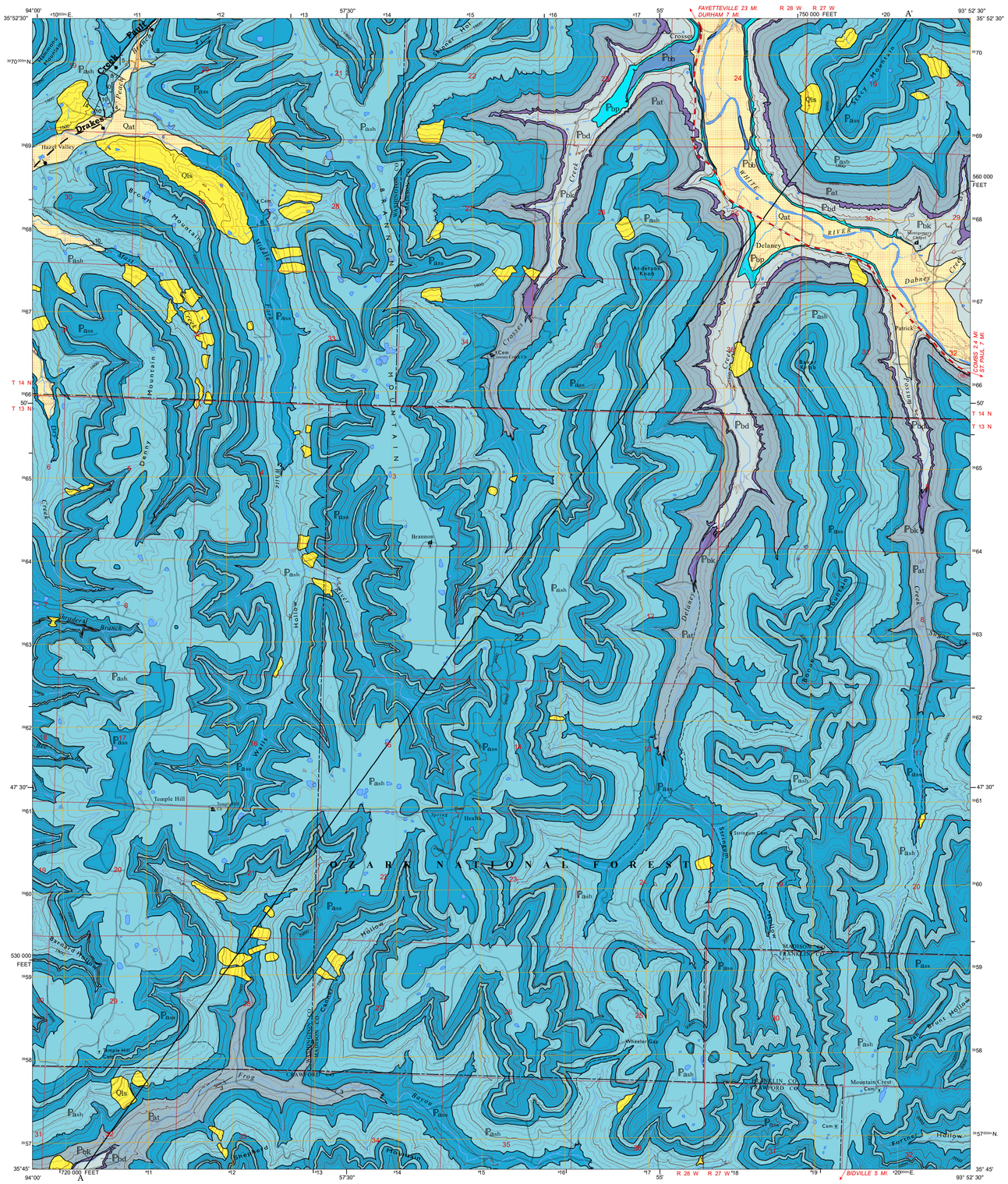
Arkansas Geological Survey
Bekki White, Director
and State Geologist

Geologic Map of the Delaney Quadrangle, Madison, Washington, Crawford, and Franklin Counties, Arkansas

