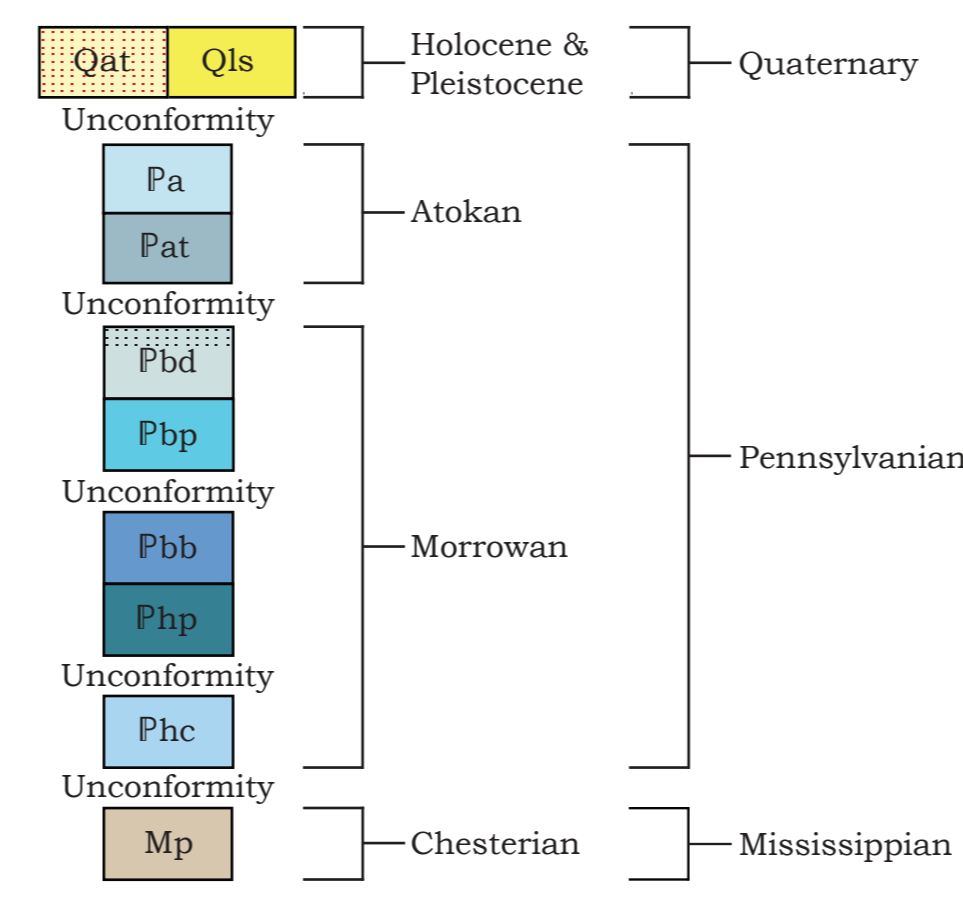
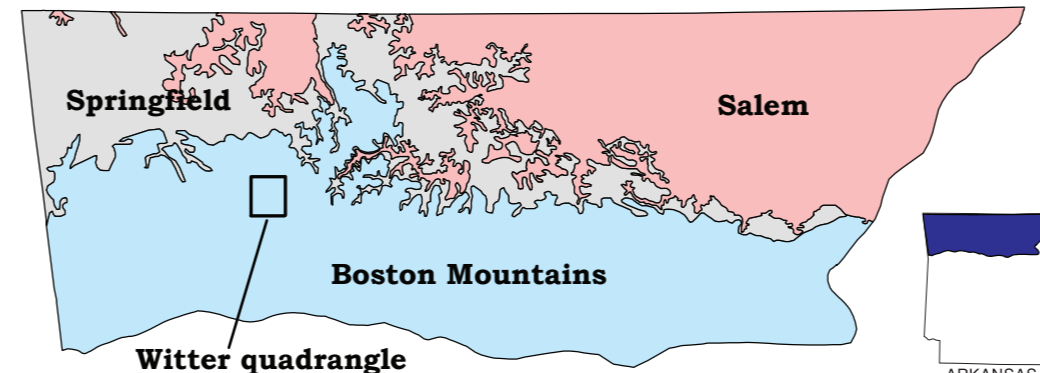


