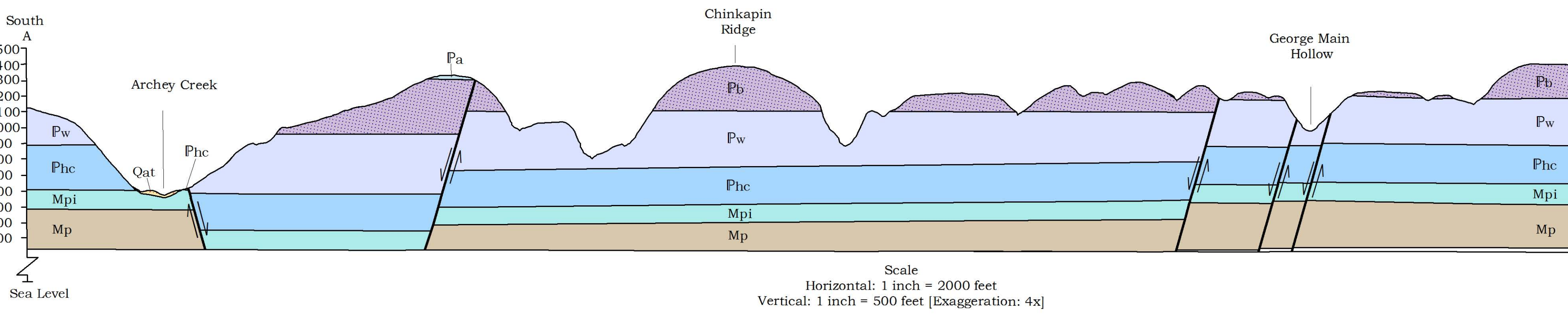
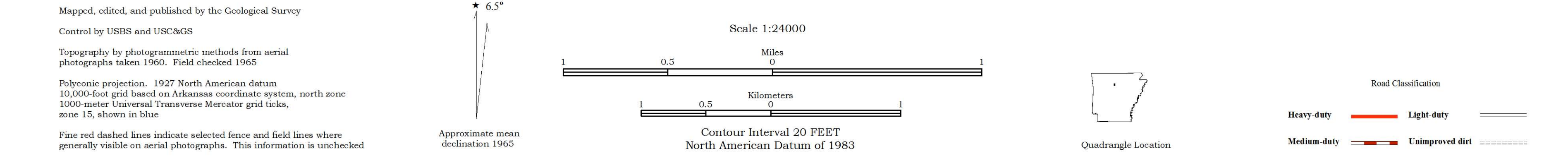
