zones of "fishscale" tectonic schist that are exposed north of the intersection of State Roads 606 and 764 are localized in

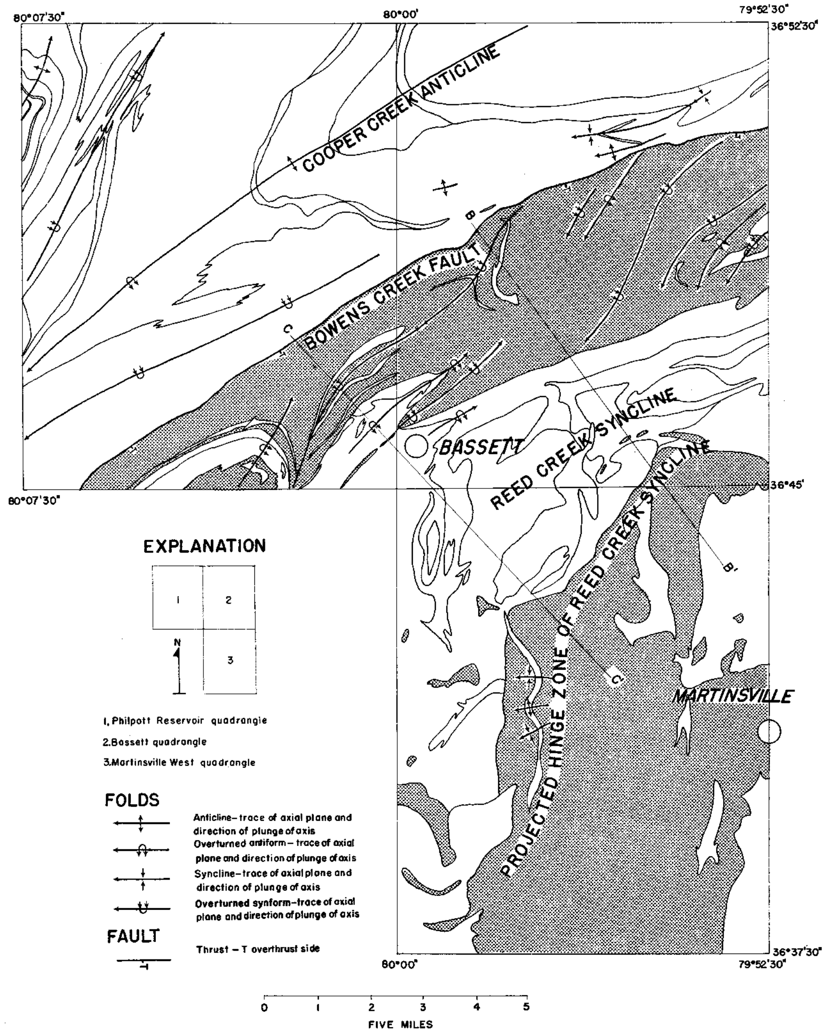

Figure 9. Generalized geologic map of Bassett, Philpott Reservior, and Martinsville West quadrangles showing location of major structural features that have been traced into the Bassett quadrangle. The schist units and biotite gneiss unit located southeast of the Bowens Creek fault have a stippled pattern to delineate both limbs of the Reed Creek syncline.

Moneta gneiss along the contact between it and the overlying Lynchburg Formation. These mylonites seem to indicate differential movement between basement (Moneta gneiss) and cover rocks during folding; disharmonic fold structures occur along the Lynchburg-Moneta contact in the southeastern limb of the anticline. These folds are delineated by the repetition and interlayering of Lynchburg and Moneta lithologies along State Roads 761 and 608 north of U. S. Highway 220 (Plate 1).

REED CREEK SYNCLINE

The Reed Creek syncline is a broad fold that is developed in the rocks that underlie the southeastern two-thirds of the quadrangle southeast of the Bowens Creek fault (Figure 9). It is interpreted as a large recumbent structure with smaller folds superimposed on its upper limb. The syncline is herein named for Reed Creek, a stream that flows to the southwest across the upper limb and axial part of the fold and follows the trend of its hinge southwest to Smith River in the Martinsville West quadrangle. The upper limb of the fold is delineated by the outcrop area of mica schist that has a dip towards the southeast across the central part of the quadrangle (Plate 1). The axial part of the fold contains the granite gneiss and amphibolite units. The lower limb is delineated by the southeastern outcrop area of mica schist and biotite gneiss which has a dip to the northwest in the adjacent Martinsville West quadrangle and the southern part of the Bassett quadrangle.

