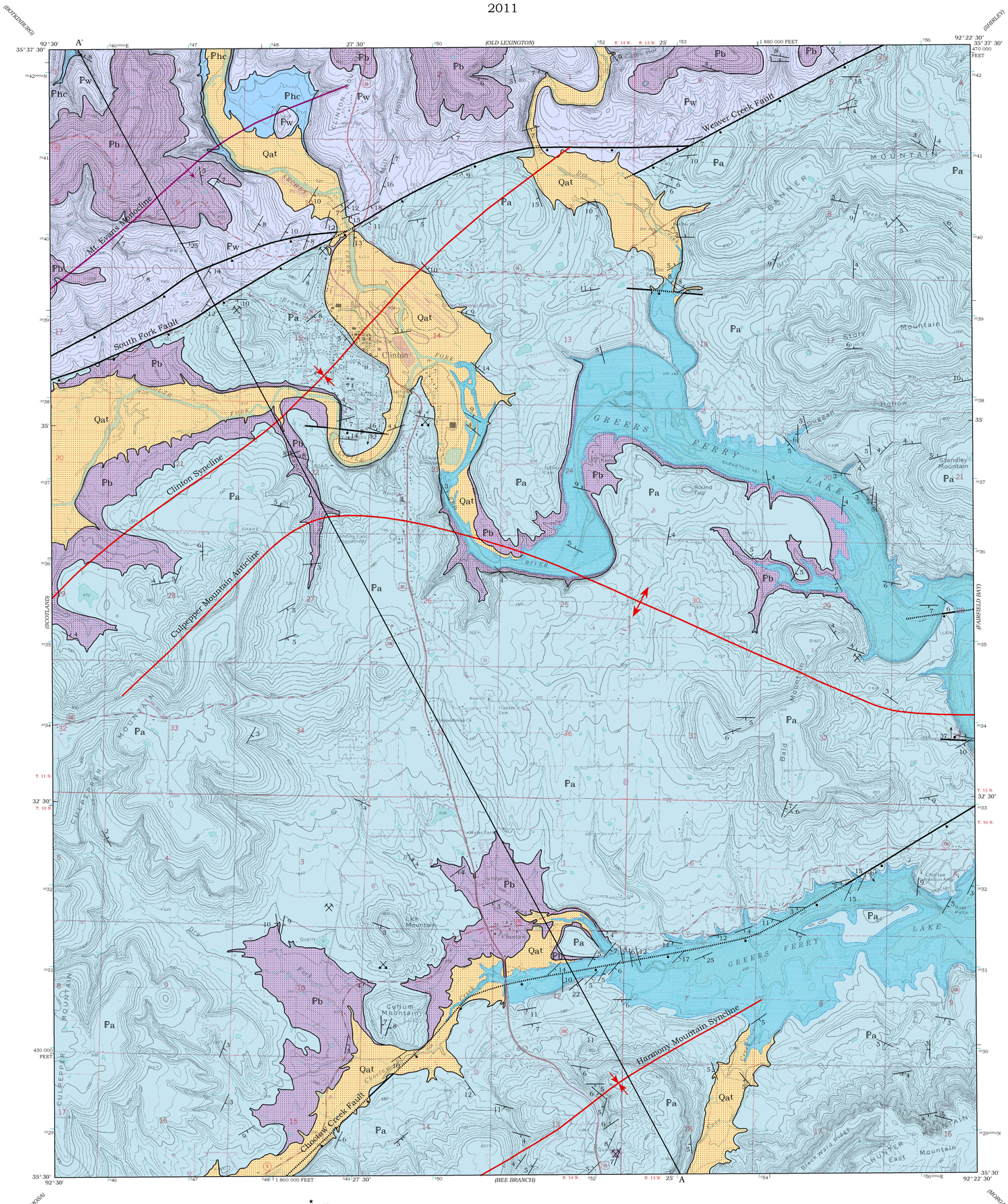
Arkansas Geological Survey
Bekki White, State Geologist and Director

Digital Geologic Quadrangle Map
Clinton Quadrangle
DGM-AR-00163

Geologic Map of the Clinton Quadrangle, Van Buren County, Arkansas

Richard S. Hutto and Daniel S. Rains

2011



The topographic base is a Digital Raster Graphic (DRG). The DRG is a scanned image of a U.S. Geological Survey standard series topographic map published in 1965. Some of the colors of the DRG have been modified and it is displayed at 50% transparency.

