GEOLOGIC MAP OF THE SMYRNA QUADRANGLE, NEWTON, POPE AND SEARCY COUNTIES, ARKANSAS

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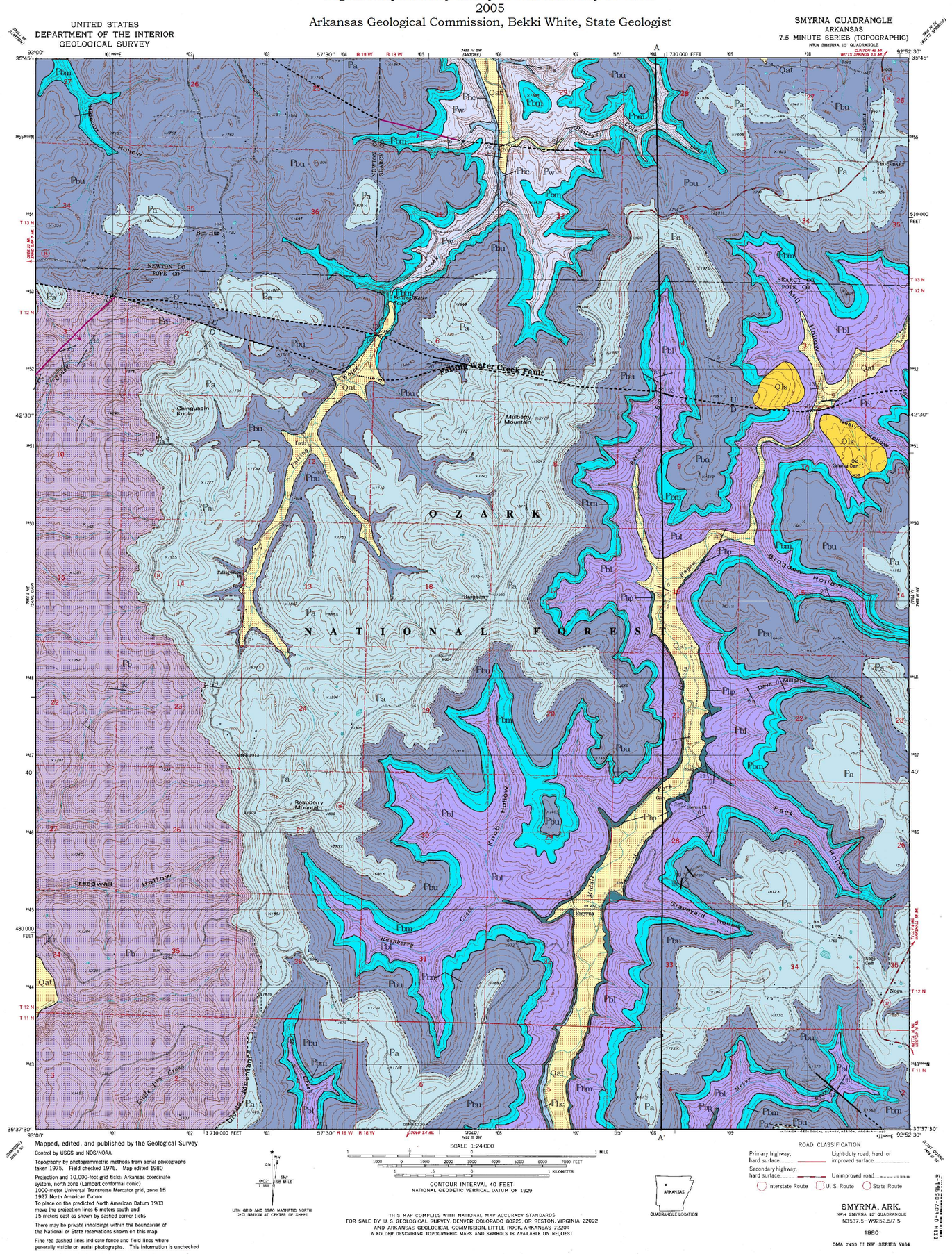
Digital compilation by Tiffany L. Celis and Jerry W. Clark
2005
Arkansas Geological Commission, Bekki White, State Geologist

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

SMYRNA QUADRANGLE
ARKANSAS
7.5 MINUTE SERIES (TOPOGRAPHIC)
NW/4 SMYRNA 15' QUADRANGLE



Mapped, edited, and published by the Geological Survey

Control by USGS and NOS/NOAA

Topography by photogrammetric methods from aerial photographs taken 1975. Field checked 1976. Map edited 1980

