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DEPARTMENT OF CONSERVATION AND ECONOMIC DEVELOPMENT
DIVISION OF MINERAL RESOURCES

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AXTON AND NORTHEAST EDEN QUADRANGLES

GEOLOGY OF THE AXTON AND NORTHEAST EDEN QUADRANGLES, VIRGINIA

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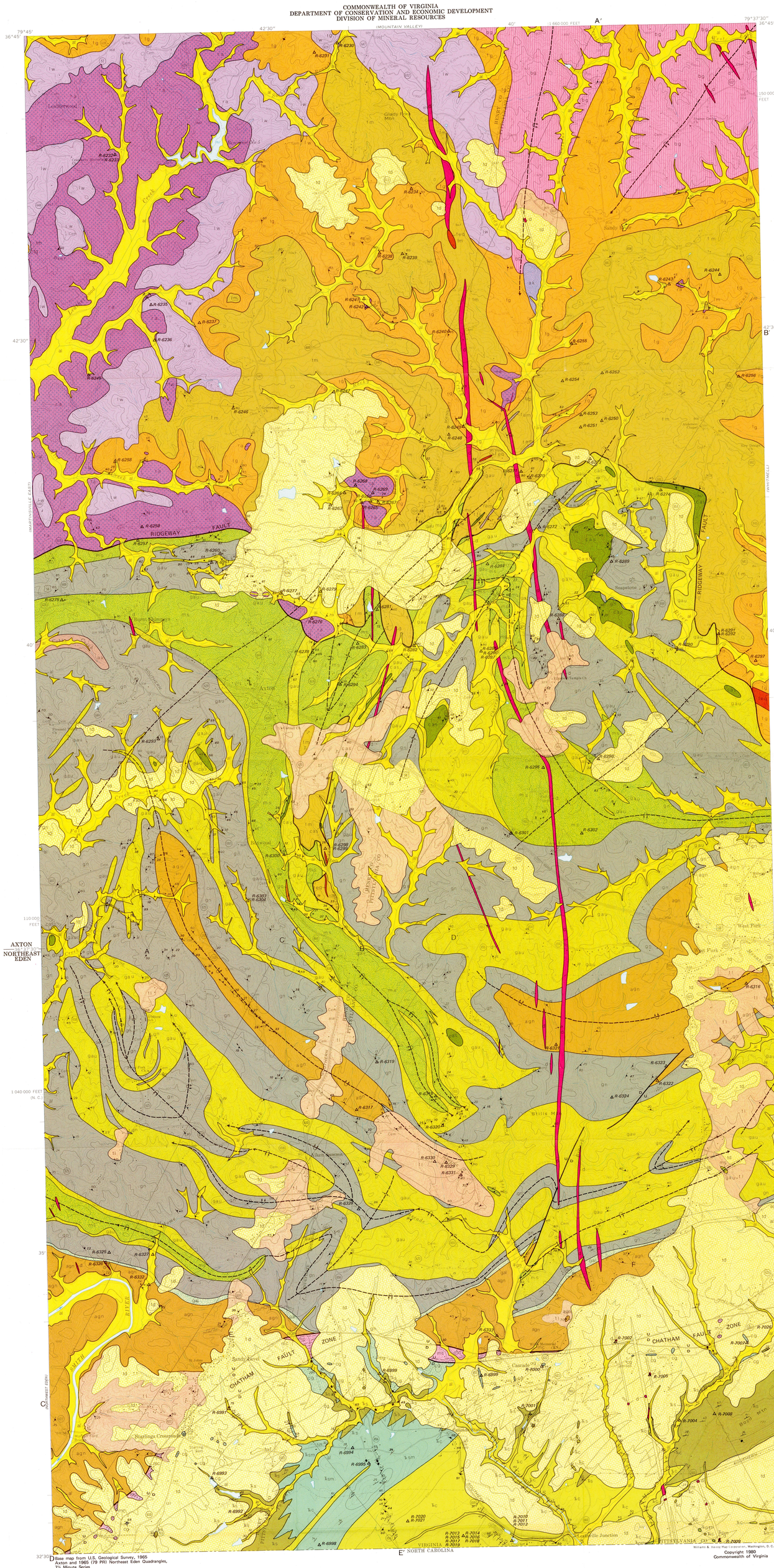