Garrett A. Hatzell and Richard S. Hutto
2019

Digital Geologic Quadrangle Map
Delaney Quadrangle, Arkansas
DGM-AR-00218



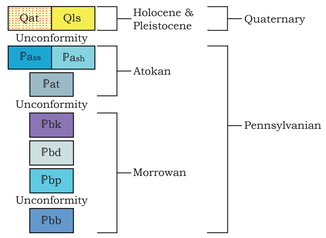
North American Datum of 1983 (NAD83)
Projection and 1 000-meter grid: Universal Transverse Mercator, Zone 15 North. US National Grid Zone 15 Band S. 100 000-meter square ID: VV. 10 000-foot ticks: Arkansas Coordinate System of 1983 (north zone)

Contours derived from LiDAR data obtained by the National Resources Conservation Service in 2017.

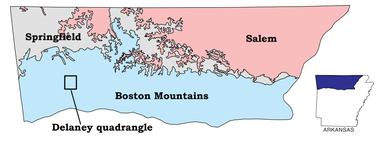
Private lands within government reservations are not shown. Obtain permission before entering private lands.

Roads and Boundaries.....US Census Bureau, 2016
Roads on US Forest Service Lands.....US Forest Service, 2009
Hydrography.....National Hydrography Dataset, 2009
Names.....Geographic Names Information System, 2010
Public Land Survey System.....Bureau of Land Management, 2015

Correlation of Map Units



Ozark Plateaus



Delaney quadrangle location within the Boston Mountains.

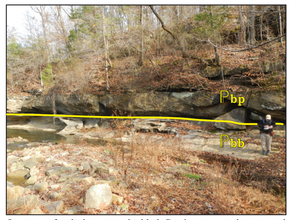
Introduction

This map depicts the bedrock and surficial geology of the 7.5-minute Delaney quadrangle. In this area, approximately 1060 feet (323 meters) of Pennsylvanian (Morrowan to 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 west-central part of the Boston Mountains Plateau, the southernmost and highest of three broad plateau surfaces in northern Arkansas known as the Ozark Plateaus Province, part of the Interior Highlands Physiographic Region. It was developed by differential erosion of Paleozoic sedimentary units deposited on the flanks of the Ozark Dome, a structural high centered in southeast Missouri that was formed by volcanic activity during the Precambrian.

The only structural feature located within the Delaney quadrangle is the Drakes Creek Fault which trends northeast to southwest and crosses the northwest corner of the map in the area of Hazel Valley. The Drakes Creek Fault is down thrown to the southeast and has approximately 200 feet (61 meters) of vertical offset in this area.

Major druainages include the White River, and the uppermost reaches of both the Middle Fork of the White River and the Frog Bayou. The drainage divide between the White River Basin and the Arkansas River Basin is separated by the ridge crest along which the communities of Mountain Crest, Health, and Temple Hill are located.

Previous mapping in this area includes part of the 15-minute geologic worksheet of the St. Paul quadrangle by B.R. Haley, circa 1972. Haley employed photogeologic methods to differentiate major formation breaks at the 1:500,000 scale for construction of the 1976 *Geologic Map of Arkansas*. A Master's thesis by M.R. Shinn, circa 1979, delineated the tops of three sandstone units in the lower Atoka. The current mapping project is based primarily on data collected from field observations made between December, 2018 and March, 2019. 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 to aid in classification and future petrographic and stratigraphic studies. Light Detection and Ranging (LiDAR) of the area was acquired by the State of Arkansas in 2017 through the cooperative efforts of numerous state and federal agencies. Imagery derived from this LiDAR data was used in correlating and delineating stratigraphic intervals as well as the construction of a new and more accurate topographic base map.



Outcrop of tabular cross-bedded Parthenon sandstone and solutioned Brentwood Limestone exposed along Crosses Creek near Crosses.

Outcrop of Kessler Limestone in contact with a sandy interval of the upper Dye Shale along Highway 16 southeast of Patrick.

Symbols

- Contact
- Normal fault - dashed where inferred, bar on downthrown side.
- Strike and dip of units
- A——A' Line of cross-section

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, unconsolidated rock and debris material resulting from failure of oversteepened slopes; composed of colluvium derived from sandstone and shale.