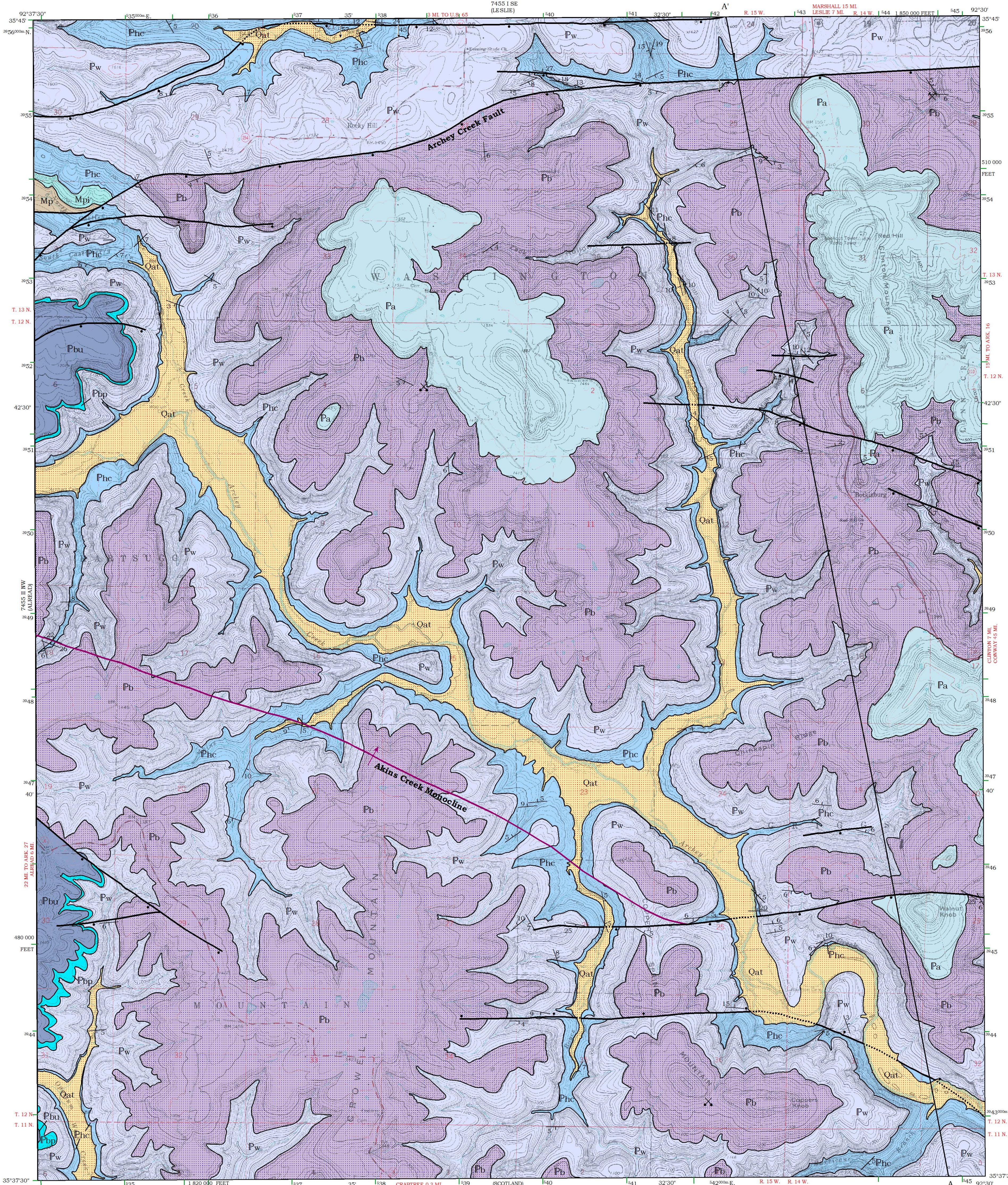
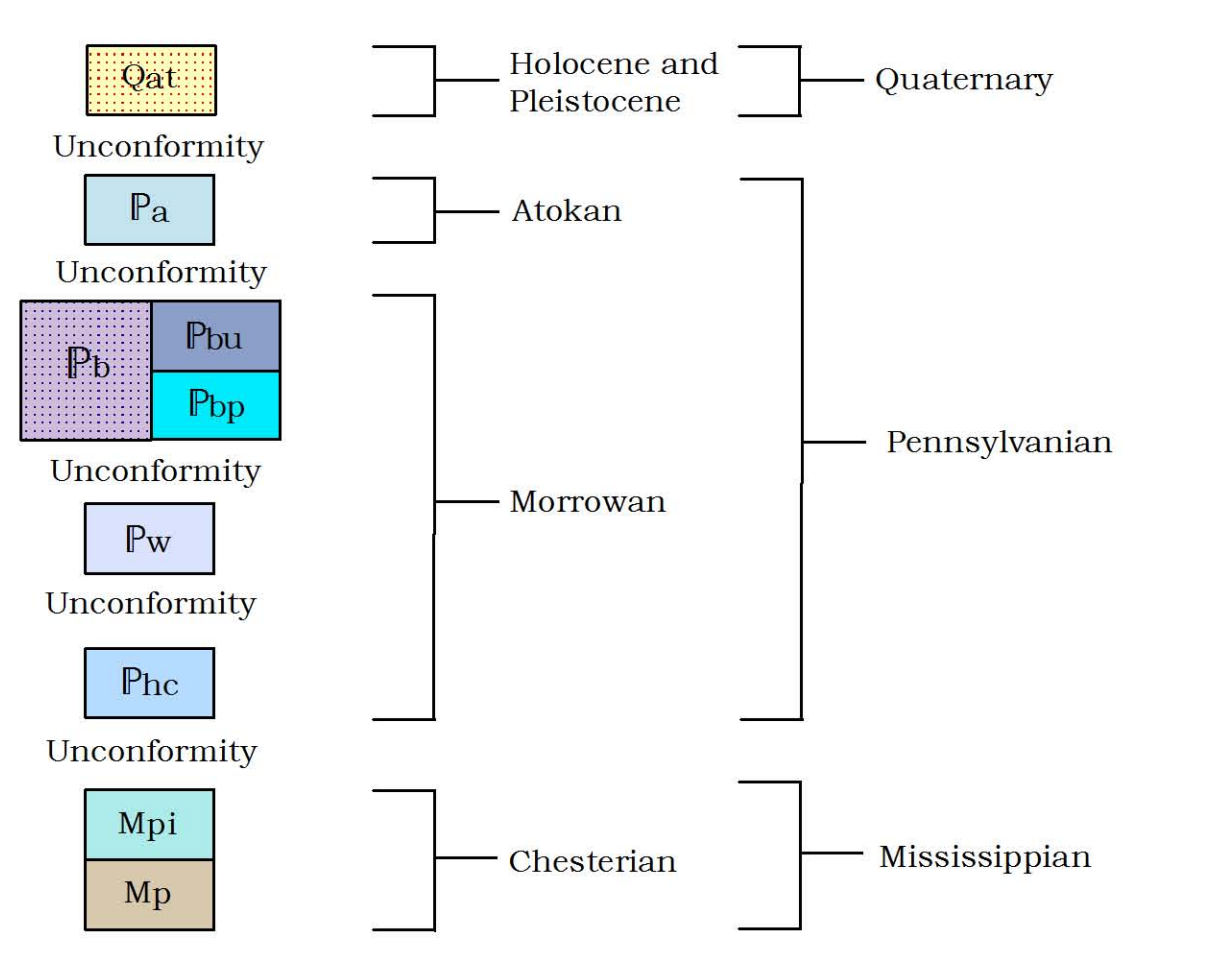