Base map from U.S. Geological Survey, 1965
Axton and 1965 (79 PR) Northeast Eden Quadrangles,
7½ Minute Series

Williams & Heinz Map Corporation, Washington, D. C. 20027

UNIT CHARACTERISTICS

QUATERNARY

al Alluvium: *Unconsolidated floodplain deposits containing interlayers and lenses of light-brown and gray organic clays and light-brown sands and gravels; some gravels in clay matrix; cut-and-fill structures and cross-bedding common.*

td **tl** Terrace deposits: td *(unconsolidated stream deposits), composed of rounded pebbles, cobbles and boulders in a matrix ranging from clay to sand; occurs as valley fill or terrace deposits along hill slopes and on interfluves; valley fill and low terrace material composed of white clay with thin, interlayered white sand beds, generally with white cobble layer at the base.* tl *(terrace lag gravels), remnants of upland gravel deposits of rounded pebbles and cobbles in sandy topsoil.*

JURASSIC

d Diabase dikes: *Dark-greenish-gray to black rock ranging from basalt to gabbro; texture diabasic, plagioclase crystals elongate, augite grains stubby, anhedral.*

mc Microbreccia and cataclasite: Microbreccia, *hard, medium-light-gray rock composed chiefly of unoriented, angular fragments of intergrowths of strained quartz and microcline, dark-gray to opaque aphanitic material, and silt-sized and angular fragments of quartz and feldspar ranging in size from 0.02 to 2 mm (these angular grains form the mortar between larger fragments), with very light-gray porphyroclasts up to several centimeters long; intensely fractured, many fractures filled, with light-green, microcrystalline chlorite that contains numerous small crystals of pyrite, mostly altered to limonite; cataclasite, aphanitic, structureless, with angular quartz and feldspar porphyroclasts; forms less than twenty percent of the unit. Unit derived from metamorphic rocks lying west of the Danville basin. (Quartz veins up to several feet long and an inch wide commonly cut the unit.)*

TRIASSIC

Triassic sedimentary rocks: cg *(western conglomerate), massively thick- and very thick-bedded, poorly sorted, sandy, pebble to boulder lithic conglomerate containing 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; clasts composed dominantly of augen gneiss, biotite gneiss, mica schist, amphibole, and pegmatite with subordinate K-feldspar, quartz, and quartz-feldspar gneiss; some sandstone contains thick and very thick trough cross-bedding; the unit is intensely sheared and silicified and is cut by quartz veins near the border fault.* ks *(Stoneville Formation, sandstone facies), chiefly light-grey, grayish-orange, and pale-yellowish-brown, poorly sorted, medium- to very coarse-grained arkose and lithic arkose sandstone; contains thin, irregular lenses of poorly sorted, pebble and cobble lithic conglomerate and about 25 percent mudrock; sandstones are massive, medium- to very thick-bedded, and 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.* ksm *(Stoneville Formation, mudrock facies), typically grayish-red and reddish-brown siltstone and claystone with subordinate, sparsely distributed lenticular beds of red, poorly sorted medium- to coarse-grained, arkosic and lithic arkosic sandstone, minor quantities of granule and pebble lithic conglomerate, and well-indurated, massive, even, uniformly thin- to medium-bedded dark-gray, mudrock. Minor sedimentary structures include even and wavy laminations, mottled and disturbed bedding, rib-and-furrow structures, primary current lineations, mudcracks, current ripple marks, and irregularly shaped calcareous concretions.* kc *(Cow Branch Formation), well-indurated, dominantly massive to thinly laminated, even, uniformly thin- and medium-bedded siltstone, claystone, and shale, with subordinate medium- to dark-gray, poorly sorted, very fine- to medium-grained, arkose and subarkose, and minor amounts of dolomicrite, with minor quantities of grayish-red mudrock near the top and base of the formation, characterized by laterally persistent, uniformly even stratification, even and wavy parallel laminations, small-scale cross-and ripple-bedding, carbonized plant matter, mud cracks, oscillation- and current-ripple marks, mottled and disturbed bedding, and irregular sandstone channel lenses.* kgm *(Pine Hall Formation, mudrock facies), even, uniformly thin- and medium-bedded dominantly pale-reddish-brown and grayish-red, siltstone, claystone, and shale with subordinate gray mudrock and thin- and medium-bedded, poorly sorted, grayish-orange, fine-to coarse-grained, arkose, subarkose, and lithic arkose. Sedimentary structures include mottled and disturbed bedding, irregularly shaped calcareous concretions, green reduction spots, wavy and parallel laminations, rib-and-furrow structures, burrow casts, and primary current lineations.* kp *(Pine Hall Formation, sandstone facies), this facies does not crop out, but is interpreted to underlie terrace deposits in the extreme southeastern part of the area on the basis of projection along strike from outcrops to the northeast in the Brosville quadrangle. In that quadrangle the unit is a light-gray and pinkish-gray, poorly sorted, medium- to very-coarse-grained, arkose, subarkose, and lithic subarkose.*

