GEOLOGIC MAP OF THE RADFORD SOUTH QUADRANGLE, VIRGINIA

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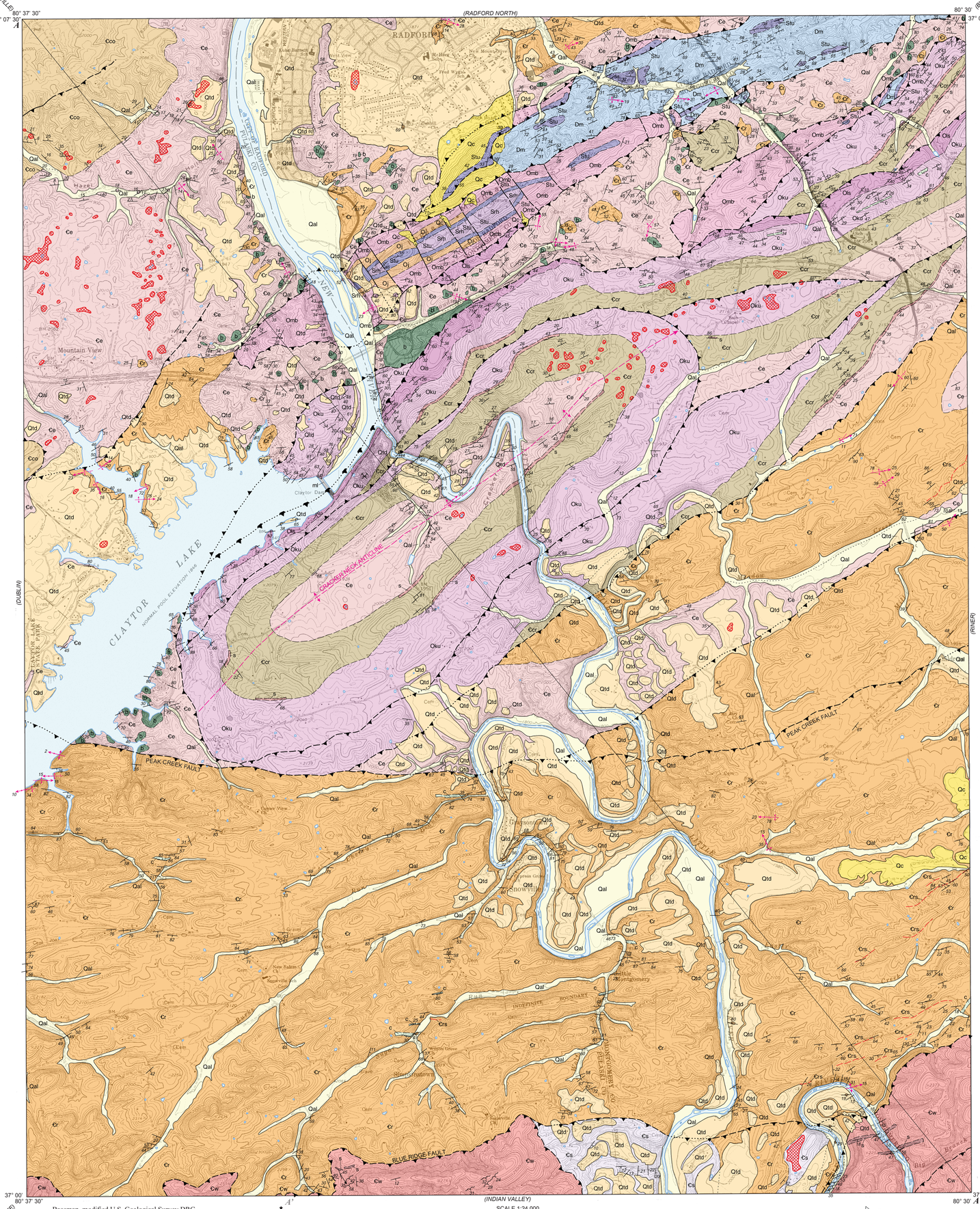
2010



Basemap, modified U.S. Geological Survey DRG
1965 Radford South Quadrangle, Virginia

Polyconic projection: UTM zone 17, NAD 1927

Digital cartography by Amy Gilmer

MN GN
7°51' 140 MILS
0°11' 3 MILS
2010 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

SCALE 1:24,000

1 0.5 0 1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 0.5 0 1 KILOMETER

CONTOUR INTERVAL 20 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

Geology mapped from 1980 to 1983

DESCRIPTION OF MAP UNITS

QUATERNARY

Qal — **Alluvium**: Unconsolidated light gray to light brown sand, silt, and clay, with channels and lenses of pebbles, cobbles, and boulders of quartzite, sandstone, and chert. Deposits are stratified and often crossbedded and/or graded bedded. Thicknesses from less than 1 to more than 30 feet (0.3 to 9.2 m).

