Arkansas Geological Survey
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Geologic Map of the Rea Valley Quadrangle Marion County, Arkansas

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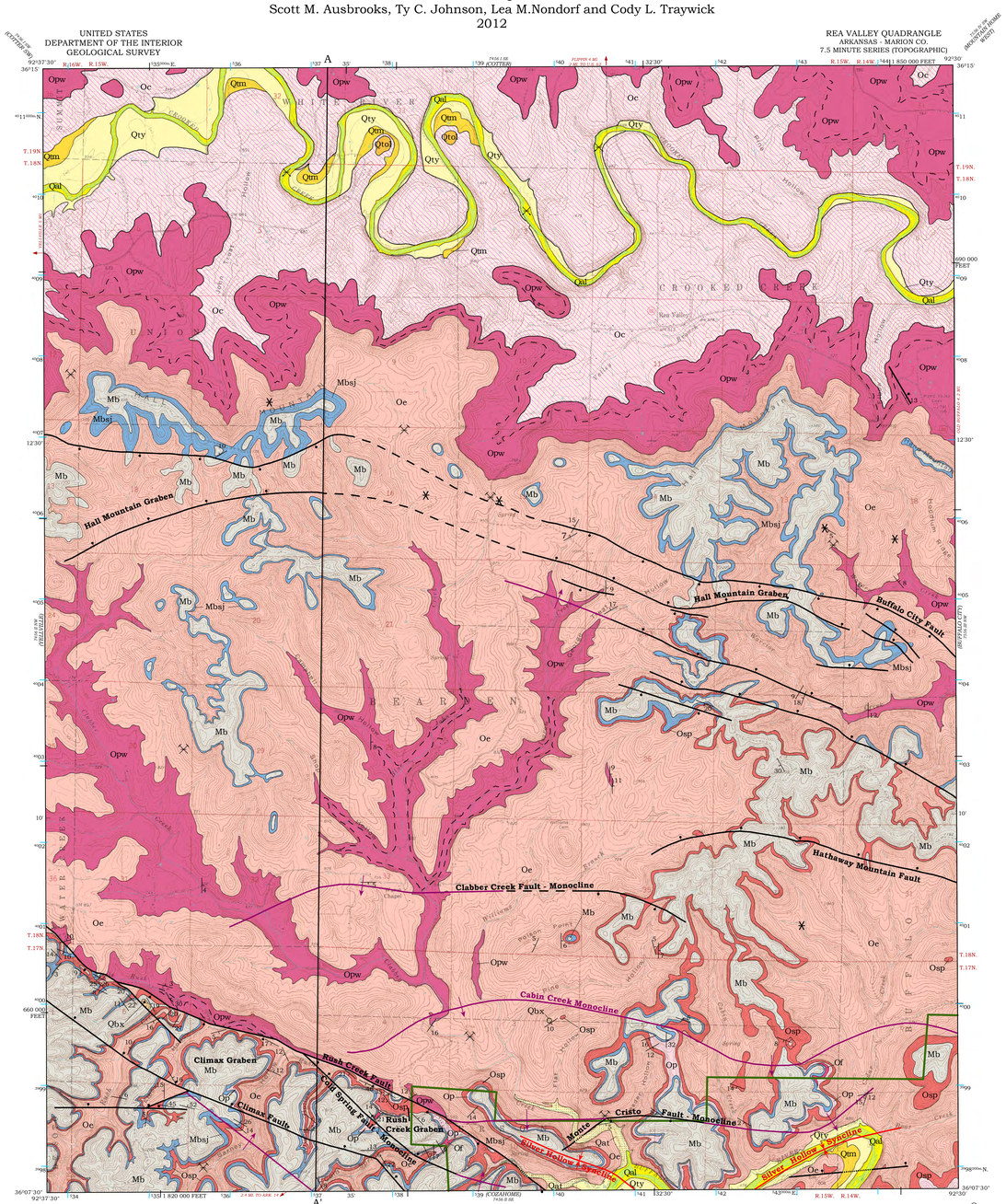
2012