The fold was first described from exposures of amphibolite, granite gneiss, sillimanite-mica schist, and biotite gneiss that occur in the central part and lower limb in the Martinsville West quadrangle (Conley and Toewe, 1968, p. 23). The characteristic northwestward dip and the broad, arcuate trend of the granite gneiss-schist contact was interpreted as representing the southeastern limb of a large open syncline that was 10 to 12 miles across. Detailed mapping across the Philpott Reservoir quadrangle and the Bassett quadrangle delineated the northwestern side of the fold and expanded the original interpretation to explain:

1. The reverse symmetry of smaller folds and the inverted sequence among granite gneiss, amphibolite, and sillimanite-mica schist exposed on the northwestern side of the fold in the vicinity of Bassett.
2. The occurrence of sllimanite-mica schist outliers that overlie granite gneiss in the Philpott Reservoir quadrangle and overlie amphibolite in the central part of the syncline in the Bassett quadrangle.
3. The reversal of dip of sillimanite-mica schist and related biotite gneiss along the southeastern side of the structure. The schist and biotite gneiss units have a dip to the northwest under amphibolite and granite gneiss in the central part of the fold throughout the Martinsville West quadrangle and most of Bassett quadrangle. In the southeastern corner of the Bassett quadrangle, the dip of these units is reversed and in the Snow Creek quadrangle to the east, the amphi-

bolite and granite gneiss units have a dip under the schist and biotite gneiss units towards the southeast.

4. The occurrence of two different styles of minor folds, steeply inclined similar folds and recumbent, isoclinal folds along the northwestern side of the Reed Creek structure.

A recumbent, synclinal model (Figure 10) best explains these features. Thus, the inverted sequence occurs on the overturned upper limb which has been subsequently warped into a broad, antiformal structure with smaller, related, antiforms and synforms along the northwestern granite gneiss contact. The stratigraphic sequence exposed in

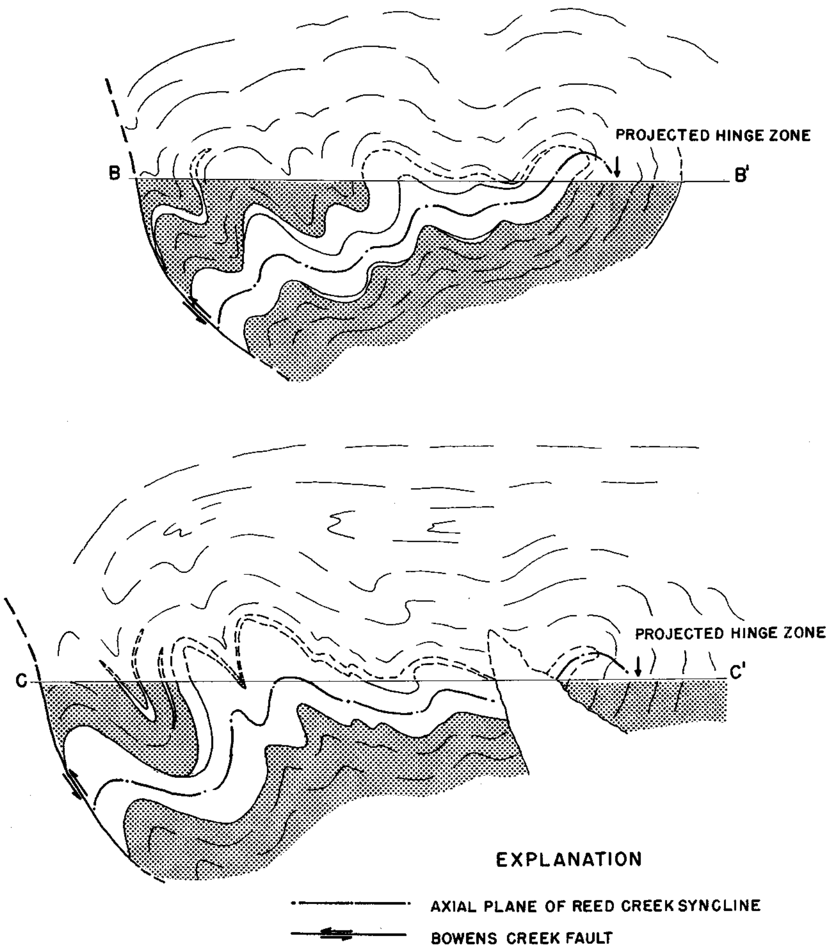

Figure 10. Interpretive, diagramatic cross sections across the Reed Creek syncline. The schist units and biotite gneiss unit that are located southeast of the Bowens Creek fault have a stippled pattern.

