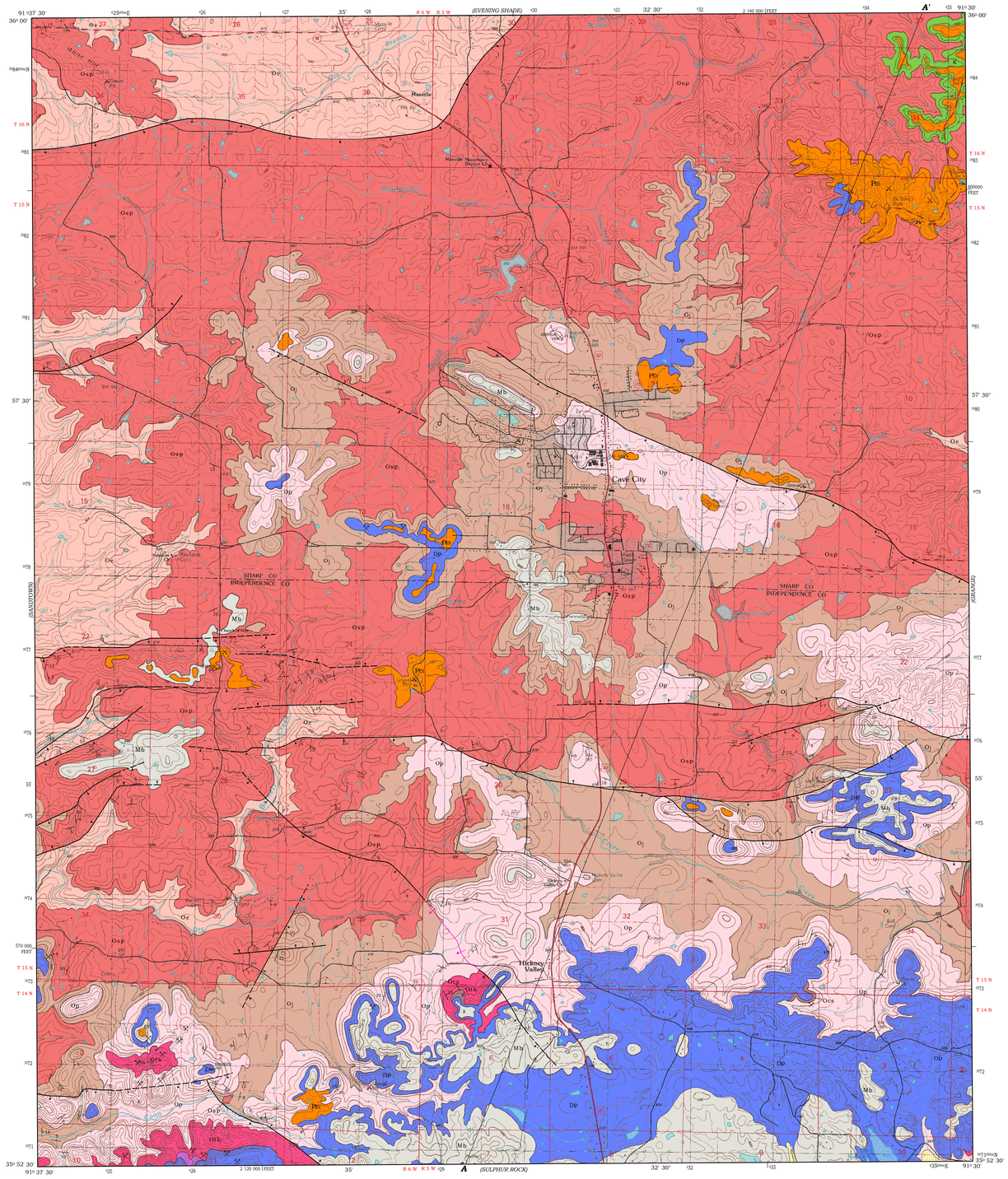
GEOLOGICAL SURVEY

Geologic Map of the Cave City Quadrangle, Independence and Sharp Counties, Arkansas

Thomas J. Liner and Scott M. Ausbrooks
2022
Scott M. Ausbrooks, Director and State Geologist

Digital Geologic Quadrangle Map
Cave City Quadrangle, Arkansas
DGM-AR-00140



Correlation of Map Units

Qat	Holocene Pleistocene		Quaternary
Unconformity			
Pzt	Paleogene		Paleogene
Unconformity			
K	Cretaceous		Cretaceous
Unconformity			
Mb	Osagean Kinderhookian		Mississippian
Unconformity			
Dp	Upper to Lower		Devonian
Unconformity			
S	Ludlow to Wenlock		Silurian
Unconformity			
Ocs	Upper		Ordovician
Unconformity			
Ofk			
Unconformity			
Op	Middle		
Oj			
Osp			
Unconformity			
Oe			

Location of Cave City quadrangle within the Ozark Plateaus.

