St. Peter Sandstone (Middle Ordovician) - fine- to medium-

grained, angular to rounded, well-sorted, calcite-cemented sand-

stone that generally displays a sugary texture. Interstitial calcite

commonly exhibits a poikilotopic texture in freshly broken

samples. Where the calcite has leached out, the sandstone is

friable when broken. Locally dolomitic towards the top especially

on Brush Creek near Buffalo River. White or light green to light

tan on fresh surfaces, but weathers dark tan or gray. Thick- to

very thick-bedded and locally cross-bedded, this massive sand-

stone typically crops out as a distinctive, smooth, concavely or

convexly rounded bluff. Outcrops and especially loose boulders

commonly contain Scolithos (Adams et al., 1904) trace fossils

that weather to form tubes of more resistant sandstone perpen-

dicular to bedding resembling tightly-packed icicles. Tight sand-

stone that acts as a confining unit for groundwater. Therefore,

many springs and seeps along its upper contact. Travertine is locally precipitated by these springs. Unconformable with the

Everton Formation, and typically displays a distinctive undulat-

ing contact Averages approximately 15-30 feet (5-9 meters)

thick, but locally as much as approximately 60 feet (18 meters)

Everton Formation (Middle Ordovician) - very fine- to fine-

grained, thin- to very thick-bedded, sandy to limy dolostone.

Medium to dark gray on fresh surfaces, but usually weathers

light-gray. Thin to medium beds of fine- to medium-grained

quartz sandstone, similar to the overlying St. Peter Sandstone,

are present in the upper section. The dolostone is typically

mottled or banded, and locally contains stromatolites, mud-

cracks or rarely, grains of glauconite. Freshly broken pieces yield

a strong petroliferous odor. Crops out only along the northern edge of the map, therefore a maximum of approximately 100 feet

Stratigraphic Column

Witts Springs Formation

Cane Hill Member

Hale Formation

Imo interval

Pitkin Limestone

Fayetteville Shale

Batesville Sandstone

Boone Formation

Plattin Limestone

Everton Formation

t. Peter Sandstone

Moorefield Formation

Silurian (undifferentiated)

(30 meters) is exposed.