Digital Geologic Quadrangle Map
Rea Valley Quadrangle, Arkansas
DGM-AR-00730



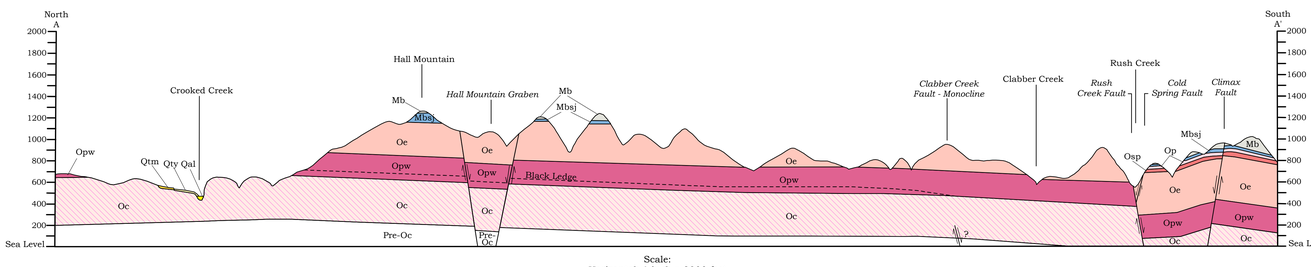
Topography mapped, edited, and published by the U.S. Geological Survey

Control by USGS AND USC&GS

Topography by photogrammetric from aerial photographs taken 1964. Field checked 1966

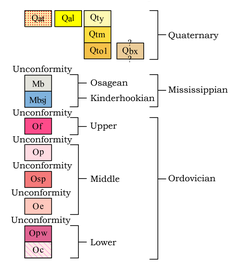
Polyconic projection. 1983 North American datum
10,000-foot grid based on Arkansas coordinate system, northzone
1000-meter Universal Tmsverse Mercator grid ticks,
zone 15, shown in blue

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



Scale:
Horizontal: 1 inch = 2000 feet
Vertical: 1 inch = 500 feet (4x Exaggeration)

Correlation of Map Units



Introduction

This map illustrates the surface geology of the Rea Valley 7.5-minute quadrangle. This quadrangle was previously mapped by E.E. Glick in 1970 for the Geologic Map of Arkansas (1976). E.T. McKnight (1935) mapped the Rea Valley as part of a larger (1:125,000-scale) map focused on the understanding of the lead and zinc deposits of the area. Structural contours on the base of the Boone Formation were adapted from McKnight (1935). This map incorporates previously collected data with new detailed geologic mapping. The geologic contacts and structural features are based on field observations. Data collection points were obtained by using a Global Positioning System (GPS) receiver in conjunction with a U.S. Geological Survey 7.5-minute topographic map. Bedrock dipping less than 3° is considered horizontal. Bedrock units of less than 20 feet thick were considered "not mappable" at a 1:24,000-scale and were incorporated into adjacent stratigraphic units. Approximately 2 miles (3 kilometers) of the Buffalo National River are located on this quadrangle and are managed by the National Park Service. Almost 17 miles (27 kilometers) of Crooked Creek meanders across the northern portion of the quadrangle.

Summary

Stratigraphically, over 1400 feet (427 meters) of Lower Ordovician to Mississippian age strata are exposed in this map. The Lower-Middle Ordovician formations comprise the surface rock over the majority of the map (north of the Rush Creek Fault) and form the gently undulating surface of the gently undulating Salem Plateau. The Mississippian Boone Formation forms ridges on the dissected Springfield Plateau. Quaternary terrace and alluvium deposits are present in the valleys of Crooked Creek, the Buffalo River and its tributaries. Two terrace levels are well-developed along the west half of Crooked Creek and the Buffalo River - a younger and medial. Several poorly exposed and isolated deposits of an older terrace were located higher above Crooked Creek.

Regional structure is controlled in large part by an uplifted area (known as the Ozark Dome) centered in southeastern Missouri. From this structural high, the progressively younger rock formations dip southward and form increasingly elevated plateau surfaces (Ozark Plateaus Region) in Arkansas. A prominent escarpment south of Crooked Creek separates the Salem and Springfield Plateaus. Locally, certain areas of bedrock have been deformed by both large and small faults and folds. Structural highlights of the Rea Valley include a pair of normal faults that form the Hall Mountain Graben spanning across the northern portion of the map and the faults and monoclines of the Rush Lead and Zinc Mining District in the southern portion of the quadrangle. These include the Rush Creek, Climax, Cold Spring and Monte Cristo Fault Systems and the Cabin Creek Monocline.

