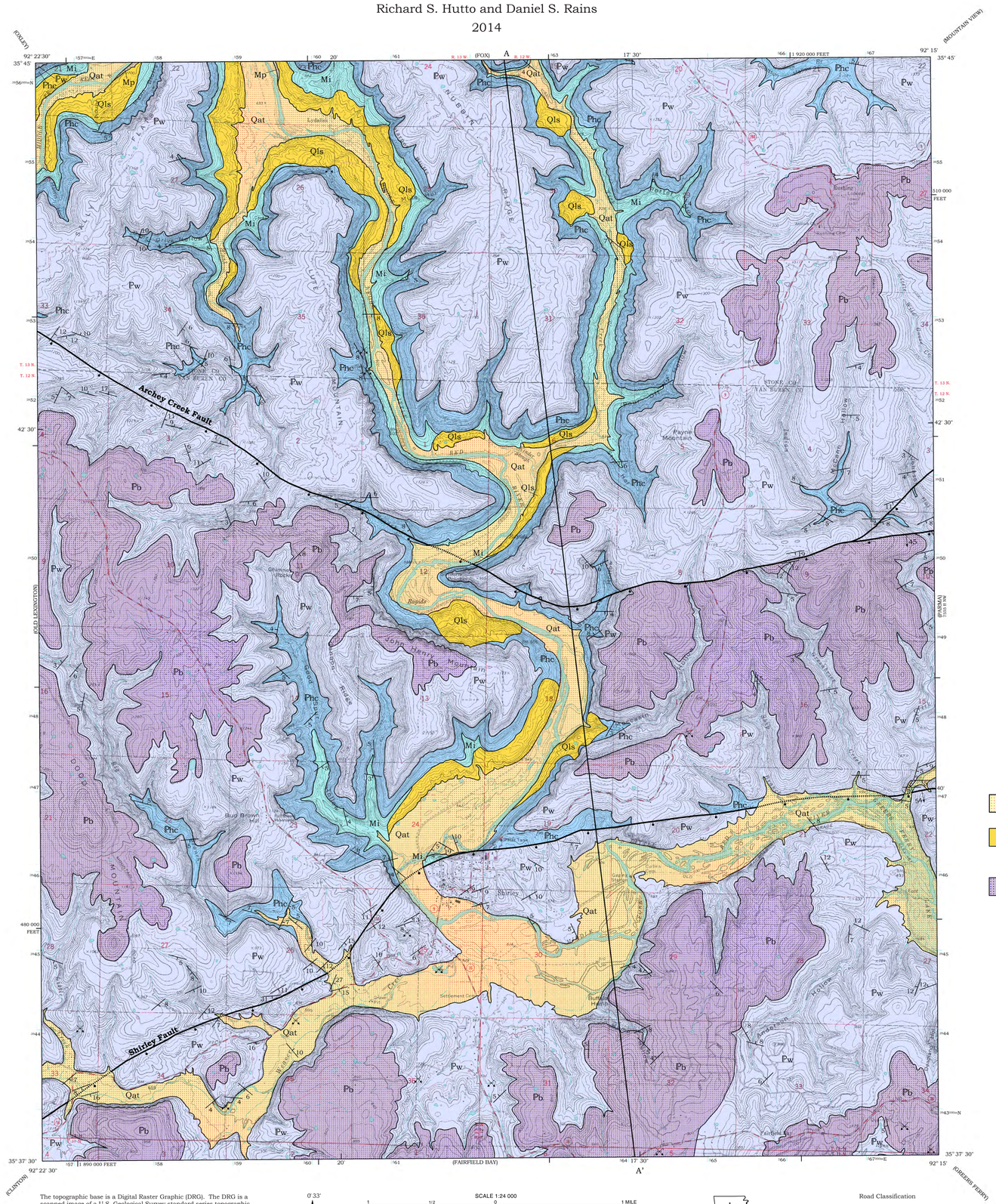
Arkansas Geological Survey
Bekki White, State Geologist and Director

Digital Geologic Quadrangle Map
Shirley Quadrangle, Arkansas
DGM-AR-00779

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

Richard S. Hutto and Daniel S. Rains

2014



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 and photorevised in 1981. Some of the colors of the original map have been modified, and it is displayed at 40% transparency.