Correlation of Map Units



Ozark Plateaus



Introduction

This map depicts the bedrock and surficial geology of the 7.5-minute Witter quadrangle. In this area, approximately 940 feet (287 meters) of Mississippian (Chesterian) to Pennsylvanian (Atokan) carbonate and clastic rocks are exposed. These rocks formed from sediment deposited in distal to near shore marine, tidal, deltaic, and fluvial environments. The quadrangle is situated on the northern part of the Boston Mountains Plateau, the southernmost and highest of three broad plateau surfaces in northern Arkansas known as the Ozark Plateaus Province. This province is part of the Interior Highlands Physiographic Region and was developed by differential erosion of sedimentary units deposited on the flanks of the Ozark Dome, a volcanic structure formed during the Precambrian, which is centered in southeast Missouri.

The Harlow Hollow Monocline and a small fault near Stow Tom Hollow in War Eagle Creek are the only observed structures in the mapped area. War Eagle Creek is a tributary to the White River which runs for approximately 13 miles (21 kilometers) through the quadrangle and reveals excellent exposures of bedrock.

Previous work in this area includes a geological worksheet by B. R. Haley, circa 1976, employing photogeological methods and Master's theses by R. A. Berry, circa 1978, and M. R. Shinn, circa 1979. The current mapping project is based primarily on data collected from field observations made between July 2017 and February, 2018. These data, along with site locations, were recorded in a geodatabase on a portable data collector/global positioning satellite receiver. Representative rock samples were collected at various sites to aid in classification and for future petrographic studies.