these folds is the reverse of that along the southeastern granite gneiss contact because of the recumbency of the syncline. The sillimanite-mica schist outliers are erosional remnants of the upper limb that originally covered the granite gneiss in the center of the fold and was continuous with the sillimanite-mica schist that underlies granite gneiss in the southeastern limb. The reversal of dip between the upper and lower limb takes place through a nearly horizontal hinge zone that can be projected along the contact between the granite gneiss-amphibolite outcrop belt and the sillimanite-mica schist-biotite gneiss outcrop belt (Figure 9). The point of reversal on the map occurs in the southeastern part of the quadrangle near Providence Church. To the east along the contact from the point of reversal, the rocks have a uniform southeastward dip and belong to the upper (overturned) limb of the syncline.

The two styles of minor folding occur in the upper limb of the Reed Creek syncline. The minor recumbent structures are exposed in the noses of larger, inclined, similar folds in the Philpott Reservoir quadrangle (Conley and Henika, 1970, p. 31) and in sillimanite-mica schist along State Road 608 in the Bassett quadrangle (Figure 11).

Figure 11. Photograph of the nose of a recumbent fold in sillimanite-mica schist saprolite that is exposed on the west side of State Road 608 about 2 miles south of Skelt Mountain.

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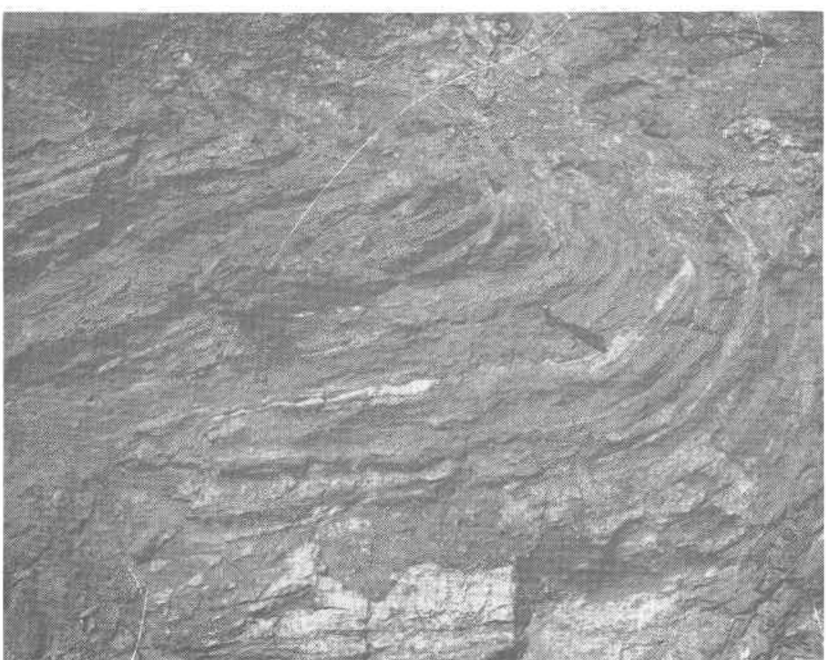

Figure 11. Photograph of the nose of a recumbent fold in sillimanite-mica schist saprolite that is exposed on the west side of State Road 608 about 2 miles south of Skelt Mountain.

The recumbent isoclinal structures are developed along the schistosity that has been, in turn, deformed into the similar folds. The isoclinal folds seem to correspond to the early development of the recumbent Reed Creek syncline, but the similar folds may be related to a subsequent phase of deformation that corresponded with the antiformal warping of the upper limb of the recumbent syncline.

BOWENS CREEK FAULT

The Bowens Creek fault (Conley and Henika, 1970, p. 34) is delineated by a continuous band of phyllonite (tectonic schists) in the footwall block that has been traced along a gentle arc for 19 miles from the southwestern part of the Philpott Reservoir quadrangle across the Bassett quadrangle (Figure 9). The tectonic schist (Plate 1) ranges in width from less than 1000 feet to slightly more than 2000 feet; foliations along the fault generally have a dip steeply toward the southeast. Mica schist (higher rank amphibolite metamorphic facies) of "uncertain age" overlies metasedimentary rocks (greenschist facies) of the Lynchburg along the fault, indicating that movement took place in an overthrust sense bringing high-rank rocks up and over low-rank rocks.

Crenulation, boudinage, and the axes of small folds are the predominant lineations along the fault. They are generally oriented either parallel to, or at small angles with, the trend to the fault and they plunge at a moderate angle either to the northeast or to the southwest (Plate 1). The lineations indicate the direction of tectonic transport was across the fault at nearly 90° to its trend. Slickensides on a minor fault plane that parallels the major fault trend, which are exposed in metagabbro along State Road 607 at 0.2 mile east of U. S. Highway 220 north of the major fault, plunge at 60° to the southeast at right angles to the fault plane.