Geologic Map of the Botkinburg Quadrangle, Van Buren County, Arkansas

Geology by Richard S. Hutto and Daniel S. Rains
 Digital Compilation by Daniel P. Holland
 2010



Correlation of Map Units



Introduction

This map graphically summarizes the bedrock geology of the Botkinburg 7.5-minute quadrangle. In this area over 1300 feet (396 meters) of late Mississippian to middle Pennsylvanian clastic and carbonate sedimentary rocks are exposed. Regional geology of the area is controlled by an uplift centered on southeastern Missouri known as the Ozark Dome. Progressively younger rocks form a series of plateau surfaces from that area southwest into Arkansas. The area of this map is located within the southernmost and highest of these plateaus—the Boston Mountains Plateau.

There are two major structural features in the study area. The Akina Creek Monocline near the center of the quadrangle extends from the west side of the map east and slightly south to Copper Springs Mountain where it terminates against a normal fault. This monocline brings the elevation of rock units that cross it down to the north by 100 to 360 feet (30 to 110 meters). The Archey Creek fault is a normal fault developed to the south that extends mostly east west across the northern portion of the quadrangle. Displacement ranges from 100 to 300 feet (30 to 91 meters) across this structure. Archey Creek is the only major drainage in the area. It flows from northwest to southeast across the quadrangle and empties into the South Fork of the Little Red River east of the mapping area near Clinton, Arkansas.

