OFFICE OF THE STATE GEOLOGIST

Geologic map of the Pleasant Plains quadrangle, Independence and White Counties, Arkansas

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2026
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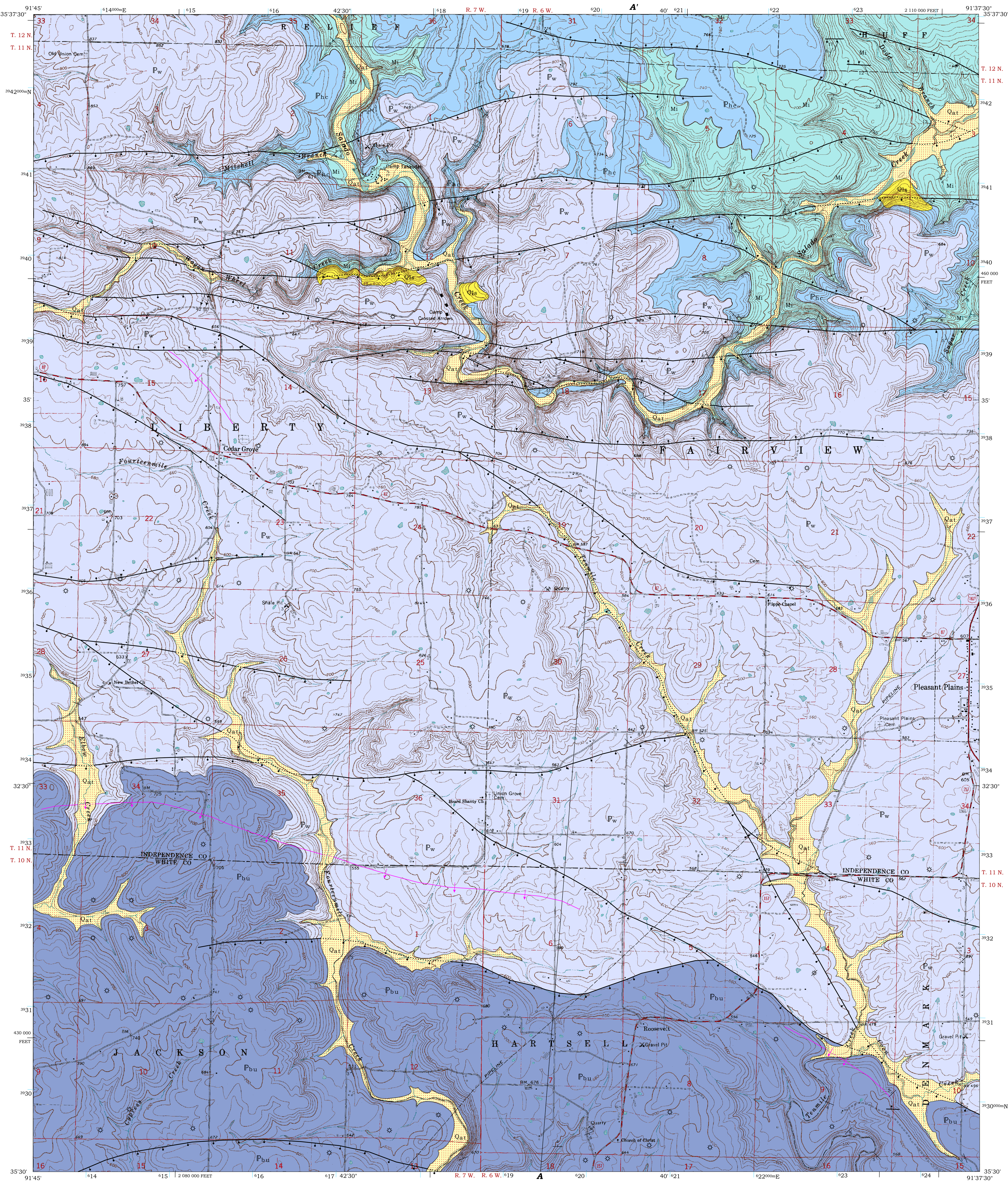


This topographic base is a Digital Raster Graphic (DRG). The DRG is a scanned image of a U.S. Geological Survey 7.5-minute series topographic map published in 1965.