1300---

1200 —

1100---

1000—

800—

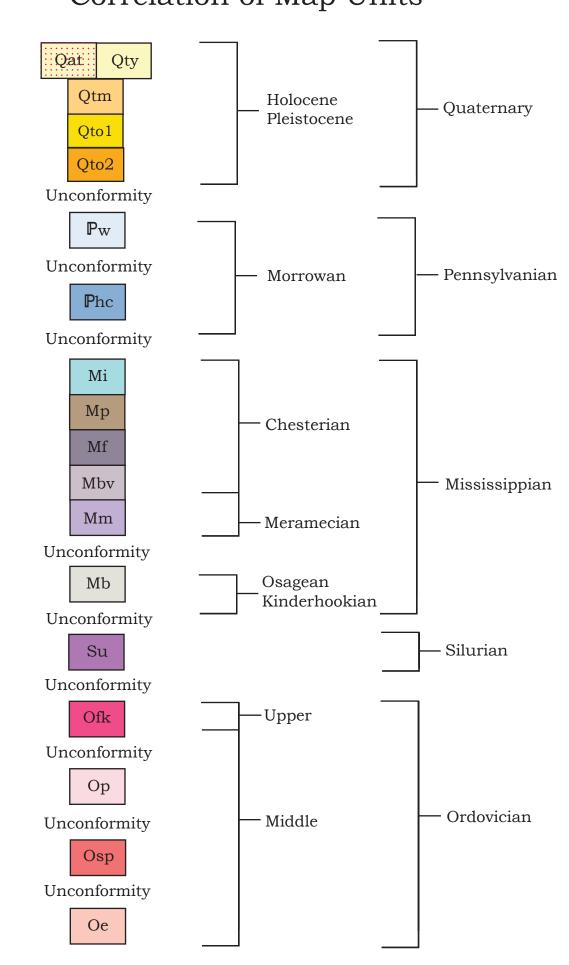
700 —

600---

Geologic Map of the Marshall Quadrangle, Searcy County, Arkansas



Correlation of Map Units



Introduction

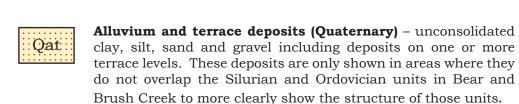
This map graphically summarizes the bedrock geology of the Marshall 7.5-minute quadrangle. In this area over 1,200 feet (366 meters) of Middle Ordovician to Lower Pennsylvanian carbonate and clastic sedimentary rocks are exposed. Bedrock is typically overlain by a veneer of unconsolidated residuum, colluvium or alluvium. The mapped area lies mostly on the Springfield Plateau, but includes the northern edge of the Boston Mountains Plateau. The Boston Mountains Plateau, formed on Early Pennsylvanian rocks, is the highest plateau surface of the Ozark Dome, a structural high centered in southeastern Missouri that affects all the bedrock in northern Arkansas. This plateau has a very distinct escarpment which can be viewed from the Highway 65 road-cut just south of Marshall. West of Marshall, the Springfield Plateau surface can be seen spreading out to the horizon and deeply incised by steep-sided drainages. It is formed on the Boone Formation 600 to 700 feet (183 to 213 meters) below the Boston Mountains Plateau.

Two of the larger drainages in this area are Bear Creek and Brush Creek, which flow north and into the Buffalo River which cuts across the northwestern corner of the quadrangle. Alluvial and terrace deposits along these two drainages are only shown in areas where they do not overlap the Ordovician through Silurian section on the northern half of the map to better show the detail of these hummocky units. Recent discoveries of old and very old terrace deposits about a mile north of the current channel of the Buffalo River near Gilbert, indicate that an ancient meander bend cutoff may have existed there. An event of this type would have resulted in a period of rapid downcutting stranding additional terraces.

The area within the thick, brown line is part of the Buffalo National River which is administered by the National Park Service. The lowest elevation on the Marshall quadrangle is on the Buffalo River at the northern edge of the map. Bryan Mountain on the southwestern corner is the highest point.

The geology of the northwestern corner of this area was mapped in 1953 by Maher and Lantz. The entire quadrangle was mapped at the 1:24,000-scale in 1965 by Clardy and Woodward and in 1973 by Glick for the 1:500,000-scale Geologic Map of Arkansas. The current map builds on the previous work using revised stratigraphy and adding structural details. The contacts and structural features on the map were derived from field observations made at numerous sites from July 2007 through April 2008. Additional data were collected in 2014-15 to delineate terraces along the Buffalo River. Data collection sites were located with the aid of a global positioning satellite receiver. Bedrock dipping at less than 2° is depicted as horizontal.

Description of Map Units



Young terrace and active channel deposits (Quaternary) unconsolidated clay, silt, sand, and gravel in gravel bars and point bar deposits along the Buffalo River. Primarily clay, silt and sand in youngest terrace above the river. The tops of terraces are generally hummocky and tree-covered but also common are flat tops dissected by tributaries. Approximately 20-30 ft. (6-9 m) thick.

Medial terrace and alluvial deposits (Quaternary)unconsolidated clay, silt, sand, gravel, and cobbles along the Buffalo River. The contact with the underlying young terrace is located at the base of a riser that is approximately 15-20 ft. (4-6 m) high and usually coincides with the edge of the riparian zone along the river. This terrace is located approximately 40 ft. (12 m) above the river and ranges in thickness from 20-60 ft. (6-18

terrace and alluvial deposits (Quaternary) unconsolidated gravel deposits on ridges above the Buffalo River. Consists of coarse sand to cobble-sized sub-angular to rounded chert and sandstone. Base is located approximately 80-100 ft. (24-30 m) above the river and ranges up to 160 ft. (48

m). Thickness unknown.

Very old terrace and alluvial deposits (Quaternary) unconsolidated gravel deposits on ridges above the Buffalo River. Consists of coarse sand to cobble-sized sub-angular to rounded sandstone and chert. Base is located approximately 200 ft. (60 m) above the river. Thickness unknown.

Witts Springs Formation (Lower Pennsylvanian, Morrowan) equivalent to the Prairie Grove Member of the Hale Formation and the lower part of the Bloyd Formation (Braden et al., 2003). Only the basal sandstone is present at the top of Bryan Mountain. There, it is thick- to very thick-bedded, massive-bedded, fine- to medium-grained, subangular, poorly-sorted, calcareous sandstone. Weathering has produced a blocky to concave appearance, honeycomb weathering, and a dark gray to medium brown color. Commonly contains liesegang banding. Fresh surfaces are gray to gray-brown, although locally decalcification makes them dark-brown and friable. There is a cross-bedded zone on the south side of the mountain where the sandstone is coarse-grained and contains brachiopod detritus and dark-red, flattened and rounded shale pebbles. Unconformable with the Cane Hill Member, and reaches a maximum thickness of approximately 100 feet (30 meters).