The geology of the Botkinburg quadrangle was mapped circa 1973 by Boyd R. Haley for the 1:500,000 scale Geologic Map of Arkansas. The current mapping builds on the previous work, but uses a revised stratigraphy and depicts structures and rock units in more detail. The contacts and structural features on this map were derived from field observations made from July 2009 through April 2010. Site locations were generated with the aid of a global positioning satellite receiver. Bedrock dipping at less than 2° was considered horizontal.

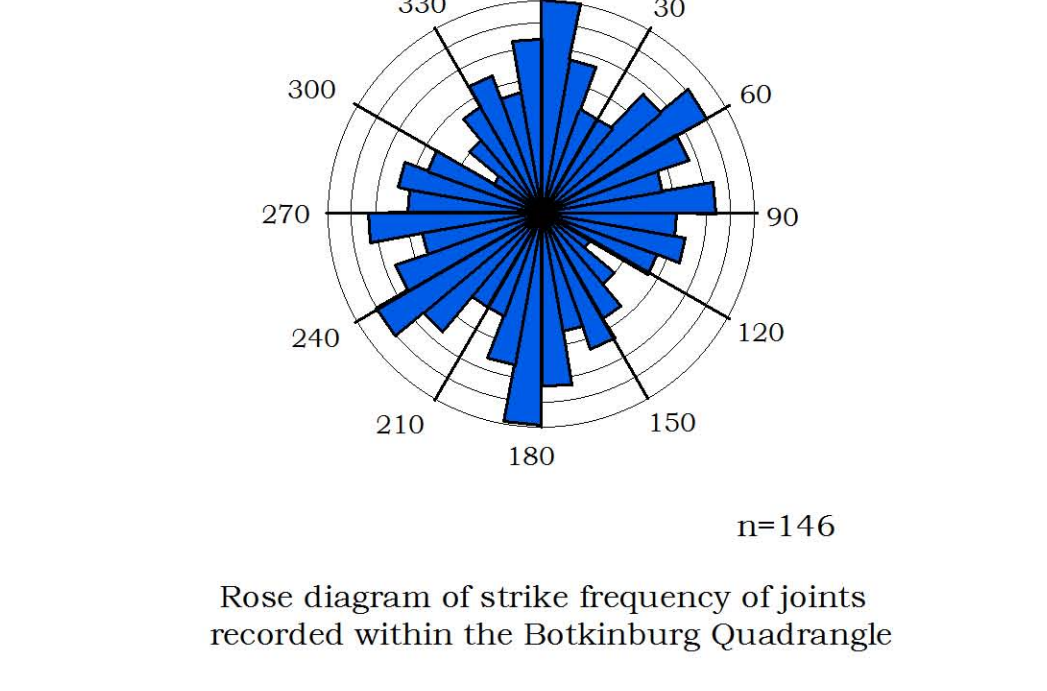
Description of Map Units

- Qat** **Alluvium and terrace deposits (Quaternary)** - composed of unconsolidated clay, silt, sand and gravel deposited by major streams, including deposits on one or more terrace levels.
- Pa** **Atoka Formation (Pennsylvanian, Atokan)** - sequence of black to tan shale interbedded with very thin- to thin-, ripple-bedded, micaceous siltstone and thin- to very thick, massive-bedded sandstone. Sandstone grains are typically very fine to fine, and sub-angular to sub-rounded and of the quartz arenite variety. Color is tan to orange on fresh surfaces, and weathers dark orange to brown. Locally exhibits cross-bedding, stylolites and shale-pebble or chert-pebble conglomerate zones. Unconformable with the underlying Bloyd Formation. Reaches a thickness of up to 320 feet (98 meters).

