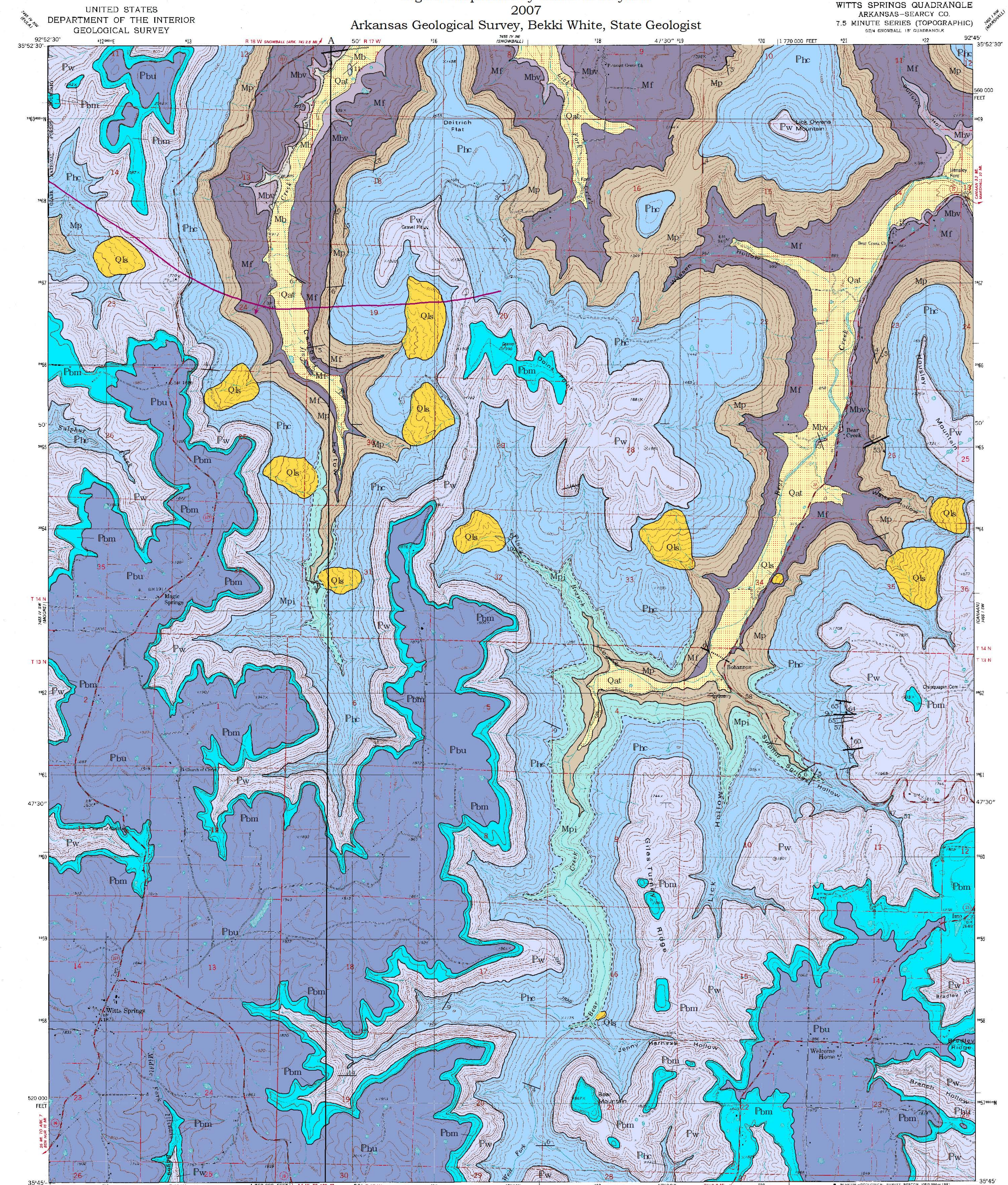


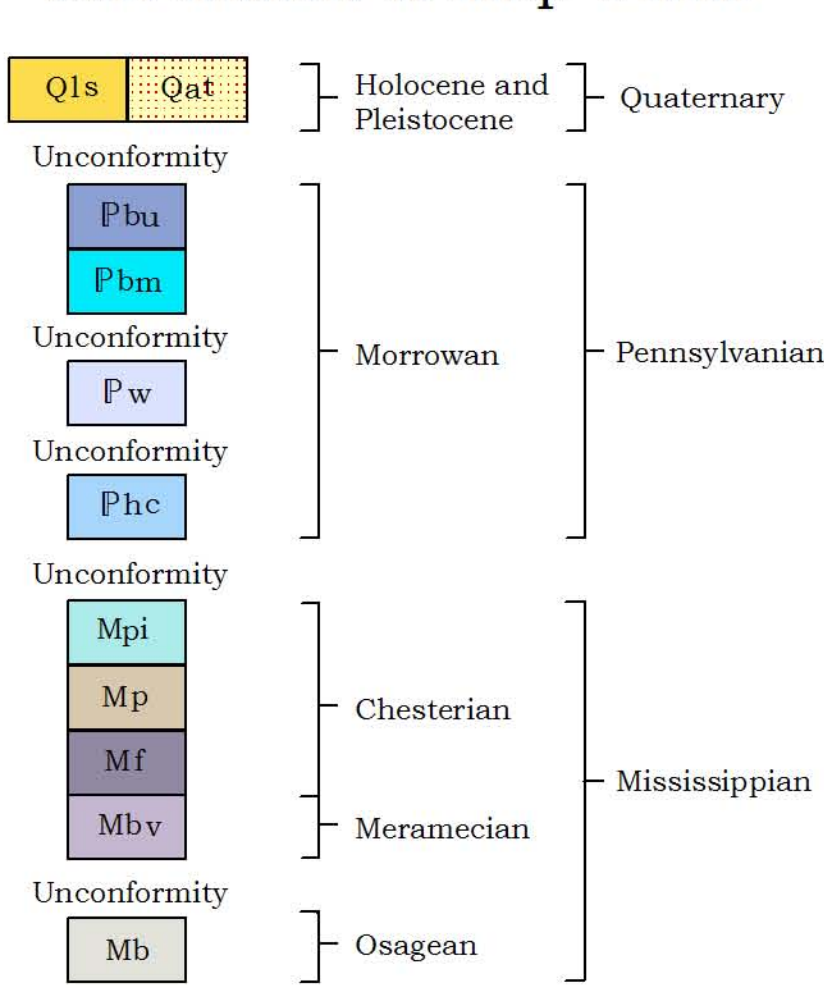
# GEOLOGIC MAP OF THE WITTS SPRINGS QUADRANGLE, SEARCY COUNTY, ARKANSAS

Geology by Daniel K. Smith and Richard S. Hutto  
Digital compilation by Walter K. Mayfield  
2007

WITTS SPRINGS QUADRANGLE  
ARKANSAS-SEARCY CO.  
7.5 MINUTE SERIES (TOPOGRAPHIC)  
1:62,500



## Correlation of Map Units



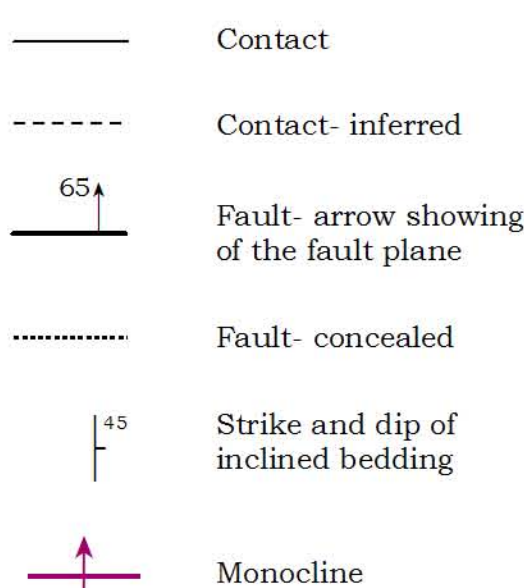
## Introduction

This map graphically summarizes the surface geology of the Witts Springs 7.5-minute quadrangle. In this area over 1240 feet of late Mississippian to early Pennsylvanian carbonate and clastic sedimentary rocks are exposed. The area lies on the northern edge of the Boston Mountains Plateau, the highest plateau on the southern flank of the Ozark Mountain dome which is centered in southeast Missouri. The major drainages in this area are Bear Creek and Calf Creek which both flow north and eventually into the Buffalo River. The type section for the Witts Springs Formation is located in the headwaters of Calf Creek, with the chief reference section in a small tributary to Richardson Creek on the western edge of the mapped area. The "Ino Formation" that was proposed by Gordon, but subsequently abandoned by the U.S. Geological Survey Geologic Names Committee in 1963, had its type section in Sulphur Springs Hollow, a tributary to Bear Creek in the southeastern quadrant.

