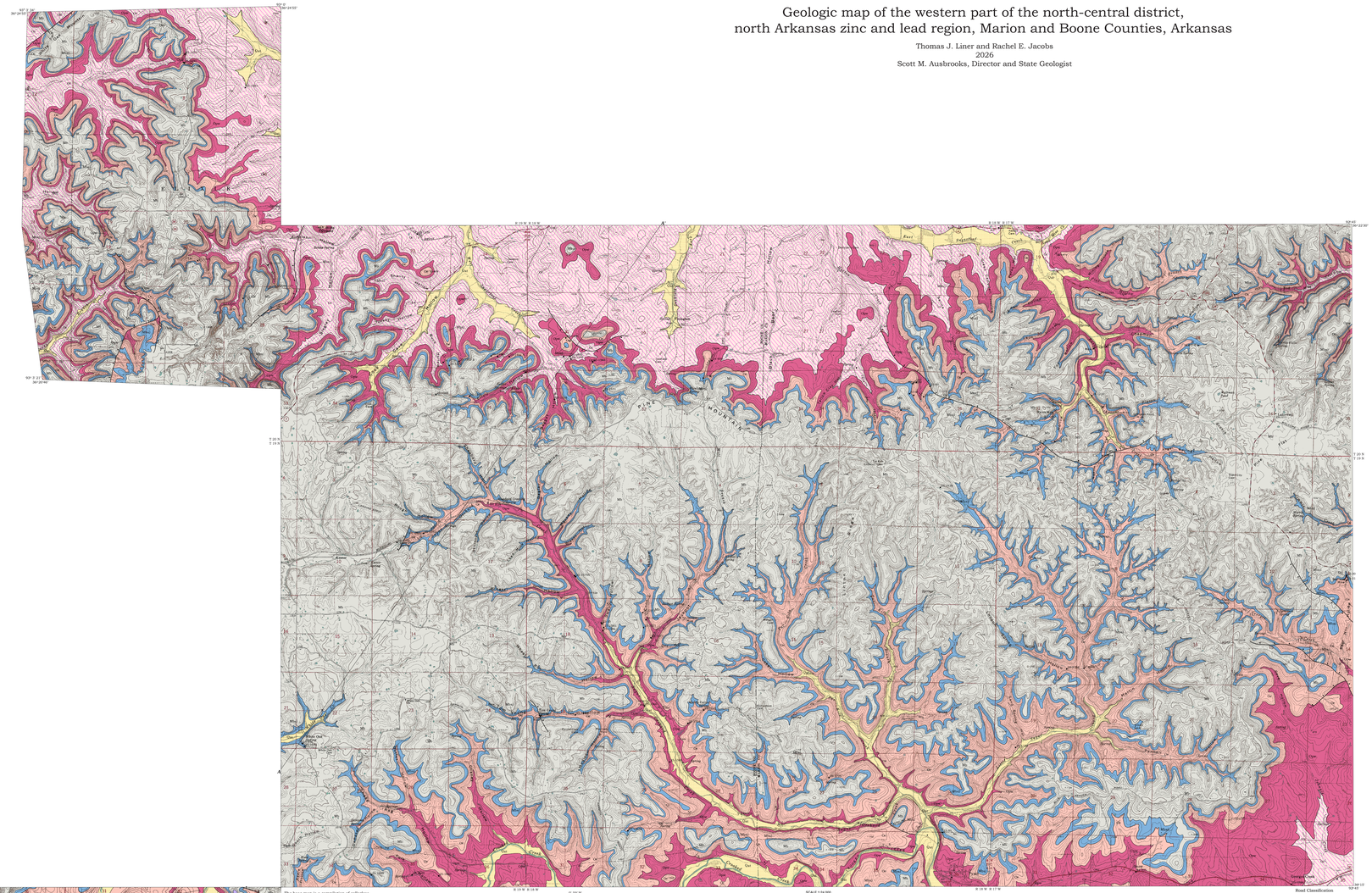
OFFICE OF THE STATE GEOLOGIST

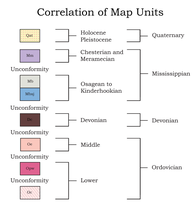
Digital Geologic Map
north Arkansas zinc and lead region
DGM-NARZLR-2W

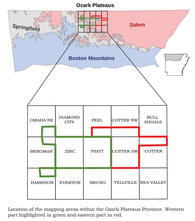
Geologic map of the western part of the north-central district, north Arkansas zinc and lead region, Marion and Boone Counties, Arkansas

Thomas J. Liner and Rachel E. Jacobs
2026
Scott M. Ausbrooks, Director and State Geologist



Correlation of Map Units





Location of the mapping areas within the Ozark Plateaus Province. Western part highlighted in green and eastern part in red.