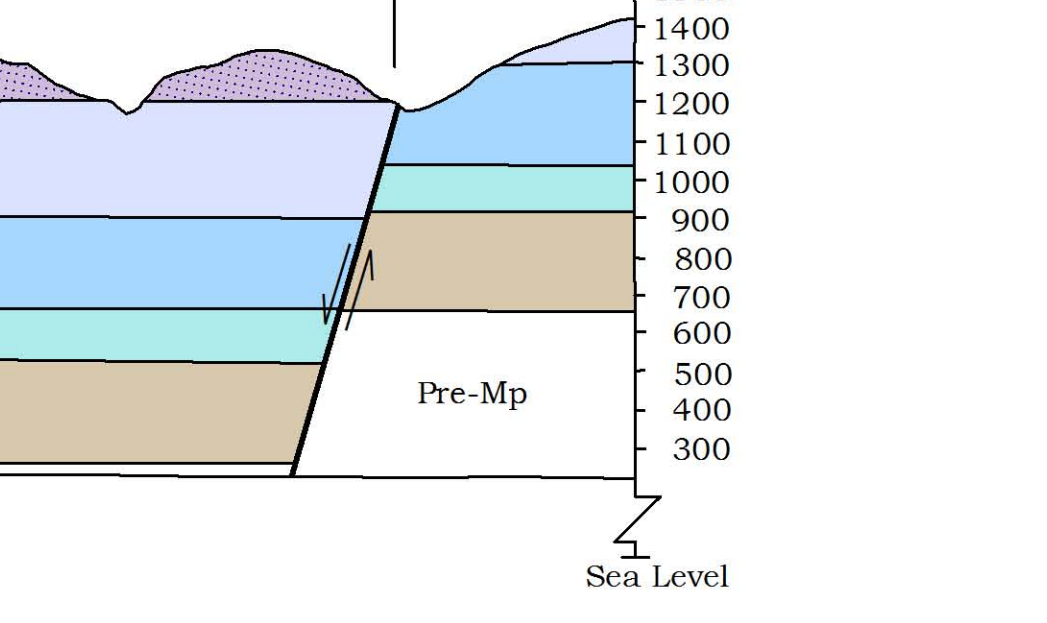
Symbols

- Contact
- Normal fault - dotted where concealed
- Indicates down-dropped block
- Indicates dip of fault plane
- Monocline
- Strike and Dip
- Mine or quarry
- Gravel pit

Joint Frequency



Bluffs of Wits Springs sandstone at Bluffton.



Bloyd Formation (Lower Pennsylvanian, Morrowan) - informally divided into upper and lower parts on adjacent quadrangles separated by the Middle Bloyd sandstone (Bradley and Ausbrooks, 2003). The term "Parthenon sandstone" has replaced the term "Middle Bloyd sandstone" (Zachry and Haley, 1975) due to recent work by Chandler and Zachry (2010). On this map, the Parthenon sandstone separates the upper part of the Bloyd from the Wits Springs Formation. In areas to the east where the Parthenon sandstone is no longer distinguishable, the Bloyd is undifferentiated.

Bloyd Formation (undifferentiated) - consists of fissile clay shale interbedded with thin- to very thick-bedded or massive, very fine- to coarse-grained sandstone with lesser amounts of siltstone, limestone and limy sandstone. Shale is tan to black on fresh surfaces and weathers orange to brown. Sandstone ranges from orange to brown, buff to tan and pink on fresh surfaces, and weathers light to dark brown. Typically well sorted, though sandstone- and chert-pebble conglomerate zones crop out locally. Commonly exhibits siliceous case-hardening and well-developed cross- and channel-beds. Siltstone units are typically very thin- to medium-bedded, light- to medium-gray on fresh surfaces, and weather tan to brown. Typically well-indurated, with shale partings along micro cross-beds. Limestone and limy sandstone units are typically thin- to medium-bedded, medium- to dark-gray on fresh surfaces and weather dark-brown. Fossils may include brachiopods, gastropods, bryozoa and nautiloids. The Bloyd is unconformable with the underlying Wits Springs Formation. Thickness ranges from 160 to 380 feet (49 to 116 meters).