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

1000-meter Universal Transverse Mercator grid ticks, zone 15, shown in blue. 1927 North American Datum.

0° 51'W
TRUE NORTH
MAGNETIC NORTH
Approximate mean declination 2026

SCALE 1:24 000

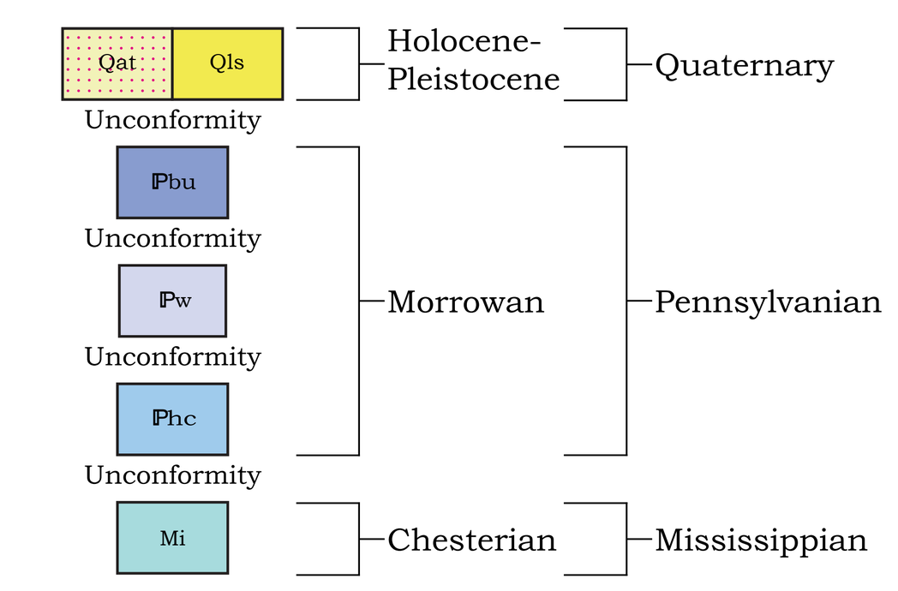
CONTOUR INTERVAL 20 FEET
DATUM IS MEAN SEA LEVEL

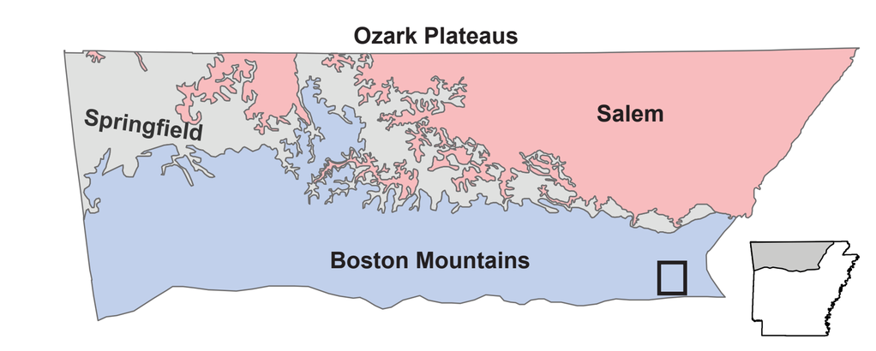
Quadrangle Location

Adjoining Quadrangles: Concord, Jamestown, Salado, Floral, Huff, Pangburn, Steprock, Velvet Ridge

ROAD CLASSIFICATION
- Secondary highway
- Light duty road
- Unimproved road
- State route

Correlation of Map Units





Location of the Pleasant Plains quadrangle on the Boston Mountains Plateau in the Ozark Plateaus Physiographic Province.

