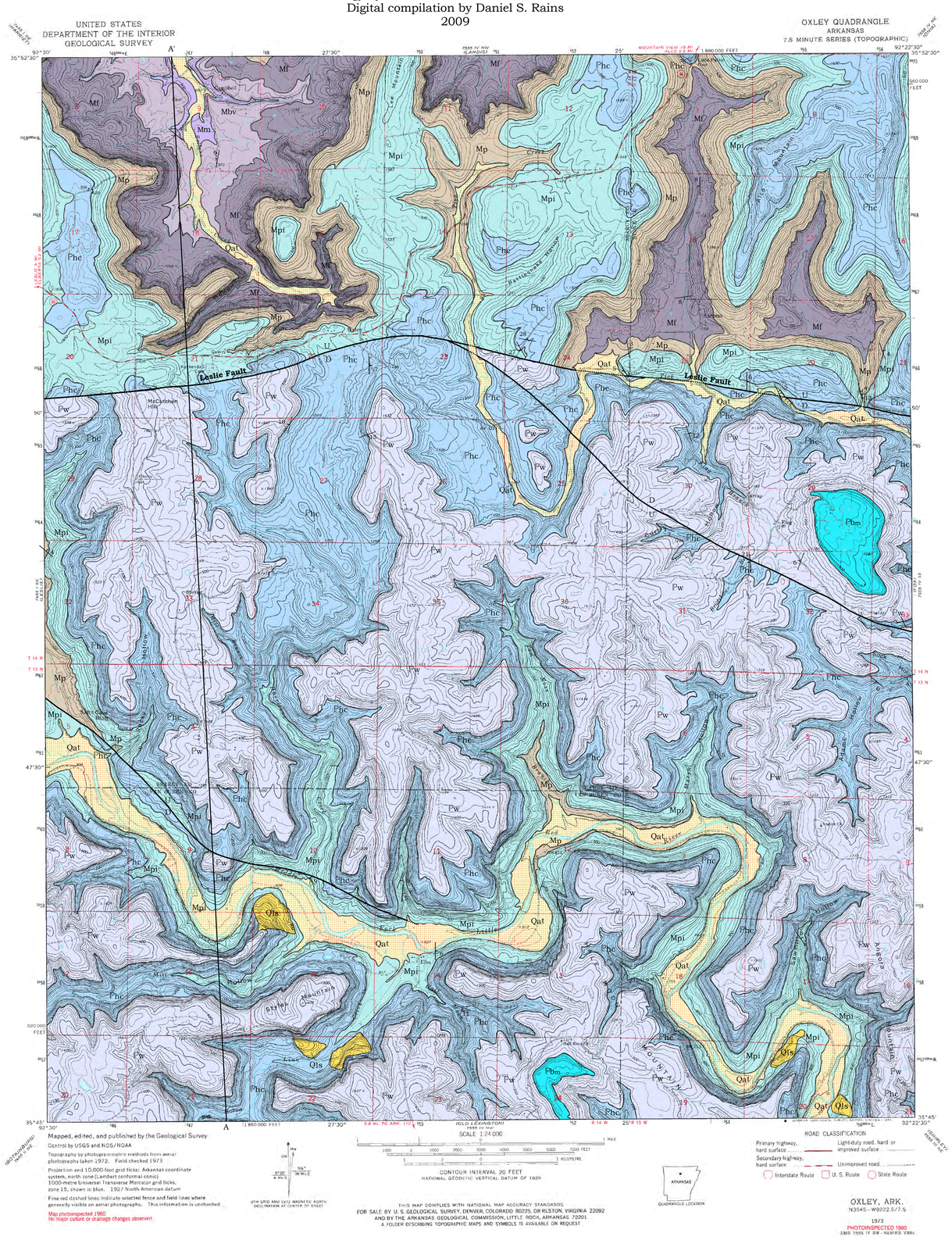
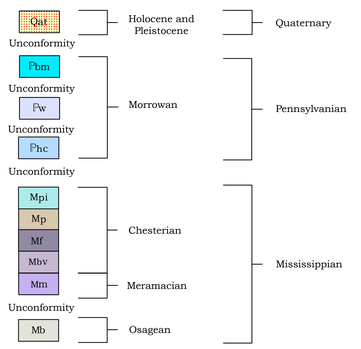
Arkansas Geological Survey
Bekki White, State Geologist and Director

