

# Geologic Map of the Durham Quadrangle, Madison and Washington Counties, Arkansas

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

## Description of Map Units

Young terrace and active channel deposits (Quaternary) unconsolidated clay, silt, sand, gravel, cobbles, and boulders in gravel bars and sandy point bar deposits along the White River including the youngest terrace deposits up to 40 feet (12 meters) above the active river channel.

Landslide deposits (Quaternary) - unsorted, unconsolidated rock and debris material typically resulting from failure of oversteepened slopes of interbedded sandstone and shale units. **Medial terrace deposits (Quaternary)** - unconsolidated clay, silt, sand, gravel, and cobbles deposited 40 to 60 feet (12 to 18

meters) above the active White River channel. Old terrace deposits (Quaternary) - unconsolidated clay, silt, sand, gravel, and, cobbles deposited on ridges 80 to 100 feet (24 to 30 meters) above the active White River channel.

Atoka Formation (Middle Pennsylvanian, Atokan) - consists of interbedded shale, siltstone, and sandstone. Shale is gray to black or tan and contains very thin to thin bedded, flaserbedded, micaceous siltstone and silty sandstone. Sandstone is tan, brown or buff in color, thin to thick bedded, very fine to fine-grained and contains shale partings, liesegang banding, horizontal and vertical trace fossils, plant fossil molds, and cross-bedding. Sandstone locally contains beds of clay-pebble conglomerate with external molds of fossils, primarily crinoids. Calcareous sandstone units are present locally but are rare. The Atoka is unconformable with the underlying Bloyd Formation. Thickness is up to 600 feet (183 meters). Greenland Sandstone - thick- to medium-bedded, very fineto medium-grained brown sandstone, locally containing rounded quartz granules and pebbles, liesegang banding, and

cross-bedding. Weathers to dark brown or orange and commonly becomes friable. This is the first laterally persistent, thick, bluff-forming sandstone above the Trace Creek Shale. Thickness ranges from 10 to 25 feet (3 to 8 meters). Trace Creek Shale - dark gray to black shale interbedded with very thin- to thin-bedded argillaceous siltstone, silty sandstone, claystone, and smectitic clay. This is the basal member of the Atoka Formation. The trace fossil Conostichus is

Bloyd Formation (Lower Pennsylvanian, Morrowan) composed of shale, sandstone, and limestone. It is represented within the quadrangle from youngest to oldest by the Kessler Limestone, Dye Shale, Parthenon sandstone, and Brentwood Limestone Members. The informally named Parthenon sandstone occupies the stratigraphic position between the Brentwood Limestone and Dye Shale Members, whereas the Woolsey Shale is present at this interval in the type section to the west at Bloyd Mountain in Washington County. The Parthenon sandstone is typically a bluff forming unit but, in upper Shumate Creek and upper Hannah Branch, the Parthenon sandstone was not observed. In upper Shumat Creek, black shale is present at this interval, possibly the Woolsey Shale. The Bloyd Formation is conformable with the underlying Hale Formation. Thickness ranges from 160 to 200 feet (48 to 61 meters).

Kessler Limestone - a sandy fossiliferous limestone, commonly oncolitic, containing crinoids, tabulate and rugose corals, brachiopods, trilobites, and bryozoans. The Kessler Limestone commonly exhibits cross-bedding in sandy intervals and locally contains coal fragments, phosphate pebbles and conglomeratic beds. The thickness of the Kessler ranges from 5 to 15 feet (1 to 5 meters). Dye Shale - composed of gray to black shale that locally contains ironstone concretions and interbedded, thin to

medium bedded sandstone and siltstone. Thickness ranges from 120 to 160 feet (36 to 43 meters). Parthenon sandstone - thin- to massive-bedded, brown to tan, very fine- to coarse-grained micaceous sandstone. Commonly contains white quartz granules or pebbles and commonly exhibits tabular cross-bedding. Shale pebbles,

overturned cross-beds, a 3 to 4 foot (0.9 to 1.2 meters) basal conglomerate, and calcareous beds near the base, are present locally. The Parthenon sandstone is unconformable with the underlying Brentwood Limestone Member. Thickness ranges from 20 to 30 feet (6 to 9 meters). Brentwood Limestone - light- to dark-gray fossiliferous sandy limestone with interbedded dark gray to black shale. Limestone contains phosphate pebbles and abundant invertebrate fossils including crinoids, tabulate and rugose

corals, brachiopods, bryozoans, and blastoids. Thin siltstone beds are locally present within shale sections. Limestone weathers light gray to white. Locally, a 2 to 4 foot (0.6 to 1.2 meter) thick argillaceous conglomerate is present, approximately 20 feet (6 meters) below the upper contact and contains abundant fossil detritus and phosphate cobbles. In some locations, the Brentwood exhibits mounded features at the upper contact. The Brentwood is conformable with the underlying Prairie Grove Member of the Hale Formation. Thickness ranges from 30 to 40 feet (9 to 12 meters).

