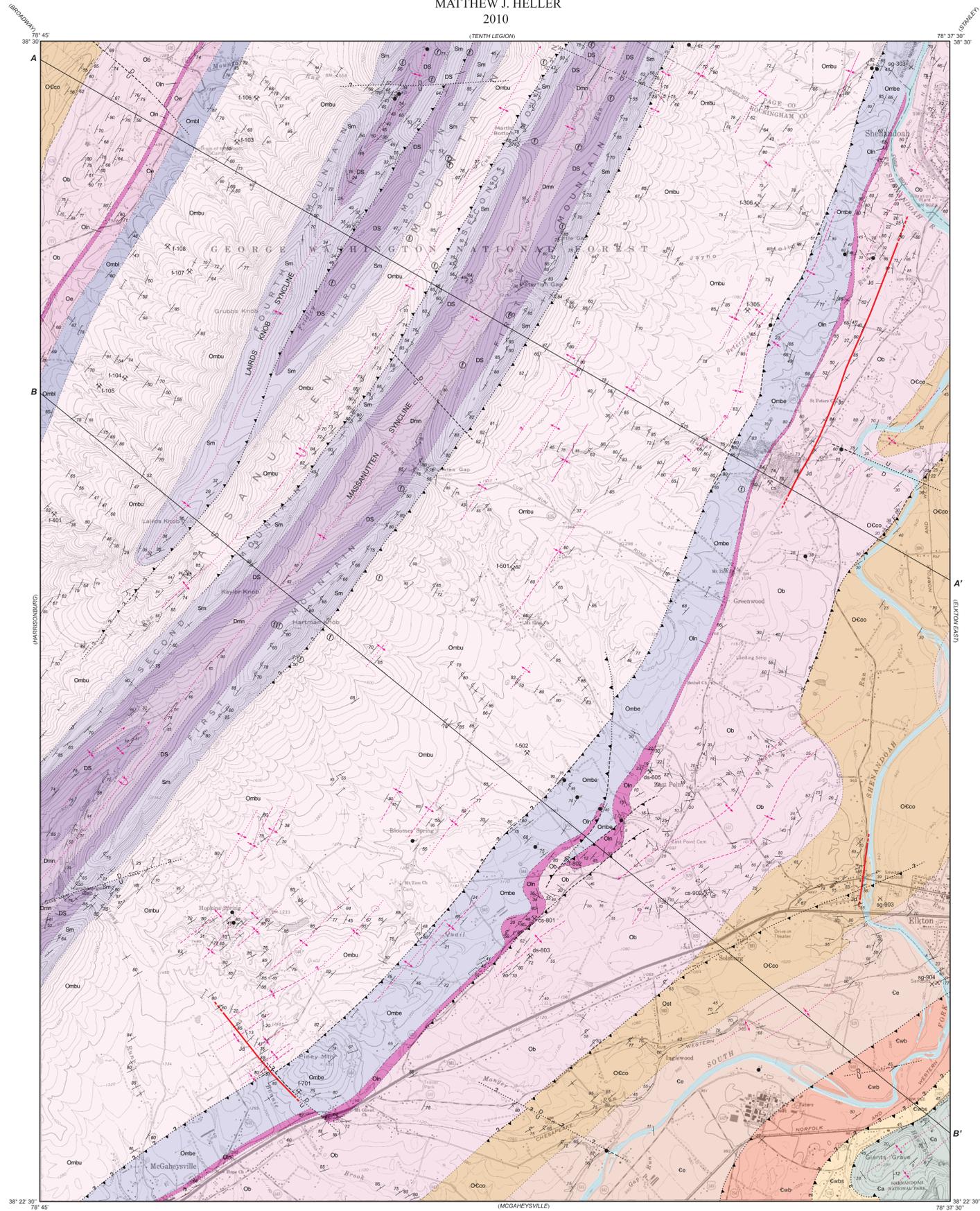


BEDROCK GEOLOGIC MAP OF THE ELKTON WEST QUADRANGLE, VIRGINIA

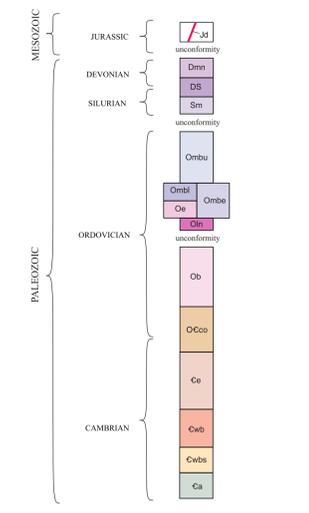
MATTHEW J. HELLER
2010



DESCRIPTION OF MAP UNITS

- INTRUSIVE ROCKS**
- Jd** **Diabase** - Black to gray-black, orange to tan weathering, fine- to medium-grained, massive basalt containing plagioclase and clinopyroxene with lesser magnetite. Occurs as dikes and sills. Similar to diabase in other parts of Virginia that is early Jurassic in age (Sutter, 1988). Difficult to excavate. Up to 20 feet (6 meters) thick.
- SEDIMENTARY ROCKS OF THE VALLEY AND RIDGE PROVINCE**
- Dmn** **Millboro Shale and Needmore Formation, undivided** - Millboro Shale: dark-gray to black, very fine grained, fissile shale that weathers gray to tan with iron oxide staining on cleavage surfaces. Needmore Formation: olive-gray, olive-tan weathering, fine-grained, thin-bedded mudstone and shale. Upper contact is not present in map area; lower contact was not observed during mapping, but is conformable in other places. Water discharging from Millboro shale may be acidic. Up to 500 feet (150 meters) thick.
 - DS** **Devonian and Silurian Rocks, undivided** - Wills Creek Formation: gray, tan to pink weathering, fine-grained, thin-bedded siltstone with brachiopod and crinoid fossils. Ridgely Sandstone: blue-gray, medium-grained, thick-bedded quartz sandstone. Bloomsburg Formation: red to maroon, thin- to thick-bedded, iron oxide cemented sandstone with common worm burrows; grades upward into red and green, fine-grained, thin-bedded siltstone. Keyser Formation and Helderberg Group rocks may also occur, but were not observed during mapping. The lower contact is conformable. Road cuts and excavations into the siltstone of the Wills Creek Formation, especially cuts that parallel bedding or joint surfaces, may be unstable. Approximately 700 feet (215 meters) thick.
 - Sm** **Massanutten Sandstone** - White to gray-white, fine- to coarse-grained, thin- to thick-bedded sandstone, orthoquartzite, and quartz pebble conglomerate that commonly exhibits cross- or graded-bedding. Iron oxide staining is common in the upper and lower parts. Lesser dark-gray, very fine grained, thin-bedded shale that occasionally contains early vascular plant fossils and gray to tan, thick-bedded, clast-supported basal conglomerate that contains quartz and chert pebbles and cobbles. Lower contact is unconformable or faulted. Difficult to excavate. 500 to 900 feet (150 to 275 meters) thick.
 - Ombu** **Martinsburg Formation, upper part, and Cub Sandstone, undivided** - Martinsburg Formation: gray to olive-gray argillite and siltstone interlayered with olive- to blue-gray, fine- to medium-grained, thin- to thick-bedded limestones and lesser dark-gray shale. Exposed surfaces weather to olive- or orange-tan. Bottom of unit is dominantly argillite and siltstone, with lesser shale and thin-bedded sandstone. The abundance, thickness, and grain size of sandstone beds increase upsection. Thick sandstone beds are also present near the lower contact of the map unit, east of the Massanutten Mountains, but due to folding and faulting, the stratigraphic position of these beds is unclear. A quartz pebble conglomerate bed is exposed at or near the top, east of First Mountain, near the Rockingham-Page County line. Brachiopod-bearing beds occur near or at the top in other