Atoka Formation (Middle Pennsylvanian, Atokan) - composed of sandstone, siltstone, and shale units differentiated by the relative abundance of sandstone and shale. The only formally recognized unit is the Trace Creek Shale. Total thickness is up to 840 feet (256 meters).

Pash **Atoka (shale-dominant intervals)** – these subdivisions of the Atoka Formation represent correlated sections of strata that are predominantly composed of shale, though numerous sandstone and/or siltstone units are interbedded throughout. Three shale-dominant intervals were recognized within the mapping area and range in thickness from 40-150 feet (12-45 meters). Shale is very thin bedded, gray to black or tan on fresh surfaces and weathers tan, gray, or orange. Ironstone concretions are present locally. Sandstone is thin to thick bedded, very fine to coarse grained, tan, brown, or buff on fresh surfaces, and weathers tan, orange, or brown. Commonly contains shale partings, liesegang banding, horizontal and vertical trace fossils, and is commonly silty and flaser bedded. Calcareous sandstone units are present locally. Siltstone is tan to gray and commonly micaceous.

Pass **Atoka (sandstone-dominant intervals)** - these subdivisions of the Atoka Formation represent sections of strata that are predominantly composed of sandstone, though numerous siltstone and/or shale units are interbedded throughout. Four sandstone-dominant intervals have been recognized within the mapping area and range in thickness from 60-200 feet (18-60 meters). Sandstone is thin to massive bedded, very fine to coarse grained, tan, brown, or buff on fresh surfaces and weathers tan, brown, or orange. Commonly friable. Typically contains shale partings, liesegang banding, horizontal and vertical trace fossils, plant fossil molds, cross-bedding, and quartz pebbles. Locally may contain very thin- to thin-bedded, commonly flaser-bedded, micaceous siltstone and silty sandstone. Calcareous sandstone units are present locally. Shale is very thin bedded, gray to black or tan on fresh surfaces and weathers tan, gray, or orange; locally contains ironstone concretions.

Pat **Trace Creek Shale** - dark-gray to black, very thin-bedded fissile shale. Locally contains ironstone concretions and is interbedded with thin- to medium-bedded siltstone, and sandstone. Sandstone is tan, gray, or brown on fresh surfaces and weathers tan, gray, or orange; very fine to coarse grained. Commonly has a basal calcareous reentrant of 3-6 feet (1-2 meters). Thickness of sandstone units ranges from 10-30 feet (3-9 meters). Siltstone is tan to gray and commonly micaceous. Unconformable with the underlying Bloyd Formation. Total thickness ranges from 80 to 120 feet (24 to 37 meters).

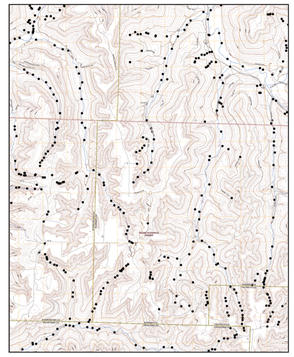
Bloyd Formation (Lower Pennsylvanian, Morrowan) - composed of sandstone, siltstone, shale, and limestone divided into four Members including, from youngest to oldest, Kessler Limestone, Dye Shale, Parthenon sandstone, and Brentwood Limestone. Total thickness ranges from 140 to 160 feet (42 to 49 meters).

Pbk **Kessler Limestone** - sandy, fossiliferous, commonly oncolitic, coarse-grained limestone. Light gray on fresh surfaces, weathers dark gray. Fossils include: crinoids, tabulate and rugose corals, brachiopods, trilobites, bryozoans, and shark teeth. Sandy intervals are commonly cross bedded. Locally contains coal fragments, phosphatic pebbles and conglomeratic beds. Conformable with the underlying Dye Shale. Ranges from 5 to 35 feet (1.5 to 11 meters) thick.

Pbd **Dye Shale** – mostly dark gray to black shale. Locally contains ironstone concretions. Locally, the upper 20 feet (6 meters) is composed of interbedded thin- to medium-bedded sandstone, siltstone, and shale. Conformable with the underlying Parthenon sandstone. Ranges from 80 to 100 feet (24 to 30 meters) thick.