10,000-foot grid based on Arkansas coordinate system, north zone. (Lambert Conformal Conic).

100-meter Universal Transverse Mercator grid ticks, zone 15 shown in blue. 1927 North American Datum.

2011 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

Scale 1:24000

CONTOUR INTERVAL 20 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

QUADRANGLE LOCATION

ROAD CLASSIFICATION

Primary highway, hard surface
Secondary highway, hard surface
Light-duty road, hard or improved surface
Unimproved road

Correlation of Map Units

Qat	Holocene and Pleistocene	Quaternary
Unconformity		
Pa	Atokan	Pennsylvanian
Unconformity		
Pb	Morrowan	
Unconformity		
Pw		
Unconformity		
Phc		

Introduction

This map graphically summarizes the bedrock geology of the Clinton 7.5-minute quadrangle. In this area over 820 feet (250 meters) of middle Pennsylvanian, clastic sedimentary rocks are exposed. Regional structure is controlled by an uplift centered in southeastern Missouri known as the Ozark Dome and an east-west trending structural low to the south called the Arkoma Basin. Progressively younger rocks form a series of increasingly elevated plateaus from that area southward into Arkansas. The area of this map overlaps the southern edge of the highest of these plateaus, the Boston Mountains Plateau, and the northern edge of the Arkoma Basin. The northern part of the basin is characterized by thick sequences of mostly fluvial sedimentary rocks disrupted by growth faults and gentle folds. Faulting occurred under conditions of rapid sedimentation and progressive subsidence to the south during the mid- to late-Pennsylvanian. Folding may be contemporaneous with the faulting or have occurred later during the Ouachita orogeny.

In this area, members of the Prairie Grove Member of the Hale Formation and members of the Bloyd Formation cannot be differentiated. Only the Cane Hill Member of the Hale Formation is recognizable. Rock units equivalent to the Prairie Grove Member of the Hale Formation along with rock units equivalent to the Lower part of the Bloyd Formation are termed the Witts Springs Formation, as mapped on adjacent quadrangles (Braden and Ausbrooks, 2003). Also, the recently named Parthenon sandstone of the Bloyd Formation (Chandler and Zachry, 2010) is indistinguishable in this area. Rock units equivalent to the Parthenon sandstone and the Upper part of the Bloyd Formation are termed the undifferentiated Bloyd Formation, as mapped on adjacent quadrangles (Hutto and Smith, 2007).

The general orientation of structural features on the map is southwest-northeast. The exception is the Culpepper Mountain Anticline which trends with regional structure on the west side of the quadrangle, but is oriented east-southeast from near the center of the map eastward. The Mount Evans Monocline brings the elevation of rock units down to the south by approximately 100 to 180 feet (30 to 55 meters). The faults in this area are normal and downdropped to the south. The South Fork Fault has approximately 800 feet (244 meters) of displacement. The Weaver Creek Fault in the northeast corner and the Choctaw Creek Fault in the southeast corner lack stratigraphic markers, so the amount of offset on these faults is unknown. The Clinton Syncline and the Harmony Mountain Syncline are broad, gentle folds that plunge southwest. These structures are probably related to the Mulberry Fault System which separates the Ozark Dome from the Arkoma Basin.

The South Fork of the Little Red River, Archey Creek, Pee Dee Creek and Choctaw Creek are the largest drainages in the area. They flow into the upper end of Greers Ferry Lake. Areas around the lake up to an elevation of 487 feet (148 meters) are subject to inundation during floods and are not mapped, though some data was collected there.

This quadrangle was mapped by Glick in 1973 for the 1:250,000 scale Russellville quadrangle in preparation for the 1976 Geologic Map of Arkansas. This is the first time the geology of the Clinton quadrangle has been mapped at the 1:24,000 scale. The contacts and structural features on this map were derived from field observations made between July 2010 and April 2011. Site locations were generated with the aid of a global positioning satellite receiver. Bedrock dipping at less than 2° was considered horizontal.

