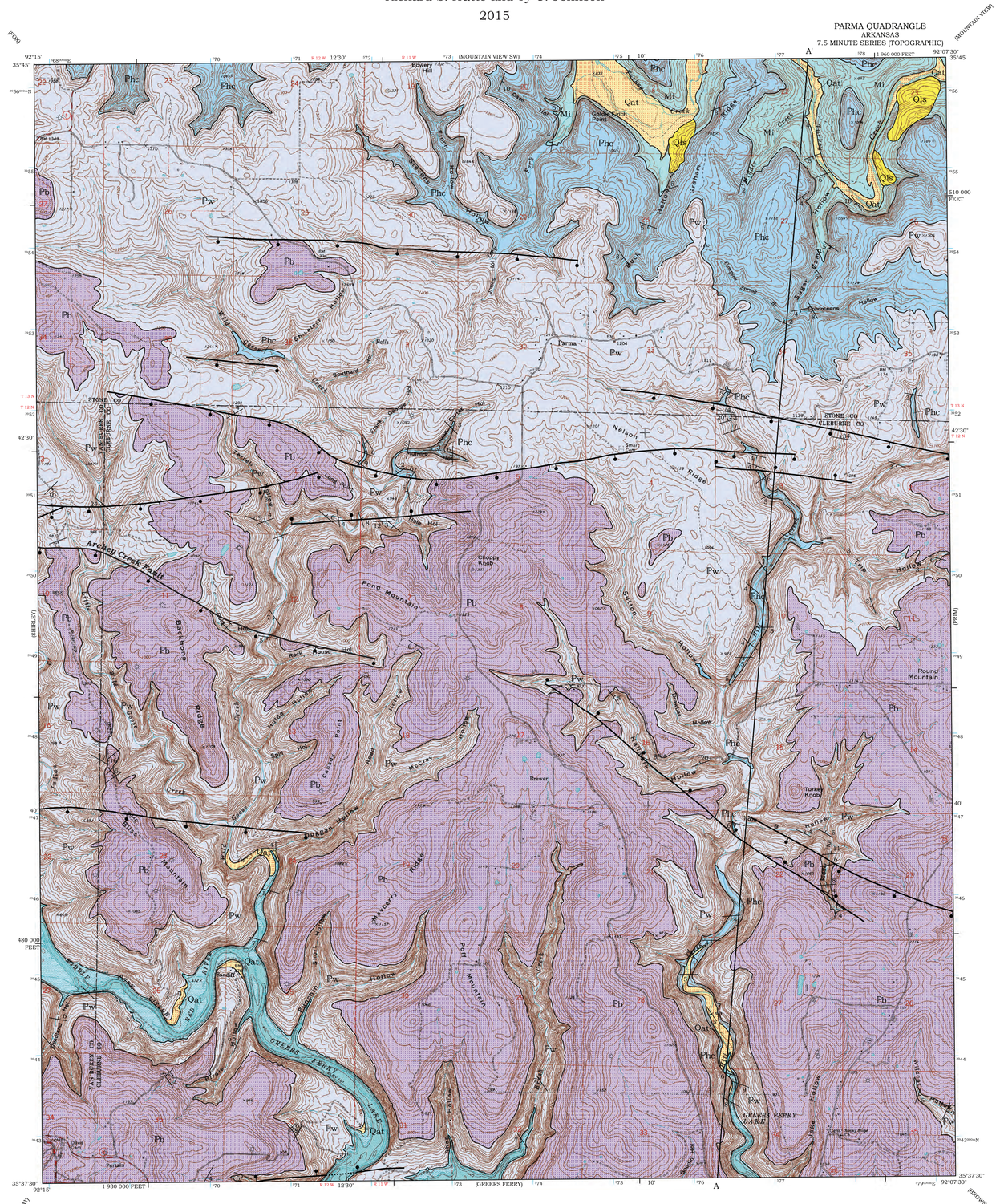
Arkansas Geological Survey
Bekki White, State Geologist and Director

Geologic Map of the Parma Quadrangle, Cleburne, Stone, and Van Buren Counties, Arkansas

Richard S. Hutto and Ty C. Johnson

2015

Digital Geologic Quadrangle Map
Parma Quadrangle, Arkansas
DGM-AR-00677



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

0.25° — TRUE NORTH, MAGNETIC NORTH
Approximate mean declination 2015

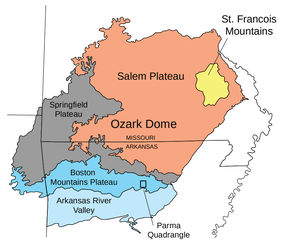
SCALE 1:24 000
1 MILE
1 KILOMETER
Contour Interval 20 Feet
National Geodetic Vertical Datum of 1929

ARKANSAS — QUADRANGLE LOCATION

Road Classification
- Secondary highway
- Light duty road
- Unimproved road
- State Route