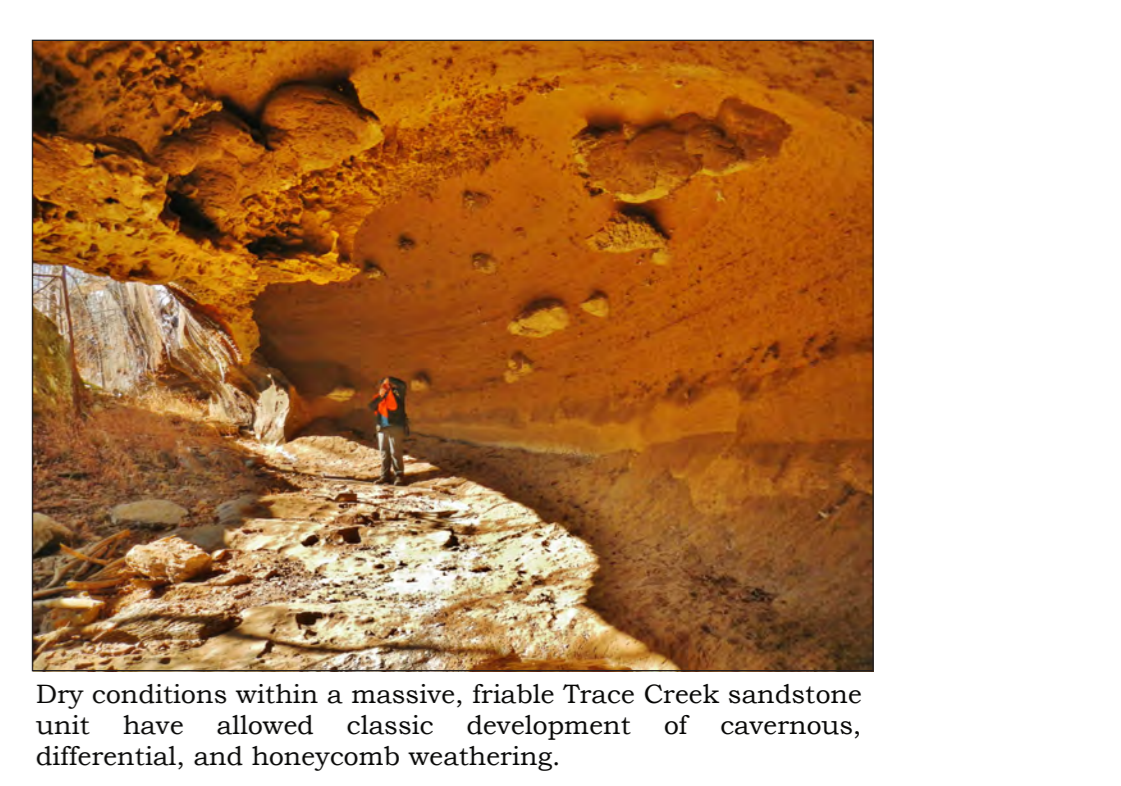
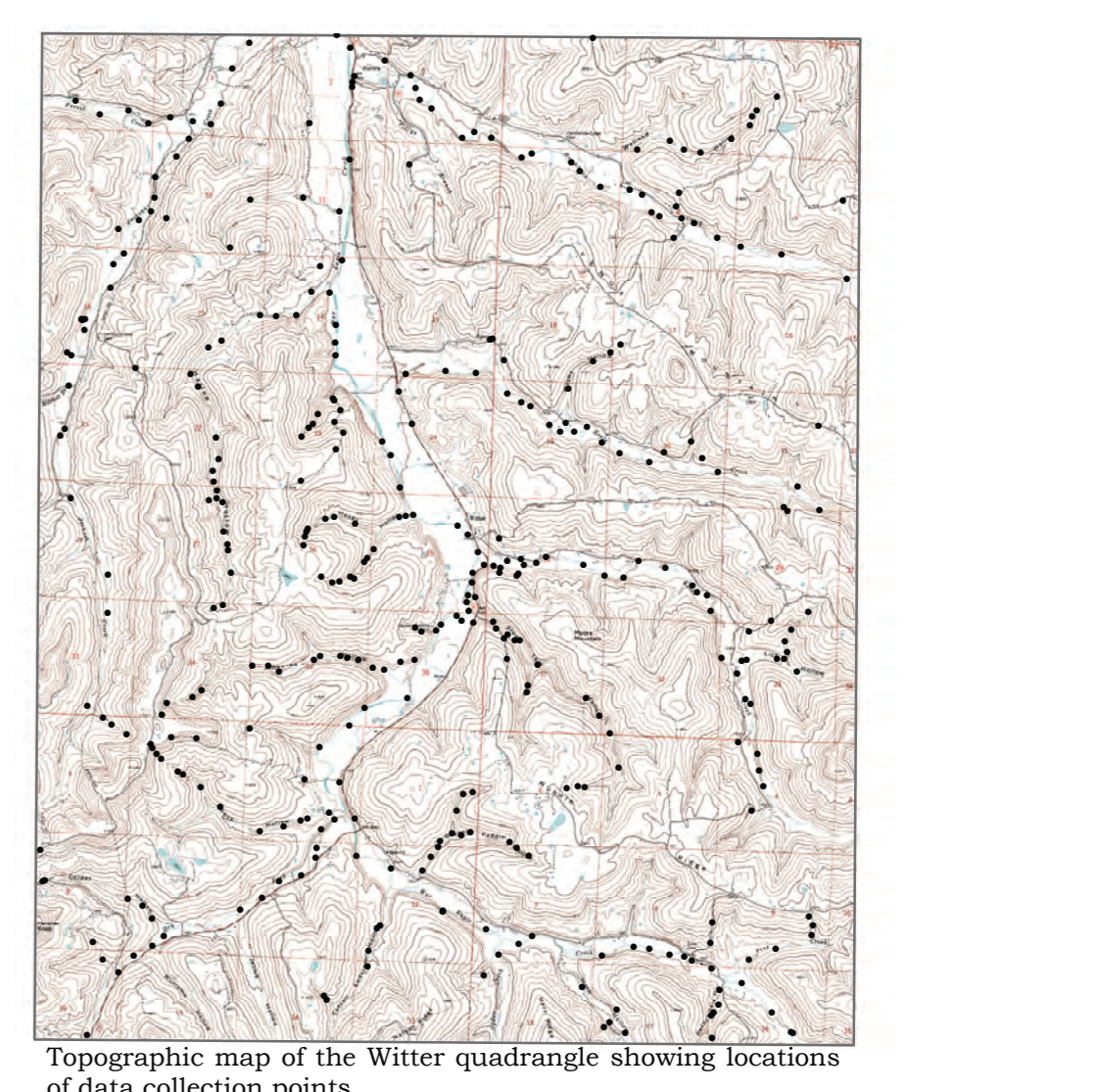