STRATIGRAPHIC UNITS ARRANGED BY STRUCTURES

SMITH RIVER ALLOCHTHON

PALEOZOIC

lw ak Leatherwood granite: lw *(granite), light-gray, porphyritic, biotite granite composed of microcline, antiperthitic oligoclase, quartz and biotite with accessory epidote, elinozoisite, apatite, sphene and opaque minerals; in sheet-like masses and dikes. Rapikivi texture and slightly sheared feldspar grain boundaries are common.* ak *(alaskite), coarse-grained to pegmatitic granite and dikes of white plagioclase-quartz-microcline granites. There are apparently two ages of these alaskitic rocks of the earlier group are sheared and foliated, later ones are only slightly sheared, this shearing is around grain boundaries.*

ra Rich Acres Formation: *Dark-gray, non-foliated to slightly foliated, medium- to coarse-grained, porphyritic, pyroxene gabbro, in places norite; some norites with diorite, generally as granophyre, filling interstices in peripheral agmatite zones. Gabbro generally composed of:* hf *hytounite-labradorite, orthopyroxene, clinopyroxene (primarily augite), nornblende (including pargasite), and biotite; accessory epidote, sphene ilmenite, wralite, rutile, zircon, and rare olivine. Contacts normally concordant but some slightly to totally discordant with regard to foliation of country rock. (Unit cut by pegmatites which generally have biotite selvages at contact with gabbro).*

PRECAMBRIAN-PALEOZOIC

tts Talc-tremolite schist: *Altered dark-green, schistose to granular, ultramafic intrusive rock, composed of talc, tremolite, chlorite, and opaque minerals (mostly magnetite). Igneous textures are not apparent, but the unit locally contains relict pyroxene partially altered to tremolite.*

farm fm Fork Mountain Formation: fm (schist unit), *medium-gray, fine- to medium-grained, porphyroblastic, schist composed of coalescing garnets, muscovite, sericite, chlorite, quartz and accessory sphene, magnetite and plagioclase. Unit shows polymetamorphism; relict sillimanite formed during first metamorphic event is altered to sericite, and small, unoriented second prograde staurolite and kyanite crystals have grown in these sites of sericite pseudomorphous after sillimanite. Second prograde muscovite prophyroblasts cut foliation and in places obliterate it thereby producing a felt (massive) texture. The schist unit in places has a gradational contact with the gneiss unit.* fg (gneiss unit), *dark-gray, segregation-banded, garnet-biotite gneiss; bands composed of quartz-feldspar and generally schistose, biotite-rich layers; layers about 0.5 inch (1.3 cm) thick. Mineral composition is plagioclase, quartz, biotite, garnet, microcline, muscovite, epidote and opaque minerals. Discordant and concordant muscovite-biotite-microcline pegmatites common.* feq *(epidote quartzite), green to greenish-gray, medium-grained, equigranular rock primarily of epidote and quartz with accessory magnetite and garnet; occurs as boudins and layers throughout the Fork Mountain Formation.* fam *(amphibolite), dark-green to black, medium-grained, equigranular, hornblende and plagioclase amphibolite with accessory epidote, garnet, quartz, and sphene. (Amphibolite in the Fork Mountain Formation may be Bassett Amphibolite in antiformal folds or may be interbeds in the Fork Mountain Formation).*

bg Bassett Formation: *Light- to medium-gray, massive biotite gneiss with equigranular crystals of biotite, quartz and plagioclase, and with microcline porphyroblasts and accessory sphene, epidote and magnetite. Foliation outlined by oriented biotite gneiss. Pegmatites and migmatites make up as much as 30 percent of the rock; some pegmatites are discordant.*