Hale Formation (Lower Pennsylvanian, Morrowan) – consists of two members: the Prairie Grove and the Cane Hill. Only the Cane Hill Member is present on this quadrangle. **Cane Hill Member** – typically a fissile silty to clay shale that contains iron nodules and limonitic boxwork fragments. Color varies from dark gray to black on fresh surfaces, and from light gray to light orange-brown on weathered surfaces. Unconformable with the Pitkin and reaches a thickness of approximately 160 feet (48 meters) on this quadrangle.

Imo interval (Upper Mississippian, Chesterian) - consists of several shale units with intervening sandstone units. Present near the top of Bryan and South Mountain is a persistent, fineto medium-grained, thin- to massive- and locally cross-bedded sandstone. Fresh surfaces are buff to tan and locally mottled or banded with dark red iron blebs. Weathered surfaces are dark orangey-brown to gray, and blocky. Commonly exhibits pronounced stylolites, liesegang banding, and honeycomb weathering. This unit is approximately 15 feet (5 meters) thick. Shaly units above this sandstone are covered with vegetation. Conformable with the Pitkin. Ranges from approximately 80-100 feet (24-30 meters) in thickness.

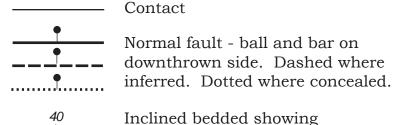
Pitkin Limestone (Upper Mississippian, Chesterian) - thin- to very thick-, massive-bedded, fine- to coarse-grained, locally oolitic bioclastic limestone. Contains abundant fossils including crinoid fragments, the bryozoan Archimedes, corals, nautiloids, brachiopods, gastropods, and trilobites. Fresh surfaces are light to dark gray, and weather light to medium gray. Grades to a tan color near the upper contact due to an increase in silt content. Commonly yields a petroliferous odor when freshly broken. Conformable with the Fayetteville Shale. Ranges from approximately 160-260 feet (49-79 meters) in thickness.

Fayetteville Shale (Upper Mississippian, Chesterian) – is comprised of a black, fissile clay shale which is increasingly dominated by thin- to medium-bedded, gray to black, micritic to finely crystalline limestone in its upper part. As the conformable contact with the overlying Pitkin Limestone is reached, the shale forms only very thin partings between the beds of micritic limestone. This upper section typically contains septarian concretions, and near the upper contact, nodular or discontinuous, thin-bedded black chert. The micritic beds typically yield a petroliferous odor when broken, and are sparsely fossiliferous. The upper Fayetteville Shale forms resistant and sometimes steep ledges where protected by the massive Pitkin above. The lower shaly unit forms a gentle slope above the relatively resistant, flat-lying beds of Batesville Sandstone. Limonitic, calcareous siltstone beds and concretions are locally present near the base of the shale. Ranges from approximately 180-270 feet (55-82 meters) in thickness and is unconformable with the Batesville

Batesville Sandstone (Upper Mississippian, Chesterian) very fine- to medium-grained, subangular, moderately-sorted, iron-cemented, calcareous sandstone. It is thin- to mediumbedded and often cross-bedded. Fresh surfaces are dark gray to dark brown and weather light red-brown to buff. It is rarely fossiliferous, but commonly contains the molds where fossils have weathered out. It is widely quarried as a dimension stone, and its plateau-like upper surface is much favored for homesites. Conformable with the Moorefield Formation. Its thickness ranges from approximately 20-90 feet (6-24 meters), though it typically measures between 40 and 60 feet (12 and 18 meters). Hindsville Limestone Member (Upper Mississippian, Chesterian) - discontinuous, thin- to medium-bedded, fine- to coarsely- crystalline limestone. It is light to dark gray on fresh surfaces, but weathers gray to brown. Typically yields a petroliferous odor when freshly broken. It is sporadically fossiliferous, oolitic, and interbedded with very thin- to thin-bedded clay shale, siltstone, or sandy siltstone. On Forest Creek, large-scale ripple-beds are present that measure 2-3 feet (0.6-0.9 meter) trough to trough. At most, only approximately 15 feet (4 meters) of the Hindsville is exposed on this quadrangle, so it is mapped with the Batesville Sandstone. Conformable with the Moorefield

Moorefield Formation (Middle Mississippian, Meramecian) silty shale with interbedded very thin- to thin-bedded siltstone. The shaly zones are usually dark gray to black on fresh surfaces, but weather medium gray with a yellow tint. The siltstone is dark gray to dark brown on fresh surfaces, but weathers light gray to buff. Develops a gentle slope between the plateau-like surface of the Batesville Formation above and the Springfield Plateau (Boone Formation) below. Unconformable with the Boone, and typically ranges from 20-50 feet (6-15 meters) in thickness.

