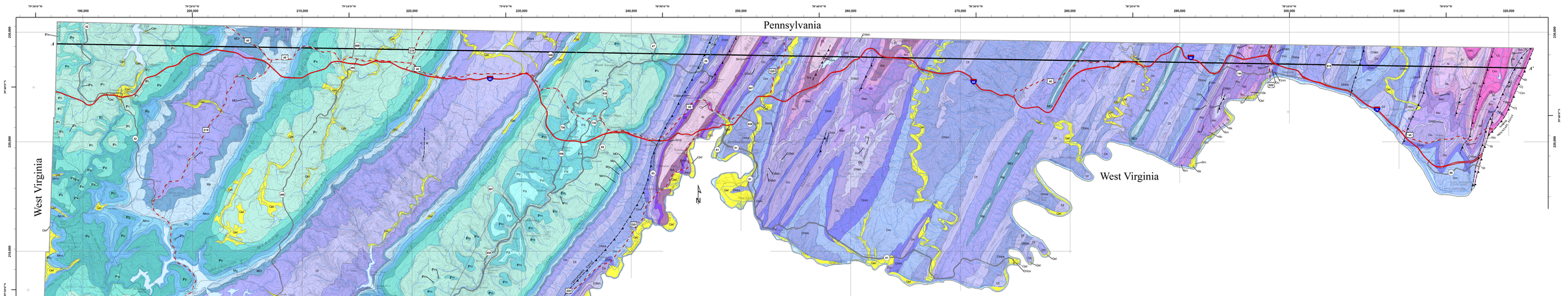

Geologic Map of Garr ett, Allegany, and western Washington Counties, Maryland

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0 5 10 miles

Description of Map Units

Quaternary

Qal — Alluvium
Unconsolidated reddish brown to tan, sand, silt, pebbles and cobbles that weathers yellow, orange, and orange-brown. Mapped alluvium deposits include those formed along modern and ancient streams, and marsh deposits formed over older bog deposits.

Permian?

Pid — Dunkard Formation
Interbedded, medium gray to dark gray, carbonaceous, silty shale and siltstone; light to medium gray, micaceous, medium- to coarse-grained sandstone; and thin, discontinuous nodular limestone, and thin coal beds. The Dunkard Formation caps several hills in the Georges Creek Syncline, and may be as much as 250 feet (76 m) thick.

Pennsylvanian

Pmo — Monongahela Group
Interbedded, medium gray to dark gray, carbonaceous, silty shale and siltstone; light to medium gray, micaceous, medium- to coarse-grained sandstone, and thin, discontinuous, nodular limestone, and coal beds. The thickness of the Monongahela Group is 225 to 250 feet (68 to 76 m).

Pc — Conemaugh Group (Undivided)
Interbedded, light gray, micaceous sandstone and gray silty shale and thin, dark gray, marine shales in the lower half of the group, and greenish-gray and reddish brown to variegated mudstone, shale, claystone, and nodular nonmarine limestone in its upper part. The Conemaugh Group is 800 to 900 feet thick (245 to 275 m).

Pa — Allegheny Formation
Interbedded, medium to dark gray shale and siltstone, tan to light gray sandstone, claystone, and mineable coal beds. The Allegheny Formation is between 200 to 250 feet thick (61 to 76 m).

Pp — Pottsville Formation
Dominantly light grey to tan, medium- to coarse-grained sandstone and conglomeratic with subordinate amounts of dark gray shale, siltstone, and coal. Total thickness for the unit is 180 to 200 feet (55 to 61 m).

Mississippian

Mmc — Mauch Chunk Formation
Interbedded, reddish brown shale; variegated, root-mottled mudstone and siltstone, and reddish brown to greenish gray lenticular sandstone. The Mauch Chunk Formation is approximately 600 feet thick in Allegany County and thins westward to 300 feet in thickness in western Garrett County (90 -180 m).

Mg — Greenbrier Formation
Light gray, cross-bedded, sandy limestone to calcareous sandstone at the base (Loyalhanna Member); overlain by interbedded, reddish, fossiliferous mudstone, and tan to reddish brown, fine-grained sandstone, and reddish brown siltstone and variegated shale (Savage Dam Member); succeeded by thin- to medium-bedded, light to medium gray, argillaceous, fossiliferous limestone at the top (Wymps Gap Member). The Greenbrier Formation is 150 to 200 feet thick (45-60 m).