Northeastward-trending, gently plunging, antiformal and synformal folds occur along the southeastern side of the fault (Figure 8). They are delineated by changes in strike and dip of foliation and in the trend of the contact between the schist containing altered staurolite and garnet and sillimanite-mica schist. The fold axes cross the trend of the Bowens Creek fault and they are sub-parallel to the hinge zone of the Reed Creek syncline. In the central part of the quadrangle they seem to be truncated along the fault trace. There are no marker units that can be correlated across the fault and it is impossible to delineate the magnitude of horizontal displacement that developed because of thrusting. Similarly, no accurate estimate of vertical or stratigraphic throw along the fault can be deduced. The Bowens Creek fault also has truncated one major fold within the Lynchburg Formation, the Deer Island syncline of Conley and Henika (1970, p. 29, 30). Additionally, several thousand feet of stratigraphic section within the Lynchburg Formation seem to have been omitted during development of the fault.

MINOR FAULTS

Several minor faults were noted in rocks southeast of the Bowens Creek fault. A steeply dipping mylonite that represents a minor fault zone is exposed along a tributary to Grassy Fork, 0.9 mile north of Oak Level Church, 0.2 mile southeast from the bridge of State Road 606 over Grassy Fork. Two faults of small displacements were recognized along the Smith River southeast of Bassett (Plate 1) where a vertically dipping, granite gneiss layer is offset with a total displacement of less than 600 feet; the southernmost fault, which is exposed in a saprolite outcrop along the southwestern side of Alternate State Highway 57, 1.2 miles southeast of the Bassett High School, has the fault plane covered by a manganese-oxide film that has slickensides.

GEOLOGIC HISTORY

The Moneta gneiss was derived from clastic sedimentary rocks, interlayered mafic igneous rocks, and impure carbonate beds. It was probably metamorphosed in Precambrian time prior to the deposition of the sedimentary beds in the younger Precambrian Lynchburg Formation. Thin, metavolcanic beds in the Lynchburg indicate centers of vulcanism that were probably west of the mapped area and only the edge of the flows of tuffaceous sediment extended east of the Cooper Creek anticline. Gabbroic sills were injected into the lower Lynchburg later than the initial vulcanism and may have been related to continued volcanic activity at higher stratigraphic levels that are not preserved within the quadrangle. The Lynchburg sedimentation and vulcanism probably occurred along an ancient continental margin close to the source of poorly sorted, heterogeneous sediment and active volcanic areas.

Sedimentation and vulcanism was terminated by extensive tectonism during which time the Lynchburg Formation was deformed and metamorphosed under moderate-temperature, high-pressure conditions that produced greenschist mineral assemblages, slight schistosity in massive units, and well-developed schistosity in the phyllites and metavolcanic rocks. The Moneta gneiss was deformed and retrogressively metamorphosed during this time.

Rocks of uncertain age were originally sedimentary ones that were subjected to high-temperature, high-pressure conditions during tectonism following their deposition. The granite gneiss and amphibolite southeast of the Bowens Creek fault probably were derived from feldspathic sediments interlayered with either impure limestones and marls or basaltic sills and flows. The biotite gneiss and the schist units, rich in aluminosilicate minerals, were derived from clays and sandy shales that may have been deposited on the seaward slope of an older continental margin. The period of regional metamorprism produced mineral assemblages that are characteristic of the upper almandine-amphibolite facies.

Hornblende metagabbro and associated ultramafic rocks were intruded into the granite gneiss, schist, and amphibolite during or after regional metamorphism. Granite, alaskite, and pegmatites probably were formed after the gabbro intrusion, but some granite may have developed in the granite gneiss by anatexis or fusion associated with gabbro intrusion. Sillimanite-mica schist and biotite gneiss units cut by the gabbroic magma were partly recrystallized, thus forming late-stage, aluminosilicate mineral assemblages that were developed from earlier, regional, metamorphic aluminosilicate minerals.

The schist south of the Bowens Creek fault was locally altered by intense tectonic movement and associated hydration of the allocthonous block over the Lynchburg Formation and injection of felsite dikes along the fault zone during and after movement.