Projection and 10,000-foot grid ticks: Arkansas coordinate system, north zone (Lambert conformal conic)
1000-meter Universal Transverse Mercator grid, zone 15
1927 North American Datum
To place on the predicted North American Datum 1983 move the projection lines 6 meters south and 15 meters east as shown by dashed corner ticks

There may be private inholdings within the boundaries of the National or State reservations shown on this map

Fine red dashed lines indicate fence and field lines where generally visible on aerial photographs. This information is unchecked

SCALE 1:24 000

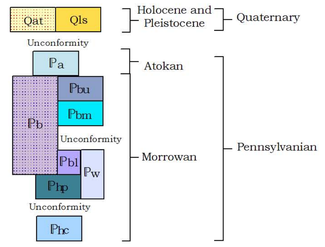
CONTOUR INTERVAL 40 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS
FOR SALE BY U.S. GEOLOGICAL SURVEY, DENVER, COLORADO 80225, OR RESTON, VIRGINIA 22092
AND ARKANSAS GEOLOGICAL COMMISSION, LITTLE ROCK, ARKANSAS 72204
A FOLDER DESCRIBING TOPOGRAPHIC MAPS AND SYMBOLS IS AVAILABLE ON REQUEST

ROAD CLASSIFICATION
Primary highway, hard surface — Light-duty road, hard or improved surface
Secondary highway, hard surface — Unimproved road
Interstate Route · U.S. Route · State Route

SMYRNA, ARK.
NW/4 SMYRNA 15' QUADRANGLE
N3537.5—W9252.5/7.5
1980
DMA 7455 III NW SERIES V864

Correlation of Map Units



Description of Map Units

Qls — **Landslide deposits (Quaternary)** - Mostly blocks of sandstone derived from the Morrowan units. Some shale slopes in the lower part of the Bloyd Formation are particularly susceptible to failure.

Qat — **Alluvium and terrace deposits (Quaternary)** - Unconsolidated clay, silt, sand and gravel including deposits on one or more terrace levels of local streams.

Pa — **Atoka Formation (Middle Pennsylvanian, Atokan)** - Consists of black to tan shales, interbedded with very thin to thin ripple-bedded micaceous siltstones, and thin to medium bedded, fine to very fine-grained sandstones with sub-rounded to rounded grains. The sandstones are tan to buff colored on fresh and weathered surfaces, sometimes calcareous and contain clay pebbles, liesegang bands, horizontal trace fossils, and cross-beds. Occasionally the sandstones contain pebble conglomerate zones with external molds of fossils. The sandstones vary from 10 - 20 ft. (3 - 6 m) thick. This contact is tentative and will be resolved with future mapping. Approximately 80-500 ft. (24-152 m) thick.

Bloyd Formation (Lower Pennsylvanian, Morrowan) - In this quadrangle, the individual members within the Bloyd Formation cannot be recognized because its limestone units (Brentwood and Kessler Limestones) are either missing or have become shaly and sandy. There are no other "marker zones" to divide the section into the recognizable members known from the type section in northwest Arkansas. Therefore the Bloyd Formation is divided informally into lower and upper parts (Hudson et al., 2001) separated by the "middle Bloyd sandstone" (Zachry and Haley, 1975). In the western portion of this quadrangle the "middle Bloyd sandstone" cannot be recognized making the Bloyd Formation indivisible. For this reason a zigzag line is drawn in the region where the "middle Bloyd sandstone" is unrecognizable. Approximately 380-560 ft. (115-171 m) thick.

Pb — **Undifferentiated** – Consists of sections of thin to thick ripple to planar-bedded sandstone interbedded with very thin to thin ripple-bedded siltstones and clay to silty shale. The sandstones are fine to medium-grained, gray, dark gray to tan, may contain quartz pebbles, clay drapes and vertical trace fossils, and are sometimes calcareous and cross-bedded. The shales and siltstones are charcoal gray to black, sometimes weather reddish and contain siltstone concretions and trace fossils. Calcareous fossiliferous conglomerate layers occur throughout the Bloyd Formation. Sandy cross-bedded limestones occur in the lower portion of the formation. They are gray to dark gray on fresh surface but weather reddish or light gray to white and contain abundant fossils such as crinoids, brachiopods, blastoids and occasionally oolites. Approximately 580-680 ft. (177-207 m) thick.