Mp — Purslane Formation
Light gray, tan, and reddish brown, coarse-grained to conglomeratic, thick-bedded to cross-bedded sandstone and thin bed s of gray shale, and coaly shale. The Purslane is more than 3 00 feet thick in western Washington County and thins westward to approximately 150 feet thick in western Garrett County (45-90 m).

Devonian

MDr — Rockwell Formation
Interbedded, gray, silty shale, light gray to tan sandstone, a nd coaly and reddish shale. In Allegany and Washington counties a reddish brown to gray, polymictic diamictite marks the base of the formation. The Rockwell Formation is more than 400 feet thick in w estern Washington County; thins to less than 100 feet in southern Garrett County (30-120 m).

Dh — Hampshire Formation
Interbedded, reddish brown to brownish red, locally g reenish gray sandstone, reddish brown siltstone, shale, and rooted claystone. The thickness of the Hampshire varies from approximately 2,000 feet in Garrett County to more than 3,000 feet in eastern Allegany and western Washington counties (600-900m).

Df — Foreknobs Formation
Interbedded, olive-gray medium- to coarse-grained, cross-bedded sandstone; greenish gray to dusky red, fossiliferous shale and siltstone. Thick (<50 feet, 10m) sandstone intervals occur both near the base and near the top of the formation. The Foreknobs ranges from 1,200 feet thick in Garrett County to more then 1,500 feet in thickness in eastern Allegany County (365 -460 m).

Dhbs — Harrell-Brallier-Sharr Formations (undivided)
The Harrell Shale is a dark gray, fissile, calcareous, thinly laminated, shale that weathers to thin yellowish gray shale chips. The base of the Harrell is marked by the black, very fissile **Burkut Shale Member**. The Harrell grades eastward into the Brallier Formation. The Harrell Shale is up to 150 feet thick (45m).
The Brallier Formation is a succession of thinly interbedded, gray to olive-gray shale and siltstone and thin, fine-grained sandstone. The Brallier is 2,000 to 2,500 feet thick (600-760 m).
The Sherr Formation is interbedded, reddish- brown to grayish brown shale; thin, gray siltstone; and fine-grained, bioturbated and fossiliferous sandstone. The thickness of the Sherr is approximately 1,000 feet in Garrett County and becomes indistinct in eastern Allegany and western Washington counties (300 m).

Dmn — Mahantango Formation
Medium gray to olive-gray, massive siltstone to fine-grained sandstone near the base and top of the formation; interbedded with these siltstone intervals are thinly interbedded siltstone, sandstone, and silty, hackly shale. Weathers brownish gray to grayish brown. The Mahantango Formation is approximately 1,400 feet thick in Allegany County and thins westward to less than 1,000 feet in thickness in the subsurface of Garrett County (300-425 m).

Dnm — Needmore-Marcellus Shales
The Needmore Shale is a dark- brownish-gray to medium-dark gray, calcareous, fossiliferous shale, with thin (1 foot, 30 c m) beds of d ark gray, argillaceous limestone. The upper Needmore Shale consists of approximately 35 feet (10 m) of interbedded, dark gray, argillaceous limestone and black shale. This interval is correlative with the Onondaga Limestone of New York. The top of the Needmore Shale is marked by the Tioga Bentonite, a brown, tuffaceous claystone. The Needmore Shale is 150 feet thick in Allegany County (45 m).
The Marcellus Shale consists of black, brittle, fissile shale in the low er 100 feet (30 m.); interbedded, thinly bedded, black limestone and shale in the middle; and very dark gray, fissile shale containing thin (0.5-1 inch, 1-2 cm) siltstone beds at the top. The Marcellus Shale is more the 350 feet thick in western Washington County and thins to approximately 150 feet in the subsurface at Keysers Ridge (45-105 m).