Introduction

This map depicts the bedrock and surficial geology of the Pleasant Plains 7.5-minute USGS topographic quadrangle in Independence and White Counties, Arkansas. The map area lies within the Boston Mountains Plateau of the Ozark Plateaus Physiographic Province. The Boston Mountains Plateau is the southernmost and highest of three major plateau surfaces that dip south from the core of the Ozark Dome in southeast Missouri. In this area, approximately 1,100 feet (335 meters) of Mississippian (Chesterian) and Pennsylvanian (Morrowan) clastic rocks crop out at the surface. The formations present in the map area are, in ascending order, the Imo interval, Cane Hill Member of the Hale Formation, Witts Springs Formation, and upper part of the Bloyd Formation. These units are composed almost entirely of sandstone and shale and record deposition in shallow marine, deltaic, and fluvial environments. Bedrock is commonly overlain by a veneer of unconsolidated colluvium, residuum, or alluvium. Approximately two-thirds of the area within the quadrangle is part of the Little Red River watershed and surface water drains to the south and west, primarily through Fourteenmile, Tenmile, and Elbow Creeks. Most of the remaining area is part of the White River watershed and drains to the north and east via Salado Creek. A small area, approximately 100 acres (40 hectares) near Pleasant Plains is part of the headwaters of Departee Creek, a separate tributary of the White River. One quarry near Roosevelt was opened for crushed stone and several borrow pits have intermittently been used to access shale or sandstone.

Regional dip is less than two degrees to the south but locally varies due to normal faulting and monoclinal folding. Maximum observed dip was 46 degrees near the intersection of two normal faults in the northeast corner of the map. Faults are primarily identified through a combination of offset bluff lines, deformation bands, non-vertical joints, and associated inclined bedding. Fault trends are generally east-west, which matches measured trends of joints where east-west and north-south are the dominant directions. Displacement along faults is generally 20-60 feet (6-18 meters). The highest frequency of faults occurs in the northern half of the map near Salado Creek. Faults on the southern half of the map display a higher deviation from the east-west trend and are accompanied by monoclinal folding that trends southeast-northwest.

The geology of the Pleasant Plains quadrangle was previously mapped by Glick (1973) in preparation for the 1:500,000 scale Geologic map of Arkansas. This map builds on previous work and depicts the structure and stratigraphy in greater detail. Data for this map was collected between August 2025 and April 2026. Representative rock samples were collected across the quadrangle and 11 were used to make thin sections for petrographic study. Field station locations and descriptions were recorded on a portable GPS data collector and integrated into a Geologic Mapping Schema (GeMS) geodatabase.

Braided deformation bands in sandstone of the Witts Springs Formation adjacent to a fault near Wagon Wheel Creek.

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. Dotted where concealed.
- Monocline - dotted where concealed
- Strike and dip
- Mine or quarry
- Pit
- Gas well
- Plugged or abandoned gas well

Description of Map Units

Qls — **Landslide deposits (Quaternary)** – a mass of rock and debris that has moved downslope due to gravity. Only the largest landslide deposits are depicted.

Qat — **Alluvium and terrace deposits (Quaternary)** – unconsolidated clay, silt, sand, and gravel including deposits on the modern floodplain and one or more terrace levels along larger tributaries. Approximately 20-40 feet (6-12 meters) thick.

Bloyd Formation (Lower Pennsylvanian, Morrowan) – informally divided into lower and upper parts. Only the upper part is present within the mapping area.