SAURATOWN MOUNTAINS ANTICLINORIUM

PRECAMBRIAN

ms gt Ms (garnet-mica schist), *silver-gray schist composed of up to 20 percent muscovite and sericite with varying amounts of staurolite, kyanite, plagioclase and quartz, and accessory chlorite, chloritoid, biotite, zircon, rutile, epidote, sphene and opaque minerals. Garnet kyanite and staurolite are porphyroblasts in a quartz-mica matrix. Foliation wrapped around rotated garnet is indicative of deformation after crystallization. Locally contains thin layers or lenses of garnetiferous quartzite.* gq (garnet quartzite), *coarse-grained quartzite predominantly composed of large poikilitic garnets and quartz. Some layers contain hornblende.*

cas Chlorite-amphibole schist: *Dark-green, schistose to granular rock composed of chlorite and hornblende with variable amounts of carbonate, talc, enthopyllite, cummingtonite, and opaque minerals. The chlorite-amphibole schist has a sporadic distribution within and along the borders of the amphibolite unit.* gau, *and the schist is probably an altered mafic to ultramafic rock.*

gau 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.*

gn gt gn (mica gneiss and mica schist), *quartz and plagioclase rock with varying amounts of muscovite and biotite and accessory microcline, sphene, epidote, hornblende, garnet, and opaque minerals. Bands 1.5 to 10 feet (0.5-3 m) thick of medium-grained, layered, light-gray gneiss are interlayered with biotite-rich, mica gneiss and garnet-mica schist; also with mica schist bands and rare amphibolite layers.* ak *(alaskite), coarse-grained to pegmatitic sills and dikes of white plagioclase-quartz-microcline quartz monzonite.*

gal 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.*

agn Augen 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 places consists of segregation-banded gneiss composed of quartz-feldspar-rich layers and muscovite-biotite-rich layers and muscovite-biotite mica schist interlayers; augen locally partially destroyed by shearing, some attenuated, flattened, and bent by crinkle folds.*

KEY

CONTACTS
- Exposed or approximate
- Covered or inferred

FOLDS
- Antiform–trace and direction of plunge
- Synform–trace and direction of plunge
- Overturned antiform–trace and direction of plunge
- Overturned synform–trace and direction of plunge
- 23 / 17 Direction and angle of plunge of hinge line and strike and dip of axial plane of minor fold
- 30 Direction and angle of plunge of hinge line of minor symmetrical antiform
- 30 Direction and angle of plunge of hinge line of minor symmetrical synform
- 30 Direction and angle of plunge of hinge line of minor asymmetrical fold

FAULTS
- U D Tr Black line where exposed or approximate; gray line where covered or inferred; U, upthrown block, D, downthrown block of normal fault; T, on overthrust block
- Shear zone

ATTITUDE OF ROCKS
- 38 Strike and dip of beds

FOLIATION
- Strike and dip of compositional layering
- Strike of vertical compositional layering
- Strike and dip of schistosity
- Strike of vertical schistosity

JOINTS
- 42 Strike and dip of joints
- Strike of vertical joints

LINEATIONS
- 30 Direction and angle of plunge of mineral lineation
- Direction of horizontal mineral lineation
- 44 Direction and angle of plunge of rodding

QUARRIES AND PROSPECTS
- Abandoned quarry
- Prospect

SAMPLE LOCATIONS
- △ R-6288 R, repository number of rock sample on file at Virginia Division of Mineral Resources

Table 1. General features of selected stratigraphic units.