GEOLOGIC MAP OF THE OXLEY QUADRANGLE, SEARCY, STONE, AND VAN BUREN COUNTIES, ARKANSAS

Geology by Richard S. Hutto and Erin E. Smart
Digital compilation by Daniel S. Rains
2009



Correlation of Map Units



Introduction

This map graphically summarizes the bedrock geology of the Oxley 7.5-minute quadrangle. In this area over 1040 feet (317 meters) of Lower Mississippian to Lower Pennsylvanian carbonate and clastic sedimentary rocks are exposed. The mapped area lies on the northern edge of the Boston Mountains Plateau, the highest in a series of south-dipping plateau surfaces composed of progressively younger rocks in the Ozark Plateaus Region.

The major structure in this area is the Leslie Fault which runs the width of this map and beyond. It is a normal fault downdropped to the south that offsets the rocks approximately 420 feet (128 meters) in the east to approximately 560 feet (171 meters) in the west. Minor faults splay off of this fault to the southeast. The major drainage in this area is the Middle Fork of the Little Red River which flows southeast to Greers Ferry Lake.

The geology of this area was mapped in 1976 by Glick for the 1:500,000 scale Geologic Map of Arkansas. The current mapping builds on the previous work, but uses a revised stratigraphy and adds certain structural details. The contacts and structural features on the map were derived from field observations made from July 2008 through April 2009. Site locations were generated with the aid of a global positioning satellite receiver. Bedrock dipping at less than 2° was considered horizontal.

Description of Map Units

Qat **Alluvium and terrace deposits (Quaternary)** – composed of unconsolidated clay, silt, sand and gravel deposited by major streams, including deposits on one or more terrace levels.

Qls **Landslide deposits (Quaternary)** – typically derived from Morrowan units, especially breakdown of thin-bedded, flaggy sandstone in the Cane Hill Member and undercutting of massive-bedded, blocky sandstone in the basal Witts Springs Formation. Primarily develop on the Morrowan shales and to a lesser extent on the Chesterian shales.

Pbm **Bloyd Formation (Lower Pennsylvanian, Morrowan) –** informally divided into upper and lower parts on adjacent quadrangles (Braden, et al., 2003) separated by the "middle Bloyd sandstone" (Zachry and Haley, 1975). Only the "middle Bloyd sandstone" is present on this map. Rocks equivalent to the "lower part" of the Bloyd are mapped as the main body of the Witts Springs Formation.

Middle Bloyd sandstone – a thin- to very thick-, massive-, cross-bedded, locally micaceous sandstone. Grains are medium to very coarse, well-sorted, subangular to subrounded and silica- or iron-cemented. Fresh surfaces are white to buff or reddish- to brownish-tan. Weathered surfaces are tan, gray or reddish- to dark-brown. Typically contains well-rounded, milky quartz pebbles. Exhibits minor honeycomb weathering and liesegang banding. Unconformable with the Witts Springs below. Reaches a maximum thickness of approximately 100 feet (12-27 meters).

Pw **Witts Springs Formation (Lower Pennsylvanian, Morrowan)** - equivalent to the "lower part" of the Bloyd Formation below the "middle Bloyd sandstone" (Braden, et al., 2003, Smith, et al., 2007), and the Prairie Grove Member of the Hale Formation. Unconformable with the Cane Hill Member below, and in some places has obviously scoured into it. Total thickness ranges from approximately 200-220 feet (61-67 meters).

Main body - primarily a very thin- to massive-bedded, very fine- to medium-grained, subangular to rounded, locally calcareous sandstone with some interbedded shale and siltstone. Fresh surfaces are orangey-brown to gray, and weather gray to brown. Unit thickness ranges from approximately 140-160 feet (43-49 meters).

Basal sandstone – typically a massive-bedded, blocky to concave-weathering, micaceous sandstone. Grains are fine- to medium, poorly to moderately well-sorted and subangular to subrounded. May also be present as a package of stacked, thin- to medium-, cross-bedded channel sands. Fresh surfaces are tan or dark-orange to brown, and weather dark-orange to brown or gray. Commonly contains small fossils and shale pebbles along bedding planes or external molds where they have weathered out. Honeycomb weathering and liesegang banding are present locally. Unit thickness ranges from approximately 40-60 feet (12-18 meters).

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 are mapped with the Witts Springs Formation.