Description of Map Units

Alluvium and terrace deposits (Quaternary) – unconsolidated clay, silt, sand, and gravel, including deposits on one or more terrace levels along larger tributaries. Ranges from 20-40 feet (6-9 meters) thick.

Moorefield Formation (Upper Mississippian, Chesterian and Meramecian) – finale shale interbedded with thin to medium bedded siltstone. Shale is dark gray to black on fresh and weathered surfaces. Siltstone is dark buff to brown on fresh surfaces but weathers light gray to buff. Only one exposure was noted and it is in the northeast corner of the mapping area. Ranges from absent to Boone Formation. Ranges from 20-40 feet (6-12 meters) thick where present.

Boone Formation (Lower Mississippian, Osagean and Kinderhookian) – interbedded limestone and chert. Limestone is thin to medium-bedded, light gray, fine grained to medium-crystalline on fresh surfaces. The chert is light gray to white. Thin unit of sandy limestone at the base is commonly present. Sinkholes and sinkholes are common. Conformable with the underlying St. Joe Limestone. Ranges from 20-350 feet (6-91 meters) thick.

St. Joe Limestone (Kinderhookian) – medium to coarse-ly crystalline, light-gray to red crinoidal limestone. Thin to medium bedded. Forms a bluff former in the area and contains no chert free with the exception of red chert nodules in some areas. The St. Joe is a persistent bluff former in the area and commonly features caves and springs. Two mines in the area are in the St. Joe. Unconformable with the underlying Chattanooga Shale. Ranges from 20-40 feet (6-12 meters) thick.

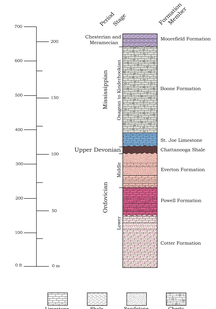
Chattanooga Shale (Upper Devonian) – black clay shale only observed near the Bear Hill Mine. The exposure is unstable in having the highest uranium concentration of any black shale in the area. Conformable with the underlying Everton Formation and overlying Everton Formation. Ranges from 10-20 feet (3-6 meters) thick.

Everton Formation (Middle Ordovician) – interbedded dolomone, sandy dolomone, sandstone, and limestone. Dolomstor is thin- to thick-bedded, light-gray to buff, and fine-grained to medium-crystalline on fresh surfaces. Gray to black on weathered surfaces. Sandstone is light gray to white and is fine- to medium- grained with stringers. Calcite and dolomite vugs are common in the dolomones throughout the area. Sandstones are fine- to medium- grained thin- to thick -bedded buff to white and friable when broken but can be silica cemented. The upper portion contains a 20-30 foot (6-9 meter) thick limestone unit that is commonly thin- to medium-bedded, fine to medium grained, buff to white, and friable. A few mines were located at the contact between the St. Joe and this sandstone. Below the sandstone a 10-20 foot (3-6 meter) thick, very fine-grained, gray limestone is present. The limestone is light-gray to buff on fresh surfaces and weathers to a medium gray color. Calcite, quartz, dolomite, sphalerite and galena are common in mineralized areas. Pyrite mineralization along sand stringers and calcite veins was observed across the area. Thirty-nine mines in this area are in the Everton. Unconformable with the underlying Powell Formation. Ranges from 40-200 feet (12-60 meters) thick. Thins from the west to the east.

Powell Formation (Lower Ordovician) – fine-grained light gray to buff, and commonly features mudcracks. Laminated in hand sample. Sparsley fossiliferous with only a few gastropods noted. Sandstone is typically thin bedded, fine grained, light gray to buff, and locally oolitic. Large stromatolites are bended, white, to buff to gray, and locally oolitic. Large stromatolites 3-5 feet (1-2 meters) in diameter are present near the top of the formation. Two mines in this area are in the Cotter. Ranges from 20-200 feet (6-60 meters) thick.

Cotter Formation (Lower Ordovician) – interbedded dolomone, sandstone, and cherty. Dolomstor is thin to massive bedded, fine grained, light gray to buff, and commonly features mudcracks. Laminated in hand sample. Sparsley fossiliferous with only a few gastropods noted. Sandstone is typically thin bedded, fine grained, light gray to buff, and locally oolitic. Chert nodules are banded, white, to buff to gray, and locally oolitic. Large stromatolites 3-5 feet (1-2 meters) in diameter are present near the top of the formation. Two mines in this area are in the Cotter. Ranges from 20-200 feet (6-60 meters) thick.

Stratigraphic Column



Introduction

This map is the second, in a series of three, that depicts the surface geology of the north Arkansas zinc and lead region. The region is divided into two major focus areas: the north-central district and the northwest district. The north-central district is further split into two focus areas: western part and eastern part. The western part of the north-central district comprises portions of five 7.5-minute series topographic quadrangles including Bergman, Harrison, Omaha NE, Pyatt, and Zinc.