Sinkholes: Areas mapped as sinkhole topography consist of rolling low hills with round to irregularly shaped sinkholes, clusters of sinkholes, and cave openings. These features have formed from solution or collapse of carbonate bedrock. Sinkholes are delineated by closed depression contours on the 1:24,000-scale topographic map. Sinkholes also occur in carbonate rocks of Cambro-Ordovician age throughout the study area. On the Pulaski thrust sheet, sinkholes are more numerous near the New River (Schultz and others, 1991).

Qc — **Colluvium**: Blocky accumulations of erosion-resistant boulders and cobbles of generally angular sandstone and quartzite with minor amounts of siltstone, shale, and chert; includes block streams, block fields, and talus. Deposits range from 0- to 30-feet-thick (0 to 9.2 m) and are derived from nearby strata of Mississippian, Devonian, and Silurian age (Schultz and others, 1991). Generally occurs on the higher elevation slopes below bedrock escarpments and may grade downslope into more matrix-supported debris deposits.

Qtd — **Terrace deposits**: Unconsolidated, poorly stratified deposits of medium brown to dark reddish-brown pebbles, sand, silt and clay with minor cobbles. The surface of these deposits have well developed soils and are often modified by sinkholes and stream incision. Clasts within these deposits may exhibit oxidized rinds due to weathering.

DEVONIAN

Dm — **Millboro Shale**: Dark gray to black, thinly bedded, sparsely fossiliferous, fissile mudstone and black shale. Contains abundant concretions and disseminated sulfides as well as a few thin beds of carbonate. Thickness ranges from about 1300 to 1000 feet (397 to 305 m).

Du — **Devonian undifferentiated**: (cross-section only) Includes faulted sections of Millboro and Braillier Formations as tectonic slices (Schultz, 1988).

SILURIAN

Srh — **Rose Hill Formation**: Interbedded, hematite-cemented, dark brownish-red, fine- to medium-grained, ferruginous sandstone and dark reddish-gray, mottled mudstone and siltstone. Lesser amounts of interbedded, fossiliferous, burrowed red siltstone and mottled greenish-gray shale. Thickness is approximately 140 feet (43 m).

Stu — **Tuscarora Formation**: Interbedded, massive, fine-grained, light gray to white orthoquartzite and massive and cross-bedded, medium- to coarse-grained, light gray to white quartzose sandstone with lenses of quartz-pebble conglomerate and greenish-gray siltstone and mudstone. Both trough and planar cross bedding occur throughout the section. Thickness is approximately 100 feet (30 m).

ORDOVICIAN

Oj — **Juniata Formation**: Predominantly interbedded maroon to dark reddish-brown, mottled siltstone and mudstone with thin beds of fine-grained reddish-brown sandstone. Fossil *Lingula* fragments and reduction spots are locally common. The thickness is about 150 feet (46 m).

Omb — **Martinsburg Formation**: Upper portion consists of interbedded 0.5- to 1.0-foot-thick (15 to 30.5 cm) beds of massive, fine-grained, medium gray sandstone with fossil debris and medium gray well-laminated calcareous mudstone. This grades down section into dominantly medium to dark gray, coarse-grained, bioclastic limestone interbedded with medium gray, well laminated calcareous mudstone. The thickness is estimated to be about 1100 feet (336 m). The use of Martinsburg Formation in this area follows past usage by Butts (1933, 1940) and Cooper (1961).

Ols — **Middle Ordovician limestone undivided**: Lower part of section consists of medium to light gray, dolomitic limestone overlain by medium to light gray, massive, calcareous dolomite with numerous fenestrae and scattered medium gray chert. The middle part of this unit consists of light gray to dark gray limestone with abundant dark gray and black nodular and bedded chert. The upper part of this section is medium to dark gray, irregular to planar-bedded, argillaceous limestone with interlaminated and interbedded, thin, olive-gray, fissile mudstone with abundant fossil fragments. Total thickness is about 600 feet (183 m).