Pbu — **upper part** – consists of interbedded sandstone, siltstone, and shale. The sandstone is generally very fine to fine grained and micaceous, but grain sizes range from very fine to coarse. Bedding is commonly thin to medium and irregular to lenticular. Locally, it is well indurated, contains abundant iron, and exhibits ripple bedding, cross bedding, cut-and-fill structures, and liesegang banding. Buff to light brown on fresh surfaces but weathers dark to light brown with a massive, rounded or blocky appearance. Locally contains rounded milky quartz pebbles and granules, clay pebbles, pebble molds, shale partings, and trace fossils. Sparse fossiliferous intervals contain crinoid, brachiopod, and gastropod molds and casts. Shale is generally poorly exposed and is clay to silty. Dark gray to black on fresh surfaces but weathers light gray to tan. Siltstone is very thinly bedded and light brown to tan on fresh surfaces but weathers brown to grayish brown. A few conglomeratic zones interbedded with shale and siltstone are calcareous and contain very fine to coarse grained quartz sand, milky quartz pebbles, clay pebbles, iron pebbles and concretions, and abundant fossil fragments. Unconformable with the underlying Witts Springs Formation. Up to 250 feet (76 meters) thick.

Pw — **Witts Springs Formation (Lower Pennsylvanian, Morrowan)** – consists of sandstone with lesser amounts of clay or silty shale, and siltstone. Sandstone is fine to coarse and friable with iron case hardening. Conglomeratic intervals contain milky quartz pebbles and granules, shale pebbles and molds, iron concretions, and fossil fragments and molds. Sandstone is typically thin to massive bedded and locally thin to medium bedded. Weathering