

shenandoah valley groundwater X



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The Shenandoah Valley features a complex, productive karst aquifer system formed within Paleozoic limestone and dolomite. Driven by dissolution, this landscape includes sinkholes, caves, and springs that are highly susceptible to contamination due to rapid groundwater recharge. Groundwater flow occurs through fractures and conduit networks, with significant storage in carbonate aquifers.  [USGS \(.gov\)](#) +4

Key Aspects of Shenandoah Valley Karst and Groundwater:

- **Geological Structure:** The Valley is a northeastern-southwestern trending synclinorium containing Cambrian and Ordovician carbonate rocks, such as the Beekmantown Group and Edinburg Formation. These layers were folded and faulted during the Alleghanian orogeny.
- **Karst Features:** The landscape is characterized by sinkholes, caves, and sinking streams, which are most concentrated near the Shenandoah River and incised streams due to steeper hydraulic gradients.
- **Groundwater Flow & Storage:** The karst system is characterized by diffuse flow through rock fractures and conduit flow along fault lines. Springs frequently emerge where fault planes intersect the surface.
- **Water Quality Concerns:** Groundwater in the region is vulnerable to pollution. A study mentioned that ~8% of groundwater wells in Virginia, particularly in areas like the Shenandoah Valley, exceed the EPA health advisory limit for Manganese (300 ppb).
- **Restoration & Management:** Studies are ongoing to understand the hydrogeology, including monitoring groundwater levels in sinkhole ponds (e.g., at [Virginia Tech](#)) to aid ecological restoration.
- **Karst Features and Risks:** The soluble rock leads to the development of sinkholes, which pose risks to infrastructure and are a critical factor in [landscape management](#). 

The [USGS](#) has conducted extensive studies on this area, providing detailed hydrogeologic frameworks to help manage and protect these resources.  [USGS \(.gov\)](#) +1

Manganese exposure from spring and well waters in the ...

Thus, the Shenandoah Valley serves as a fertile testing ground for studying Mn contamination in both karst and non-karst aquifers.

PubMed Central (PMC) (.gov)

Comparison of age distributions estimated from environmental ...

Aug 1, 2013 — Measured concentrations of environmental tracers in spring discharge from a karst aquifer in the Shenandoah Valley, USA, were used...

USGS (.gov)

Hydrogeologic Framework of the Northern Shenandoah Valley ...

Oct 25, 2024 — KARST FEATURES Karst in the study area is expressed by sinkholes, caves, springs, and areas of poorly developed surface drainage o...



USGS (.gov)

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National Park Service (.gov)

https://www.nps.gov › articles › shenandoah-valley-geol...

Geology of the Shenandoah Valley

Dec 3, 2025 — Because of its limestone base, the **Shenandoah Valley is karst**, a terrain type with distinctive landforms and water resources. Slightly acidic ... [Read more](#)



USGS (.gov)

https://pubs.usgs.gov › publication

Karst geomorphology and hydrology of the Shenandoah ...

by DH Doctor · 2014 · Cited by 17 — The karst of the central Shenandoah Valley has characteristics of **both shallow and deep phreatic formation**. This field guide focuses on the ...



USGS (.gov)

https://www.usgs.gov › water-resources › science › karst...

Karst Aquifers: Valley and Ridge, Piedmont, and Blue ...

Jul 19, 2021 – The **Valley** and Ridge, Piedmont, and Blue Ridge Aquifers demonstrate **karst** features such as caves, sinkholes, sinking streams, and conduits. [Read more](#)



Virginia Department of Conservation and Recreation (.gov)

<https://www.dcr.virginia.gov/introvakarst>

Introduction to Virginia's Karst ^{PDF}

There are few surface streams in these limestone **valleys** as runoff from mountain slopes disappears into the subsurface upon contact with the **karst** bedrock. [Read more](#)

39 pages



GeoScienceWorld

<https://pubs.geoscienceworld.org/gsa/books/chapter>

Karst geomorphology and hydrology of the Shenandoah ...

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Friends of the Shenandoah River

<https://fosr.org/karst-area-of-shenandoah-valley>

A Reference Stream for the Karst Area of Shenandoah Valley

Mar 5, 2015 – **Ground water** comprises more than 90% of all the water that is contributed directly to **karst** streams because of the permeability of fractured ... [Read more](#)



PubMed Central (PMC) (.gov)

<https://pmc.ncbi.nlm.nih.gov/articles/PMC11065944>

Manganese exposure from spring and well waters in the ...

by MAG Hinkle · 2024 · Cited by 6 – **Groundwater** in the **Shenandoah Valley** typically flows along faults, fractures, bedding planes, or through dissolution features, and often emerges as springs or ... [Read more](#)



Shenandoah County, VA (.gov)

<https://www.shenandoahcountyva.gov/View/2...>

Water In Shenandoah County A Primer ^{PDF}

Portions of the Shenandoah Valley with karst consistently form the most productive aquifers in Virginia's consolidated rock formations. Ridges and upland ... [Read more](#)



Keck Geology Consortium

<https://keckgeology.org> › Summer 2018 Posts

Karst Aquifers of Rockbridge County Virginia

Nov 28, 2025 — The low-lying **Shenandoah Valley** portion is underlain primarily by Cambro-Ordovician limestone and dolomite, which form productive **karst** aquifers ... [Read more](#)

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