Silurian

Do — Oriskany Formation
Interbedded, medium to dark gray, siliceous shale and sandy and cherty limestone near the base (Shriver Shale Member); overlain by tan fine-grained, calcareous sandstone; and then by light gray, medium- to coarse-grained, thin- to thick-bedded, cal careous sandstone at the top (Ridgely Member). The Oriskany Formation is approximately 50 feet thick in western Washington County and thickens westward into Allegany County where it is up to 300 feet thick (15 -90 m).

DSkh — Keyser-Helderberg Formations (undivided)
The Keyser Limestone consists of light gray, coarsely crystalline crinoidal limestone in the lower 50 feet (15 m), becoming, medium to dark gray, medium- to thick-bedded, nodular, fossiliferous limestone containing dark gray chert nod ules. The upper Keyser is thin-bedded, cherty, fossiliferous limestone. The Keyser is up to 300 feet thick in western Washington County and thins to approximately 200 feet in thickness in western Allegany County (60-90 m).
The Helderberg Limestone consists of medium gray, medium-bedded, cherty, crinoidal limestone (New Creek Member); overlain in western Washington County by a light gray, cross-bedded, calcareous sandstone (Elbow Ridge Sandstone); then a m edium-gray fossiliferous limestone containing beds of brow n-weathering chert (Corriganville Limestone), which is succeeded by interbedded, cherty, dark-gray limestone, and dark calcareous shale (Licking Creek Member); and topped by a thin, black, brittle shale (Mandata Shale). The Helderberg Limestone is 150 to 180 feet thick in western Maryland (30-55 m).

Sto — Tonoloway Formation
Medium to light gray, fine-grained, thinly laminated, mudcracked, dolomitic limestone with thin layers of medium gray, fine-grained limestone, and tan, laminated dolomite. The Tonoloway Limestone is approximately 400 feet thick (120 m).

Swc — Wills Creek Formation
Interbedded, greenish gray to light gray, calcareous shale, and tan, dolomitic shale containing mud cracks, laminations, and salt and gy psum casts. The thickness of the Wills Creek is approxima tely 400 feet (120 m).

Sb, Sm — McKenzie - Bloomsburg Formations (undivided)
Interbedded, greenish gray, calcareous shale and medium to dark gray, thinly bedded, fossiliferous limestone (**Sm** McKenzie Formation); overlain by interbedded, reddish gray to brownish gray, fine-grained sandstone and hackly shale to mudrock (**Sb** Bloomsburg Formation). The McKenzie Formation is up to 300 feet thick (90 m), and the Bloomsburg Formation rarely exceeds 100 feet (30 m) in thickness.

Sk, Sr — Rose Hill-Keefer Formations (undivided)
The Rose Hill Formation (**Sr**) consists of pale olive-gray to pa le reddish g ray, fissile shale. Shales are locally interbedded with fine-grained, thinly laminated to cross-laminated sandstone. The Rose Hill is overlain by the Keefer Sandstone (**Sk**), a light gray to tan, fine to medium-grained, thin- to medium-bedded, bioturbated sandstone, that is mapped separately in eastern Allegany and western Washington counties. The approximate thickness of the Rose Hill Formation and Keefer Formation combined is 300 feet (90 m).

St — Tuscarora Sandstone
Light-gray, fine- to medium-grained, medium-bedded, dense sa ndstone. Locally, sandstone layers are interbedded with thin, gray shale. The thickness of the Tuscarora Sandstone varies from less than 50 feet in Washington County to up to 380 feet in w estern Allegany County (15-115 m).

Ordovician

Oj — Juniata Formation
Interbedded, reddish brown to brownish red, fine- to medium-grained, medium- to thick-bedded, cross-bedded sandstone and micaceous siltstone and silty shale. The Juniata Formation is up to 300 feet thick in western Allegany County (90 m).

Om — Martinsburg Shale
Medium to dark gray, fissile shale at the base, overlain by medium gray, silty shale and thinly interbedded medium-grained sandstone; and then by thick-bedded, medium-grained, fining- upward sandstone at the top of the formation. The Martinsburg is up to 5,000 feet thick in the Washington County (1,500 m).

Cambrian and Ordovician

C - O — Older Cambrian and Ordovician strata
Illustrated in cross-section only.