Description of Map Units

Qat **Alluvium and terrace deposits (Quaternary)** – unconsolidated clay, silt, sand and gravel deposited along larger streams with intermittent outcrops of bedrock also present. Includes deposits on one or more low terrace levels.

Pa **Atoka Formation (Pennsylvanian, Atokan)** – primarily gray to black shale interbedded with very thin- to thin-, ripple-bedded, tan to gray siltstone and thin- to thick-bedded, flat- to cross-bedded massive sandstone. Shale weathers tan to orange, and typically contains a zone of abundant gray to brown siltstone concretions in the lower portion. Sandstone is tan to brown and medium- to dark-gray on fresh surfaces, and weathers tan to orange to brown. Typically micaceous and very fine- to fine-grained, though locally coarse-grained. Generally exhibits liesegang banding, boxwork and manganese staining. Usually contains flaser structures, shale partings, ripple-beds and hummocky channel sands. Commonly bioturbated and contains shale-pebble conglomeratic zones. *Zoophycus*, *conostichus* and other trace fossils are common. Rarely calcareous and fossiliferous, though fossil molds (especially crinoid) are common. Contains sparse ammonoids. Unconformable with the underlying Bloyd Formation. A thickness of up to approximately 460 feet (140 meters) is exposed.

Pb **Bloyd Formation (Lower Pennsylvanian, Morrowan)** – primarily shale with lesser siltstone and very thin- to thin-bedded sandstone. Shale is clay to silt, gray to black on fresh surfaces and weathers tan to orange. Siltstone is very thin- to medium-bedded, light- to medium-gray on fresh surfaces, and weathers tan to brown. Locally, a thin- to very thick-bedded, cross-bedded massive sandstone is present. It is very fine- to medium-grained, ranges from orange to brown and buff to tan on fresh surfaces, and weathers light- to dark-brown. Locally calcareous, micaceous, stylolitic and friable. Commonly exhibits siliceous case-hardening, honeycomb weathering and liesegang banding. Cross-bedded fossiliferous sandstone lenses are locally interbedded in shale. These lenses are typically very fine- to fine-grained, light- to dark-gray on fresh surfaces, and weather gray to brown. Usually contain zones of shale-pebble conglomerate and shale-partings. Fossil material is typically a hash which includes crinoid and brachiopod fragments. The Bloyd is unconformable with the Witts Springs Formation below. Up to approximately 320 feet (98 meters) is exposed.

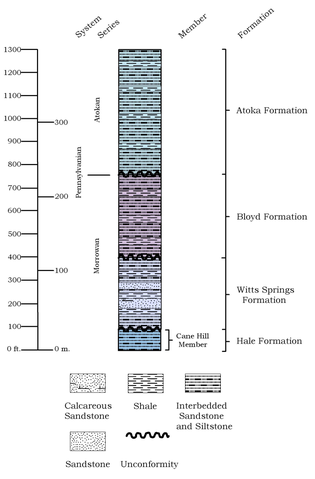
Symbols

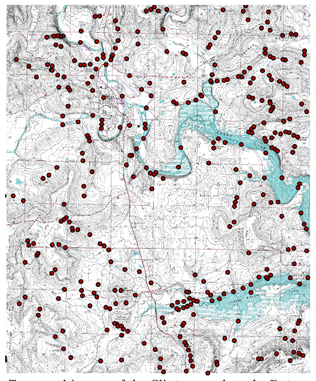
- Contact
- Normal fault - dotted where concealed
  - Indicates downdropped block
  - Indicates dip of fault plane
- Line of cross-section
- Anticline axis
- Syncline axis
- Monocline axis
- Strike and Dip
- Mine or quarry
- Gravel pit