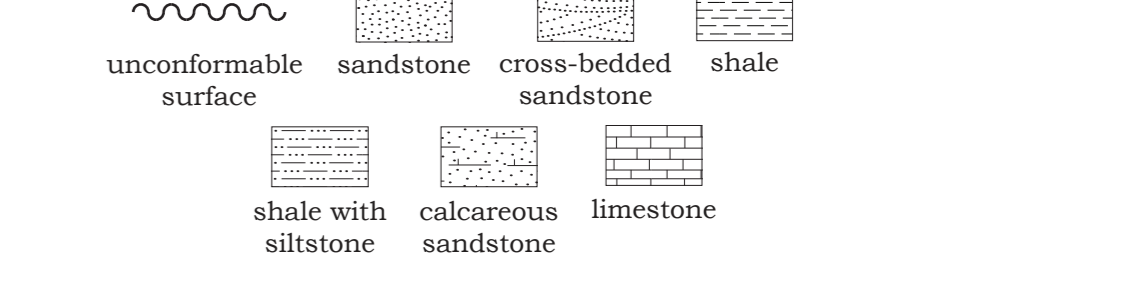
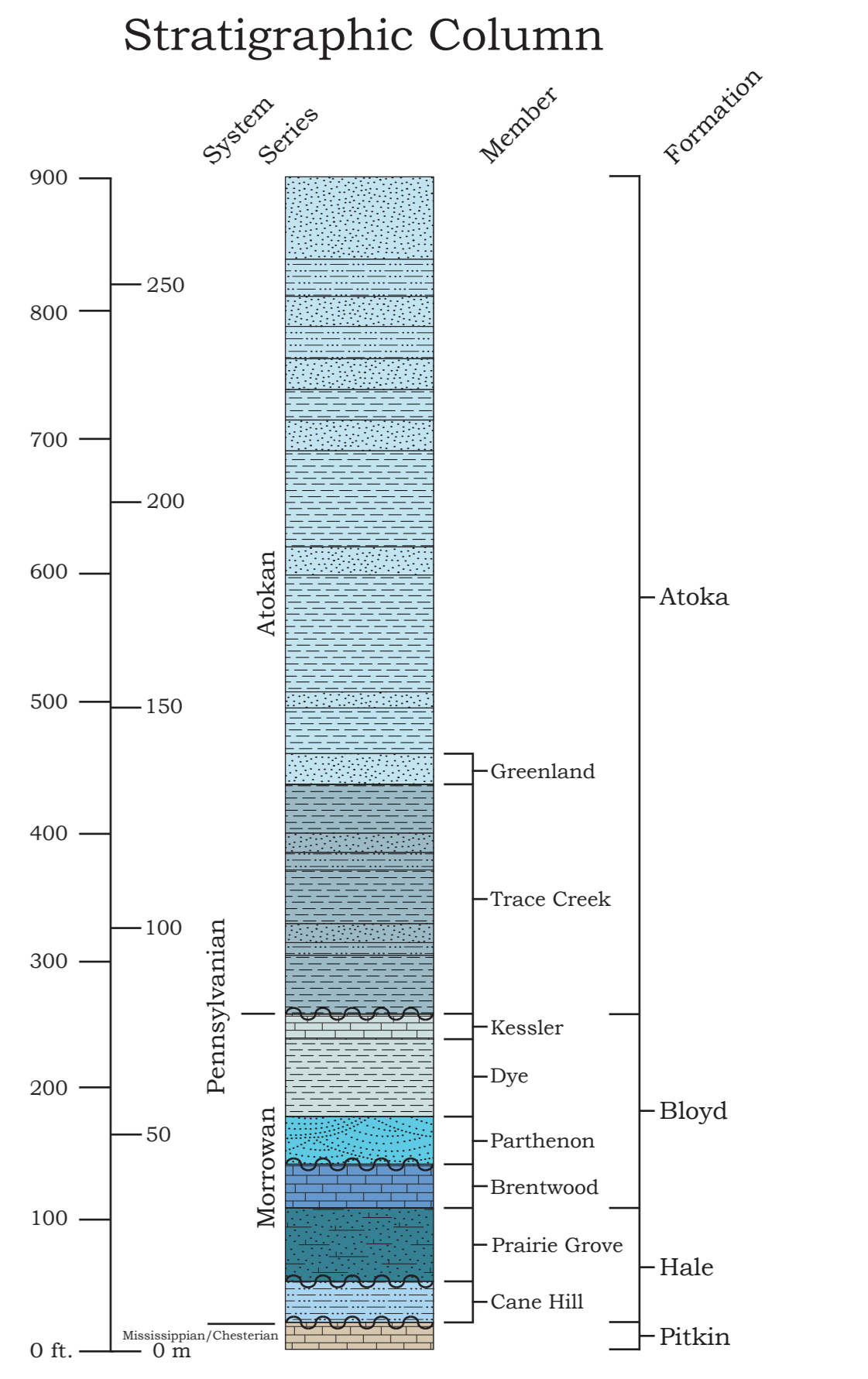
Description of Map Units