areas. The upper part of the Martinsburg is equivalent to the sandstone and argillite members of Gathright and Frischmann (1986). Cub Sandstone: olive- to blue-gray, medium- to coarse-grained, thick-bedded lithic sandstone with common coarse angular fragments. Occurs in the uppermost portion of the map unit. Equivalent to the Cub Sandstone of Thornton (1953). The lower contact of the map unit is conformable and gradational west of the Massanutten Mountains. This contact appears to be faulted to the east, based on dip-reversals and folding, a sharp transition from calcareous shale to thick-bedded sandstone, and common springs along the contact. Commonly used for fill material. This soil cover is typical. Excavations in argillite and siltstone, especially those that parallel bedding or joint surfaces, may be unstable. Minor faults and folds are common. Thickness was not determined.
 - Omba** **Martinsburg Formation, lower part** - Dark-gray to black, light-gray to tan weathering, well-foliated calcareous shale with interlayers of dark-gray to black, thin-bedded lime mudstone near the base. Granitic interlayers of dark-gray to black, thin-bedded lime mudstone. Edinburg Formation: dark-gray to black, very fine to fine grained, thin- to medium-bedded, moderately well foliated, impure lime mudstone, lime mudstone, and calcareous shale. Non-calcareous shale with common granolites observed at base in several locations. These two formations could not be mapped separately east of the Massanutten Mountains. Lower contact is conformable. Minor faults and folds are common in this map unit. Thickness was not determined.
 - Ombc** **Martinsburg Formation, lower part and Edinburg Formation, undivided** - Martinsburg Formation: dark-gray to black, light-gray to tan weathering, well-foliated calcareous shale with occasional interlayers of dark-gray to black, thin-bedded lime mudstone. Edinburg Formation: dark-gray to black, very fine to fine grained, thin- to medium-bedded, moderately well foliated, impure lime mudstone, lime mudstone, and calcareous shale. Non-calcareous shale with common granolites observed at base in several locations. These two formations could not be mapped separately east of the Massanutten Mountains. Lower contact is conformable. Minor faults and folds are common in this map unit. Thickness was not determined.
 - Oe** **Edinburg Formation** - Dark-gray to black, gray to orange-tan weathering, very fine to fine-grained, thin- to thick-bedded, limestone consisting of lime mudstone with lesser wackestone, crystalline limestone, and calcareous shale. Lower contact is conformable. Areas underlain by limestone are prone to karst development. Up to 600 feet (180 meters) thick.
 - On** **Lincolshire and New Market limestones, undivided** - Lincolshire Formation: light-gray to dark-gray, fine- to coarse-grained, fine to very thick bedded limestone consisting of grainstone, packstone, and crystalline limestone with lesser lime mudstone; may contain bedded black chert; fossiliferous. New Market Formation: light-gray to gray, micro- to fine-grained, medium-bedded to massive limestone consisting of crystalline limestone, lime mudstone and lesser boundstone. A pink wackestone bed occurs at the base of New Market Formation near East Point. The New Market Formation is a high purity limestone. Prone to karst development. Up to 200 feet (60 meters) thick.