Unit	ROCK CHARACTERISTICS: Topographic expression	Joint spacing	Parting	Potential economic value	Groundwater	SAPROLITE CHARACTERISTICS: Approximate thickness	Composition of B soil horizon	Susceptibility to slumping after excavation	Drainage quality
al	flat		bedding	sand and gravel; agriculture		absent[1]			
td	gentle slopes and flat hill tops		bedding	sand and gravel; agriculture		absent[1]			
d	gentle hills and ridges		none, massive	possible crushed stone from wider dikes		0-25'	clay rich	moderate	poor
cg	gently rolling terrain	usually sheared	massive, thick-bedded		low yield	thick	clay rich	moderate	good
Trs	moderate hills and ridges		massive to thick-bedded		domestic use	thin	clay rich	moderate; slumps along bedding and joint planes	good
Trsm	low ridges		thin-bedded		domestic use	few feet	silty clay		poor
Trc	flat and low areas		thin-bedded	brick and ceramic ware from saprolite clays	high iron content	0-15'	silty, clay rich	moderate	poor
Trpm	flat areas		thin-medium-bedded		domestic use	0-50'	clay rich	moderate	poor
lw	low cliffs	wide	massive to slightly foliated	dimension stone		0-50'	sandy, clay rich	moderate	good
ra	valleys	wide	massive to slightly foliated	quarry stone; occurrences of magnetite and emery	thin saprolite restricts recharge	0-25'	clay rich	moderate	poor
tts	moderate ridges		schistose	quarry stone, talc		0-25'	clay rich		poor
fm	highlands, steep slopes and ridges	moderate	schistose	occurrences of magnetite	possible high yield	0-25'	micaceous, clay-rich loams	slight	good
fg	rolling terrain	moderate	schistose to gneissic banding	crushed stone, dimension stone, agriculture	possible high yield	0-60'	sandy, clay rich	moderate	excellent
feq	low ridges		massive to slabby		high iron content	0-25'	sandy, clay rich	slight	good
fam	low ridges	moderate	slabby			0-25'	clay rich	slight	good
bg	subdued, rolling terrain	moderate	schistose to gneissic banding		possible high yield	0-50'	sandy, clay rich	moderate	excellent
ms	low ridges	wide	schistose		thin saprolites, restricts recharge	0-10'	micaceous and quartz rich	moderate along foliation planes	poor
gq	low ridges		slabby to massive			0-10'	sandy	moderate	good
cas	moderate ridges		schistose to massive	quarry stone, talc		0-25'	clay rich	moderate	poor
gau	moderate ridges	moderate	slabby		high iron content	0-25'	clay rich	moderate	poor
gn	gently rolling terrain	moderate	schistose to gneissic banding	agriculture		0-50'	micaceous, sandy loams	moderate	excellent
gal	moderate ridges	moderate	slabby		high iron content	0-25'	clay rich	moderate	poor
agn	gently rolling terrain	moderate	irregular gneissic banding	agriculture		0-75'	micaceous; sandy clay	moderate	excellent

[1] Alluvial and also terrace deposits have high susceptibility to slump; drainage in the units is generally good, but alluvial deposits are commonly saturated.

ECONOMIC GEOLOGY

Fuel Resources

Coal: The Triassic beds in the study area occupy a portion of the Danville basin. Coal has been encountered during drilling in some water wells within the basin (Le Grande, 1960, p. 48). Surface exposures of coal are in the Virginia Solite Company quarry in rocks along strike in the North Carolina part of the Northeast Eden quadrangle.

Mineral Resources

Asbestos: An asbestos prospect, located about two miles (3.2 km) southeast of Axton, consists of a few pockets of anthophyllite asbestos in mafic rocks. The largest pocket is a few feet across. Several carloads of asbestos were shipped from the site. (All data based on a report by E. O. Gooch on file with Virginia Division of Mineral Resources.)

Kyanite: The garnet-mica schist unit in the Axton and Northeast Eden quadrangles contains coarsely bladed kyanite. Some observable exposures of this unit occur at the intersection of U.S. Highway 58 and State roads 620-648 (R-6275); south of Greens Store (R-6295); and north of State Road 615 between State roads 614 and 647—all in the Axton quadrangle.

Mica: A number of pegmatites in the area were worked for mica (Pegau, 1932 and Brown, 1962), but the sites were not found during the present study. The mine shown on the present map of the Axton quadrangle has not been previously reported; it lies about 0.5 mile (0.8 km) southeast of the Foley prospect reported by Brown (1962).

Magnetite and Emery: Magnetite and emery are in the Fork Mountain Formation within the contact aureole surrounding the intrusive Rich Acres Formation. Emery occurs about one mile (1.6 km) northeast of Axton; magnetite float is abundant in the same area.

Pyrite: There is disseminated pyrite 0.8 mile (1.3 km) N14°W of the intersection of State roads 855 and 700 and at a locality 0.3 mile (0.5 km) east of the intersection (Northeast Eden quadrangle).

Talc: A relatively pure, massive talc body occurs along State Road 855 about 1.9 miles (2.1 km) northeast of Aiken Summit (Northeast Eden quadrangle).