Pbu — **Upper part** - Consists of interbedded thin ripple-bedded to thick micaceous sandstones interbedded with clay to silty shales. The sandstones consist of fine to coarse-grained sub-angular to sub-rounded quartz. They are light-brown to gray on fresh surface but weather dark-gray. The shales are dark-gray to black on fresh and weathered surfaces. This interval contains many trace fossils and load features. Approximately 200-240 ft. (60-73 m) thick.

Pbm — **"middle Bloyd sandstone"** - A thin to massive, medium to coarse-grained, cross-bedded quartz or iron-cemented sandstone with sub-angular to sub-rounded quartz grains. Reddish, gray, or light-tan on fresh surface but weathers brown to orange-brown due to iron content. The cross-bedded packages can be up to three feet thick and occasionally "overturned". Contains abundant lycopod fossils and rounded quartz pebbles. This sandstone forms a prominent bluff throughout this quadrangle and separates the upper from the lower part of the Bloyd Formation. A pebble clast conglomerate is present at some localities at the base of this sandstone. The "middle Bloyd sandstone" is unconformable with the lower part of the Bloyd Formation or the Witts Springs Formation. Approximately 60-100 ft. (18 - 30 m) thick.

Pbl — **Lower part** - Consists of interbedded very thin to thin ripple-bedded micaceous siltstones and sandstones that are fine to medium-grained interbedded with black clay to silty shales. Throughout the lower portion is black fissile clay shales to silty shales interbedded with thin to thick-bedded fossiliferous carbonate to sandy carbonate layers. The carbonate layers vary from red to gray on fresh and weathered surface and can be mottled. Sometimes the fossiliferous sandy layers look "rotten" due to decalcification. The sand grains are medium and sub-angular to sub-rounded. The contact between the lower part of the Bloyd Formation and the Prairie Grove is placed below a shaly layer conformable with the underlying massive calcareous sand of the Prairie Grove Member of the Hale Formation. This contact is conformable. Approximately 120-200 ft. (37-61 m) exposed along the western edge of the quadrangle.

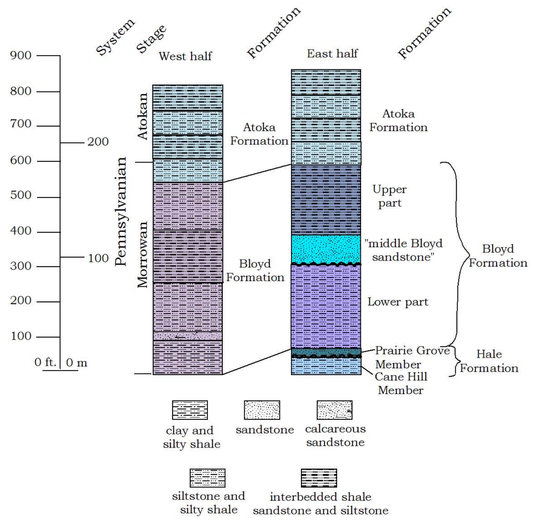
Pw — **Witts Springs Formation (Lower Pennsylvanian, Morrowan)** Glick et. al., 1964, gave this name to a sequence of rocks in the Snowball Quadrangle equivalent to the Prairie Grove Member of the Hale Formation and the entire Bloyd Shale (Formation) of the type Morrowan region, northwestern Arkansas. In their definition of this unit they identified the first massive quartz pebble sandstone they encountered above the Witts Springs as the Atoka Formation. Subsequently, the "middle Bloyd sandstone" which is not present in the type area of the Bloyd Formation in northwestern Arkansas was identified in north-central Arkansas by Zachry and Haley in 1975. It is this sandstone ("middle Bloyd sandstone") that is present above the Witts Springs Formation in the Snowball Quadrangle instead of the Atoka. Therefore, the Witts Springs Formation is equivalent to the Prairie Grove Member of the Hale Formation and the lower part of the Bloyd Formation in north central Arkansas. The Witts Springs is underlain by the Cane Hill Member of the Hale Formation and overlain by the "middle Bloyd sandstone" and strata equivalent to the upper part of the Bloyd Formation.
- Consists mostly of very thin to medium-bedded micaceous sandstone and interbedded clay shale. The sands are fine to medium-grained and usually ripple-bedded. Calcareous fine to medium-grained fossiliferous cross-bedded sandstones with sub-angular to rounded grains are present throughout this unit and contain clay pebble clasts and fine to coarse quartz pebbles. The sandstones are gray, greenish gray, or reddish gray on fresh surface but weather brown or dark-gray. Contains plant fragments, liesegang bands, stylolites and pock marks. The base of this unit is placed at the base of a 20-30 ft. (6-9 m) sandstone. A dark-gray shale pebble conglomerate is present at the base of the sandstone. The Witts Springs Formation is unconformable with the underlying Cane Hill Member of the Hale Formation. Approximately 200-320 ft. (60- 98 m) thick.

