Arkansas Geological Survey
Bekki White, State Geologist and Director

Geologic Map of the Fox Quadrangle
Stone County, Arkansas

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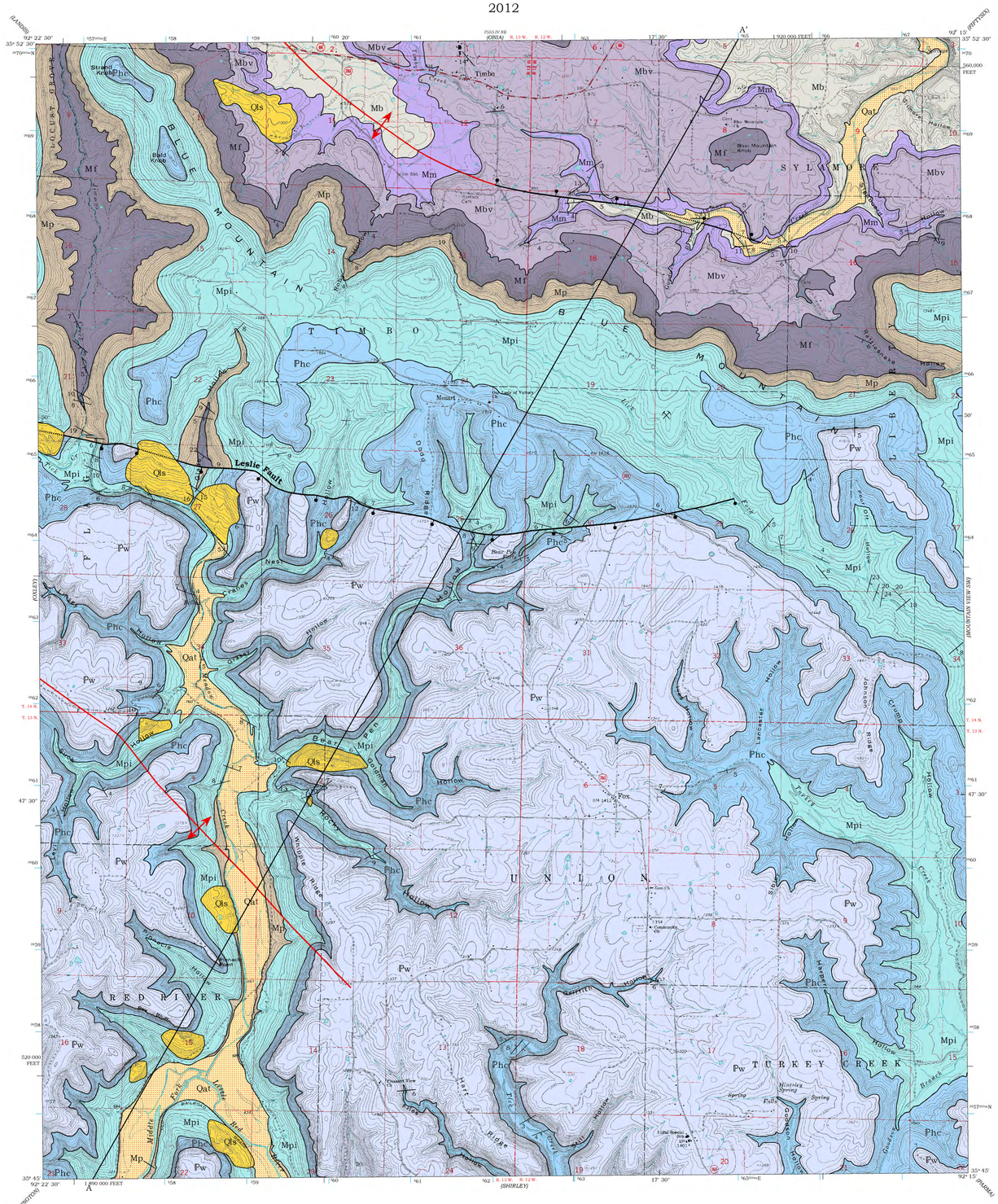
2012

Digital Geologic Quadrangle Map
Fox Quadrangle, Arkansas
DGM-AR-00310



Geologic Cross Section A - A'

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

The topographic base is a collarless Digital Raster Graphic (DRG). The DRG is scanned from a U.S. Geological Survey standard series topgraphic map published in 1969. Some colors on the DRG have been modified.