commonly masks bedding, giving the sandstone a massive and rounded appearance. Reddish orange to brown or buff on fresh surfaces, weathers gray to brown or dark brown. Typical sedimentary features include cut-and-fill structures, cross bed sets up to 6 feet (2 meters), ripple bedding, and soft sediment deformation. Liesegang banding, stylolites, and honeycomb weathering are common. Locally contains trace fossils, fossil wood prints and molds, and other fossil fragments. Shale and siltstone units are light to dark gray or black on fresh surfaces and weather tan to light brown. Prominent bluff former. Unconformable with the underlying Cane Hill Member of the Hale Formation. Thickness ranges from 80-400 feet (24-121 meters).

Hale Formation (Lower Pennsylvanian, Morrowan) – contains two members, the Prairie Grove and the Cane Hill. Only the Cane Hill is present on this quadrangle.

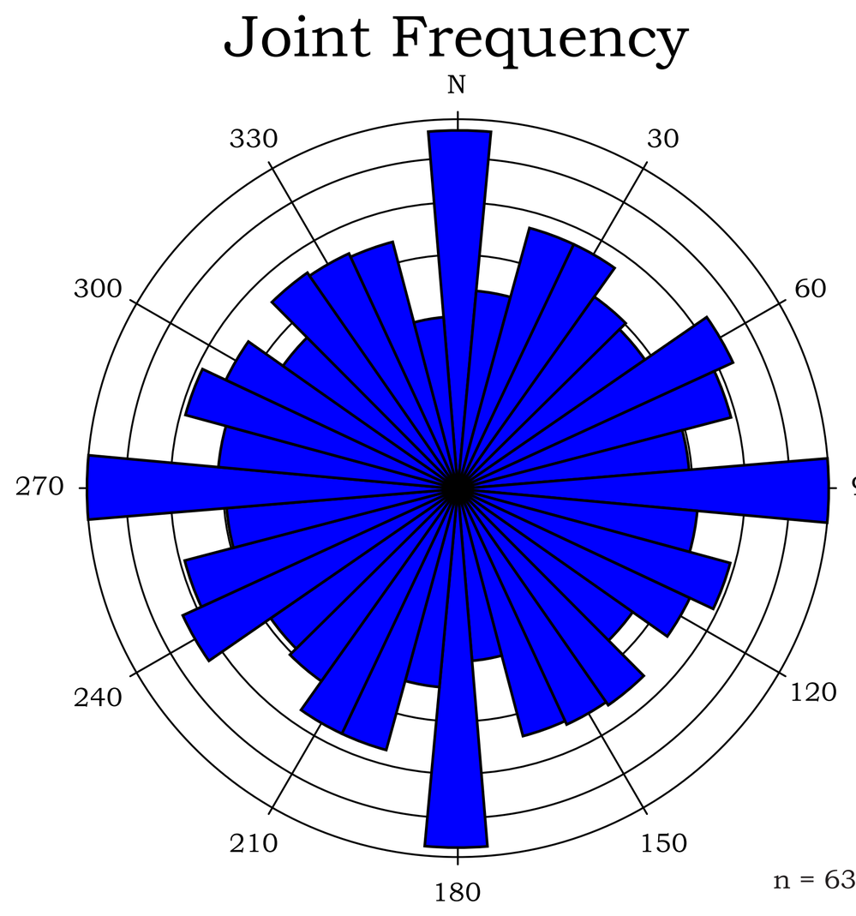
Phc — **Cane Hill Member** – consists of sandstone interbedded with shale and siltstone. Sandstone is very thin to medium bedded and commonly ripple, flaser, or cross bedded. Very fine to fine grained and commonly silty and micaceous. A thick bedded to massive sandstone interval up to 6 feet (2 meters) thick with cross beds and ripples is locally present. Buff to tan on fresh surfaces but weathers grayish brown to dark brown. Trace fossils and coalified fossil wood molds are common. Locally contains shale pebbles and partings. Shale is rarely exposed, but is clay or silty, gray to black on fresh surfaces, and weathers brown to tan. Siltstone is tan to brown or gray on fresh surfaces and weathers dark brown. Unconformable with the underlying Imo interval. Ranges from 80-120 feet (24-36 meters) thick.