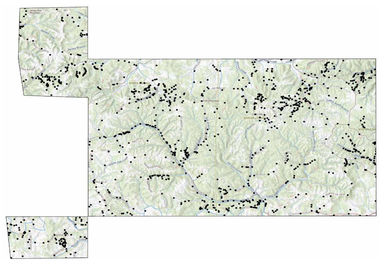
The region is part of the Ozark Plateaus Province across the Springfield and Salem Plateaus of the Ozark Plateaus Province. Approximately 700 feet of Lower Ordovician to Upper Mississippian carbonate and clastic rocks are exposed in this area.

The first recorded occurrence of lead in this area was by Schoolcraft (1819). Mining in the Zinc-Pyatt area of Boone County in this area did not begin until 1899. Total production in the district is estimated to be 8,250 tons of zinc and 500 tons of lead (McKnight, 1935). Mining activity had ceased by 1930 leaving approximately fifty-seven abandoned zinc and lead mines in the western part of the north-central district.

Bush, Haley, and Glick (Bush, 1972; Bush and Haley, 1972a–b., Glick, 1986, 1987a–b.) mapped the area in preparation for the 1:500,000-scale Geologic Map of Arkansas. Field work for the current project was conducted for the Earth Mapping Resources Initiative (EMRI) to investigate zinc as a critical mineral resource. New field data was recorded on a portable GPS unit and plotted on aerial photos. Two hundred and seventy-seven fifty-three samples were collected for petrographic analysis and ninety-four samples were collected and submitted to the U.S. Geological Survey for geochemical analysis. Eight sandstone samples were collected for detrital zircon analysis.

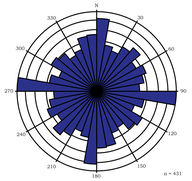
Symbols

- Contact
- A — A' Line of cross-section
- Normal fault – ball and bar on downthrown side
- Strike and dip
- Abandoned Mine or Quarry
- Sample Locality (n=81)



Shaded relief map of the area showing the location of data collection sites.

Joint Frequency



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

References

Bush, W.V. and Haley, B.R., 1972a, Geologic worksheet of the Pyatt quadrangle: Arkansas Geological Commission, 1 sheet, 1:24,000

Bush, W.V. and Haley, B.R., 1972b, Geologic worksheet of the Zinc quadrangle: Arkansas Geological Commission, 1 sheet, 1:24,000

Glick, E.E., 1987a., Geologic worksheet of the Bergman quadrangle: Arkansas Geological Commission, 1 sheet, 1:24,000.

Glick, E.E., 1987b., Geologic worksheet of the Harrison quadrangle: Arkansas Geological Commission, 1 sheet, 1:24,000.

Glick, E. E., 1987c, Geologic worksheet of the Omaha NE quadrangle: Arkansas Geological Commission, 1 sheet, 1:24,000

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

Swanson, V.E. and Landis, E.R., 1962, Geology of a Uranium-bearing Black Shale of Late Devonian Age in North-central Arkansas: Arkansas Geological Commission, Information Circular 22, 16 p.

Acknowledgments: This map was produced for the Earth Mapping Resources Initiative (EMRI) grant program administered by the U.S. Geological Survey under Cooperative Agreement Award G22AC00460. Special thanks to Mr. Blackwell, Mr. Pritchet, Mr. Mertlves, Mr. Moon, and Mr. Parker for access to their properties and sharing their knowledge of the area.

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:
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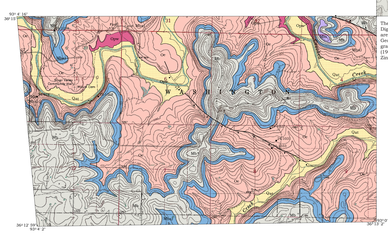
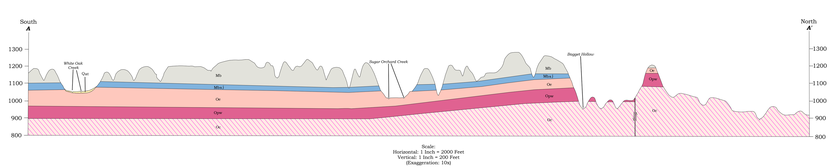
Suggested citation:
Liner, T.J. and Jacobs, R.E., 2026, Geologic map of the western part of the north-central district, north Arkansas zinc and lead region, Marion and Boone Counties, Arkansas: Office of the State Geologist, Digital Geologic Map DGM-NARZLR-2W, 1 sheet, 1:24,000.



The base map is a compilation of collarless Digital Raster Graphics (DRGs). The DRGs were produced from scans of the following U.S. Geological Survey 7.5-minute series topographic maps: Bergman (1967), Harrison (1967), Omaha NE (1966), Pyatt (1972), *Zinc* (1972)

APPROXIMATE MEAN DECLINATION, 2024



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