Symbols



strike and dip Abandoned mine or quarry

Gravel pit

Joint Frequency

Rose diagram of strike frequency of joints

Boone Limestone (Middle-Lower Mississippian, Osagean and **Kinderhookian)** – fine- to coarse-grained, crystalline to coarsegrained fossiliferous limestone interbedded with anastomosing or discontinuous, thin-bedded chert. The limestone is light- to medium-gray on fresh surfaces, but weathers light to dark gray and locally contains crinoid columnals or brachiopod fossils. The chert is white to dark gray and rarely red on fresh surfaces, but typically weathers buff to white and tripolitic. In the northeastern quadrant, locally contains dendritic manganese at the base. A regolith composed of red-brown residual clay and angular chert gravel covers nearly the entire surface of the Boone and the formations below it. Karst features including springs, sinkholes and small caves are common. Bedding broadly undulates due to settling into the paleokarst features of older units. The topography of the Boone features steep, relatively flat-topped ridges that are incised by ravine-like drainages. The tops of these ridges form the surface of the Springfield Plateau. Unconformable with the underlying formations, and ranges from 250-320 feet (76-98 meters) in thickness. St. Joe Limestone Member (Middle-Lower Mississippian,

Osagean and Kinderhookian) - thin- to medium-bedded, fineto coarse-grained, crinoidal limestone. Lithology can vary considerably between a coarse-grained, light pink to light gray, crystalline limestone and a fine-grained, light green, shaly limestone with included white or pink crinoid fragments. It ususally weathers light to dark gray. Locally, it contains pyrite in the form of single crystals, clusters or rusty blebs where weathered. Manganese-rich zones exhibit dark gray colors on fresh surfaces and are typically fine-grained and shaly. Normally ranges from 2-8 feet (0.6-2.4 meters) in thickness, but can be as much as 20 feet (6 meters) thick along the northern edge of the map.

Silurian (undifferentiated) – though present in more places than designated, these limestones are only considered mappable where their combined thickness is greater than 20 feet (6 meters). Individual formations are even less likely to form mappable units, and are therefore combined. The Silurian units crop out along the Buffalo River and its major drainages, and typically form broad domes and troughs with the Ordovician below. They are unconformable with these older units and range from 0-60 feet (0–18 meters) in thickness. **Lafferty Limestone** – medium- to thick-bedded, stylolitic, finely

crystalline, sparsely fossiliferous limestone. On fresh surfaces, color ranges from light to medium-gray with light- to dark-pink blebs throughout. Weathers medium- to dark- gray and rounded to blocky. Contains minor inclusions of pyrite crystals which weather to rusty blebs. Typical fossils include crinoids, brachiopods, and bryzoans. **St. Clair Limestone** – thick-bedded, coarsely crystalline, fossiliferous limestone. Its color ranges from light gray to light pinktains pyrite clusters, especially along stylolitic boundaries. Com-

monly contains veins of white to clear, coarsely crystalline calcite. Typical fossils include brachiopods, ostracods, trilobites, crinoids, corals, and gastropods. Brassfield Limestone - thick- to massive-bedded, coarsely to very coarsely crystalline, sparsely fossiliferous limestone. Color ranges from light-gray to light- to dark-pink on fresh surfaces, but weathers light- to medium-gray or tan to brown. Outcrops weather rounded along the streams, but blocky on the hillsides. Generally contains vugs up to 3 inches (7.6 centimeters) across that are filled with very coarsely crystalline calcite, or less commonly, with calcite and a buff-colored silt or clay. Locally,