During Triassic time, northward-trending diabase dikes were intruded into rocks of "uncertain age" in the southeastern part of the quadrangle. Since the Triassic, the region has undergone intermittent uplift, weathering, and continuous erosion. In late Tertiary or Pleistocene time, thick alluvial sediments were deposited along the ancient stream channels. Later uplift of the area, or lowering of stream base level, has resulted in erosion and dissection of the ancient alluvial deposits. Sand, silt, and clay are being deposited today in the southern part of the quadrangle along streams with gentle gradients. Angular boulders, sand, and silt are currently forming talus slopes along prominent ridges in the central and southern parts of the quadrangle.

ECONOMIC GEOLOGY

STONE

Granite gneiss, biotite gneiss, and the Lynchburg Formation are potential sources of dimension stone and crushed aggregate, but neither product is currently being produced from the quadrangle. An abandoned quarry, which was operated by the Snyder Stone Company from 1949 until 1967, is located just north of State Road 657 along Reed Creek (Plate 1, No. 3). This quarry has two levels: the lower level is developed along the contact between amphibolite and granite gneiss; the upper one is in the granite gneiss that seems to have been the main source for crushed aggregate. The granite gneiss in the quarry is part of a concordant layer that is traceable for 2000 feet or more along strike southwest of the quarry; its maximuum thickness is approximately 325 feet perpendicular to the strike of the enclosing amphibolite layers. This layer appears to thin and pinch out about 700 feet northwest of the quarry site.

The amphibolite in the lower level of the quarry seems to be a partition between the granite gneiss in the upper level and the major body of granite gneiss along State Road 657 about 500 feet southeast of the quarry (Plate 1). A sample from the quarry, presumably from the granite gneiss exposed in the upper level, was tested by the Virginia Department of Highways (Gooch, Wood, and Parrott, 1960, p. 44) and gave the following results: Los Angeles loss (500 rev.) 34.2; absorption 0.60; specific gravity 2.74.

TALC AND SOAPSTONE

Talc is being produced from a pod-shaped body of talc-chlorite-dolomite schist at the quarry of the Blue Ridge Talc Company, Incorporated near Henry (Plate 1, No. 1). The rock is pulverized at a plant about 3000 feet southwest of the quarry and is used as industrial filler in foundry facings, insecticides, and other products as reported by Smith (1961, p. 8). Talc also occurs in a discontinuous schist body less than 30 feet wide, which is exposed along a farm road 2.4 miles east-northeast of Henry and 1.6 miles northwest of Oak Level.

Soapstone exposures large enough to be of potential economic interest occur in tremolite-chorite-talc schist interlayered in granite gneiss in the eastern part of the quadrangle, along State Road 665 (R-4003), and near the gas pipeline at the eastern border of the quadrangle. A talcose phase of the hornblende metagabbro is exposed along Reed Creek 0.7 mile northeast from the bridge of State Road 609 that crosses the creek.

PEGMATITE MINERALS

Mica was mined from 1935 until 1944 from pegmatite dikes in the western part of the quadrangle along State Road 674. The abandoned mines, which were described in detail by Brown (1962, p. 148), are generally filled with debris and overgrown by vegetation. Several of the dikes are still possible sources of feldspar (perthite and plagioclase), quartz, and scrap mica. Mica veins and crystal fragments of golden beryl were found in residuum overlying a large alaskite dike along a ridge crest 0.6 mile east-southeast from the bridge of State Road 665 over Reed Creek and 1.4 miles north of Providence Church.

KAOLIN

Kaolin-rich saprolites overlie several of the larger pegmatite and alaskite dikes in the quadrangle. One such saprolite, about 2 miles west of Oak Level, was mined for kaolin in the early 1900's by John Sant and Company (Watson, 1907, p. 169). Several circular pits, as much as 150 feet wide and 20 feet deep, are all that remain of the original, extensive mining-complex (Watson, 1907, Plate 22). The kaolin in the walls of the abandoned pits is white and sandy, and contains much admixed, fine-grained white mica and quartz that were washed from the kaolin during processing. A similar occurrence in a road embankment along State Roads 608 and 609 about 2 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 depth of the weathered profile of the body. Similar outcrops are present over smaller areas on most of the alaskite and pegmatite intrusions shown on Plate 1.

SILLIMANITE

Sillimanite occurs in the sillimanite-mica schist primarily as fibrolitic masses and rarely as euhedral crystals. The fibrolite is generally altered to fine-grained white mica (sericite and paragonite) that constitutes as much as 50 percent of the rock. The actual sillimanite content, however, is generally less than 2 percent and is in the 200-mesh-size range.

GEM STONES

Abundant sericite pseudomorphs after twinned-staurolite crystals are found in the residuum overlying the schist containing altered staurolite and garnet (Plate 1). These cross-shaped pseudomorphs are identical to those near Philpott that are polished and sold as "Virginia Fairystones". No commercial production is known within the Bassett quadrangle.