Introduction

This map depicts the surface geology of the Cave City quadrangle, a 7.5-minute series USGS topographic map. This area was mapped as part of the Earth Mapping Resources Initiative (EMRI). The EMRI project involved the mapping of the Batesville Manganese District with an emphasis on the Cason Formation. In this area, approximately 750 feet (228 meters) of Middle Ordovician to Ealy Mississippian and Cretaceous carbonate and clastic rocks are exposed.

The area spans the Springfield and Salem Plateaus within the Ozark Plateaus Province. Generally, the rock formations dip gently southward with local variations due to monoclines and normal faults. Karst features such as springs, disappearing streams, caves, and sinkholes are common throughout the area.

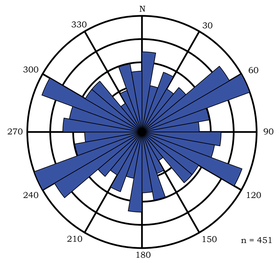
Prospecting in the district began in the late 1800's, but historical mining was active in two phases. Mining of phosphate in the Cason Formation took place between 1902 and 1912. Manganese mining took place primarily in the Cason Formation and Fernvale Limestone from about 1915 to 1959 (Miser, 1922; and Stroud et al., 1981). Other units that were mined for manganese include the Penters Chert, Lafferty Limestone, and uppermost Plattin Limestone.

The Cave City quadrangle lies on the eastern margin of the Batesville Manganese District. The geology of the Batesville Manganese District and surrounding area has been the subject of multiple reports by generations of geologists. Glick (1972) mapped the Cave City quadrangle after Gordon and Kinney (1944) and Straczek et al., (1950), in preparation for the 1:500,000-scale Geologic Map of Arkansas. New field data was recorded on a portable GPS data collector and uploaded to a geodatabase. Eight samples were collected on the Cave City quadrangle for analysis using Inductively Coupled Plasma Mass Spectrometry (ICP-MS) to determine rare earth element concentrations in the Cason Formation. Representative rock samples were collected for lithologic description and petrographic analysis.

Symbols

- Contact
- A — A′ Line of cross-section
- Normal fault - ball and bar on downthrown side. Dashed where inferred. Dotted where concealed.
- Monocline
- Strike and dip
- Mine
- Pit
- x Prospect

Joint Frequency



Rose diagram of the strike frequency of joints recorded on the Cave City quadrangle.

Description of Map Units

Qat — **Alluvium and terrace deposits (Quaternary)** - unconsolidated clay, silt, sand, and gravel, including deposits on one or more terrace levels along larger tributaries. Ranges from 10-15 feet (3-5 meters) thick.

Pzt — **Terrace deposits (Paleogene?)** - gravel deposits that consist of unconsolidated, coarse sand to cobble sized sub-rounded to rounded chert and sandy red to white clay on hilltops 60-100 feet (18-30 meters) above nearby drainages. Ranges from a veneer to 80 feet (24 meters) thick.

K — **Cretaceous (Cretaceous)** - loosely consolidated, medium- to coarse-grained, dark-red sand interbedded with light gray or red clay. Contains abundant iron-cemented beds and concretions in shapes consistent with Liesegang banding. Upper surface is hummocky where overlain by gravel deposits. Unconformable with Paleozoic rocks below. Ranges from 20-40 feet (6-12 meters) thick.

Mb — **Boone Formation (Lower Mississippian, Osagean and Kinderhookian)** - fine-grained limestone interbedded with anastomosing and bedded chert. Light to medium gray on fresh surfaces but usually weathers to dark gray. The chert varies in color from white to light gray in the upper portion to dark gray or blue gray in the lower portion of the unit. Springs, caves, and sinkholes are common common. A thick regolith of angular chert fragments in a red clay matrix is present throughout the quadrangle. Unconformable with the underlying Penters Chert or Lafferty Limestone. Ranges from 60-100 feet (18-30 meters) thick.

Dp — **Penters Chert (Lower to Middle Devonian)** - medium- to thick bedded chert. Gray and white banding is common and red, orange, and white mottling is also present. Commonly brecciated and highly fractured. Contains drusy quartz and manganese oxide coatings. Sandstone boulders are locally preserved above or in place of the chert. Sandstone is clean, white, silica-cemented, and contains chert fragments. Chert is present as residual boulders on hilltops throughout the area. Historically mined for manganese. Unconformable with the underlying Lafferty Limestone. Ranges from 15-60 feet (5-18 meters) thick.

The following units are discontinuous and typically too thin to be mapped at this scale and are therefore grouped with adjacent units. Thickness may be locally exaggerated.