Pw **Witts Springs Formation (Lower Pennsylvanian, Morrowan)** - a variable sequence of sandstone, siltstone and shale. Sandstone is typically medium- to very thick-bedded, massive, very fine- to medium-grained and rarely, coarse-grained. It ranges from orange to brown, white to buff and tan to light-gray on fresh surfaces, and weathers dark-orange to dark-brown. Typically displays liesegang banding, honeycomb weathering and fossil molds. Locally calcareous, micaceous and friable. Intervals of shale-, quartz- and sandstone-pebble conglomerate are common. Massive sandstone units are typically separated by units of clay to silt shale, siltstone and very thin- to thin-bedded, ripple- to flat-bedded, very fine- to fine-grained sandstone. Discontinuous, thin- to medium-bedded, cross-bedded, fossiliferous limy sandstone and sandy limestone interbedded with shale is present at sporadic intervals throughout the sequence. This sandstone is very fine- to fine-grained, finely to coarsely crystalline, light- to dark-gray on fresh surfaces and weathers gray to brown. Commonly exhibits alternating bands of dark and light color depending on the ratio of sand to carbonate. Usually has shale partings and intervals of shale-pebble conglomerate. Crinoid fragments are well-represented, but other fossils include ammonoids, brachiopods, fenestrate bryzoans and rugose corals. Coal stringers with accompanying gypsum coralloids, wood and lycopod prints are locally present at the base of these units. Unconformable with the underlying Cane Hill Member of the Hale Formation. Thickness ranges from approximately 260 to 360 feet (79 to 110 meters).

Phc **Hale Formation (Lower Pennsylvanian, Morrowan) – Cane Hill Member –** dark-gray to black clay to silt shale and siltstone interbedded with medium- to dark-gray, thin-, ripple- to cross-bedded sandstone. Locally calcareous with associated zones of fossil fragments common. Trace fossils and load casts are typically present at the base of sandy units. Up to approximately 80 feet (24 meters) of the uppermost Cane Hill is exposed.

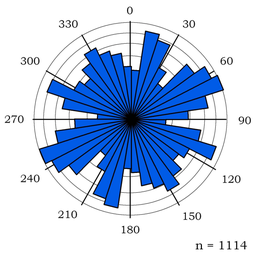
Stratigraphic Column





Topographic map of the Clinton quadrangle. Dots indicate locations of data collection points.

Joint Frequency



n = 1114

Rose diagram of strike frequency of joints recorded within the Clinton Quadrangle.

References

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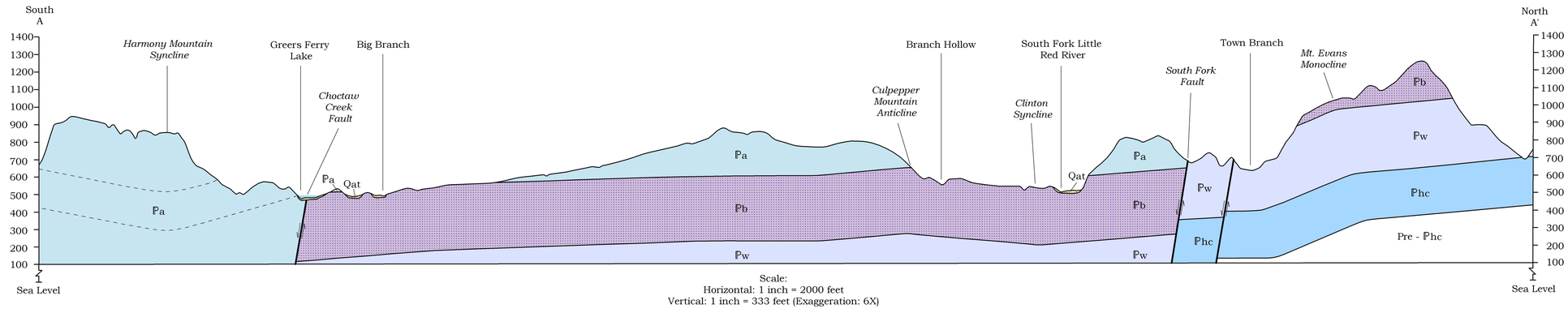

Scale:
Horizontal: 1 inch = 2000 feet
Vertical: 1 inch = 333 feet (Exaggeration: 6X)

Map and cross section digitized by Nathan Taylor