GEOLOGICAL SURVEY

Geologic Map of the Mount Pleasant Quadrangle Izard, Independence, and Stone Counties, Arkansas

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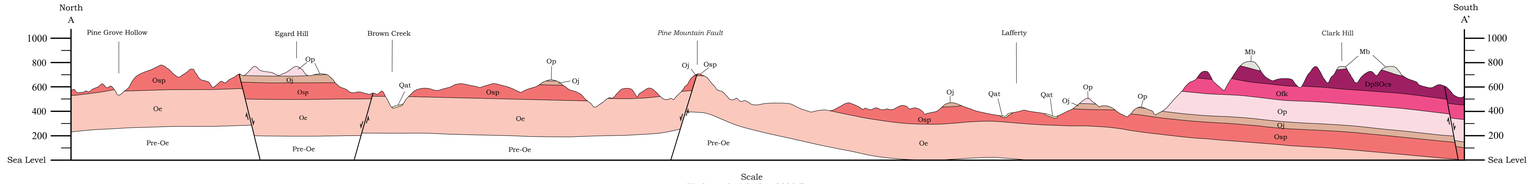
Digital Geologic Quadrangle Map
Mount Pleasant Quadrangle, Arkansas
DGM-AR-00595

The topographic base is a collarless Digital Raster Graphic (DRG). The DRG is a scanned image of a U.S. Geological Survey standard series topographic map by photogrammetric methods from aerial photographs taken in 1986. It was field checked in 1987 and edited in 1989.

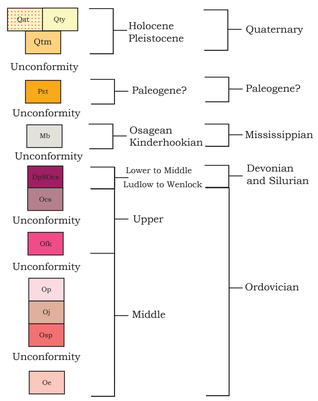
10,000-foot grid based on Arkansas coordinate system, north zone.

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



Scale
Horizontal: 1 inch = 2000 Feet
Vertical: 1 inch = 400 Feet (Exaggeration = 5X)

Correlation of Map Units



Location of Mount Pleasant quadrangle within the Ozark Plateaus

Introduction

This map illustrates the surface geology of the Mount Pleasant quadrangle. This quadrangle was previously mapped by Earnest E. Glick in 1973 and was the subject of two master's theses at the University of Arkansas by Daniel D. Doss and March E. Smith Jr. in 1976. Doss mapped the southern portion of the quadrangle and wrote a history of the limestone quarrying in the area. Smith mapped the geology of the northern half of the quadrangle and documented the history of the silica sand operation at Guion, Arkansas.

Approximately 700 feet (213 meters) of Middle Ordovician to Lower Mississippian strata are exposed in this quadrangle. The area is mostly covered by Middle to Upper Ordovician sandstone and limestone. Silurian limestone and Devonian Penters Chert are only present in the southern portion of the quadrangle. The Lower Mississippian Boone Formation crops out in the higher elevations in the southwestern portions of the quadrangle. A thick regolith of the Boone has formed along faults and at other locations throughout the quadrangle.

Normal faulting locally offsets strata throughout the quadrangle. The majority of faults are located along deformation band clusters and ridges within the St. Peter Sandstone. The St. Peter Sandstone locally exhibits steeply dipping beds due to it's undulatory nature.

Quaternary terrace and alluvium deposits are present along the White River and East and West Lafferty Creeks. Both a medial and younger terrace level developed along the White River. Older terraces are located on Stewart Hill in the southeastern part of the quadrangle.

This area was heavily prospected for manganese in the late 1800's through the 1950's (Miser, 1922 and Stroud et al, 1981). Most mining was concentrated within the upper part of the Fernvale and the overlying Cason Formation. Other units that were mined for manganese included the Penters Chert, Lafferty Limestone, and the top of the Plattin Limestone. Upper Ordovician limestone, in the southeastern portion of the quadrangle, was quarried for high calcium limestone, crushed stone, and building stone.