AEROMAGNETIC SURVEY

Part of an aeromagnetic survey (Virginia Division of Mineral Resources, 1969) covers the Bassett quadrangle. Figure 12 is a composite map showing geologic units on which aeromagnetic contours are superimposed. Lithologic units with similar magnetic susceptabilities have been grouped together; however, rock units of limited areal extent have been omitted.

The magnetic contours are generally parallel to the contacts between the three major lithologic groups or outcrop belts: the Moneta gneiss-Lynchburg Formation in the northern third of the quadrangle, the mica schist in the central part, and the granite gneiss-amphibolite in the southern third. The lowest magnetic intensities occur over the mica schist. Northwest of this schist, a continuous rise in magnetic intensity forms a linear gradient front along the northwest side of the Bowens Creek fault; the intensity increase on the northwest side of the gradient seems to be associated with amphibole gneiss in the Moneta gneiss. Southwest of the mica schist, several of the localized highs appear to be associated with amphibolite that is interfolded with granite gneiss. Localized magnetic lows occur over the granite gneiss and may correspond with granite intrusions in this unit.

EXPLANATION

- Diabase dikes
- Metagabbro and norite
- Granite, granite gneiss, Moneta gneiss
- Mica schist and biotite gneiss
- Amphibolite, amphibole gneiss and schist
- Lynchburg Formation
- Bowens Creek fault

N

Magnetic contour interval
20 and 100 gammas

Scale 0 1 2
Miles

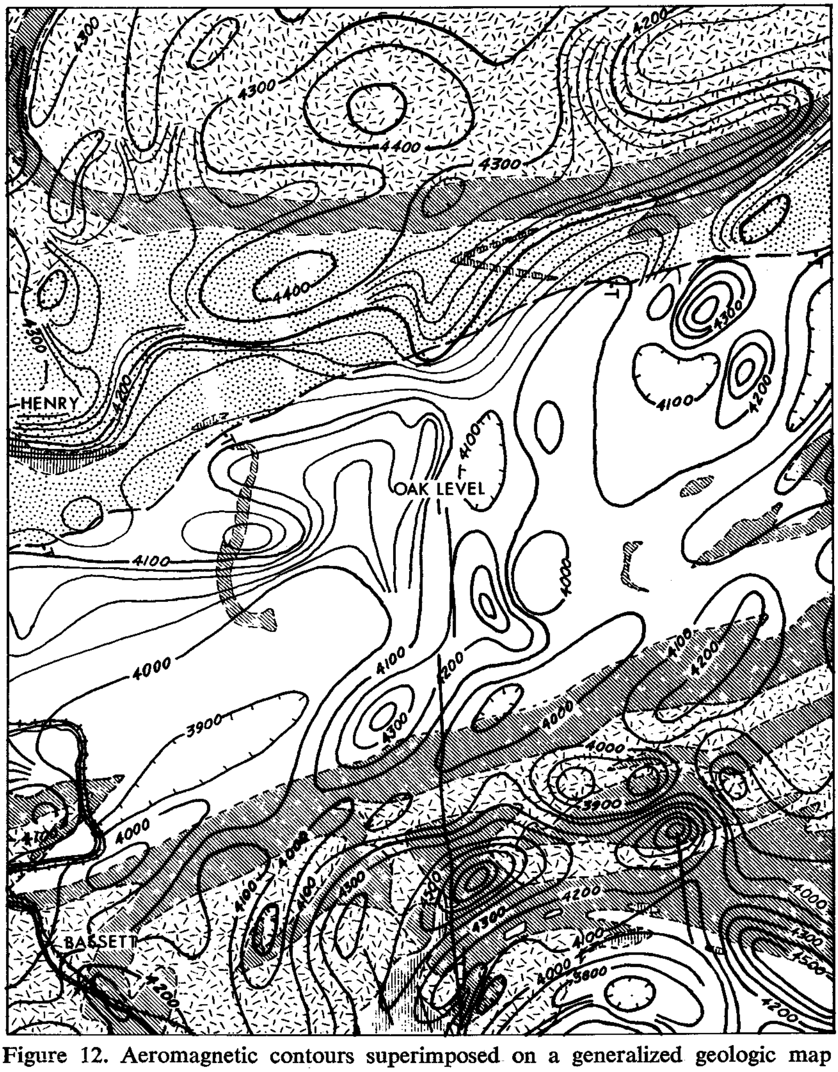

Figure 12. Aeromagnetic contours superimposed on a generalized geologic map of Bassett quadrangle.