Correlation of Map Units

Qat, Qls		Holocene, Pleistocene	Quaternary
Unconformity			
Pb		Morrowan	Pennsylvanian
Unconformity			
Pw		Morrowan	Pennsylvanian
Unconformity			
Phc		Morrowan	Pennsylvanian
Unconformity			
Mi		Chesterian	Mississippian



Modified from Shepherd et al., 2011

Introduction

This map depicts the bedrock and surficial geology of the Parma 7.5-minute quadrangle. In this area, approximately 1240 feet (378 meters) of Late Mississippian through Early Pennsylvanian (late Chesterian through Morrowan) carbonate and clastic sediments were deposited in near-shore fluvial and deltaic environments. Regionally, the mapped area is situated on the southern flank of the Boston Mountains Plateau. This is the southernmost of a series of plateau surfaces known as the Ozark Plateaus. Structurally, the Ozark Plateaus is controlled by an area of uplift centered in the St. Francois Mountains of southeast Missouri known as the Ozark Dome. The Boston Mountains Plateau is the highest of these plateau surfaces and is developed on mostly Pennsylvanian rocks. Topography of the quadrangle is rugged and steep with a relief of 980 feet (299 meters). It exhibits typical bench and bluff topography due to differential weathering of the sandstone and shale units, and it is strongly dissected by streams. Some valley floors are flat, but narrow canyons with steep walls are more typical. The Middle Fork of the Little Red River and Turkey Creek are the main drainages in the quadrangle, and are major tributaries to Greers Ferry Lake. Strata dip an average of about 1.5 degrees to the south.

The geology of this area was mapped circa 1973 by E. E. Glick at the 1:100,000 scale for the Geologic Map of Arkansas. This map uses a more comprehensive stratigraphy and depicts structural features in greater detail. The contacts and structures depicted are based primarily on field observations made from July 2014 to April 2015. Locations of data collection sites were recorded with a global positioning satellite receiver.

Description of Map Units

Qat — **Alluvial terrace deposits (Quaternary)** - unconsolidated clay, silt, sand, and gravel along streams deposited on one or more terrace levels.

Qls — **Landslide deposits (Quaternary)** - rock debris that has moved downslope. Failures of this type are typical of the Cane Hill Member of the Hale Formation and the Imo interval on slopes where thick sandstone units are underlain by incompetent shale units.

Pb — **Bloyd Formation - undifferentiated (Lower Pennsylvanian, Morrowan)** - consists of interbedded sandstone, siltstone, and shale. Sandstone beds are medium to thick bedded and typically flat to lenticular. Very fine to fine grained and, less commonly, medium grained. Tan on fresh surfaces but weathers brown. Locally contains stylolites, scour-and-fill structures, shale-partings, and fossil wood casts and molds. Locally micaceous. Contains shale and/or quartz pebbles, ironstone concretions, and liesegang banding. Sandstone units are typically 20 to 80 feet (6 to 24 meters) thick. Shale is dark gray and siltstone is tan on fresh surfaces. Both weather tan to orange. Unconformable with the Witts Springs Formation. Up to 360 feet (110 meters) is exposed.

Pw — **Witts Springs Formation (Lower Pennsylvanian, Morrowan)** - consists of sandstone, limy sandstone, sandy limestone, and minor shale and siltstone. Sandstone is typically thin to thick bedded and commonly cross bedded. Weathering commonly masks bedding so that it appears massive, and either friable and rounded, or blocky. Locally exhibits soft-sediment deformation and overturned cross-beds. Rockshelters are common at the base of massive sandstone bluffs. Exfoliation of massive sandstone along stream beds produces a characteristic concave reentrant. Sandstone is typically fine grained, but locally is medium to coarse. Orange to buff on fresh surfaces but weathers gray to brown or orange. Commonly contains quartz pebbles, shale pebbles, and trace fossils. Liesegang banding and honeycomb weathering are common. Locally contains fossil wood casts and molds (some coalified), coal stringers, and at least one coal seam. Wood prints include both *Calamites* and *Lepidodendron*. Discontinuous units up to 100 feet (30 meters) thick of fine-grained, interbedded limy-sandstone and sandy-limestone are deeply solutioned, cross bedded, and fossiliferous. Fossil fragments include: brachiopods, crinoids, and rugose corals. Gray to brown on fresh surfaces but weathers brown to dark brown. Shale units are commonly interbedded with siltstone. Both are dark gray to black on fresh surfaces but weather tan to orange. Unconformable with the Cane Hill Member of the Hale Formation. Ranges from 280 to 460 feet (85 to 140 meters) thick.

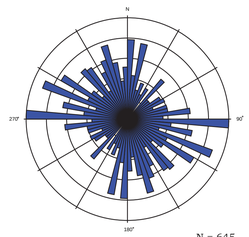
Phc — **Hale Formation (Lower Pennsylvanian, Morrowan)** - consists of two Members: the Prairie Grove and the Cane Hill. Only the Cane Hill Member is present on this quadrangle. Rocks equivalent to the Prairie Grove Member and the lower part of the Bloyd Formation are mapped as the Witts Springs Formation.