Hale Formation (Lower Pennsylvanian, Morrowan) interbedded sequence of sandstone, siltstone, shale, and limestone. The Hale Formation is the basal Pennsylvanian unit of northern Arkansas and consists of two members: the Prairie Grove and the Cane Hill. The lower contact is unconformable with the underlying Pitkin Formation. Thickness ranges from 120 to 180 feet (36 to 55 meters).

Prairie Grove - thin to massive-bedded, commonly crossbedded, light-gray to dark-brown, very fine- to medium-grained, limy sandstone or sandy limestone with lenses of relatively pure fossiliferous and/or oolitic limestone. Fossils include crinoids, brachiopods, gastropods, tabulate and rugose corals, ammonoids, and trilobites. Herringbone cross-stratification is present locally. Honeycomb weathering is common. Thickness ranges from 40 to 80 feet (12 to 24 meters). **Cane Hill** - interbedded, dark-gray silty shale, siltstone, and

thin- to thick-bedded, tan to gray, very fine- to fine-grained micaceous sandstone. Some sandstone beds are locally calcareous. Flaser bedding and rippled beds are common. Locally, there is a 10 to 15 foot (3 to 5 meter) thick unit containing ball-and-pillow structures ranging in diameter from 2 inches to 6 feet (5 centimeters to 2 meters) with olistoliths of ripple-bedded sandstone up to 15 feet (5 meters) long surrounded by laminated gray mudstone. The lower contact with the Pitkin Limestone is unconformable and marks the Mississippian-Pennsylvanian boundary in northern Arkansas. Locally contains a 2 to 3 foot (0.6 to 0.9 meter) thick basal conglomerate composed of black phosphate pebbles, gray to black limestone pebbles, oolitic limestone and oolitic phosphate pebbles, and crinoid fragments. Thickness ranges from 80 to 120 feet (24 to 37 meters).

Pitkin Limestone (Upper Mississippian, Chesterian) - lightto dark-gray, micritic to coarsely crystalline fossiliferous thin- to thick-bedded limestone. Sequences of thin micritic beds with interbedded black shale occur in the lower part of the unit. Locally contains caliche horizons at the upper contact. Fossils are abundant and include bryozoans, crinoids, brachiopods, corals, gastropods, blastoids, and ammonoids. The lacy bryozoan Archimedes is used as an index fossil to mark the Mississippian-Pennsylvanian boundary in northern Arkansas. The basal contact is conformable and gradational. Thickness ranges from 20 to 60 feet (6 to 18 meters).

Fayetteville Shale (Mississippian, Chesterian) - a black concretionary shale. Dark gray fine-grained limestones are locally interbedded. Siderite concretions are common in lower beds but are found throughout the formation. Fossils are locally abundant. **Upper Fayetteville shale** - composed of black shale with an increasing abundance up section of interbedded, black to dark-

gray, thin-bedded micritic limestone. Usually emits a petroliferous odor when freshly broken. Thickness ranges from 100 to 140 feet (30 to 43 meters). Wedington Sandstone - light gray to brown, very finegrained, thin- to thick-bedded, micaceous cross-bedded

sandstone. Sandstone channel casts formed by cutting and filling of underlying shale are present. Pyrite nodules are found locally. Thickness ranges from 4 to 20 feet (1 to 6 meters). Lower Fayetteville shale - black shale containing abundant concretions. Iron-rich septarian concretions, commonly containing black scalenohedral calcite veins, are as large as 15 feet across. Ammonoids and nautiloids are present locally. Some fossil localities contain pyritized specimens. Locally, contains thin horizons of fossiliferous limestone with brachiopods and bryozoans such as Archimedes. Thickness ranges from 120 to 160 feet (36 to 49 meters). Hindsville *Limestone* is a member of the Batesville Sandstone and crops out in the center of Sec. 7, T 15N, R 28W, along the White River. It is a gray fossiliferous limestone with abundant crinoid detritus. The Hindsville is unconformable with the underlying Boone Formation. The basal bed contains angular white fossiliferous chert clasts derived from the Boone. Thickness

Boone Formation (Mississippian, Osagean) – light- to medium-gray, micritic to sparry, fossiliferous limestone with interbedded chert. The chert is light gray to white and commonly contains fossil molds. Crinoids, bryozoans, brachiopods, bivalves, shark teeth, and trilobites are present and are most often preserved as molds or casts. Approximately 30 feet (9 meters) of the upper Boone Formation is exposed within the quadrangle.





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