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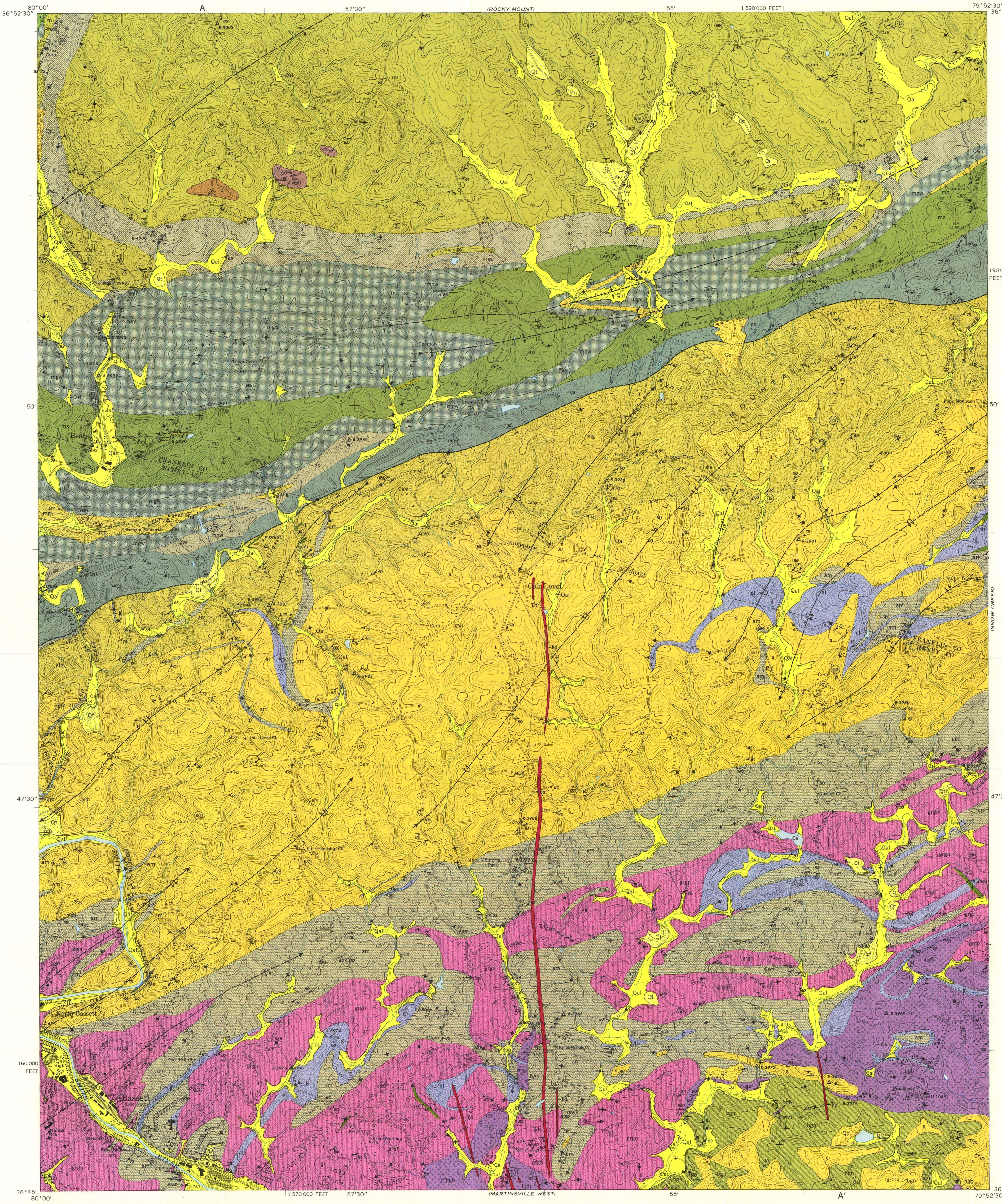
COMMONWEALTH OF VIRGINIA
DEPARTMENT OF CONSERVATION AND ECONOMIC DEVELOPMENT
DIVISION OF MINERAL RESOURCES
James L. Calver
Commissioner of Mineral Resources and State Geologist