Upper part - fissile clay shale interbedded with thin- to medium-, massive-bedded fine- to medium-grained, micaceous sandstone and siltstone. Sandstone is tan on fresh surfaces, with local red iron-oxide concentrations. Weathers orange and friable. Commonly contains ripple-marks and cross- to channel-bedding. Locally contains fossiliferous sandy limestone beds, conglomeratic zones, shale-partings, leaching-banding and coal stringers. The upper part is conformable with the Parthenon sandstone below. Thickness ranges from 120 to 360 feet (37 to 110 meters).

Parthenon sandstone - medium- to very thick-, massive-bedded, very fine- to medium-grained sandstone with minor shale interbeds. Sandstone is white to tan on fresh surfaces, and weathers brown or red to orange. Sandstone is typically a well-indurated lithuminate that is locally cross- to channel-bedded, stylitic, micaceous and siliceous. Locally contains fossils or fossil molds and shale- or quartz-pebble conglomerate. The Parthenon is unconformable with the Wits Springs Formation below. Thickness ranges from 20 to 40 feet (6 to 12 meters).

Wits Springs Formation (Lower Pennsylvanian, Morrowan) - equivalent to the Lower part of the Bloyd Formation below the Parthenon sandstone (Bradley and Ausbrooks, 2003; Chandler and Zachry, 2010) and the Prairie Grove Member of the Hale Formation. Composed of a variable sequence of interbedded calcareous sandstone and limestone. A typical sequence contains up to 3 massive sandstone beds ranging from 5 to 80 feet (1.5 to 24 meters) thick that locally form prominent bluffs. Sandstone is quartz arenite to litharenite, typically well-sorted, very fine- to fine-grained and rounded to sub-rounded. Color is gray to buff on fresh surfaces, and weathers orange to orange-brown with leaching banding common. Intervals of shale- and quartz-pebble conglomerate are common. Disconformities, typically cross-bedded limy sandstone and sandy limestone from ledges interbedded with shale at irregular intervals in the upper third. They consist of fine sand and finely to coarsely crystalline calcite and are locally fossiliferous, oolitic and conglomeratic. Crinoid fragments are well-represented, but other fossils may include rugose corals, brachiopods, fenestrate bryozoa, and rarely shark's teeth. Bluff-forming massives are separated by clay shale, thin-, ripple-bedded, fine-grained sandstone and interbedded sandstone/shale units. Unconformable with the Cane Hill Member below and in some places has obviously scored into it. Total thickness ranges from approximately 220 to 480 feet (67 to 146 meters).

Hale Formation (Lower Pennsylvanian, Morrowan) - consists of two members: the Prairie Grove and the Cane Hill. Only the Cane Hill Member is mapped on this quadrangle. Rocks equivalent to the Prairie Grove Member are mapped with the Wits Springs Formation.