Hale Formation (Lower Pennsylvanian, Morrowan) - The Hale Formation consists of two Members; the Prairie Grove Member and the Cane Hill Member. The term Witts Springs is used for strata above the Cane Hill Member where the Prairie Grove is indistinguishable.

Php — **Prairie Grove Member** - A fine to coarse-grained quartz sandstone with varying amounts of carbonate, crinoidal fragments and quartz pebbles. Reddish-gray to brown or mottled on fresh surfaces but weathers dark reddish-brown. Bedding varies from thin to massive and exhibits a rounded weathering profile. This unit often contains cross-beds, liesegang bands, and a pitted surface that is referred to as honeycomb weathering. The base of the Prairie Grove Member contains a fossiliferous quartz pebble conglomerate that contains clay drapes, limonite pebbles and clasts of shale, siltstone, and sandstone. It is becoming increasingly difficult to differentiate the Prairie Grove Member due to additional sandstone packages in the Hale Formation and the lower part of the Bloyd Formation. The Prairie Grove Member is unconformable with the Cane Hill Member. Approximately 40-60 ft. (12-18 m) thick.

Phc — **Cane Hill Member** – Consists of a gray to black fissile clay to silty shale containing iron nodules and small limonitic boxwork fragments. Varies from black to dark-gray on fresh surface to light-gray and light-orange-brown on weathered surface. A thicker than normal package of thin-bedded ripple-marked micaceous siltstones and sandstones is present above the clay shale. Trace fossils are abundant. Approximately 40-60 ft. (12-18 m) exposed in Falling Water Creek.

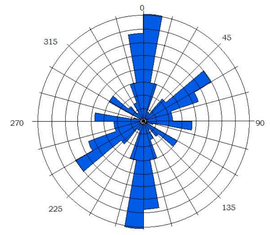
Stratigraphic Column



Symbols

- Contact
- Contact - inferred
- Fault (U - upthrown, D - downthrown)
- Fault - approximately located
- Fault - concealed
- Monocline
- Strike and dip of inclined bedding (10)

Joint Frequency



N=68

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

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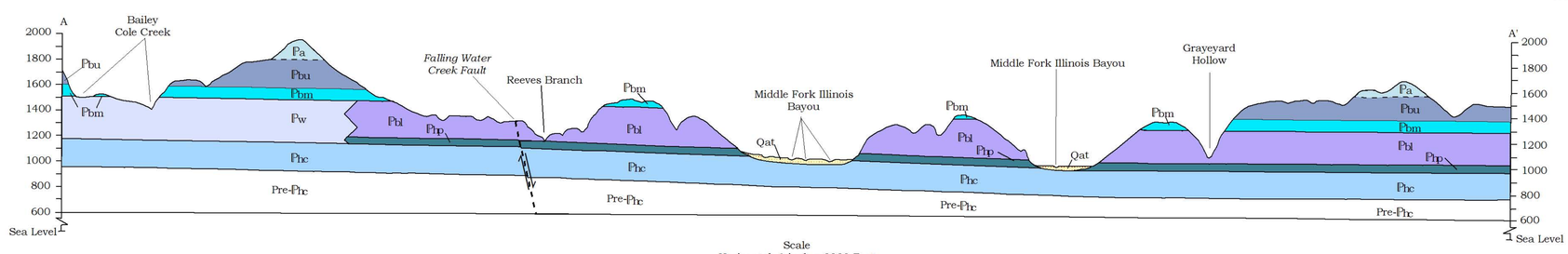

Scale
Horizontal: 1 inch = 2000 Feet
Vertical: 1 inch = 500 Feet (Exaggeration: 4x)

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