The Hall Mountain Graben spans across the northern portion of the map and has approximately 20 to 80 feet (6 to 24 meters) of vertical displacement along its length. The Rush Creek Fault is downthrown to the southwest. According to McKnight (1935) the Rush Creek Fault has a maximum vertical displacement of approximately 450 feet (137 meters). The Climax and Cold Spring Faults are downthrown to the northeast and have maximum vertical displacements of approximately 150 feet (45 meters) each. The north-dipping Climax and Cold Spring Faults in conjunction with the south-dipping Rush Creek Fault form the Climax and Rush Creek Grabens, respectively. The Cabin Creek Monocline dips to the south with a structural drop of approximately 450 feet (McKnight, 1935). This area was heavily prospected for zinc in the late 1800's and early 1900's. Zinc mines and prospect pits are present throughout the quadrangle; however locations are not shown within the National Park since they are considered sensitive park resources.

Description of Map Units

Qal **Alluvium and terrace deposits (Quaternary)** – Unconsolidated deposits of clay, silt, sand and gravel including deposits on one or more terrace levels in small creeks and tributaries to the Buffalo River. Thickness is variable and reaches up to 20 feet (0-6 meters).

Qal **Alluvium (Quaternary)** – Unconsolidated deposits of clay, silt, sand and gravel within the "active channel" and sandy/gravel point bar deposits along Crooked Creek and the Buffalo River. Thickness is variable and reaches up to 20 feet (0-6 meters).

Qty **Young terrace deposits (Quaternary)** – Unconsolidated deposits of primarily clay, silt and sand in the youngest terrace approximately 20-40 feet above Crooked Creek and the Buffalo River. The tops of the terraces are generally flat but can be hummocky and dissected by smaller streams. This terrace may correspond with the terrace portion of Turner and Hudson's (2010) young terrace. Thickness is variable and reaches up to 20 feet (0-6 meters).

Qtm **Medial terrace deposits (Quaternary)** – Unconsolidated deposits of clay, silt and sand in higher terraces approximately 40-80 feet above Crooked Creek and the Buffalo River. This terrace may correspond with Turner and Hudson's (2010) medial terrace. Thickness is variable and reaches up to 20 feet (0-6 meters).

Qto1 **Old terrace deposits (Quaternary)** – Unconsolidated deposits of gravel and sand in even higher observed terraces approximately 80-160 feet above Crooked Creek. Deposits are poorly exposed and consists of pebble to cobble sized angular to rounded chert and other Paleozoic rocks in a coarse sandy matrix. Several isolated deposits are located above the western portion of the Crooked Creek. This terrace may correspond with Turner and Hudson's (2010) old terrace. Thickness is variable but reaches 20 feet (0-6 meters).

Qbx **Remnant block deposits (Quaternary)** – Unconsolidated and consolidated remnants of Batesville Sandstone and St. Joe Limestone in large sinkholes or collapsed features within the Boone and Everton Formations. Deposits most likely correspond to those that were first recognized by Turner and Hudson (2010). The erosional blocks of the Batesville Sandstone are characterized by tabular sandstone blocks with moderately rounded edges 1 to 4 feet in diameter and interspersed with the chert of the Boone Formation (Tuner and Hudson, 2010). The remnant beds of St. Joe Limestone are preserved in a sinkhole or collapse feature within the dolostones of the Everton Formation. Deposits are interpreted to be related to more recent, late-stage karst development because blocks are not encased in paleokarst features as observed in calcified collapsed breccia (Tuner and Hudson, 2010). Exact relationship to faulting and thickness of deposits are unknown, but appear to occur in close proximity to faults and other structures.

Mb **Boone Formation (Mississippian - Osagean)** – Consists of interbedded thin- to medium-bedded limestone and anastomosing and bedded chert. The limestone is light- to medium-gray on fresh surfaces, but weathers white. The chert is various shades of white, gray, blue, brown and green. Springs and sinkholes are common. Quartz crystal mineralization is present locally, especially near faults. The Boone Formation is present on the tops of most ridges as regolith consisting of chert rubble and clay. Conformable with the underlying St. Joe Member and unconformable with the underlying Plattin Limestone or St. Peter Sandstone when the St. Joe is absent. Thickness ranges from approximately 20-160 feet (6-49 meters).