Cane Hill Member - consists mostly of sandstone with interbedded siltstone and shale. Sandstone is thin to medium bedded and commonly flaser, ripple, and cross bedded. Very fine to fine grained. Tan to gray on fresh surfaces but weathers brown and flaggy to blocky. A persistent 40 feet-(12 meter-) thick sandstone unit is present in the lower half of the Cane Hill. It is fine grained, stylolitic, and ripple, cross, or hummocky bedded. Commonly contains coalified fossil wood casts and molds, shale pebbles and partings, pyrite concretions, and trace fossils. Locally contains liesegang banding, honeycomb weathering, lenticular bedding, and soft sediment deformation. Shale is clay to silty. Gray to black on fresh surfaces but weathers orange to tan. Siltstone is gray to black on fresh surfaces but weathers brown. Unconformable with the Imo interval. Approximately 250-300 feet (76-91 meters) thick.

Mi — **Imo interval (Upper Mississippian, Chesterian)** - consists mostly of sandstone with minor interbedded shale. Sandstone is medium to thick bedded and commonly cross bedded. Lenticular- and convolute-bedding are also common. Weathering typically masks bedding so that outcrops appear massive. Very fine to fine grained. White to buff on fresh surfaces but weathers tan to brown. Sandstone units are typically 15 to 80 feet (5 to 24 meters) thick, commonly stylolitic, contain fossil wood casts and molds, and liesegang banding. Shale is dark gray to black on fresh surfaces but weathers brown. Contains ironstone concretions. Approximately 180-200 feet (55-61 meters) of the upper Imo is exposed.

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

Joint Frequency



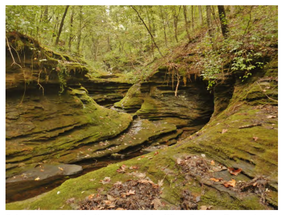
N = 645

Rose diagram of strike frequency of joints recorded within the Parma quadrangle

Blocky massive sandstone in the Bloyd Formation in Jake Hollow

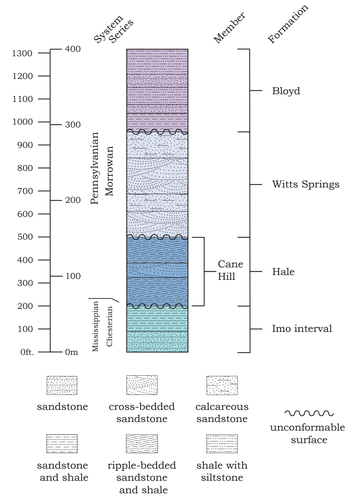
Witts Springs - Cane Hill contact in Hill Creek

Soft-sediment deformation in Witts Springs sandstone in Wild GooseCreek



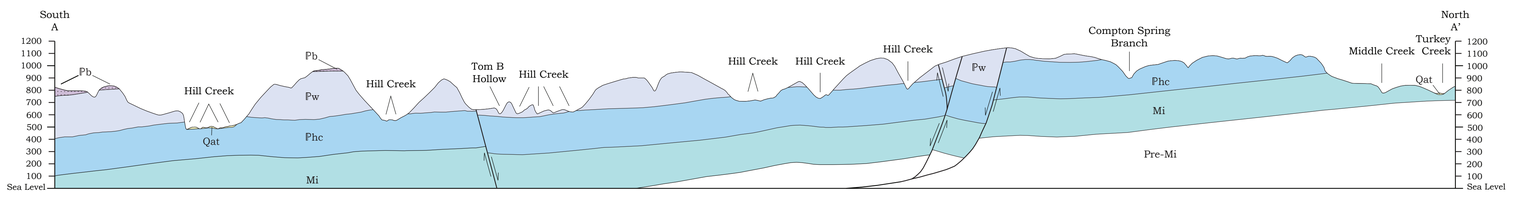
Solutioning of sandy limestone of the Witts Springs Formation in Shop Hollow

Stratigraphic Column



Symbols

- Contact
- Normal fault - bar on downthrown side.
- 7 — Inclined bedding showing direction and magnitude of dip
- Gas well
- Gravel Pit
- Quarry
- A — A' — Line of cross-section



Geologic Cross-Section A-A'

Scale:
Horizontal: 1 Inch = 2000 feet
Vertical: 1 inch = 500 feet (4X exaggeration)

References

Glick, E. E., 1973, Partial geologic map of the Batesville quadrangle, Arkansas: Arkansas Geological Survey, Geologic Worksheet, 1 sheet, 1:100,000

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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 data is collected, the contacts and structures depicted on this map may be changed.

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Map and cross-section digitized by Nathan Taylor