Polyconic projection. 1927 North American datum
10,000-foot grid based on Arkansas coordinate system, north zone
1000-meter Universal Transverse Mercator grid ticks,
zone 15, shown in blue.

Fine red dashed lines indicate selected fence and field lines where generally visible on aerial photographs. This information is unchecked.

Approximate mean declination 2012

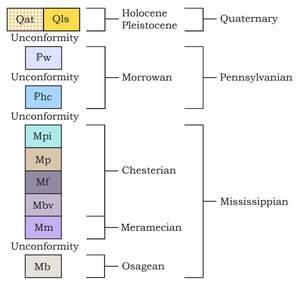
SCALE 1:24 000

Contour Interval 20 Feet
Datum is mean sea level

Quadrangle Location

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

Correlation of Map Units



Introduction

This map graphically summarizes the bedrock geology of the Fox 7.5-minute quadrangle. In this area over 1300 feet (396 meters) of Lower Mississippian to Lower Pennsylvanian carbonate and clastic sedimentary rocks are exposed. Regional structure of the area is controlled by an uplift centered in southeast Missouri known as the Ozark Dome. From that area southward into Arkansas, progressively younger rocks form a series of increasingly elevated plateau surfaces known as the Ozark Plateaus Region. This map is situated on the northern edge of the Boston Mountains Plateau and the southern edge of the Springfield Plateau. They are divided by a prominent escarpment.

The largest structure on this map is the eastern end of the Leslie Fault, which trends mostly east/west from its western end on the Marshall quadrangle, across Canaan, Leslie and Oxley quadrangles to Lick Fork, a distance of approximately 29 miles (47 kilometers). It is a normal fault downthrown to the south with a maximum displacement of 340 feet (104 meters). Smaller structures include an east/west trending normal fault downthrown to the north along South Sylamore Creek with up to 80 feet of offset. This fault dies out into an anticline to the northwest that raises the Boone Formation above the Moorefield Formation. The anticline across Meadow Creek is probably the surface expression of a northwest/southeast trending splay off the Leslie Fault that dies out to the west on the Oxley quadrangle. The largest drainage in this area is the Middle Fork of the Little Red River which is in the watershed of Greers Ferry Lake to the south.

The geology of this area was mapped in 1973 by E. E. Glick for the 1:500,000 scale Geologic Map of Arkansas. This map incorporates a revised stratigraphy and adds greater structural detail. The contacts and structural features were derived from field observations made from July 2011 through April 2012. Site locations were generated with the aid of a global positioning satellite receiver. Bedrock dipping 2° or less

Description of Map Units

Qat **Alluvium and terrace deposits (Quaternary)** - unconsolidated clay, silt, sand and gravel intermittantly deposited along larger streams. Includes deposits on one or more low terrace levels.

Qls **Landslide deposits (Quaternary)** - a mass of rock and debris that has moved downslope as a result of destabilization and subsequent failure of surficial materials.

Pw **Witts Springs Formation (Lower Pennsylvanian, Morrowan)** - a variable sequence of sandstone, siltstone and shale. Sandstone is typically medium- to very thick-bedded, massive, very fine- to medium-grained and rarely, coarse-grained. Locally crops out as a package of stacked, thin- to medium-, cross-bedded channel sands. It ranges from orange to brown, white to buff and tan to light-gray on fresh surfaces, and weathers dark-orange to dark-brown. Typically displays liesegang banding, honeycomb weathering and fossil molds. Locally calcareous, micaceous and friable. Intervals of shale-, quartz- and sandstone-pebble conglomerate are common. Massive sandstone units are typically separated by units of clay to silt shale, siltstone and very thin- to thin-bedded, ripple- to flat-bedded, very fine- to fine-grained sandstone. Unconformable with the underlying Cane Hill Member. Up to approximately 380 feet (116 meters) thick.