Oku — **Upper Knox Group, undivided**: Medium to light gray, fine-grained dolomite typically in 1- to 3-foot-thick (0.3 to 0.9 m) beds which are internally either massive or stylolitically laminated. The unit commonly contains light gray, laminated chert as well as 0.5- to 2.0-foot-thick (15 cm to 0.6 m) beds and lenses of nodular chert that are often irregularly shaped and vuggy. The thickness is estimated to be about 1000 feet (305 m). The rocks mapped as upper Knox Group are equivalent to the Knox Group (upper part) as mapped on the Blacksburg quadrangle (Bartholomew and Lowry, 1979) and the portion of the Knox Group as described by Cooper (1961) and the Beekmantown Formation of Butts (1933, 1940).

CAMBRIAN

Ꞓco — **Conococheague Formation**: Cyclic 3- to 4.5-feet-thick (0.9 to 1.4 m) packages of basal intraformational limestone and dolomite clasts, conglomeratic limestone overlain by millimeter to centimeter laminated blue gray limestone. This part of the cycle is overlain by bluish-gray "ribbon" limestone. Tops of the cycles are capped by blocky, light gray dolomite. In places, the upper part of the cycles may consist of light pink dolomitic mudstone. These cycles are interbedded with chert-bearing stromatolitic dark gray limestone, light pink limestone and dolomite, rippled and mud-cracked light gray limestone and dolomite, and distinctively white weathered, highly fractured, blocky dolomite and oolitic chert. Discontinuous, medium- to fine-grained, light gray, 1- to 8-inch-thick (2.5 to 20.3 cm) carbonate cemented quartz sandstones are present near the base of the unit and throughout the section but exposures are relatively rare. Total thickness is between 1800 and 2000 feet (549 and 610 m).

Ꞓcr — **Copper Ridge Formation**: Medium to light gray, fine-grained dolomite typically in 1- to 3-foot-thick (0.3 to 0.9 m) beds, algal laminated and often interbedded with lenses of dolomitic, quartzose sandstones and nodular, laminated chert. Silicified carbonate sandstones (s), which range up to 4 feet (1.2 m) thick, occur as discontinuous beds and lenses. Stromatolites and cross-bedded silicified oolites are present locally. Approximately 1000 feet (305 m) thick. The Copper Ridge is mapped on the Narrows and Saltville thrust sheets and is roughly equivalent to the Conococheague on the Pulaski thrust sheet.

Ꞓe — **Elbrook Formation**: Upper part consists of 3- to 20-foot-thick (0.9 to 6.1 m), tan and gray, irregularly banded, partially dolomitized limestone interbedded with 1- to 3-foot-thick (0.3 to 0.9 m) stylolitic, dark gray, fine-grained dolomitic limestone and massive, 3- to 6-foot-thick (0.9 to 1.8 m), thrombolitic dolomite. Occasional 5- to 10-foot-thick (1.5 to 3.1 m) cyclic packages of 1.5- to 2.5-inch-thick (4 to 6 cm) intraformational dolomite clasts, limestone conglomerate are overlain by 1- to 3-foot-thick (0.3 to 0.9 m) ribbon-banded, partially dolomitized limestone overlain by 3-foot-thick (1 m) massive dolomite. Middle part consists of cyclic sequences 3- to 20-foot-thick (0.9 to 6.1 m) , partially dolomitized, wavy laminated limestone with 1- to 10-foot-thick (0.3 to 3.1 m), centimeter-laminated, light gray, argillaceous dolomite and 1- to 15-foot-thick (0.3 to 4.6 m) cherty dolomite with thin, evaporite-disrupted laminations. The lower part of the middle section consists of cyclic interbedded sequences of 3- to 20-foot-thick (0.9 to 6.1 m), flat and stromatalitic algal laminates and 1- to 10-foot-thick (0.3 to 3.1 m) centimeter-laminated argillaceous dolomite. The lower Elbrook is dominantly 15- to 30-foot-thick (4.6 to 9.2 m) centimeter-laminated, argillaceous dolomite, 3- to 10-foot-thick (0.9 to 3.1 m), massive bedded, light gray dolomite and 3- to 20-foot-thick (0.9 to 6.1 m) algal laminated dark gray dolomite and dolomitic limestone. Near the base of the formation, light olive-green and pale-pink argillaceous dolomite occurs. Near Radford, an undeformed section of the lowermost Elbrook consists of two 1-foot-thick (0.3 m), maroon phyllitic mudstones interbedded with 3- to 6-foot-thick (0.9 to 1.8 m) olive-gray, massive dolomite and 1- to 6-foot-thick (0.3 to 1.8 m) centimeter-laminated dolomite. A fine to medium-grained sandstone (s) also occurs in 1- to 10-cm-thick lenses within sandy, crossbedded fine grained dolomite. In the map area, the lower most Elbrook has been described as a broken formation (Schultz, 1986, Bartholomew, 1987). The total thickness of the Elbrook Formation ranges from 1800 to 2000 feet (549 to 610 m).