Mbsj **St. Joe Limestone Member (Kinderhookian – Osagean)** – Consists of thin-bedded, reddish to gray crinoidal and argillaceous limestones interbedded with very thin shaly intervals. Locally contains white crinoid fragments in a red fine-grained matrix with red chert nodules. Manganese-rich beds (darker in color) are locally present in the lower portion of the unit. Thickness ranges from 0-40 feet (0-12 meters). However, it is up to 80 feet (24 meters) thick on Hall Mountain and the NW corner of Section 26 T18N R15W.

Basal Sandstone – Fine to medium-grained, moderately sorted phosphatic sandstone. Grains are subangular to subrounded in shape. Color is white to light-gray or tan in fresh surface and typically displays a "salt and pepper" or blotchy appearance. Phosphate grains range from fine sand to pebble size. Where present, it is unconformable with the underlying Fernvale or Plattin Limestones. Thickness ranges from 0 to 15 feet. (0-5 meters).

Of **Fernvale Limestone (Upper-Middle Ordovician)** – A medium- to coarse-grained bioclastic limestone that is medium to thick-bedded. Color is light-pink to reddish white on fresh surfaces, but weathers dark-gray. Locally, contains barrel-shaped crinoids, brachiopod fragments, calcite vugs and pyrite. It weathers to rounded moss-covered boulders that are usually friable. Present in isolated outcrops within the Rush Creek Graben and in the southeast corner of Section 1 T17N R15W of the quadrangle. It is unconformable with the underlying Plattin Limestone. Thickness ranges from 0-30 feet (0-9 meters).

Op **Plattin Limestone (Middle Ordovician)** – Consists of thin- to thick-bedded, micritic to finely crystalline limestone and is light- to medium-gray on fresh surfaces, but weathers white- to light-gray. It is locally argillaceous and dolomitic with occasional stylolites and chert nodules. Intervals of medium-gray fine- to medium-grained dolostone were observed in thicker sections. Springs are abundant at the Plattin/St. Peter contact. The Plattin Limestone is present in the southern portion of the quadrangle. It is unconformable with the underlying St. Peter Sandstone. Where present, the Plattin is commonly 20-40 feet (6-12 meters) thick but is up to 120 feet (37 meters) thick south of Cabin Creek Monocline in Section 2 T17N R15W.

Osp **St. Peter Sandstone (Middle Ordovician)** – Consists of fine-grained medium- to massive- cross-bedded calcite-cemented quartz arenite sandstone with locally inter-bedded blue-green to dark-gray shale. Quartz grains are sub-angular to sub-rounded. The sandstone is white on fresh surfaces, but weathers to yellowish-brown. Commonly case hardened on the surface but friable when the calcite cement has been leached out. The St. Peter contains the vertical trace fossil *Skolithos* which weathers in relief to resemble icicles. Locally, the unit can be subdivided into three parts. When present, the upper part of the unit forms a ledge up to 20 feet (6 meters) thick. The middle part is a poorly exposed slope former comprised of thin-bedded sandstones and shale. The lower part is best preserved and forms a bluff up to 40 feet (12 meters) thick. Glades, sinkholes and cylindrical columns of sandstone referred to as "sandstone pipes" were observed at several localities. Unconformable with the underlying Everton Formation with up to 20 feet (6 meters) of relief on the undulating contact. Thickness ranges from 0-100 feet (0-30 meters).

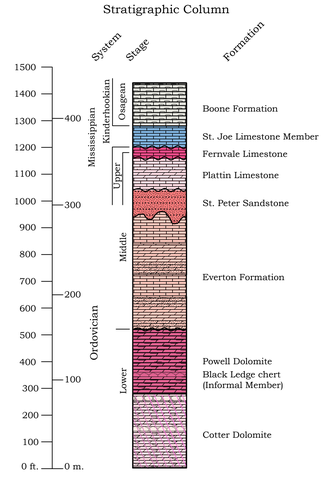
Oe **Everton Formation (Middle Ordovician)** – Consists primarily of interbedded dolostone, sandy dolostone, and sandstone with lesser amounts of bedded chert. Dolostones are thin- to medium-bedded and fine- to coarsely-crystalline. They are medium-gray on fresh surfaces, but weather light-gray. Sandstones are very thin- to medium-bedded and are locally silica-cemented. Quartz grains are fine- to coarse- and sub-rounded to well-rounded. At most localities, a very thin- to medium-bedded limestone approximately 40 feet (12 meters) thick is present beneath the unconformity with the overlying St. Peter Sandstone. It is light- to medium-gray on fresh surfaces but weathers white to light-gray and is finely crystalline to micritic. This limestone commonly contains stromatolites. This limestone is referred to as the Jasper Limestone by Purdue and Miser (1916). Another interval of limestone approximately 30 feet (9 meters) thick and thin bedded cherts are present in the lower part of the formation. Springs are common. The majority of the zinc prospects are located in this unit. The Everton is unconformable with the underlying Powell Dolomite. Thickness ranges from approximately 200-420 feet (60-128 meters).