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

Cane Hill Member - typically silt to clay shale that contains flattened ironstone nodules and discontinuous, thin-bedded, limonitic siltstone that weathers to form boxwork. Fresh exposures are dark-gray to black, and weather tan to light-orangey-brown. Units of very thin- to thin-, ripple-bedded, very fine- to fine-grained, micaceous silty sandstone with shale partings are common throughout. Near the base is an especially persistent unit of this type that is usually light- to dark-gray on fresh surfaces and weathers tan or dark-gray to dark-brown. It ranges from 40-80 feet (6-24 meters) in thickness, and weathers to a flaggy colluvium that is extensively collected for building stone. Unconformable with the underlying Imo shale. Total thickness ranges from 180-320 feet (55-98 meters).

Pitkin Formation (Upper Mississippian, Chesterian) – informally divided into two members: the Imo shale and the Pitkin Limestone (Smith and Hutto, 2007).

Imo shale – consists mostly of shale with intermittent sandstone units. Shale ranges from light-gray, calcareous to dark-gray, non-calcareous and locally contains abundant fossils. Fossils include bivalves (commonly nuculoids), cephalopods (commonly ammonoids and conical nautiloids), solitary corals (commonly rugose), crinoids, brachiopods, gastropods, trilobites and plant material. Amorphous and crystalline pyrite are commonly associated with the fossiliferous zones. Discontinuous, orange to dark-red, fossiliferous sandy limestone beds are common in the upper part. Spherical, non-fossiliferous ironstone concretions, either solitary in shale or adhered to sandstone bedding surfaces, are common throughout. Tempestites, composed of solitary or loosely accreted crinoid stems and typically associated with light-gray calcareous shale, locally weather out of the lower part. A persistent, fine- to medium-grained, thin- to massive- and locally cross-bedded sandstone unit with a thickness of approximately 15-40 feet (5-12 meters) typically crops out within 40-60 feet of the base. Fresh surfaces are buff to tan and locally mottled or banded with dark-red iron blebs. Weathers dark-orangey-brown to gray, and blocky. Commonly exhibits pronounced stylolites, liesegang banding and honeycomb weathering. Conformable with the underlying Pitkin Limestone. Ranges from 160-260 feet (49-79 meters) in thickness.

Pitkin Limestone – a thin- to very thick-, massive-bedded, fine- to coarse-grained, locally oolitic bioclastic limestone. Upper half contains discontinuous, black shale intervals. The limestone contains abundant fossils including crinoid fragments, the bryozoan *Archimedes*, corals, nautiloids, brachiopods, gastropods, and trilobites. Fresh surfaces are light- to dark-gray and usually petroliferous. Weathers light- to medium-gray. Is commonly cross-bedded near the upper contact, and grades to a tan color due to an increase in silt content. Conformable with the underlying Fayetteville Shale. Ranges from 140-260 feet (43-79 meters) in thickness.

Fayetteville Shale (Upper Mississippian, Chesterian) – a black clay shale which is increasingly interbedded with thin- to medium-bedded, dark-gray, micritic to finely crystalline limestone in its upper part. Shale forms only very thin partings between the beds of micritic limestone near the upper contact. Also near the upper contact, nodular or discontinuous, thin-bedded black chert is commonly present. Micrite is usually petroliferous and sparsely fossiliferous. Septarian concretions are common in the shaly units of the upper part, but isolated zones may be found in the lower part. Conformable with the underlying Batesville Sandstone. Ranges from 120-300 feet (37–91 meters) in thickness.

Batesville Sandstone (Upper Mississippian, Chesterian) – a thin- to medium-bedded, calcareous sandstone. Grains are very fine to medium, moderately well-sorted, and subangular. Fresh surfaces are dark-gray to dark-brown and weather reddish-brown or tan to buff. Locally contains sandy limestone beds, cross-beds and fossil molds. Conformable with the underlying Moorefield Shale. Ranges from 60-100 feet (18-30 meters) in thickness.