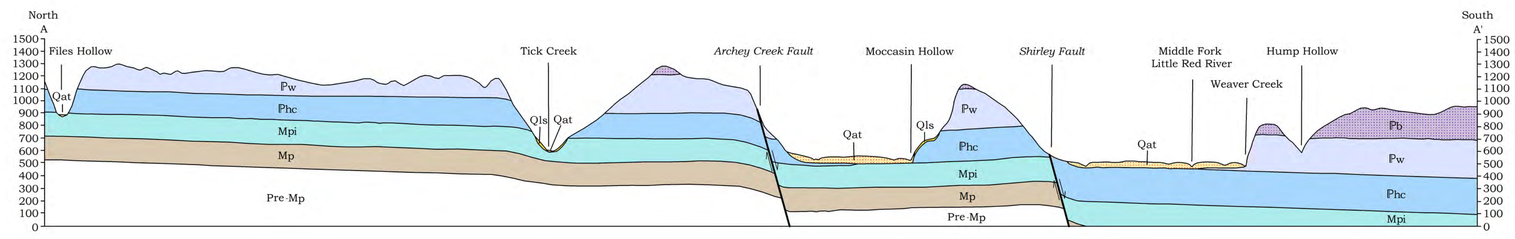
Projection and 10,000-foot grid ticks: Arkansas coordinate system, north zone (Lambert conformal conic).
1000-meter Universal Transverse Mercator grid ticks, zone 15, shown in blue. 1927 North American datum.

0°33'
TRUE NORTH
MAGNETIC NORTH
Approximate mean declination 2014

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

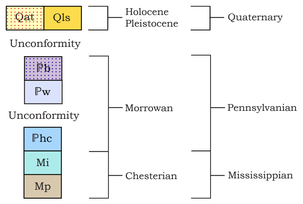
ARKANSAS
QUADRANGLE LOCATION

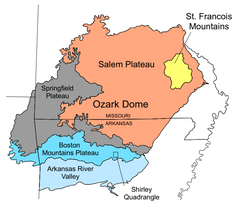
Road Classification
Secondary highway
Light duty road
Unimproved road
State Route



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

Correlation of Map Units





Modified from Shephard et al., 2011

Introduction

This map depicts the bedrock and surficial geology of the Shirley 7.5-minute quadrangle. In this area, approximately 1,200 feet (366 meters) of late Mississippian through early Pennsylvanian (Chesterian through Morrowan) clastic sedimentary rocks were deposited in near-shore fluvial and deltaic environments. Regional geology of the Shirley quadrangle is controlled by an uplift centered in the St. Francois Mountains of southeast Missouri known as the Ozark Dome. Progressively younger rocks form a series of plateau surfaces from the core of the dome southward into Arkansas. This map lies within the Boston Mountains Plateau, the southernmost and highest of these plateau surfaces.

The geology of the Shirley quadrangle was mapped circa 1973 by E. E. Glick for the 1:500,000-scale Geologic Map of Arkansas. This map builds on previous work but uses a more detailed stratigraphic section and depicts structures in greater detail. The contacts and structural features are based primarily on field observations made from July 2013 to April 2014. Locations of data collection sites were recorded with a global positioning satellite receiver. Bedrock inclined at less than 2° is shown as horizontal.

Description of Map Units

Qat — **Alluvial terrace (Quaternary) -** Unconsolidated clay, silt, sand, and gravel on one or more terrace levels.

Qls — **Landslide deposits (Quaternary) -** A mass of rock and debris that has moved downslope. Failures of this type are more prevalent in the shale units of the Cane Hill Member, and the Imo interval.

Pb — **Bloyd Formation (Lower Pennsylvanian, Morrowan) -** Primarily shale with lesser siltstone and very thin- to thin-bedded, very fine-grained sandstone. Shale is dark-gray and siltstone is tan on fresh surfaces. Both weather tan to brown. Sandstone is buff to orange fresh and tan to brown weathered. Locally contains a basal sandstone that is typically thin- to very thick-bedded, very fine- to medium-grained, and commonly forms rounded bluffs and chimneys. Exhibits a variety of colors ranging from gray to orange and red on freshly broken surfaces and gray after weathering. Commonly has scour and fill structure. Locally micaceous and calcareous. Locally contains shale-partings, quartz pebbles and ironstone concretions. Locally cross-bedded and liesegang-banded. Unconformable with the underlying Witts Springs Formation. Up to 240 feet (73 meters) thick.

Symbols

- Contact
- Normal fault - bar and ball on downthrown side. Dotted where concealed
- 45 — Indicates orientation of fault plane
- 5 — Inclined bedding showing direction and magnitude of dip
- Inactive gravel pit
- A ——— A' — Cross-section line