 - Ob** **Beekmantown Group** - Gray, very fine grained, thin to very thick bedded, laminated to massive dolostone consisting of dolomitized mudstone and wackestone, algal boundstone, and crystalline dolostone. Weathers light gray. Lesser dark gray, fine-grained, medium- to thick-bedded limestone that weathers blue-gray and sometimes contains silty laminae. Bedded blue-gray, white weathering chert beds are present in the middle part. Lower contact is conformable. Has historic, current, and potential use as aggregate. Areas underlain by thicker limestone beds are prone to karst development, especially on ridges. Approximately 3,000 feet (915 meters) thick.
 - OCo** **Conococheague Formation** - Dark gray, fine-grained, thin-bedded lime mudstone with common pink to tan silty or dolomitic laminae. Weathers gray and tan. Interlayered with light-gray, fine- to medium-grained, medium- to thick-bedded dolostone and lesser gray, medium-grained, medium- to thick-bedded sandstone that weathers orange-tan. Flat-pebble conglomerate beds are common. The lower contact is conformable. Areas underlain by thicker limestone beds are prone to karst development, especially on ridges. Between 1,500 and 2,500 feet (460 to 760 meters) thick.
 - Ce** **Elbrook Formation** - Gray, fine-grained, shaly to thick-bedded, dolostone consisting of dolomitic mudstone, wackestone and lesser algal boundstone. Weathers light-gray. Interlayered with gray to dark-gray, medium-bedded limestone commonly containing red dolomite or silty partings. Lower contact was not observed during mapping; overturned beds near the contact suggest that it is faulted. Areas underlain by thicker limestone beds are prone to karst development, especially on ridges. Thickness was undetermined.
 - Cwb** **Waynesboro Formation** - Maroon and green, very fine grained, thin-bedded phyllite, argillite, and shale. Interlayered with gray, fine-grained, thin- to medium-bedded dolostone. Formation is poorly exposed and lower contact was not observed. Minor faults and folds are common in the Waynesboro. Thickness was not determined.
 - Cwb1** **Waynesboro Formation and/or Shady Dolomite** - This map unit is not exposed and may include phyllite, argillite, and shale of the Waynesboro Formation and/or light- to dark-gray, fine-grained, thin- to thick-bedded dolostone mapped as the Shady Dolomite. Shady dolomite is present immediately northeast and southwest of the quadrangle, but may be cut out by faulting in this area. Lower contact of this map unit appears to be faulted based on breccia in the hanging wall near contact and seismic data (Evans, 1989). The Waynesboro - Shady contact, if present, may also be faulted. Thickness was not determined.
 - Ca** **Antietam Formation** - Gray to tan, very fine to fine-grained, thick-bedded to massive, weakly metamorphosed quartz arenite that is strongly jointed and contains *Spirifer* trace fossils. The lower contact is not exposed in the quadrangle. Difficult to excavate. Thickness was not determined.
- SEDIMENTARY ROCKS OF THE BLUE RIDGE PROVINCE**
- Ca** **Antietam Formation** - Gray to tan, very fine to fine-grained, thick-bedded to massive, weakly metamorphosed quartz arenite that is strongly jointed and contains *Spirifer* trace fossils. The lower contact is not exposed in the quadrangle. Difficult to excavate. Thickness was not determined.