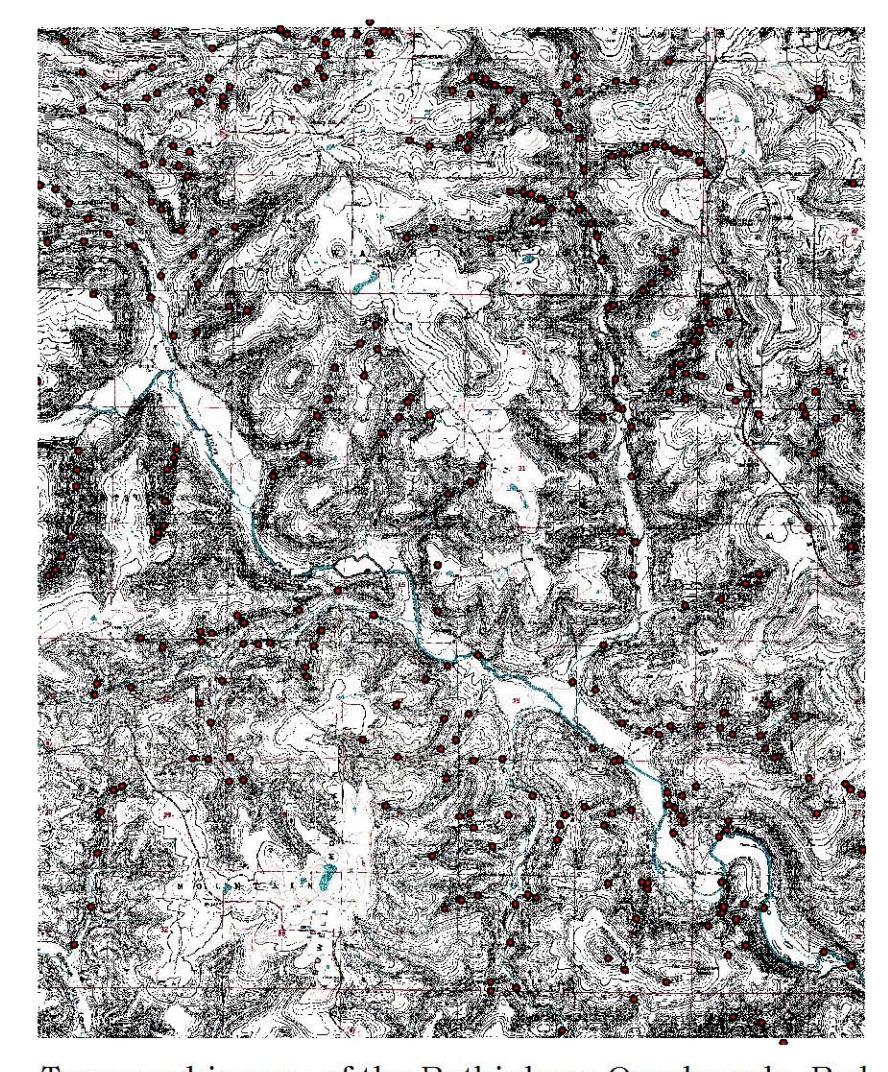
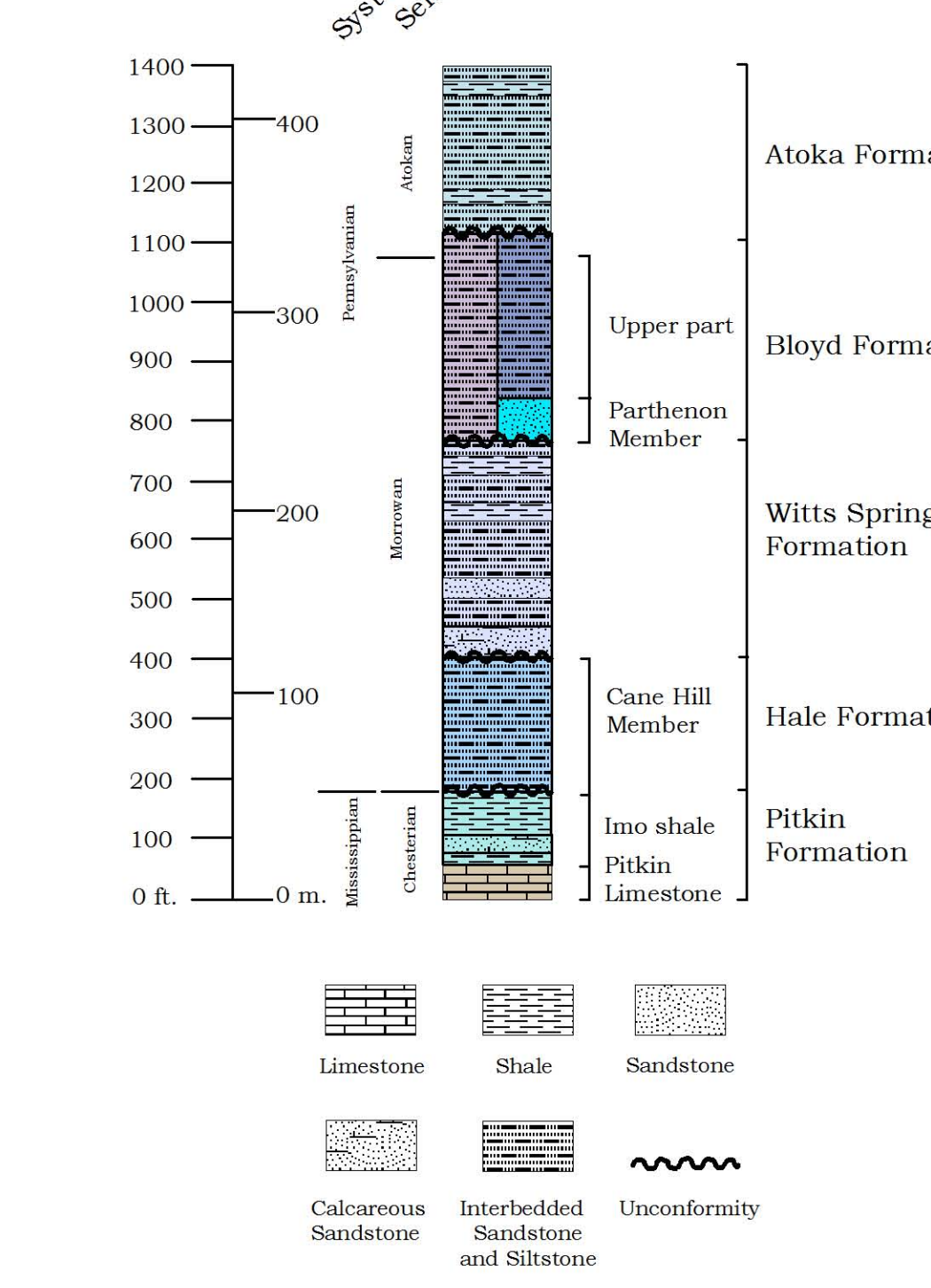
Cane Hill Member - medium- to dark-gray, thin-, ripple- to cross-bedded sublitharenite interbedded with black clay to silty shale and siltstone. Medium- to thick-, massive-bedded sandstone crops out locally. Sand is composed of mostly subangular, glassy to opaque quartz grains that are very fine to fine and moderately sorted. Cement is typically siliceous, however is locally calcareous. Fossil fragments are associated with these calcareous zones. Trace fossils and load casts are present above shaly units. Unconformable with the underlying Imo shale. Thickness ranges from 220 to 280 feet (67 to 85 meters).