Uranium: Uranium-bearing rocks occur in Triassic strata and associated rocks along the boundaries of the Danville basin (Dribus, 1978).

Rock Resources

Clay Materials: The Webster Brick Company, Inc. operates a brick plant at Fitzgerald, North Carolina, located about 1 mile (1.6 km) southwest of Leaksville Junction (Northeast Eden quadrangle). A brick plant was in operation at Leaksville Junction early in the 20th century (Watson, 1913). The raw material used for brick-making at these plants is and was weathered shale from the Cow Branch and Pine Hall formations. Clay and shale samples from the Cow Branch Formation and from the mudrock facies of the Stoneville Formation were tested and evaluated as structural clay products (Meyertons, 1963; Sweet, 1973).

Crushed Stone: Two rock units may be valuable as sources of crushed stone, the gneiss unit of the Fork Mountain Formation and the sandstone facies of the Stoneville Formation. The gneiss, which crops out in the northern part of the Axton quadrangle, has been quarried in the adjoining quadrangle to the west, the Martinsville East quadrangle. A well-indurated sandstone that crops out along the flanks of Boyd Mountain may have potential for crushed stone.

Lightweight Aggregate: The Virginia Solite Company plant at Leaksville Junction uses shale from the Cow Branch Formation in nearby North Carolina to produce lightweight aggregate.

REFERENCES

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Sweet, P.C., 1973, Analyses of clay, shale, and related materials—southern counties: Virginia Division of Mineral Resources Mineral Resources Report 12, 183p.

Watson, T. L, 1913, Mineral production of Virginia: Virginia Geol. Survey Bull. 8, 61p.

REFERENCE NOTE

Portions of the publication may be quoted if credit is given to the Virginia Division of Mineral Resources. It is recommended that reference to this report be made in the following form:
Price, Van and others, 1980, Geology of the Axton and Northeast Eden quadrangles, Virginia: Virginia Division of Mineral Resources Publication 22, text and 1:24,000 scale map.

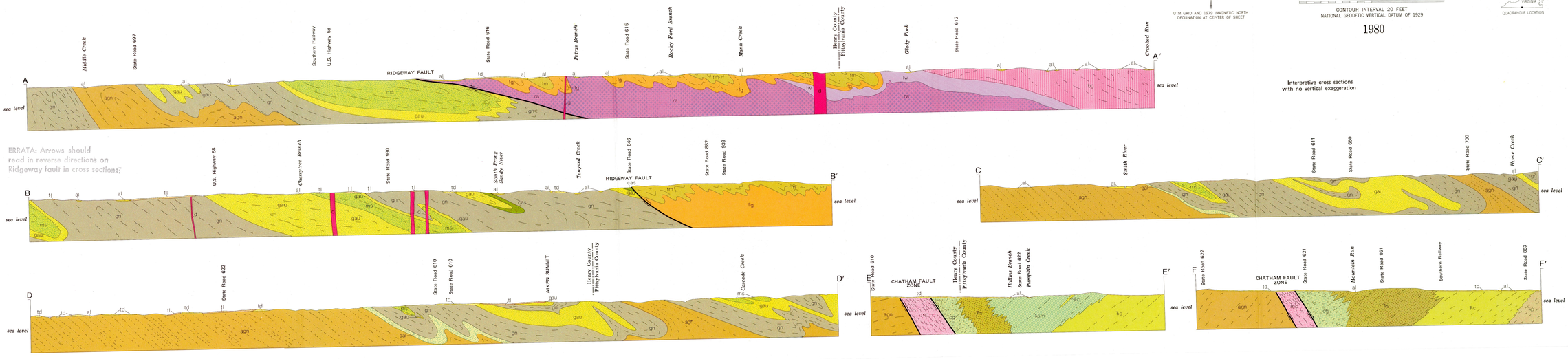
MN GN 5° 99 MILS 0°47' 14 MILS
UTM GRID AND 1979 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

SCALE 1:24 000
1 0 1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 0 1 KILOMETER

CONTOUR INTERVAL 20 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

VIRGINIA
QUADRANGLE LOCATION

1980



Interpretive cross sections
with no vertical exaggeration

ERRATA: Arrows should
read in reverse directions on
Ridgeway fault in cross sections.