Moorefield Formation (Upper Mississippian, Meramecian) – a silt shale with interbedded very thin- to thin-bedded siltstone. Shaly zones are usually dark-gray to black on fresh surfaces, but weather medium-gray to yellowish-brown. Siltstone is dark-gray to dark-brown on fresh surfaces, but weathers tan to buff. Locally the siltstone contains abundant brachiopods, usually near the upper contact. Unconformable with the underlying Boone Limestone. Ranges from 60-100 feet (18-30 meters) in thickness.

Boone Formation (Lower Mississippian, Osagean) – a finely to coarsely crystalline or coarse-grained fossiliferous limestone interbedded with anastomosing or lenticular chert. The limestone is medium-gray on fresh surfaces, but weathers light- to dark-gray and locally contains abundant fossils, especially crinoid columnals and brachiopods. The chert is white to dark-gray on fresh surfaces, but usually weathers buff to white and tripolitic. Most of the unit is broken down into a regolith of angular chert fragments mixed with residual, reddish-brown clay. Sinkholes, springs, disappearing streams and other karst features are common. Reaches a maximum thickness of 260 feet (79 meters).

Symbols

- Contact
- Normal fault - bar and ball on downthrown side. Dotted where concealed
- 45 — Indicates orientation of fault plane
- Axis of anticline
- 5 — Inclined bedding showing direction and magnitude of dip
- Quarry
- A — A' Line of cross-section

References

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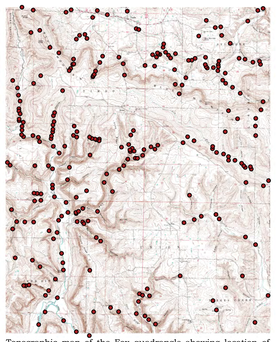
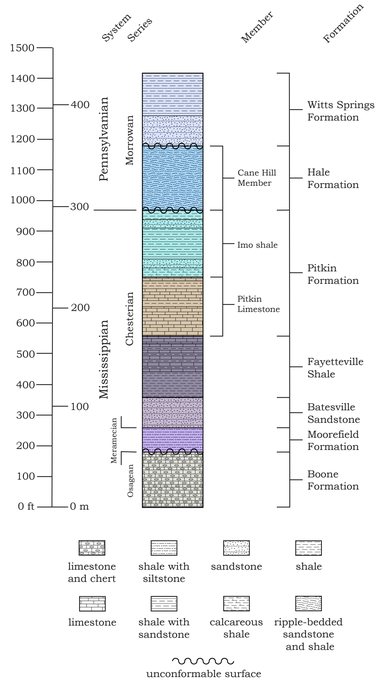


Topographic map of the Fox quadrangle showing location of data collection points.

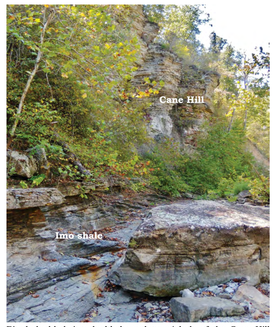
Stratigraphic Column



limestone and chert | shale with siltstone | sandstone | shale

limestone | shale with sandstone | calcareous shale | ripple-bedded sandstone and shale

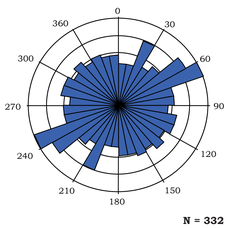
unconformable surface



Ripple-bedded, interbedded sandstone/shale of the Cane Hill above fossiliferous shale of the Imo in Meadow Creek. Contact is covered.

Part of a thick-bedded package of channel sands in the upper Imo just downstream of the photo above. Thickness is approximate.

Joint Frequency



N = 332

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

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Map and cross-section digitized by Nathan Taylor.