Pitkin Formation (Upper Mississippian, Chesterian) - informally divided into two members, the Pitkin Limestone and the Imo shale. Lower contact of the Imo placed at the top of the final limestone bed in the Pitkin, and upper contact placed below the base of a competent, very thin- to thin-, ripple-bedded, silty sandstone that is the first recognizable unit in the Cane Hill Member (Smith and Hutto, 2007). The Pitkin only crops out in a small area in North Castleberry Creek.

Imo shale (Upper Mississippian, Chesterian) - thin- to thick-bedded ledges of sandstone interbedded with black silty shale. The shales locally contain lenticular ironstone concretions. The sandstone is very fine-grained, light- to dark-gray on fresh surfaces, and weathers red or brown. Moderately calcareous, silty, coaly and contains sparse fossil and rock fragments. Fossils are typically crinoids and bivalves. Conformable with the underlying Pitkin Limestone. Ranges from approximately 80 to 100 feet (24 to 30 meters).

Pitkin Limestone (Upper Mississippian, Chesterian) - consists of interbedded black shale and medium- to dark-gray, oolitic, fossiliferous, coarse-grained limestone. Fossils include brachiopods, bryozoa and crinoids. Limestone locally has petrolicolor odor when freshly broken. Only the upper part of the Pitkin is exposed and thickness ranges from 60 to 80 feet (18 to 24 meters).

Stratigraphic Column



Topographic map of the Botkinburg Quadrangle. Red dots indicate location of data collection points.

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