Description of Map Units

Alluvium and terrace deposits (Quaternary) - unconsolidated clay, silt, sand and gravel including deposits on one or more terrace levels along East and West Lafferty Creeks.

Young terrace and active channel deposits (Quaternary) unconsolidated clay, silt, sand, and gravel in gravel bars and sandy point bar deposits along the White River. Primarily clay, silt, and sand in youngest terrace above the river. The tops of terraces are generally flat but can be hummocky and dissected by tributaries. Approximately 20-30 feet (6-9 meters) thick.

Medial terrace and alluvial deposits (Quaternary) - unconsolidated clay, silt, and sand in a higher terrace along the White River. It is approximately 30 feet (9 meters) above the river and ranges in thickness from 20-40 feet (6-12 meters).

Symbols

- Contact
- A — A' Line of cross-section
- Normal fault - ball and bar on downthrown side. Arrow shows dip direction and degree of fault plane. Dashed where inferred. Dotted where concealed.
- Monocline
- Anticline
- Inclined bedding showing strike and dip
- Mine, pit, or quarry
- Prospect pit or small open cut
- Mine shaft

Terrace deposits (Paleogene?) - consists of unconsolidated, coarse sand- to cobble-sized angular to rounded chert and sparse sandstone stranded on hilltops 200-300 feet above nearby drainages (60-91 meters). Historically these deposits assigned to the Tertiary (Glick 1973). Ranges from a veneer to approximately 80 feet (24 meters) thick.

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 section to dark gray or blue gray in the lower section of the unit. Springs, caves, and sinkholes are common. A thick regolith of angular chert fragments in a red clay matrix is locally present thoughout the quadrangle. Unconformable with the underlying Penters Chert or Lafferty Limestone. Ranges from 60-280 feet (18-85 meters) thick.

St. Joe Limestone Member (Kinderhookian) - consists of thin-bedded reddish to gray crinoidal limestone. Locally contains white crinoid fragments in a red, fine-grained matrix. The St. Joe Limestone was seen at only two localities in the quadrangle. Manganese within the limestone was been mined at one locality. Ranges from 0-5 feet (0-1.5 meters) thick.

The following units are combined because they are too thin to map as separate units at this scale. The Cason Formation is mapped separately where present on hilltops.

Penters Chert (Lower to Middle Devonian) - gray to red, orange, and white mottled chert, commonly brecciated, that is medium to massively bedded and highly fractured. Contains manganese oxide coatings. Locally, clean white sandstone is preserved as masses above or in place of the chert. The sandstone is silica-cemented and contains chert fragments. Residual boulders of Penters Chert are preserved on the tops of hills in the southern portion of the quadrangle. This unit was mined throughout the quadrangle for manganese. Unconformable with the underlying Lafferty Limestone. 0 - approximately 20 feet (6 meters) thick.

Lafferty Limestone (Silurian, Ludlow to Wenlock) - sparsely fossiliferous, finely crystalline limestone. Commonly medium gray with red crinoidal fragments on fresh surfaces and weathers light gray. Locally contains light red finely crystalline limestone. Thin to thick bedded with stylolites along bedding planes. Contains manganese dendrites and nodules, as well as green clay and pyrite. This limestone was mined for manganese in the Hankins Hollow area. Conformable with the underlying St. Clair Limestone. 0- approximately 20 feet (6 meters) thick.

St. Clair Limestone (Silurian, Wenlock) - coarse-grained fossiliferous limestone. Contains abundant trilobite fragments, and green clay, locally. Light gray to white on fresh surfaces but weathers medium gray. Unconformable with the underlying Cason Formation. 0 - approximately 20 feet (6 meters) thick in the southwestern portion of the quadrangle.

Cason Formation (Upper Ordovician) - reddish brown to black siltstone that is thin to medium bedded and interbedded with silty shale. The siltstone contains white chert fragments, bone fragments, and locally flattened buttons. Green shale and red siltstone are present locally. This unit was mined extensively for manganese. Unconformable with the underlying Fernvale Limestone. 0 - approximately 10 feet (3 meters) thick.