Mi — **Imo interval (Upper Mississippian, Chesterian)** – consists primarily of sandstone with minor shale, siltstone, conglomerate, and limestone. Sandstone is very fine to medium grained and locally contains subangular to rounded milky quartz pebbles and granules. Bedding is commonly masked by iron case hardening but where visible, it is thin to thick bedded and commonly cross bedded, ripple bedded, or hummocky with a massive, rounded to blocky appearance with locally abundant liesegang banding, stylolites, and honeycomb weathering. On fresh surfaces it is buff to tan and weathers light or medium gray. Sandstone units are typically 15-80 feet (5-24 meters) thick. Shale units are dark gray to black, clay to silty, and contain a wide variety of fossils including corals, bryozoans, ammonoids, nautiloids, crinoids, bivalves, and brachiopods. The sandstone units commonly have molds and casts of plants and scale trees, coalified wood fragments, and locally abundant trace fossils. Forms multiple bluffs and benches. Thickness ranges from 300-350 feet (91-106 meters).

Milky quartz pebble conglomerate, Witts Springs Formation, Salado Creek.

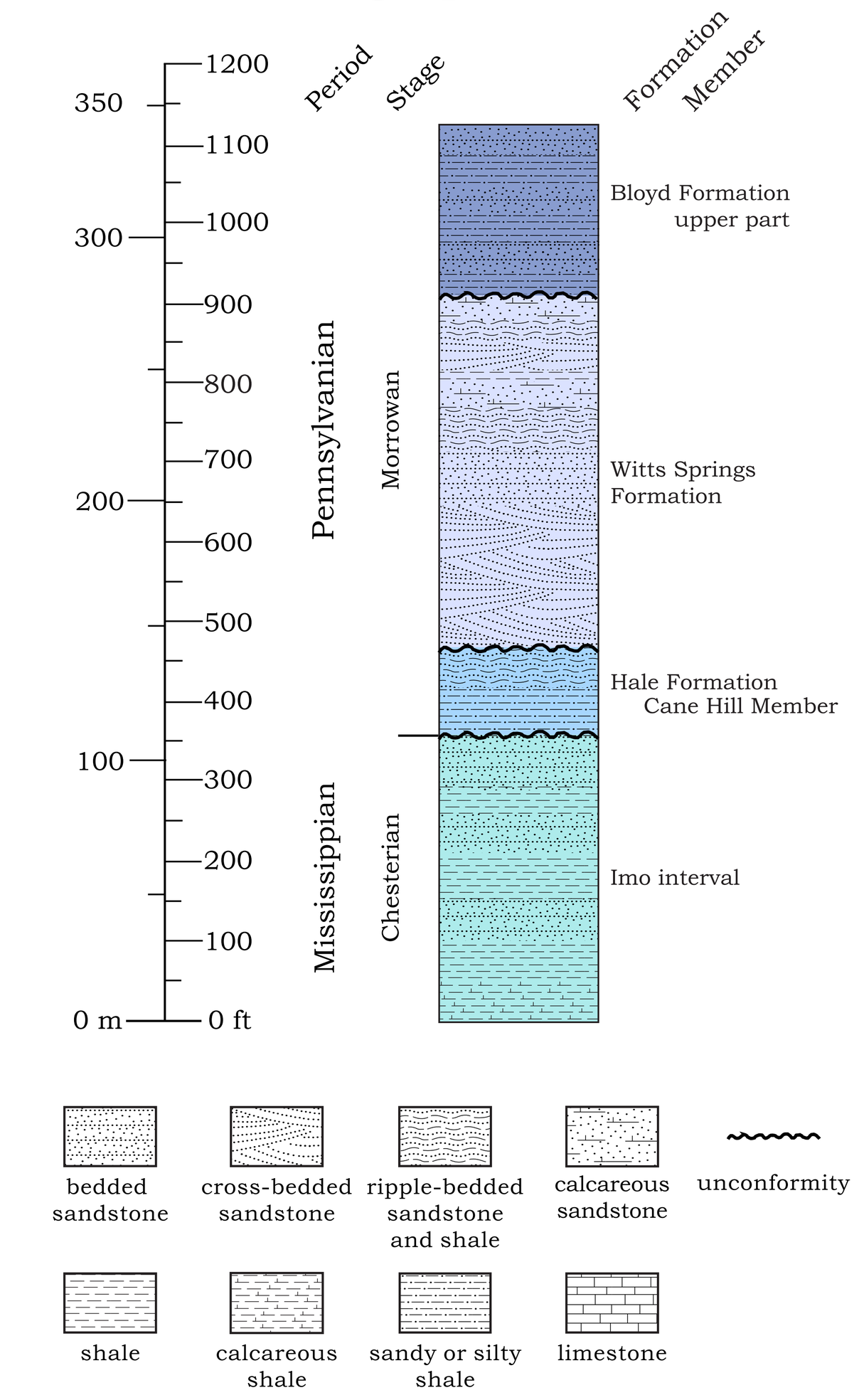
Cut-and-fill, channel bedding, and cross bedding in the Imo interval, Salado Creek.