Explanation of Map Symbols

Contacts

Geologic contacts; approximately located dotted where concealed

High angle Fault-U upthrown block D-downthrown block dotted where concealed

Thrust fault- triangles point to upthrown block

Cross section line

Base Map Symbols

Interstate Highway

U.S. Highway

State Numbered Highway

Stream

Water body (eg. lakes, ponds, rivers)

Map Location

Geologic Map Compilation Sources

1. Clear Spring and Hedgesville quadrangles (Maryland part). Mapping by D.K. Brezinski and J.D. Glaser.
2. Geologic Map of Portions of the Hancock, Cherry Run, and Big Pool quadrangles, Maryland. J.D. Glaser, 2003, Maryland Geological Survey digital geological map, scale 1:24,000. Field checked and modified by D.K. Brezinski 2012.
3. Geologic map of the Bellegrove Quadrangle, Allegany and Washington counties, Maryland. J.D. Glaser, 1994, Maryland Geological Survey OpenFile Geologic Map, scale 1:24,000. Field checked and modified by D.K. Brezinski, 2012.
4. Geologic map of the Artemas Quadrangle, Allegany County, Maryland. J.D. Glaser, 1994, Maryland Geological Survey Open-File Geological Map, scale 1:24,000. Field checked and modified by D.K. Brezinski, 2012.
5. Geologic map of the Paw-Paw Quadrangle, Allegany County, Maryland. J.D. Glaser, 1994, Maryland Geological Survey Open-File Geological Map, scale 1:24,000. field checked and modified by D.K. Brezinski, 1999.
6. Geologic map of the Oldtown Quadrangle, Allegany County, Maryland. J.D. Glaser, 1994, Maryland Geological Survey Open-File Geological Map, scale 1:24,000. Field checked and modified by D.K. Brezinski, 2012.
7. Geologic map of the Flintstone Quadrangle, Allegany County, Maryland. J.D. Glaser, 1994, Maryland Geological Survey Open-File Geological Map, scale 1:24,000. Field checked and modified by D.K. Brezinski, 2012.
8. Bedrock Geology of the Evitts Creek and Patterson Creek Quadrangles Maryland, Pennsylvania, and West Virginia, W. de Witt and G.W. Colton, 1964, US Geological Survey Bulletin 1173.
9. Geology of the Cresaptown quadrangle, Allegany County, Maryland. J.D. Glaser, 1994, Maryland Geological Survey Open-File Geological Map, scale 1:24,000.
10. Geologic Map of the Cumberland quadrangle, Allegany County, Maryland. J.D. Glaser and D.K. Brezinski, 1994, Maryland Geological Survey Open-File Geological Map, scale 1:24,000. Modified by D.K. Brezinski, 2012.
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12. Geologic map of the Lonaconing Quadrangle, Allegany and Garrett counties, Maryland, J.D. Glaser and D.K. Brezinski, 1998, Maryland Geological Survey Open-File Geologic Map, scale 1:24,000.
13. Geologic map of the Avilton and Frostburg quadrangles, Allegany and Garrett counties, Maryland, D.K. Brezinski, 1999, Maryland Geological Survey, scale 1:24,000.
14. Coal Geology of the Castleman coal field, Garrett County, Maryland. P.C.Lyons, E.F. Jacobsen, and B.K. Scott, 1985, US Geological Survey Coal Investigations Map C-98.
15. Unpublished Geologic Mapping of the Barton and Westernport Quadrangles, D.K. Brezinski. 1988-1990.
16. Frostburg and northern Sang Run quadrangles from Coal Geology of the Lower Youghiogheny coal field, Garrett County, Maryland. E.F. Jacobsen and P.C.Lyons, 1985, US Geological Survey Coal Investigations Map C-103. Modified by D.K. Brezinski, 2012.
17. Unpublished geologic mapping of the Accident, Bittinger, McHenry, Oakland, Gorman, Deer Park, Kitzmiller, Mt. Storm, and southern part of the Sang Run quadrangles, D.K. Brezinski. 1997-1999.
18. Geology of the Davis and Table Rock quadrangles in Maryland. D.K. Brezinski and J.D. Glaser 2002, Maryland Geological Survey Digital Geologic map, sc ale 1:24,000.

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Map available as printable version and GIS coverage from the website http://www.mgs.md.gov/

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Interpretive Geologic Cross Section for *A – A'*