Fernvale Limestone (Upper-Middle Ordovician) - medium to coarsely crystalline limestone. Medium to thick or massive bedded. Light-pink to reddish on fresh surfaces, but weathers dark gray to brown. Contains 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 portion of the limestone. Unconformable with the underlying Kimmswick Limestone. Ranges from 0-30 feet (0-9 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 fossilized red algae formerly known as *Tetradium* (Steel-Petrovich, 2011). Unconformable with the underlying Plattin Limestone. Approximately 20 feet (6 meters) thick where present.

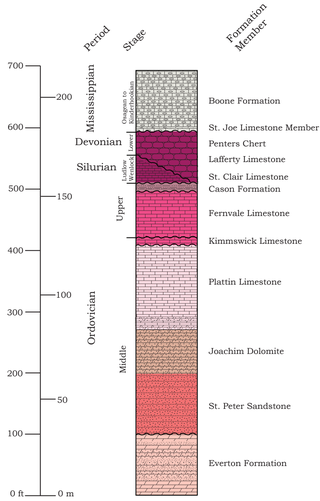
Plattin Limestone (Middle Ordovician) - very thin- to medium-bedded micritic to finely crystalline limestone. Light to medium gray on fresh surfaces, but weathers white to light gray and is locally mottled. Contains gastropods, bryozoans, and horizontal trace fossils. Very thin shale layers are present in the top of the unit. Interbedded dolostone is present in the lower portion making it difficult to locate the lower contact. Limestone glades, containing abundant solutionally enlarged joints, are present thoughout the outcrop area. Sinkholes and springs are abundant. Conformable with the underlying Joachim Dolomite. Approximately 100-200 feet (30- 60 meters) thick.

Joachim Dolomite (Middle Ordovician) - finely 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 veins, calcite blebs, 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.

St. Peter Sandstone (Middle Ordovician) - fine-grained, thin- to massive- cross-bedded sandstone. Quartz grains are sub-angular to sub-rounded. White to light gray on fresh surfaces, but weathers light brown. Commonly case hardened or silica cemented near faults otherwise friable when broken. Balds or glades, and sinkhoes are common. Ridges of deformation bands are prominent along faults. This sandstone was mined near the town of Mount Pleasant. Pillars of sandstone rise above the surrounding terrain in the area called Standing Rocks in the northwest portion of the quadrangle. Unconformable with the underlying Everton Formation. Ranges from 80-220 feet (24-67 meters) thick.

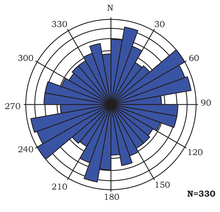
Everton Formation (Middle Ordovician) - consists primarily of interbedded dolostone, sandy dolostone, and sandstone. Dolostone is thin to medium bedded and finely to coarsely crystalline. It is medium gray on fresh surfaces, but weathers light gray and contains mud cracks. Locally petroliferous, contains calcite blebs, and is mottled. Sandstone is very thin to medium bedded and locally silica cemented. Quartz grains are fine to coarse and sub-rounded to well-rounded. Approximately 60-380 feet (18-116 meters) exposed on this quadrangle.

Stratigraphic Column



Topographic map of the Mount Pleasant quadrangle showing locations of data collection points.

Joint Frequency



Rose diagram of strike frequency of joints recorded within the Mount Pleasant quadrangle.

References

Doss, D.L., 1976, Geology of the southern half of the Mt. Pleasant quadrangle, Izard and Independence Counties, Arkansas, with special emphasis on the high-calcium limestones: University of Arkansas Master's Thesis, 32 p.

Glick, E.E., 1973, Geologic map of the Mount Pleasant quadrangle: Arkansas Geological Survey Geologic Worksheet, 1:24,000.

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

Smith, M.E., 1976, Geology of the northern half of the Mt. Pleasant quadrangle, Arkansas, with emphasis on the economic aspects of the St. Peter Sandstone: University of Arkansas Master's Thesis, 88 p.

Stroud, R.B., Kinew, 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.

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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 work continues and new information is collected, the contacts, structures, and other features depicted on this map may be changed.

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Map digitized by Jerry Clark.