OFFICE OF THE STATE GEOLOGIST

Geologic Map of the Northeast District in the North Arkansas Lead and Zinc Region, Sharp and Lawrence Counties, Arkansas

Thomas J. Liner and Sara E. Patton
2024
Scott M. Ausbrooks, Director and State Geologist

Digital Geologic Map
North Arkansas Lead and Zinc Region (Northeast District)
DGM-AR-LZD-NE-001
Sheet 1

Introduction

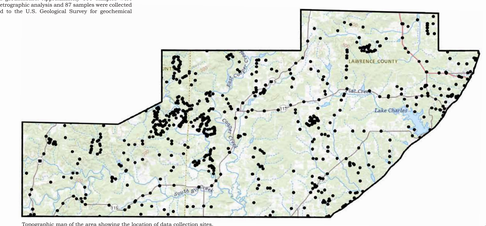
This map is the first, in a series of three, that depicts the surface geology of the North Arkansas Lead and Zinc Region. The Region is divided into two major focus areas: the Northcentral District and the Northeast District. The Northeast District contains abandoned lead and zinc mines and prospects (red circles), including Poughkeepsie, Smithville, Eaton, Black Rock, and Imboden. The larger Northcentral District is split into two major focus areas: West Half and East Half.

The Northeast District is within the Salem Plateau of the Ozark Plateaus Province. Approximately 350 feet of Early to Middle Ordovidian carbonate and clastic rocks, and Cretaceous clastic rocks are exposed in this area. The lower part of the Everton Formation on this map includes rocks that were divided into the Smithville limestone and the overlying Black Rock limestone on the Geologic Map of Arkansas (1929) and included in the upper part of the Powell Formation on the Geologic Map (1976).

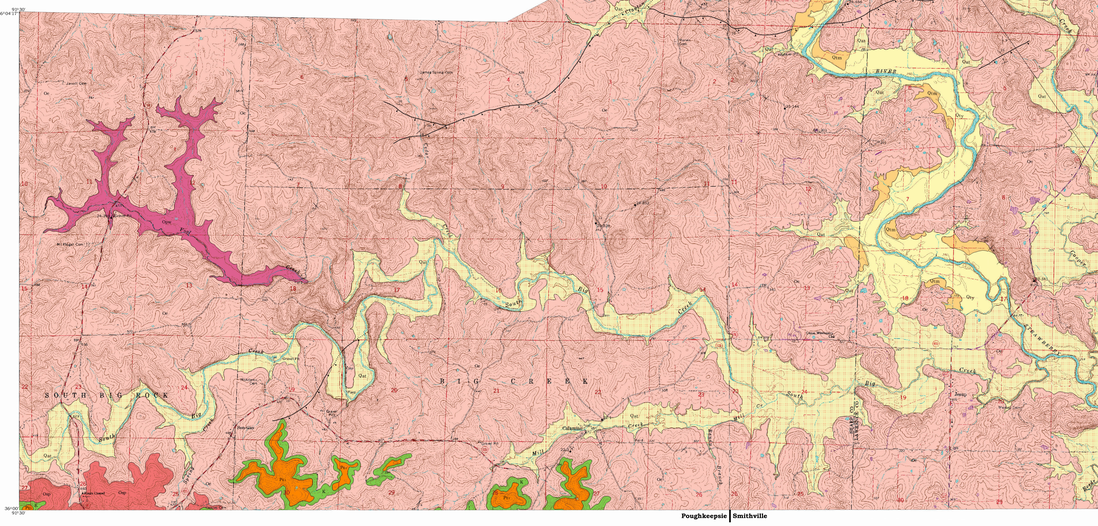
Lead mining started in 1851 and the earliest zinc mining in Arkansas began around 1858. The oldest zinc mines are in Sharp and Lawrence Counties. A smelter built during 1857 in Calamine of Sharp County is thought to be one of the first zinc smelters in the country. Total production in the district is estimated to be 4,000 tons of mostly zinc. Mining activity had ceased by 1930 having 33 abandoned lead and zinc mines in the Northeast District.

E.E. Glick (1972-1974) mapped the area in preparation for the 1:500,000-scale Geologic Map of Arkansas. Field work for the current project was conducted for Earth Mapping Resources Initiative (EMRI) investigating zinc as a critical mineral resource. Data from the mines, prospects, and outcrops were collected and uploaded to a geodatabase. Approximately 100 samples were collected for petrographic analysis and 87 samples were collected and submitted to the U.S. Geological Survey for geochemical analysis.