- Qat** Alluvium and terrace deposits (Quaternary) - unconsolidated gravel, sand, silt, and clay deposited by streams on one or more terrace levels.
- Qls** Landslide deposits (Quaternary) - unsorted, deposited rock and debris material typically resulting from failure of oversteepened slopes, especially those that are north facing, composed of interbedded sandstone and shale.
- Pa** **Atoka Formation (Middle Pennsylvanian, Atokan)** - composed of sandstone, siltstone, and shale units, largely undifferentiated. The only Member mapped separately is the Trace Creek Shale. The Greenland Sandstone is present at the base of the undifferentiated portion. Total thickness is up to 840 feet (256 meters).
- Pat** **Atoka undifferentiated** - mostly shale, locally containing very thin to thin-bedded, fine-bedded, micaceous siltstone and silty sandstone. Shale is gray to black or tan on fresh surfaces and weathers tan or orange. Sandstone is thin to thick bedded, very fine to fine grained, tan, brown, or buff on fresh surfaces, and weathers tan to brown. Commonly contains shale partings, lenticular banding, horizontal and vertical trace fossils, plant fossil molds, and cross-bedding. Locally contains beds of clay-pebble conglomerate and the internal and external molds of fossils, primarily crinoids and gastropods. Calcareous sandstone units are present locally. The portion of the Atoka, higher than approximately 400 feet (122 meters) above the contact with the Bloyd Formation, is much sandier and typically orange to brown and friable. Up to 520 feet (158 meters) thick.
- Pbd** **Greenland Sandstone** - thick to medium-bedded, very fine- to coarse-grained sandstone. Commonly friable. Locally contains rounded quartz granules and pebbles, lenticular banding, and cross-bedding. Tan to brown on fresh surfaces, weathers dark brown or orange. Because this unit is so thin, it is mapped with the Atoka undifferentiated. Conformable with the underlying Trace Creek Shale. Ranges from 10 to 25 feet (3 to 8 meters) thick.
- Pbb** **Bloyd Formation (Lower Pennsylvanian, Morrowan)** - composed of shale, sandstone, and limestone units divided into several Members. From youngest to oldest they are: Kessler Limestone, Dye Shale, Parthenon sandstone, and Brentwood Limestone. In the Bloyd type area at Bloyd Mountain, 20 miles (32 kilometers) west in Washington County, the Woolsey Shale is present between the Brentwood Limestone and Dye Shale. Here, this interval is occupied by the Parthenon sandstone. On the Witter quadrangle, the Parthenon sandstone is a prominent bluff-former along War Eagle Creek. Ranges from 140 to 180 feet (43 to 55 meters) thick.
- Pbb** **Kessler Limestone** - sandy, fossiliferous, commonly oolitic limestone. Light gray on fresh surfaces, weathers dark gray. Fossils include: crinoids, tabulate and rugose corals, brachiopods, trilobites, bryozoans, and shark teeth. Sand fragments, ammonoids, phosphatic pebbles, and conglomeratic limestone. Because this unit is so thin, it is mapped with the Dye Shale. **Areas where the Kessler crops out extensively in stream beds are marked with black stippled pattern.** Conformable with the underlying Dye Shale. Ranges from 5 to 15 feet (1.5 to 5 meters) thick.
- Pbb** **Dye Shale** - mostly gray to black shale. Locally contains ironstone concretions. Locally interbedded with thin- to medium-bedded sandstone and siltstone. Conformable with the underlying Parthenon sandstone. Ranges from 40 to 100 feet (12 to 30 meters) thick.
- Pbb** **Parthenon sandstone** - thin to massive-bedded, very fine- to coarse-grained, micaceous sandstone. Tan on fresh surfaces, weathers tan to brown. Commonly exhibits tabular cross-bedding. Commonly contains white quartz granules and pebbles. Unconformable with the underlying Brentwood Limestone. Ranges from 10 to 40 feet (3 to 12 meters) thick.
- Pbb** **Brentwood Limestone** - thin to thick-bedded, fossiliferous limestone, locally interbedded with sandy limestone, dark-gray to black shale, and light-gray siltstone. Limestone is light gray on fresh surfaces and weathers light gray to white. Locally exhibits cross-bedding. Locally contains phosphatic pebbles and abundant invertebrate fossils, including: crinoids, tabulate and rugose corals, brachiopods, bryozoans, and blastoids. Conformable with the underlying Prairie Grove Member of the Hale Formation. Shale. Ranges from 30 to 40 feet (9 to 12 meters) thick.
- Pbb** **Hale Formation (Lower Pennsylvanian, Morrowan)** - is composed of interbedded sandstone, siltstone, shale, and limestone units divided into two Members: the Prairie Grove and the Cane Hill. Up to 160 feet (49 meters) thick.
- Pbb** **Prairie Grove** - thin to massive-bedded, very fine- to medium-grained, limy sandstone or sandy limestone with lenses of relatively pure fossiliferous and oolitic limestone. Light gray to light brown on fresh surfaces and weathers dark brown. Commonly cross-bedded, locally in a herringbone pattern. Homogeneous weathering is common. Fossils include: crinoids, brachiopods, gastropods, tabulate and rugose corals, ammonoids, and trilobites. Unconformable with the underlying Cane Hill. Ranges from 40 to 80 feet (12 to 24 meters) thick.
- Pbb** **Cane Hill** - interbedded, dark-gray silty shale, siltstone, and thin- to thick-bedded, very fine- to fine-grained, micaceous sandstone. Tan to light gray on fresh surfaces, weathers tan to gray. Fine-bedding and ripple-bedding are common. Locally calcareous. The lower contact with the Pitkin Limestone is unconformable and marks the Mississippian-Pennsylvanian boundary in northern Arkansas. Just above this contact, a 2- to 3-foot (0.6- to 0.9-meter)-thick conglomerate composed of black phosphate pebbles, gray to black limestone pebbles, oolitic limestone pebbles, oolitic phosphate pebbles, and crinoid fragments is locally present. Unconformable with the underlying Pitkin Limestone. Ranges from 40 to 80 feet (12 to 24 meters) thick.
- Pbb** **Pitkin Limestone (Upper Mississippian, Chesterian)** - micritic to coarsely crystalline, thin- to thick-bedded, fossiliferous limestone. Light to dark gray on fresh and weathered surfaces. Exposures are limited to an area along War Eagle Creek near Harlow Hollow. Up to 10 feet (3 meters) thick.