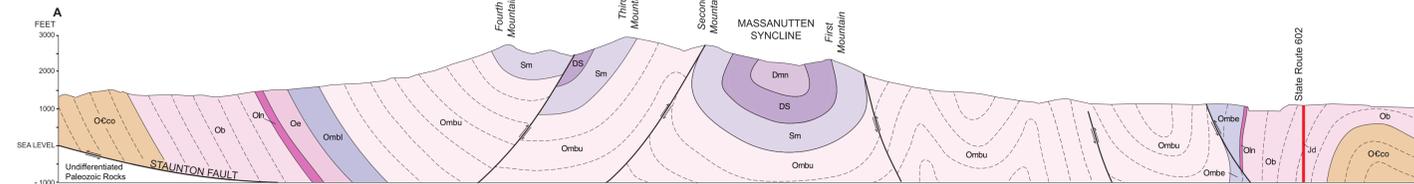
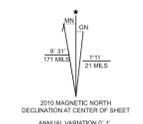
CORRELATION OF MAP UNITS



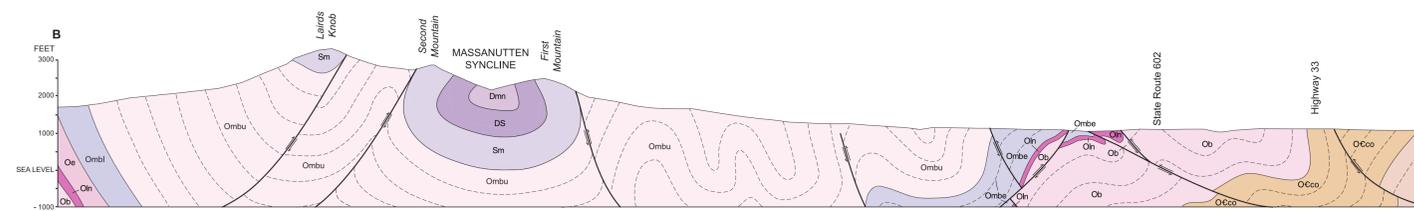
MAP SYMBOLS

- For all contact and fold symbols: lines are solid where the location is exact, long-dashed where the location is approximate; short-dashed where the location is inferred; dotted where the location is concealed. Queries added where identity or existence may be questionable. For geologic observation symbols, observation sites are centered on the strike bar or at the intersection point of multiple symbols.
- Contacts
 - Fault Contacts
 - Reverse - sawtooth on upthrown block
 - Normal - U - upthrown block, D - downthrown block
 - Strike-slip - arrows show relative motion
 - Folds - arrows showing direction of plunge and dip of beds where appropriate
 - Anticline
 - Syncline
 - Overturned Anticline
 - Overturned Syncline
 - Geologic Observations
 - Strike and dip of inclined beds
 - Strike of vertical beds
 - Strike and dip of overturned beds
 - Strike and dip of inclined cleavage
 - Strike of vertical cleavage
 - Float, used to delineate contacts
 - Mineral Resources - identification numbers are preceded by "187B" in Mineral Resources of Virginia database
 - Prospect (es-crusht stone)
 - Mine or quarry (es-crusht stone, ds-dimension stone, f-fill)
 - Abandoned mine or quarry (es-crusht stone, ds-dimension stone, f-fill)
 - Abandoned sand and gravel pit (sg-sand and gravel)
 - Water Resources
 - Spring - line indicates direction of flow

Basemap, modified U.S. Geological Survey DRG
1987, Elkton West Quadrangle, Virginia
Projection: Polyconic
Digital Cartography by Matthew J. Heller



Interpretive cross-sections:
1. No vertical exaggeration
2. Subsurface structures interpreted from surface measurements



ACKNOWLEDGEMENTS

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