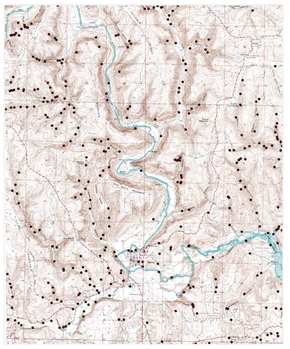
Pw — **Witts Springs Formation (Lower Pennsylvanian, Morrowan) -** Primarily consists of very fine- to fine-grained sandstone with interbedded shale. The sandstone is typically gray to brown on both freshly broken and weathered surfaces; locally orange to tan with orange or brown mottles when freshly exposed. Bedding thickness is variable throughout, ranging from very thin to very thick. Grain size varies from very fine to coarse. Shale- and quartz-pebble conglomerates are present locally. Commonly calcareous. Calcareous sections typically contain fossil fragments, including crinoid stems and rugose corals. Weathers to rounded or blocky, massive bluffs that commonly develop honeycomb weathering. Flaggy-bedded, non-calcareous, locally micaceous sandstone is also common. Typical sedimentary features include scour and fill structure, cross-bedding, and ripple-bedding. Locally exhibits soft-sediment deformation. Liesegang banding, stylolites, and wood prints are present locally. Shale intervals range from laminae to about 25 feet (8 meters) thick and are silty to clayey. Typically dark-gray to black when freshly exposed and tan after weathering. Evidence of bioturbation was noted in shaley sandstone intervals including *Conostichus*. Unconformable with the underlying Cane Hill Member of the Hale Formation. Ranges from 300 to 600 feet (91 to 183 meters) thick.

Hale Formation (Lower Pennsylvanian, Morrowan) - Consists of two members: the Prairie Grove and the Cane Hill. Only the Cane Hill Member is depicted on this quadrangle.

Phc — **Cane Hill Member -** Consists mostly of very thin- to thin-bedded, very fine-grained silty sandstone with shale interbeds. The sandstone is buff to brown on freshly broken surfaces and brown on weathered surfaces. Characteristically ripple-bedded, locally flat-bedded, and weathers to flagstone. Usually micaceous along bedding surfaces. Shale partings are common. Local features include liesegang boxwork, bioturbation, channel-fill structure, honeycomb weathering, iron nodules, soft-sediment deformation, fossils, trace fossils, conglomeratic sections, and wood prints. Commonly flaser-bedded and rarely calcareous. The shale is mostly clayey and black to dark-gray when freshly broken and has fairly common limonitic concretions. Lithologies of this type are prone to mass wasting events such as landslides. Unconformable with the underlying Imo interval. Ranges from 220 to 340 feet (67 to 104 meters) thick.

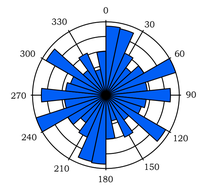
Mi — **Imo interval (Upper Mississippian, Chesterian) -** Consists of thin- to thick-bedded sandstone intervals interbedded with shale. Sandstone is mostly very fine- to fine-grained, buff- to tan-colored and rarely orange-mottled on freshly broken surfaces. Gray to brown after weathering. Scour and fill structure, and soft-sediment deformation are common, distinguishing features. Locally calcareous, stylolitic, and conglomeratic. Locally flat- to ripple-bedded, locally contains liesegang-banding and load casts. The shale is typically black when freshly broken and tan after weathering. Commonly contains rounded limonitic or calcareous siltstone concretions, lepidodendron prints, and coalified or pyritized wood prints. Locally contains fossiliferous, calcareous siltstone nodules. Typical fossils include: crinoids, rugose corals, brachiopods, gastropods, ammonoids, conical nautiloids, and the bryzoan *Archimedes*. Lithologies of this type are prone to mass wasting events such as landslides. Conformable with the underlying Pitkin Limestone. Up to 280 feet (85 meters) thick.

Mp — **Pitkin Limestone (Upper Mississippian, Chesterian) -** Thin- to very thick-bedded, finely to coarsely crystalline, locally oolitic bioclastic limestone. Fresh surfaces are light- to dark-gray and usually petroliferous. Weathers light- to medium-gray. Upper 20 feet (6 meters) exposed.



Topographic map of the Shirley quadrangle showing location of data collection points (red dots).

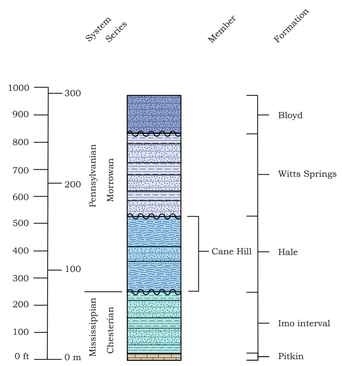
Joint Frequency



N = 713

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

Stratigraphic Column



Soft sediment deformation in silty sandstone of the Imo interval along the Middle Fork of the Little Red River near Shirley, Arkansas.

Interbedded sandstone and shale showing a scoured channel surface.

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Acknowledgments: 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 G13AC00162. Special thanks to the private landowners who graciously allowed access to their properties. Very special thanks to Angela Chandler for her tireless dedication to this mapping project.

Limitations: This geologic map 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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Suggested citation for this map:
Hutto, R. S. and Rains, D. S., 2014, Geologic map of the Shirley quadrangle, Stone and Van Buren Counties, Arkansas: Arkansas Geological Survey, Digital Geologic Map, DGM-00779, 1 sheet, 1:24,000

Map and cross-section digitized by Brian Kehner