Joint Frequency

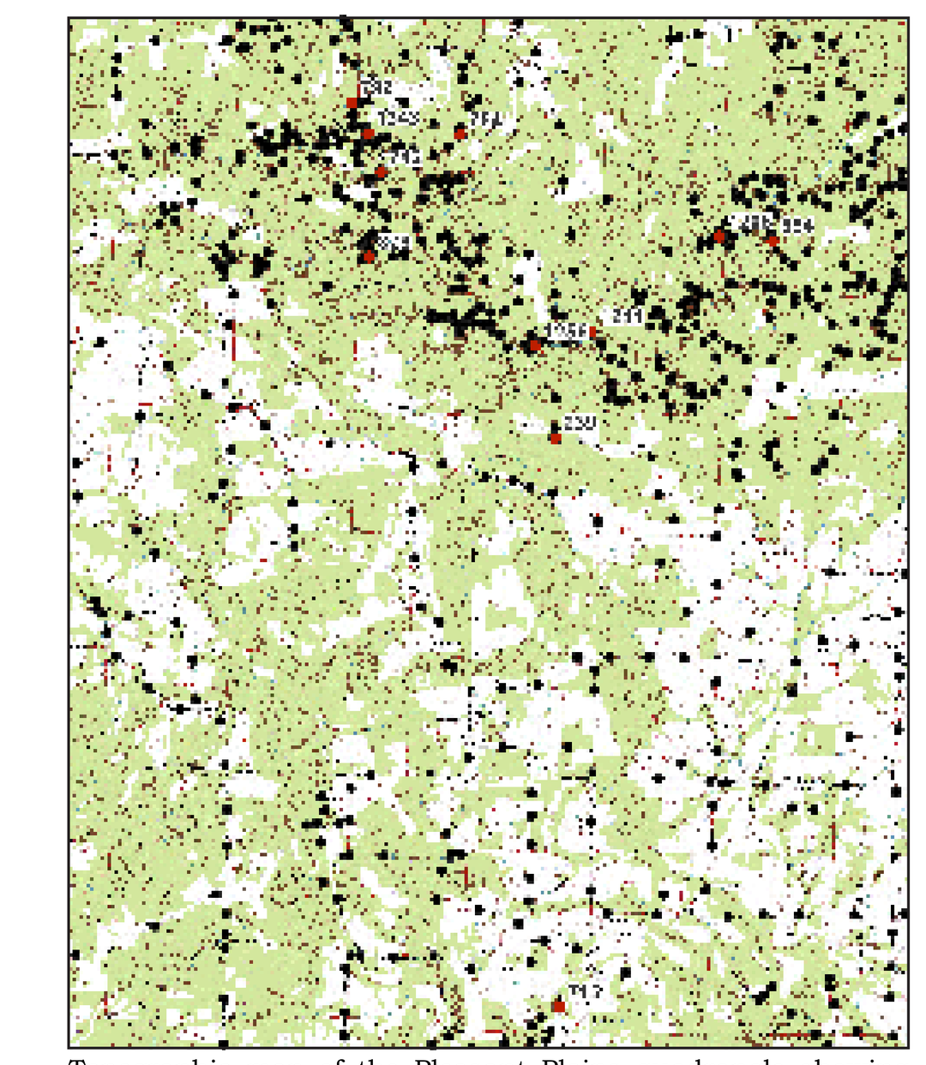


Rose diagram of the strike frequency of joints recorded on the Pleasant Plains quadrangle.

Stratigraphic Column



Differential weathering and pedestal formation in sandstone of the Witts Springs Formation, Wagon Wheel Creek.



Topographic map of the Pleasant Plains quadrangle showing location of data collection points in black. The numbered points in red represent locations sampled for thin section analysis

References

Glick, E.E., 1973, Geologic map of the Pleasant Plains quadrangle, Independence and White Counties, Arkansas: Arkansas Geological Commission, Geologic Worksheet, 1 sheet, 1:24,000.

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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 new information is collected, the features depicted on this map may be changed.

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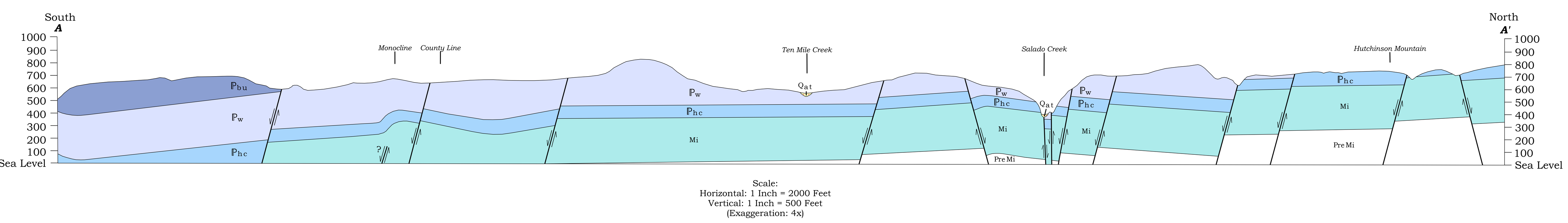
Map and cross section digitized by Brian Kehner.



Scale:
Horizontal: 1 Inch = 2000 Feet
Vertical: 1 Inch = 500 Feet
(Exaggeration: 4x)