S — **Lafferty Limestone (Silurian, Ludlow to Wenlock)** - sparsely fossiliferous, finely crystalline limestone. Medium gray with red crinoidal fragments or blebs on fresh surfaces and weathers light gray. Locally contains light red finely crystalline limestone. Thin to thick bedded and commonly stylolitic along bedding planes. Locally contains manganese dendrites and nodules, green clay, pyrite, and nautiloid fossils. Historically mined for manganese. Conformable with the underlying St. Clair Limestone. Up to 20 feet (6 meters) thick.

St. Clair Limestone (Silurian, Wenlock) - coarsely crystalline fossiliferous limestone. Locally contains abundant trilobite fossil fragments and green clay. Light gray to white on fresh surfaces but weathers medium gray. Unconformable with the underlying Cason Formation. Up to 15 feet (5 meters) thick.

Ocs — **Cason Formation (Upper Ordovician)** - thin- to medium-bedded, reddish brown to buff siltstone interbedded with silty shale. Locally contains white chert fragments, glauconite grains, limonite blebs, and flattened button-shaped impressions. This unit was previously mined for phosphate and manganese. Unconformable with the underlying Fernvale Limestone. Up to 20 feet (6 meters) thick.

Ofk — **Fernvale Limestone (Upper-Middle Ordovician)** - medium- to coarse crystalline limestone. Medium- to thick or massive bedded. Light pink to reddish on fresh surfaces, and weathers dark gray to brown. Fossils include barrel-shaped crinoids, brachiopods, bryozoans, and corals. Caves and sinkholes are abundant. Manganese oxide is present in nodules and thin horizontal zones within the upper section. The top of this unit is heavily solutioned and was mined for manganese at multiple locations. Unconformable with the underlying Kimmswick Limestone where present. Ranges from 20-100 feet (6-30 meters) thick.

Kimmswick Limestone (Middle Ordovician) - medium crystalline, gray to white, stylolitic limestone. Locally contains chert fragments. Contains brachiopods, bivalves, crinoids, horizontal trace fossils, and *Prismostylus*, a type of red algae. Unconformable with the underlying Plattin Limestone. Up to 20 feet (6 meters) thick.

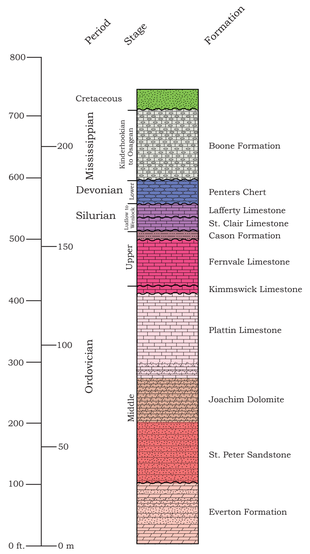
Op — **Plattin Limestone (Middle Ordovician)** - very thin- to medium-bedded micritic to finely crystalline limestone. Light to medium gray on fresh surfaces but weathers white to light gray and is locally mottled. Contains gastropods, brachiopods, bryozoans and stromatolites. Horizontal and vertical trace fossils are locally infilled with silt, especially in the upper section. Very thin shale layers are present in the top of the unit. Interbedded dolostone is present in the lower section making it difficult to locate the lower contact. Limestone glades containing abundant solutionally enlarged orthogonal joint sets are present throughout the area. Sinkholes and springs are abundant. The top of the unit is heavily solutioned and contains manganese prospects at various locations. Conformable with the underlying Joachim Dolomite. Ranges from 40-140 feet (12-43 meters) thick.

Oj — **Joachim Dolomite (Middle Ordovician)** - fine- to medium crystalline sandy dolostone that is thin- to medium bedded. Medium to dark gray on fresh surfaces, but weathers light gray to white. Mudcracks are common. Locally contains calcite blebs and veins, stromatolites, and dolostone breccia. Contains solutionally enlarged fractures, caves, and springs. A thin oolitic interval is present near the top of the unit. Conformable with the underlying St. Peter Sandstone. Ranges from 20-120 feet (6-36 meters) thick.

Osp — **St. Peter Sandstone (Middle Ordovician)** - fine-grained, thin- to massive- bedded sandstone. Commonly cross-bedded. Quartz grains are sub-angular to sub-rounded. White to light gray on fresh surfaces, but weathers light brown. Friable when broken. Commonly silica-cemented and quartzitic near faults. Balds or glades are common. Long ridges or walls composed of tightly spaced deformation bands commonly stand in relief along faults. Sandstone pipes are present locally near monoclines or faults. Sinkholes and caves are common. Unconformable with the underlying Everton Formation. Ranges from 40-120 feet (24-37 meters) thick.