Opw **Powell Dolomite (Lower Ordovician)** – Very fine to fine-grained thin to medium-bedded argillaceous dolostone interbedded with very thin-bedded dolomitic shale. Dolostones are white to light-gray on fresh and weathered surfaces and often laminated. Shale is greenish-grey to blue-green on fresh and tan to buff weathered surfaces. Locally contains pink dolomite. Overall thickness ranges from approximately 200-420 feet (60-128 meters).

Black Ledge Chert - Approximately 40-60 feet (12-18 meters) above the base of the Powell is a chert referred to as "black ledge" (McKnight, 1935 and Cullison, 1944) because of its dark weathering appearance. Typical "black ledge" is vuggy, comby, and covered in drusy quartz that contains gastropod molds. Thick to massive siliceous beds of red, black, brown and white chert containing the casts of angular clasts are also common in this interval. Thickness ranges from approximately 5-20 feet (1.5-6 meters).

Oc **Cotter Dolomite (Lower Ordovician)** – Consists of a fine- to medium-grained crystalline dolostone. Light-gray on fresh surfaces but weathers dark-gray and has a "hackly" appearance. The Cotter is noted for concentric light and dark banded chert nodules. It also contains angular chert fragments, quartz druse vugs and laminations. Massive beds of white to translucent chert were observed locally. Approximately 60-180 feet (18-54 meters) of Cotter is exposed in the quadrangle.

Stratigraphic Column



Paleozoic Rocks within the quadrangle. (Maximum thickness of each unit shown).

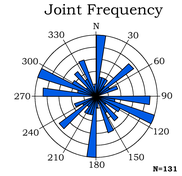
Stomatolites in the lower limestone of the Everton Formation (Oe) on Hall Mountain.

Deformation bands in the St. Peter Sandstone (Osp) near Rush Creek Fault.

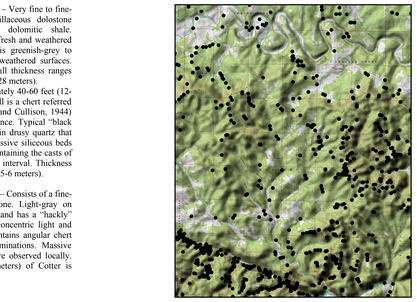
Symbols

- Contact
- Opw Black Ledge
- Normal Fault (Ball & Bar showing downthrown block)
- Inferred Fault
- Concealed Fault
- Syncline Axis
- Monocline Axis with Direction
- Buffalo National River Park Boundary
- Sinkhole or Collapse Feature
- 45 Strike and Dip
- Mine, Abandoned
- Pit, Abandoned
- Prospect, Abandoned

Joint Frequency



Rose diagram of strike frequency of joints recorded within the Rea Valley quadrangle.



Map of the Rea Valley quadrangle showing location of data collection points.

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Acknowledgments

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Disclaimer

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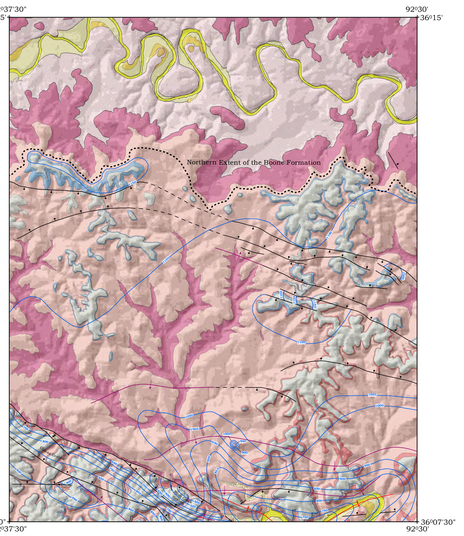

Map of the Rea Valley quadrangle showing location of major structures and generalized structural contours on the base of the Boone Formation. Contour interval: 50 Feet (Adapted from McKnight, 1935)