Pbp **Parthenon sandstone** - thin- to massive-bedded, very fine- to coarse-grained, micaceous, fluvial sandstone. Tan on fresh surfaces, weathers tan to brown. Commonly exhibits high-angle cross-stratification. Commonly contains white quartz granules and pebbles. Unconformable with the underlying Brentwood Limestone. Ranges from 20 to 30 feet (6 to 9 meters) thick.

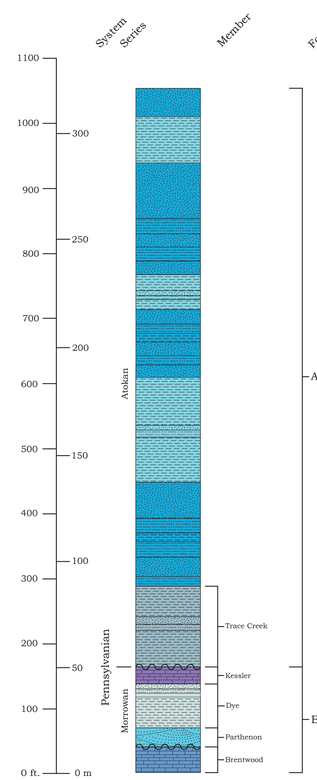
Pbb **Brentwood Limestone** – thin- to thick-bedded, micritic to coarsely crystalline fossiliferous limestone. Light gray on fresh surfaces and weathers light gray to white. Contains phosphatic pebbles and abundant invertebrate fossils including crinoids, corals, brachiopods, bryozoans, and blastoids. Up to 30 feet (9 meters) thick.



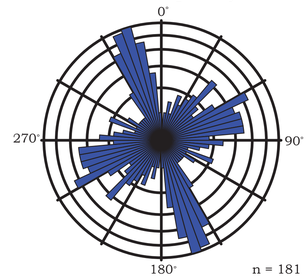
Topographic map of the Delaney quadrangle showing locations of data collection points.

Outcrop of the first persistent and recognizable Atokan sandstone unit, mapped within the Trace Creek Shale.

Stratigraphic Column



Joint Frequency



Rose diagram of strike frequency of joints recorded within the Delaney quadrangle.

Outcrop of the base of the lowermost Atokan sandstone-dominant interval, located on the western slope of Baker Knob above Delaney Creek.

References

Haley, B. R., 1972, Geologic map of the St. Paul quadrangle, Arkansas: Arkansas Geological Survey, 15-minute series Geologic Worksheet, scale 1:62,500.

Shinn, M. R., 1979, Structural geology of the Brentwood-St. Paul area, northwest Arkansas [Master's Thesis, unpublished] University of Arkansas, Fayetteville, 99 p.

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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.

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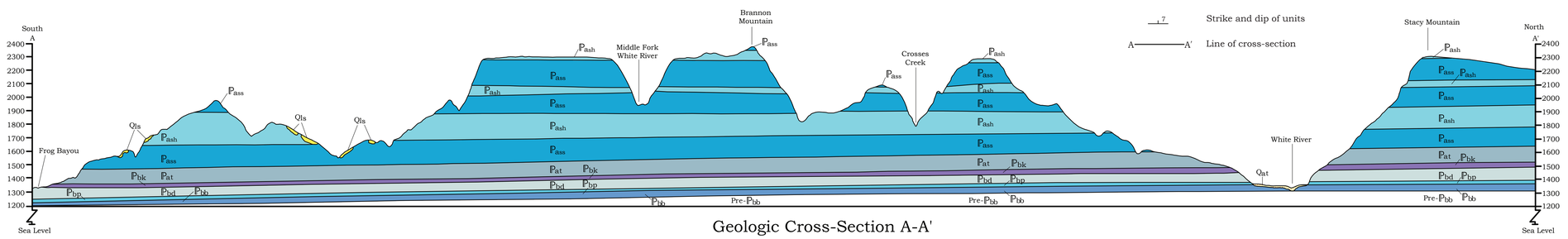
Map and cross-section digitized by Kerstein Dunn, Garrett Hatzell, and Brian Kehner.



Geologic Cross-Section A-A'

Scale:
Horizontal: 1 Inch = 2,000 Feet
Vertical: 1 Inch = 400 Feet (Exaggeration: 5x)