Location of the mapping area at the eastern margin of the Ozark Plateaus Region.



Topographic map of the area showing the location of data collection sites.



Description of Map Units

Qal — **Alluvium and terrace deposits (Quaternary)** - unconsolidated clay, silt, sand, and gravel, including deposits on one or more terrace levels along larger tributaries. Ranges from 15-40 feet (5-9 metres) thick.

Qty — **Young terrace and active channel deposits (Quaternary)** - unconsolidated clay, silt, sand and gravel in gravel bars and channels of active streams and rivers and on the lowest alluvial terraces above the river which are primarily clay, silt, and sand. Uppermost surfaces are generally flat but are locally hummocky and dissected by tributaries. Up to 20 feet (6 metres) thick.

Qtm — **Medial terrace and alluvial deposits (Quaternary)** - older terraces composed of unconsolidated clay, silt, and sand in a deposit approximately 20-30 feet (6-9 metres) above the Strawberry River. Ranges from 20-30 feet (6-9 metres) thick.

Tpu — **Terrace deposits (Paleogene?)** - stranded gravel deposits that are poorly sorted and consist of unconsolidated, coarse sand- to cobble-sized, rounded chert gravel. Deposits are located primarily along the fall line. Ranges from 20-40 feet (6-12 metres) thick.

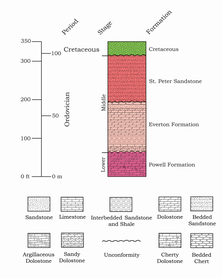
K — **Cretaceous (Cretaceous)** – medium- to coarse-grained dark -brown to red sandstone with sub-rounded to rounded grains. Commonly iron cemented where consolidated in outcrop. Rarely outcrops and exposures usually consist of unconsolidated red sand and clay. A 4-5 feet (1-1.5 metres) thick bed of dark-gray to black clay shale is exposed below the sand at one locality. Unconformable with Paleozoic rocks below. Ranges from 10-50 feet (3-15 metres) thick.

Osp — **St. Peter Sandstone (Middle Ordovician)** - fine-grained massive bedded white to buff sandstone with sub-angular to sub-rounded quartz grains. Friable when broken. Commonly silica -cemented with abundant deformation bands near faults. Unconformable with the underlying Everton Formation. Ranges from 40-100 feet (12-33 metres) thick.

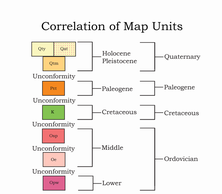
Oe — **Everton Formation (Middle Ordovician)** - interbedded dolostone, sandy dolostone, sandstone, limestone, chert, and shale. Dolostone is thin- to thick-bedded, light-gray to buff, and fine-grained to medium-crystalline on fresh surfaces. Gray to black on weathered surfaces. Commonly sandy with floating sand grains and abundant sand stringers. Calcite and dolomite vugs are common in the dolostones throughout the area. Sandstones are fine- to medium-grained thin- to medium-bedded buff to white and friable when broken but can be silica cemented. Massive chert boulders and sandstone boulders commonly cap the hills in the western part of the district. In some locations the top of the formation consists of a thin bed of oolitic chert. In the eastern part of the district numerous high spired gastropods 0.5 inches (1.3 centimeters) in length. The lower Everton contains discontinuous very fine-grained, gray limestone with approximately 12 feet (4 metres) of interbedded light-gray dolostone, green shale, and green sandstone. The beds of green shale and sandstone are deposited together in 3 inch (7 centimeters) beds that are separated by 2-3 feet (1 meter) thick beds of medium-bedded dolostone. In two locations the base of the formation is marked by a fine-grained or finely-crystalline gray limestone that features large silicified gastropods up to 3 inches (8 centimeters) in diameter and operculum up to 1 inch (2.5 centimeters) in length. The limestone is light-gray to white on weathered surfaces. Abundant druzy quartz, dolomite, sphalerite and galena are present in vugs and fractures. Abundant dolomite and calcite veins and stringers and calcite veins were observed across the area. Unconformable with the underlying Powell Formation. Ranges from 10-200 feet (3-61 metres) thick. All mines in this district are within the Everton Formation.