Base from U.S. Geological Survey 1969,
Bassett Quadrangle, 7½-Minute Series

GEOLOGIC MAP OF THE BASSETT QUADRANGLE, VIRGINIA

Geology by William S. Henika and William E. Workman

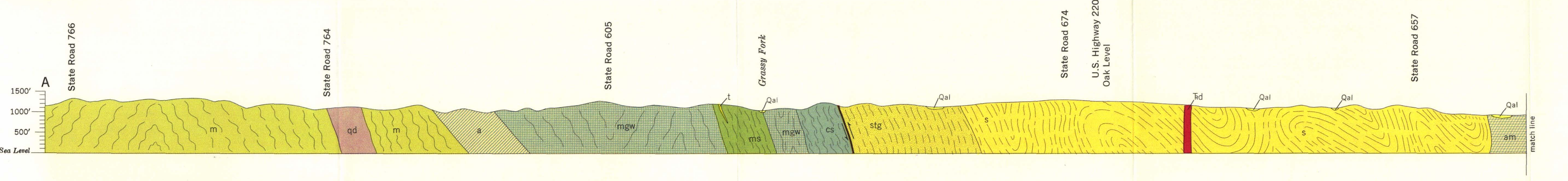
1965 MAGNETIC DECLINATION (3½°; Magnetic North; True North)

SCALE 1:24 000

CONTOUR INTERVAL 20 FEET

1970

QUADRANGLE LOCATION (VIRGINIA)



Interpretive cross section
with no vertical exaggeration

EXPLANATION

CENOZOIC — QUATERNARY

Qal — Alluvium
Gray silts and sands containing cobbles at base.

Qt — Alluvial terrace deposits
Rounded cobbles and boulders in red clay and silt matrix.

Qc — Colluvium
Angular cobbles and boulders in red silt and sand matrix and talus boulder beds.

MESOZOIC — TRIASSIC

Ꞧd — Diabase dikes

PRECAMBRIAN

f — Felsite dikes

cs — Schist
Muscovite-chlorite schist and phyllite derived from deformation of the Lynchburg Formation; shear zones are adjacent to the schist on the southeast and northwest.

Lynchburg Formation
gs, *graphite schist and phyllite;* ms, *muscovite-sericite and muscovite-biotite schist and phyllite;* mb, *metabasalt (epidote-actinolite schist);* t, *talc-chlorite-dolomite schist and tremolite-chlorite schist;* mg, *metagabbro;* mgw, *metagraywacke, metagraywacke conglomerate, and micaceous quartzite.*

md — Meta-diabase

qd, a, m, q — Moneta gneiss
qd, *quartz diorite gneiss;* a, *actinolite gneiss and schist;* m, *plagioclase-mica gneiss;* q, *quartzite.*

ROCKS OF UNCERTAIN AGE

p, al, g — Intrusive granitic rocks
p, *coarse-grained, quartz-feldspar-mica pegmatite, some containing tourmaline and beryl;* al, *coarse-grained, quartz-feldspar alaskite;* g, *medium- to coarse-grained biotite and muscovite granite.*

hgb — Hornblende metagabbro, metapyroxenite, and norite.

tts — Tremolite-chlorite-talc schist

stg, s — Schist
stg, *mica schist containing altered staurolite and garnet;* s, *sillimanite-mica schist.*

am — Amphibolite
Black and white amphibole gneiss with pyroxene granulite and veins of white granite.

grgn — Granite gneiss
Light-gray, medium- to fine-grained, equigranular feldspar-quartz-biotite gneiss and amphibole gneiss.

bgn — Biotite gneiss
Coarse- to medium-grained, blue-gray, garnetiferous biotite gneiss.

CONTACTS

- exposed
- approximate
- covered or inferred

FOLDS

- Anticline—trace of axial plane and direction of plunge of axis
- Syncline—trace of axial plane and direction of plunge of axis
- Overturned anticline—trace of axial plane and direction of plunge of axis
- Overturned syncline—trace of axial plane and direction of plunge of axis
- 33 — Direction and angle of plunge of minor anticline
- 26 — Direction and angle of plunge of minor syncline

FOLIATIONS

- 80 — Strike and dip of inclined beds
- 66 — Strike and dip of overturned beds
- 72 — Strike and dip of inclined compositional banding
- Strike of vertical compositional banding
- 79 — Strike and dip of inclined foliation
- Strike of vertical foliation

LINEATIONS

- 12 — Bearing and plunge of mineral lineation
- Bearing of horizontal mineral lineation
- 23 — Bearing and plunge of rodding, boudinage, and crinkle folds
- Bearing of horizontal rodding, boudinage, and crinkle folds

FAULTS

THRUST

T — overthrust side

NORMAL OR REVERSE

U — upthrown side
D — downthrown side

TRANSVERSE

Arrows indicate inferred movement

SAMPLE LOCATIONS

△ R-4000 — Location and repository number of sampled lithology

QUARRIES AND PROSPECTS

Active quarry
1. Blue Ridge Talc Co., Inc.

Abandoned quarry
2. Kaolin
3. Amphibolite and granite gneiss

Prospect (kaolin)