b — **Tectonic breccia (Elbrook Formation)**: Light to medium gray, massive- to crudely-layered, well to poorly indurated breccia consisting of angular to rounded unsorted clasts of dolomite, limestone, and chert in an unsorted matrix of dolomite. Forms sill- and dike-like bodies up to 50 feet (15 m) thick. A second type of breccia consists of light to medium grayish-green fragments of phyllitic, dolomitic mudstone and dolomite in dolomitic cement.

Ꞓcr — **Rome Formation**: Mottled maroon, green and yellow, phyllitic, finely laminated mudstone interbedded with red siltstone, light gray to pinkish-gray to red, fine-grained well sorted, sandstone and quartzite (s), dark gray massive dolomite, and medium gray, thinly laminated, fine-grained silty dolomite (c). This unit is extensively folded, cleaved, and fractured and neither the top nor base is exposed. Thickness probably exceeds 900 feet (274 m).

Ꞓs — **Shady Formation**: Medium gray to dark gray, massive to thinly laminated dolomite with local argillaceous interbeds and cobble-sized nodules of pale yellowish brown, translucent chert. The outer weathered surface is typically a very light brown. Total thickness is about 400 feet (122 m)

Ꞓw — **Weverton Formation**: The lower part of the Weverton consists of finely laminated, 75- to 90-foot-thick beds of medium to dark gray phyllitic metamudstone and metasiltstone overlain by 90 to 120 feet thick beds of medium gray, well bedded, medium to coarse-grained conglomeratic metagraywacke. The upper part of the section consists of light greenish-gray to white, poorly to moderately well bedded, medium- to coarse-grained metagraywacke and massive quartzite including coarse quartz-pebble and lithic metaconglomerate (s). Thickness ranges from 1800 to 2400 feet (549 to 732 m).

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SUGGESTED REFERENCE

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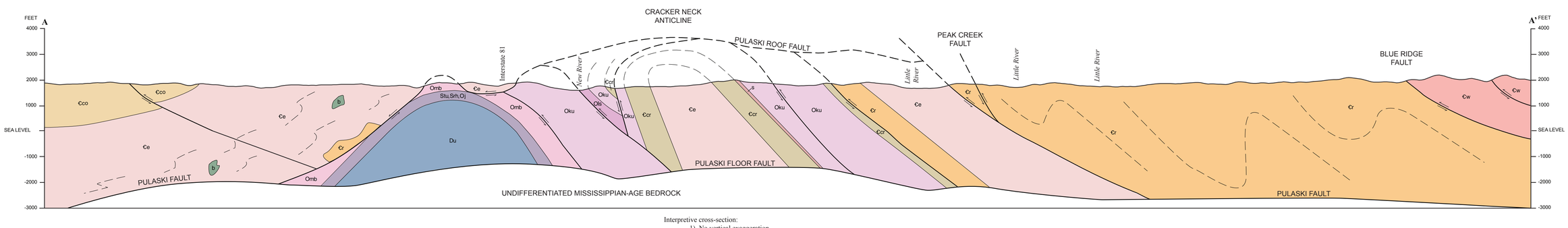
MAP SYMBOLS

- Contact, surficial deposits
- Contact, approximate
- Contact, covered
- Thrust fault, approximate, teeth on upthrown block
- Thrust fault, covered, teeth on upthrown block
- Thrust fault, overturned, teeth on upthrown block
- Cross fault, displacement uncertain
- Anticline, approximate
- Strike and dip of inclined beds
- Strike of vertical beds
- Strike and dip of overturned beds
- Horizontal beds
- Strike and dip of crenulated beding
- Strike and dip of axial surface and trend and plunge of mesoscopic anticlinal fold axis
- Abandoned mine or quarry



Interpretive cross-section:
1) No vertical exaggeration.
2) Subsurface structures interpreted from surface measurements.
3) Subsurface breccia is diagramatic.