Opw — **Powell Formation (Early Ordovician)** - fine-grained light-gray to greenish-gray dolostone. Thin- to massive-bedded. Mostly sand free and commonly argillaceous. Laminated white to light-gray on fresh surfaces. In a few exposures floating sand grains were present along bedding planes. Light-gray to buff on weathered surfaces. Contains chert nodules that are dark-gray to dark-blue to black. Large calcite vugs and veins are common. Thin sandstone stringers and thin sandstone beds were present in one area. Brachiopods were observed at one location. Operculum 1 inch (2.5 centimeters) in length were noted in a red clay regolith in the northern part of the mapping area. Ranges from 10-70 feet (3-21 metres) thick.

Stratigraphic Column



Correlation of Map Units



References

Glick, E.E., 1974 Geologic worksheet of the Black Rock quadrangle: Arkansas Geological Commission, 1 sheet,1:24,000.

Glick, E.E., 1972., Geologic Worksheet of the Eaton quadrangle: Arkansas Geological Commission, 1 sheet, 1:24,000.

Glick, E.E., 1972., Geologic worksheet of the Imboden quadrangle: Arkansas Geological Commission, 1 sheet, 1:24,000.

Glick, E.E., 1972., Geologic worksheet of the Poughkeepsie quadrangle: Arkansas Geological Commission, 1 sheet,1:24,-000

Glick, E.E., 1972., Geologic worksheet of the Smithville quadrangle: Arkansas Geological Commission,1sheet,1:24,000.

McKnight, E.T., 1935, Zinc and lead deposits of northern Arkansas: U.S. Geological Survey Bulletin 853, 311 p.

Acknowledgements: This map was produced for the Earth Mapping Resources Initiative (EMRI) grant program administered by the U.S. Geological Survey under STATEMAP award number G24AC00460. Special thanks to Mr. Broadway, Mr. Perkins, Mr. Goff, Mr. Bilbrey, and Mr. Sloan for access to their properties and sharing their knowledge of the area. A very special thanks to Mr. Wesley Smith and White River Materials for being so helpful over the last three field seasons.

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.

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This map is also available at:
https://www.geology.arkansas.gov/docs/pdf/maps-and-data/geologic_maps/DGM-AR-LZD-NE-001.html

Suggested citation:
Liner, T.J., and Patton, S.E., 2024, Geologic map of the Northeast District in the North Arkansas Lead and Zinc Region, Sharp and Lawrence Counties, Arkansas: Arkansas Geological Survey Digital Geologic Map DGM-AR-LZD-NE-001, 1 sheet, 1:24,000.

Map and cross-section digitized by Megan Easter and Brian Kehner.

The base map is a compilation of collarless Digital Raster Graphics (DRGs). The DRGs are scanned images of the following U.S. Geological Survey 7.5-minute series topographic maps: Poughkeepsie, 1965, Smithville, 1965, Eaton, 1966, Black Rock, 1974, Imboden, 1966.

10,000-foot grid based on Arkansas coordinate system, north zone.1927 North American Datum.

0° 00' W

APPROXIMATE MEAN DECLINATION, 2024

SCALE 1:24 000

1 0 1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
500 0 500 1000 1500 2000 METERS
1 KILOMETER

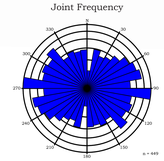
Contour Interval 10 Feet
National Geodetic Vertical Datum of 1929

Map Location

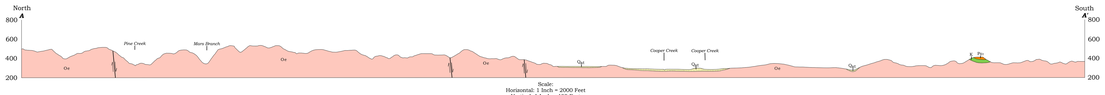
Road Classification
Heavy duty
Medium duty
Light duty
Unimproved dirt

Symbols

Contact
A — A' Line of cross-section
Normal fault - ball and bar on downthrown side. Dotted where concealed.
Strike and dip
Abandoned Mine or Quarry
Prospect (pit or small open cut)
Vertical mine shaft
Sample Locality
n-402



Rose diagram of the strike frequency of joints recorded in the area.



Scale:
Horizontal: 1 Inch = 2000 Feet
Vertical: 1 Inch = 400 Feet
(Exaggeration: 5x)

Location of map and adjacent quadrangles.