Cane Hill Member – typically a fissile silty to clay shale that contains ironstone nodules and discontinuous, thin-bedded, limonitic siltstone that weathers to form boxworks. 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 the Cane Hill. Going eastward across the quadrangle, these sandstone units are increasingly dominant. On the east side they are the principal lithology, with only minor shale units separating the sandstone units. Near the base is an especially competent sandstone unit that is typically light to dark-gray on fresh surfaces and weathers tan or dark-gray to dark-brown. It ranges from approximately 40-80 feet (6-24 meters) in thickness, and erodes to form a thick, flaggy colluvium that is extensively collected for building stone. At the lower contact, a discontinuous, orangey-brown, limonitic shale-pebble conglomerate is locally present that is approximately 12-36 inches (30-91 centimeters) thick. Unconformable with the "Imo shale" below. Ranges from approximately 180-320 feet (55-98 meters) in thickness.

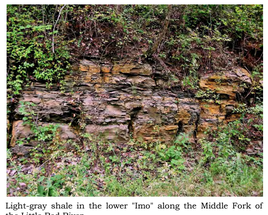
Pitkin Formation (Upper Mississippian, Chesterian) informally divided into two members, the Pitkin Limestone and the "Imo shale". Lower contact of the "Imo" placed at the top of the final limestone bed in the Pitkin, and upper contact placed below the base of a competent, very thin- to thin-, ripple-bedded, silty sandstone that is the first recognizable unit in the Cane Hill Member (Smith, et al., 2007).

Mpi **Imo shale (Upper Mississippian, Chesterian)** – consists of several shale units with intervening sandstone units. The lowest unit is a light-gray, calcareous or dark-gray, non-calcareous, fissile shale with interbedded, discontinuous sandstone and limestone. This limestone commonly takes the form of small, yellowish, platy concretions encrusted with fossils, especially *Chonetes*, or light-gray, lenticular, septarian concretions. Locally, loosely accreted, cigar-sized crinoid stems weather out. Above this shale is a persistent, fine- to medium-grained, thin- to massive- and locally cross-bedded sandstone. 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. Unit thickness ranges from approximately 15-40 feet (5-12 meters). Above this sandstone is fossil-bearing, dark-gray to black, fissile shale. Fossils are abundant and include bivalves (commonly muculoids), cephalopods (commonly conical nautiloids), solitary corals (commonly rugose), crinoids, brachiopods, gastropods, trilobites and plant material. Typically contains lenticular, orange to dark-red fossiliferous limestone tempestites, rounded, non-fossiliferous ironstone concretions, and secondary, fibrous calcite partings. Additional discontinuous, thin-bedded sandstone and limestone beds are interbedded within the upper shale unit. The limestone beds are dark-gray on fresh surfaces, and weather dark-red. They are fine- to coarse-grained, oolitic and fossiliferous. Conformable with the underlying Pitkin. Ranges from approximately 120-180 feet (37-55 meters) in thickness.

Mp **Pitkin Limestone (Upper Mississippian, Chesterian)** – a thin- to very thick-, massive-bedded, fine to coarse-grained, locally oolitic bioclastic limestone. Contains abundant fossils including crinoid fragments, the bryozoan *Archimedes*, corals, nautiloids, brachiopods, gastropods, and trilobites. Fresh surfaces are light to dark-gray, and weather light- to medium-gray. Grades to a tan color near the upper contact due to an increase in silt content. Commonly has a petroliferous odor when freshly broken. About half way up the section, there is a black shale interval that typically forms a bench. Conformable with the underlying Fayetteville Shale. Ranges from approximately 180-220 feet (55-67 meters) in thickness.

Mf **Fayetteville Shale (Upper Mississippian, Chesterian)** – a black, fissile shale which is increasingly dominated by 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 contact with the overlying Pitkin Limestone. Also near the upper contact, nodular or discontinuous, thin-bedded black chert is commonly present. Micritic beds usually have a petroliferous odor when broken, and are sparsely fossiliferous. Septarian concretions are common in the upper part, but isolated zones may be found in the lower, shaly part. Conformable with the underlying Batesville Sandstone. Ranges from approximately 300-320 feet (91–98 meters) in thickness.

Cross-bed sets in "Imo" Sandstone in Tom Moss Hollow.



Light-gray shale in the lower "Imo" along the Middle Fork of the Little Red River.