Symbols

- Contact
- Normal fault - dotted where concealed, bar on downthrown side.
- Strike and dip of units
- Line of cross-section
- Monocline

Stratigraphic Column



Dry conditions within a massive, friable Trace Creek sandstone unit have allowed classic development of cavernous, differential, and honeycomb weathering.

References

- Berry, A. B., 1978, Stratigraphy and petrology of the middle Bloyd Sandstone (Morrowan) southeast Madison county, Arkansas. [Master's Thesis, unpublished] University of Arkansas, 102 p.
- Haley, B. R., 1976, Geologic map of the Witter quadrangle, Arkansas. Arkansas Geological Survey, 7.5-minute series Geologic Worksheet, scale 1:24,000.
- Shinn, M. R., 1979, Structural geology of the Brentwood-St. Paul area, northeast Arkansas (Master's Thesis, unpublished) University of Arkansas, Fayetteville, 99 p.

Acknowledgements

This map was produced for the National Cooperative Geologic Mapping Program (STATEMAP), a matching-funds grant program administered by the U.S. Geological Survey, under Cooperative Agreement Award G17AC00194. Special thanks to the private landowners who graciously allowed access to their properties. Very special thanks to Angela Chandler for serving as principal investigator for this mapping project.

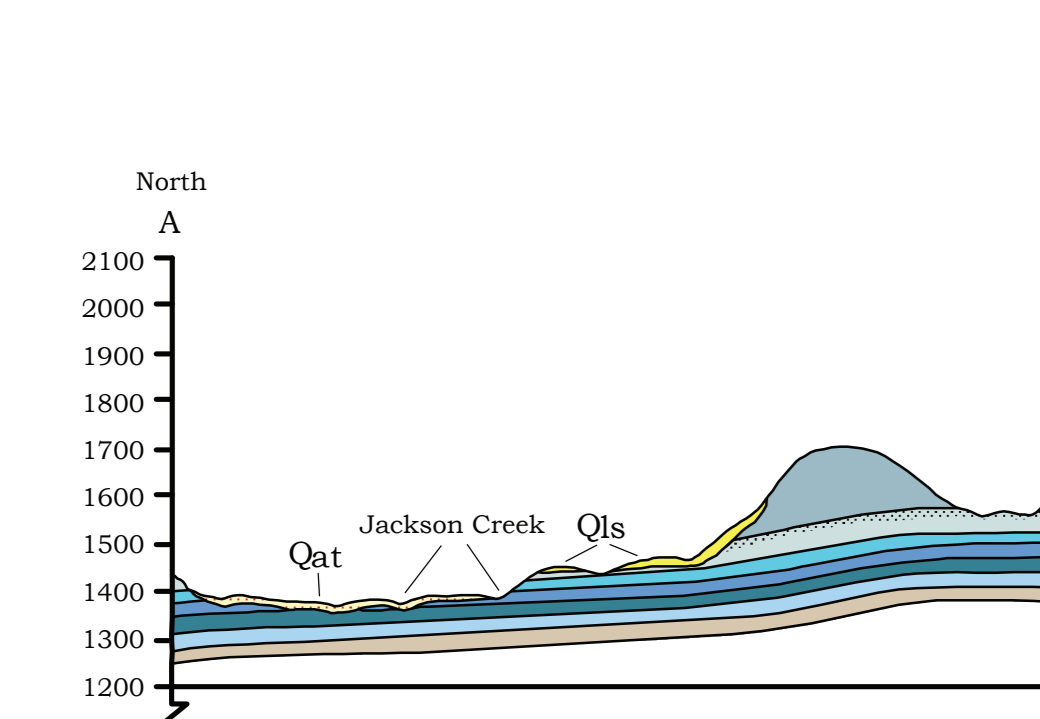
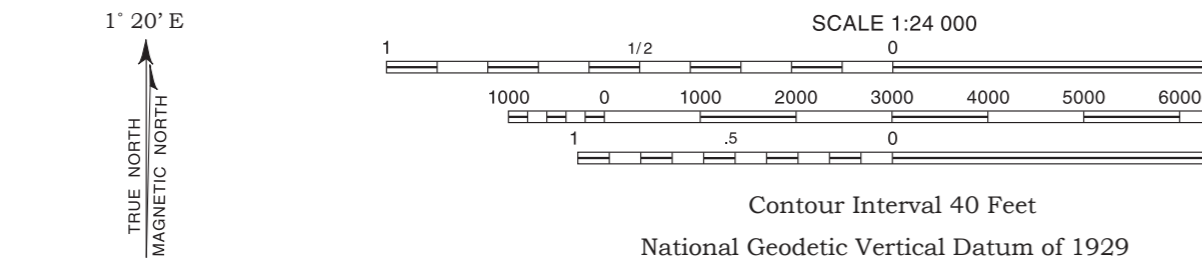
Limitations: This map, like all geologic maps, is based on interpretations which were made from the data available at the time it was created. As work continues and new information is collected, the contacts, structures, and other features depicted on this map may be changed.