Oe — **Everton Formation (Middle Ordovician)** - consists primarily of interbedded dolostone, sandy dolostone, and sandstone. Dolostone is thin to medium bedded and fine to coarsely crystalline. Medium gray on fresh surfaces, but weathers light gray and is locally mottled. Locally petroliferous when broken and contains calcite blebs and mudcracks. Sandstone is very thin to medium bedded and locally silica cemented. Quartz grains are fine to coarse and sub-rounded to well-rounded. Ranges from 60-140 feet (18-43 meters) thick.

Stratigraphic Column



Point map indicating data collection sites on the Cave City quadrangle.

References

Glick, E.E., 1972, Geologic map of the Cave City quadrangle, Independence and Sharp Counties, Arkansas: Arkansas Geological Survey Geologic Worksheet, 1 sheet, 1:24,000.

Miser, H.D., 1922, Deposits of manganese ore in the Batesville District, Arkansas: U.S. Geological Survey Bulletin 734, 302 p.

Straczek, J.A., Kinney, D.M., Palmstrom, W.N., and Spurrier, F.H., 1950, Geologic map of the central part of the Batesville Manganese District, Independence and Izard Counties, Arkansas: U.S. Geological Survey Mineral Investigations Field Studies Map, MF-1, 1 sheet, 1:31,680.

Stroud, R.B., Kline, H.D., Brown, W.F., and Ryan, J.P., 1981, Manganese resources of the Batesville District, Arkansas: Arkansas Geological Survey Information Circular 27, 146 p.

Acknowledgments: This map was produced for the Earth Mapping Resources Initiative, a grant program administered by the U.S. Geological Survey under Cooperative Agreement Award G19AC00261. A special thanks to Mr. Wilson, Mr. Mobley, and Mr. Tony Carter. A very special thanks to Angela Chandler, John Gist, and Ciara Mills for technical assistance.

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 new information is collected, the features depicted on this map may be changed.

For the latest edition of this and other Arkansas Geological Survey maps and publications, please call Publication Sales at 501-296-1877 or visit our office at 5301 Northshore Drive North Little Rock, AR 72118. This map is also available at:

https://www.geology.arkansas.gov/maps-and -data/geologic_ maps/geologic-quadrangle-maps-for-arkansas-1-24k-scale.html

Suggested citation for this map:
Liner, T.J., and Ausbrooks, S.M., 2022, Geologic map of the Cave City quadrangle, Independence and Sharp Counties, Arkansas: Arkansas Geological Survey, Digital Geologic Map, DGM-AR-00140, 1 sheet, 1:24,000.

Map and cross section digitized by Jerry Clark, Brian Kehner, and Kerstein Finan.

Pit gravel deposit in NE 1/4 Section 3 T15N R5W. Geologist for scale.

The topographic base is a collarless Digital Raster Graphic (DRG). The DRG is a scanned image of a U.S. Geological Survey 7.5-minute series topographic map published in 1989.

10,000-foot grid based on Arkansas coordinate system, north zone.

1000-meter Universal Transverse Mercator grid, zone 15. 1927 North American Datum.

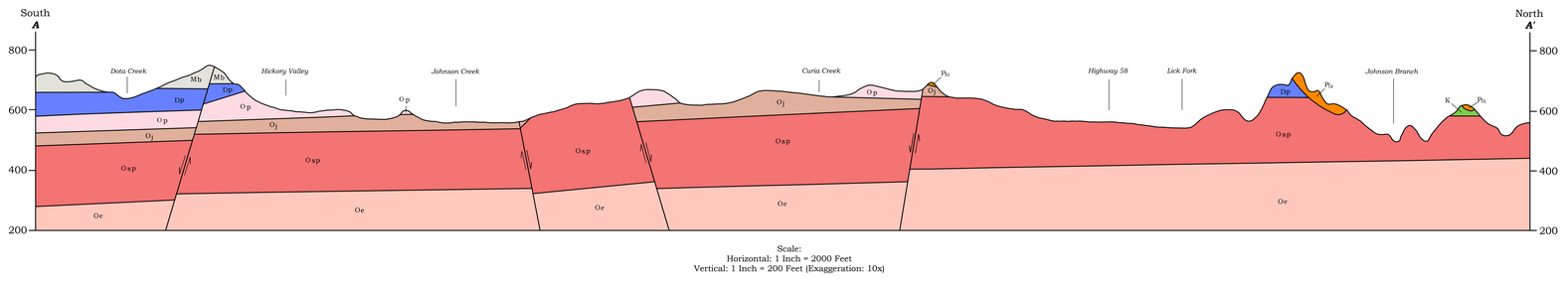
Approximate mean declination 2022

SCALE 1:24 000

Contour Interval 20 Feet
National Geodetic Vertical Datum of 1929

Quadrangle Location

Primary highway
Secondary highway
Light duty road
Unimproved road



Scale:
Horizontal: 1 Inch = 2000 Feet
Vertical: 1 Inch = 200 Feet (Exaggeration: 10x)