Mbv **Batesville Sandstone (Upper Mississippian, Chesterian)** – a thin- to medium- and locally cross-bedded sandstone. Grains are very fine to medium, moderately well-sorted, subangular and carbonate-cemented. Fresh surfaces are dark-gray to dark-brown and weather reddish-brown or tan to buff. Rarely fossiliferous, but locally contains external molds where fossils have weathered out. Conformable with the underlying Moorefield Shale. Ranges from approximately 40-80 feet (12-24 meters) in thickness.

Hindsville Limestone Member (Upper Mississippian, Chesterian) – a discontinuous thin- to medium-bedded, finely to coarsely crystalline limestone. Light- to dark-gray on fresh surfaces, but weathers gray to brown. Usually has a petroliferous odor when freshly broken. Locally fossiliferous and oolitic. Typically interbedded with very thin- to thin-bedded shale, siltstone or sandy siltstone. Only present near Campbell where it is less than 15 feet (4.6 meters) thick. Not considered mappable at this scale as a separate unit, therefore mapped with the Batesville. Conformable with the underlying Moorefield.

Mm **Moorefield Shale (Upper Mississippian, Meramecian)** – a silty 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 light-gray to buff. Unconformable with the Boone Limestone below. Reaches a maximum thickness of approximately 40 feet (12 meters).

Mb **Boone Limestone (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. Reaches a maximum exposure of approximately 20 feet (6 meters).

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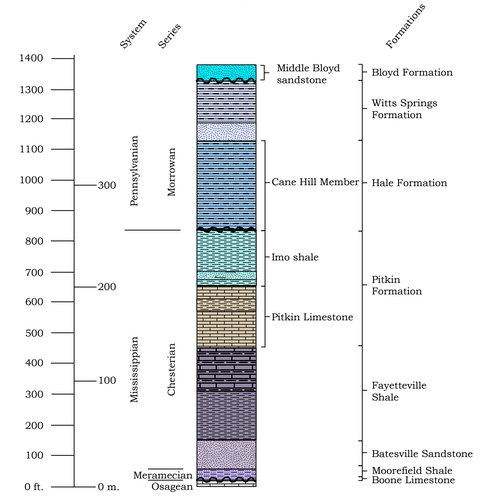
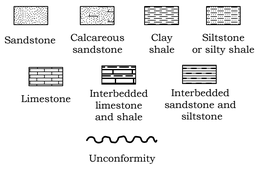
Stratigraphic Column





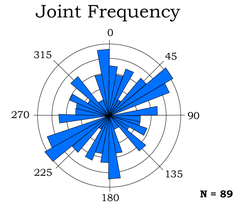
Symbols

Contact

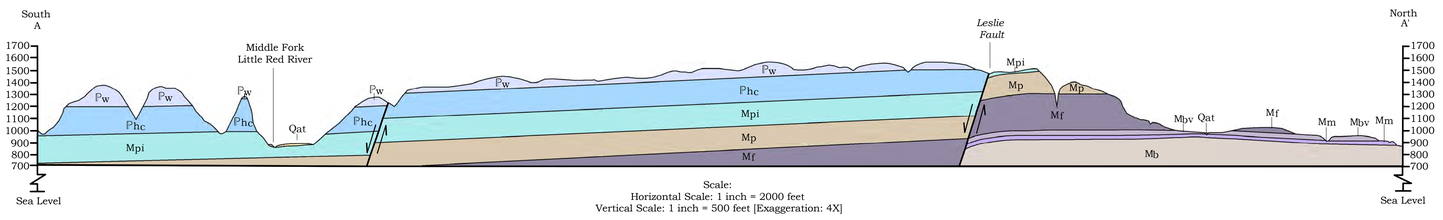
U / D Fault - dotted where concealed
U - Upthrown
D - Downthrown

45 Strike and Dip

Joint Frequency



Rose diagram depicting the strike frequency of joints recorded within the Oxley Quadrangle



Acknowledgments: This map was produced for The National Cooperative Geologic Mapping Program (STATEMAP), a matching-funds grants program administered by the US Geological Survey, under Cooperative Agreement Award 08HQAG0108. Special thanks to private landowners who graciously allowed access to their property, to Daniel S. Rains for his assistance in the field, and to Angela K. Chandler for her tireless dedication to this mapping project.

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