Cason Shale (Upper Ordovician) - rarely exposed and of abbreviated thickness, therefore mapped with the Fernvale Limestone. Composed of silty to clay shale that is light blue-green on fresh surfaces, but weathers medium green-gray. Locally, contains dark brown to black, irregularly rounded phosphate pebbles, especially near the top. In locations where these pebbles have weathered out, they may provide the only trace of the Cason Shale in that particular outcrop. A dark gray, fine-grained, nodular limestone with sparse, fine-grained pyrite and glauconite inclusions is exposed at the top of the Cason just beneath the Silurian bluff at Grinder's Ferry on the Buffalo River. Ranges from a few inches to approximately 10 feet (3 meters) thick near

contains veins of coarsely crystalline calcite as well. Typical

fossils include crinoids, cephalopods, bryozoans, and brachio-

Gilbert, and is unconformable with the older units. Fernvale Limestone (Upper Ordovician) – medium- to coarsegrained crystalline, sparsely fossiliferous limestone. On fresh surfaces, is white to light-gray with light- to dark-pink tint or pink mottling. Weathers light to dark gray. The medium- to very thick-bedding is usually massive, and can be locally crossbedded. Weathered exposures are rounded, moss-covered masses that are typically friable. Locally, contains barrel-shaped crinoid columnals, nautiloids, and brachiopods that are typically revealed on weathered surfaces. Normally 10-20 feet (3-6 meters) thick, but can be as much as 40 feet (12 meters) thick. Unconformable with older units.

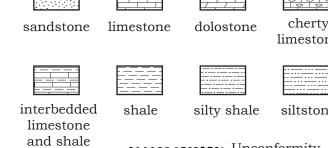
Kimmswick Limestone (Middle Ordovician) - fine- to medium-grained, crystalline, sparsely fossiliferous limestone. Light-gray on fresh surfaces. Weathers light to dark gray. Only a few feet thick and exposed in only a few places, therefore it is mapped with the Fernvale Limestone. Unconformable with the Plattin Limestone.

Plattin Limestone (Middle Ordovician) – thin to thick-bedded, Op micritic limestone that is locally fine-grained. Very dense and typically breaks with conchoidal fracture. Light beige-gray to dark gray on fresh surfaces, and weathers white to medium-gray. Locally contains interbedded calcareous shale up to a foot (0.3 meter) thick. Resistant enough to form a persistent blocky ledge. Springs and seeps commonly emerge at or near the contact with the St. Peter Sandstone below. Unconformable with the St. Peter Sandstone. Ranges from approximately 60-150 feet (18-46 meters) in thickness.

Topographic map of the Marshall quadrangle showing location

of data collection points.

100 —



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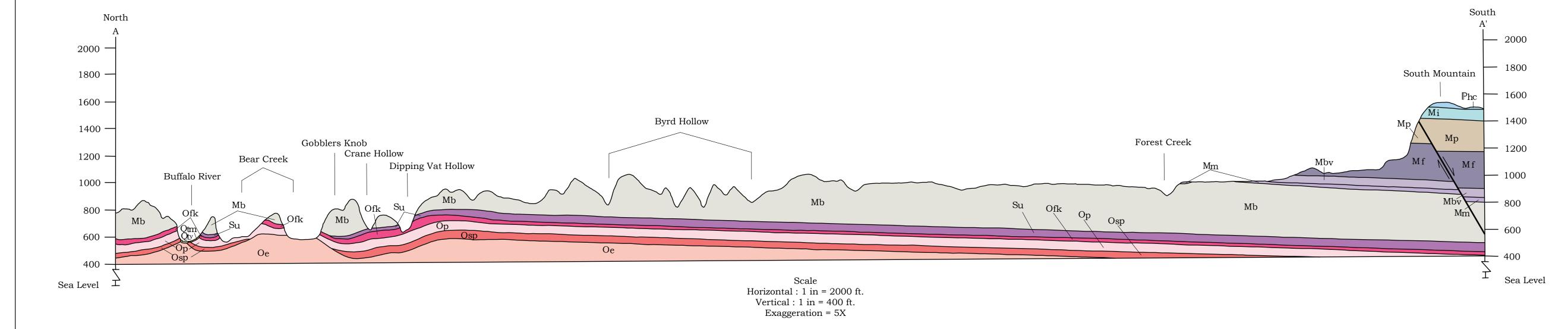
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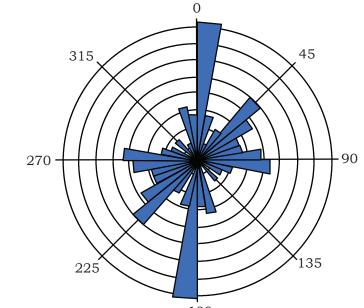
Limitations: This map, like all geologic maps, is based on interpretations which were made from the data available at the time it was created. As work continues and new data is collected, the contacts and structures depicted on this map may be changed.

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declination 2015



recorded in the Marshall quadrangle.