For the latest edition of this and other Arkansas Geological Survey maps and publications, please call Publication Sales at 501-296-1877, or visit the Vardelle Parham Geology Center, 3815 West Roosevelt Road, Little Rock, Arkansas 72204. This map is also available at: http://www.geology.ar.gov/geologic_maps/dgm24k.htm

Suggested citation for this map:
 Hutto, R. S., and Hatzell, G. H., 2018, Geologic map of the Witter quadrangle, Madison County, Arkansas. Arkansas Geological Survey, Digital Geologic Map, DGM-AR-00926, 1 sheet, 1:24,000.
 Map and cross-section digitized by Brian Keener.

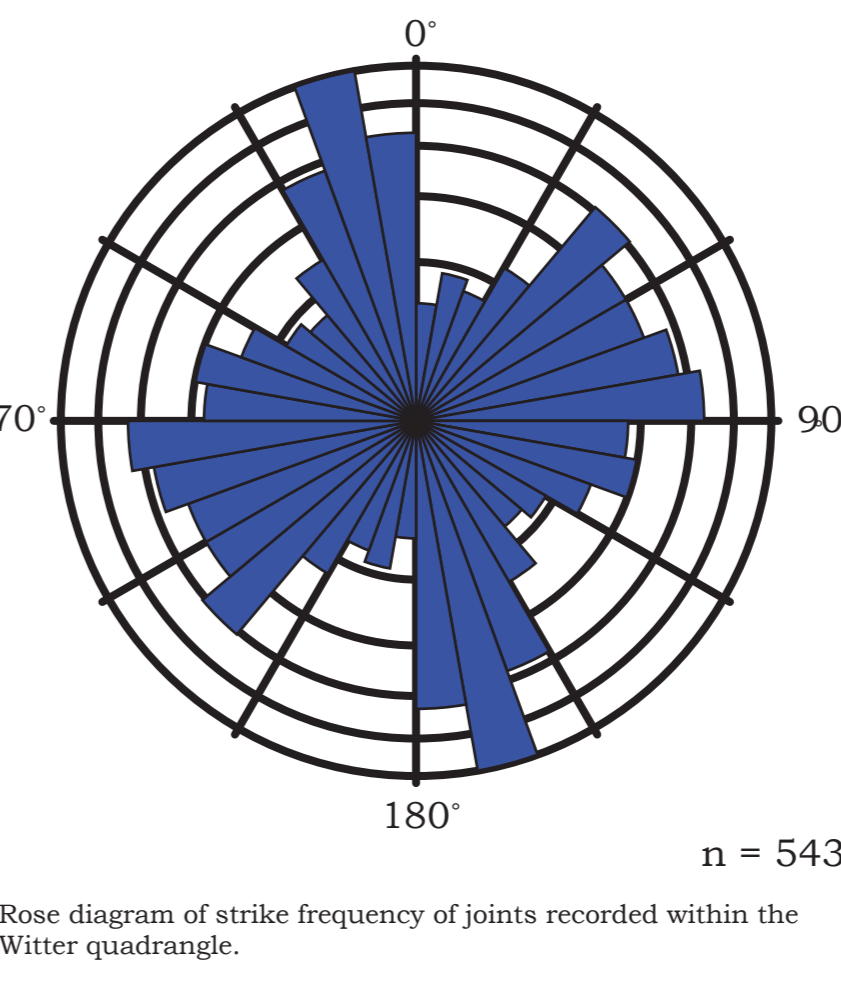
The topographic base is a Digital Raster Graphic (DRG). The DRG is a scanned image of a U.S. Geological Survey standard topographic map published in 1973.

Projection and 10,000-foot grid ticks: Arkansas coordinate system, north zone (Lambert conformal conic).
 1000-meter Universal Transverse Mercator grid ticks, zone 15, shown in blue. 1927 North American datum.



Geologic Cross-Section A-A'
 Scale:
 Horizontal: 1 Inch = 2000 Feet
 Vertical: 1 Inch = 400 Feet (Exaggeration: 5x)

Joint Frequency



Rose diagram of strike frequency of joints recorded within the Witter quadrangle. n = 543