## Description of Map Units

- Landslide deposits (Quaternary)** - Mostly blocks of sandstone derived from Morrowan units. The landslides primarily develop on the Morrowan Shales and to a lesser extent the Chesterian shales. Landslides occur adjacent to stream channels or stream valleys.
- Alluvium and terrace deposits (Quaternary)** - Unconsolidated clay, silt, sand and gravel including terrace deposits of local streams on one or more levels.
- Bloyd Formation (Lower Pennsylvanian, Morrowan)** - The individual members of the Bloyd Formation (Brenwood and Kessler Limestones) cannot be differentiated in this quadrangle. These "marker zones" are used to divide the section into discernible units at the type section in northwest Arkansas and are either missing or have become unrecognizable on this quadrangle. Therefore, the Bloyd Formation is informally divided into upper, middle and lower parts on adjacent quadrangles (Braden, et al., 2003) using the "middle Bloyd sandstone" (Zachry and Haley, 1975). On this map the "middle Bloyd sandstone" was formerly considered to be the basal Atoka, is used to separate the upper part from the Witts Springs Formation. The rocks equivalent to the lower part of the Bloyd are mapped as the main body of the Witts Springs. The formation thickness ranges approximately 80 - 255 feet (24 - 78 meters) on this quadrangle.
- Upper part** - consists of thin, ripple-bedded to thick-bedded, micaceous sandstones interbedded with clay to silty shales. The sandstone consists of fine to coarse-grained, sub-angular to sub-rounded grains. They are light-brown to gray on fresh surfaces and weather brown to dark gray. The shales are dark-gray to black on fresh surfaces and weather tan to brown. This interval contains many trace fossils and load features. The upper part ranges approximately 40 - 215 feet (12 - 66 meters) thick.
- "Middle Bloyd sandstone"** - is a thin to massive-bedded, cross-bedded, medium to very coarse-grained, well-sorted, quartz or iron-cemented sandstone with sub-angular to sub-rounded quartz grains. Fresh surfaces are light-tan, light-gray or reddish to brownish-tan, whereas weathered surfaces are tan, gray, reddish-brown to dark-brown depending upon iron content. Well-rounded, milky quartz pebbles are typically present and help distinguish it from adjacent units. In some localities the sandstone will be slightly micaceous or contain lycopods. The sandstone also exhibits minor honeycomb weathering and Liesegang banding. This unit is a prominent bluff former throughout the quadrangle and is unconformable with the Witts Springs Formation. Thickness ranges from approximately 40 - 80 ft. (12 - 24 meters).

## Symbols



## Witts Springs Formation (Lower Pennsylvanian, Morrowan)

In 1964, Glick et al. 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 description of this unit they defined its upper limit as the base of the Atoka Formation which they identified as the first massive quartz pebble sandstone they encountered above the Witts Springs Formation. In 1975, the "middle Bloyd sandstone", which is not present in the type area in northwestern Arkansas, was identified and described as belonging in the Bloyd Formation in north-central Arkansas by Zachry and Haley. It is this sandstone to which Glick referred when defining the upper limit of the Witts Springs. Therefore, in current mapping, we have defined the upper limit of the Witts Springs Formation as the base of the "middle Bloyd sandstone" and divided it from the middle and upper Bloyd. The unit is underlain by and unconformable with the Cane Hill member of the Hale Formation. The Witts Springs Formation is equivalent to the Prairie Grove Member of the Hale Formation and the lower part of the Bloyd Formation (Braden, et al., 2003). Formation thickness ranges approximately 220 - 400 ft. (67 - 122 m).

**Hale Formation (Lower Pennsylvanian, Morrowan)** - The Hale Formation consists of two members: the Prairie Grove Member and the Cane Hill Member. Glick, et al., in 1964, proposed that the Cane Hill be raised to formation rank to the area of Searcy County Arkansas, to include the Mississippian-aged unit above the highest Pitkin Limestone and the entire Cane Hill Member. While we used this nomenclature in mapping the Snowball 15-minute quadrangle, it has fallen into disuse, and is not used here. Only the Cane Hill Member of the Hale Formation is interpreted to be present on this quadrangle.

**Pitkin Limestone (Upper Mississippian, Chesterian)** - The Pitkin Limestone consists primarily of limestone with some minor interbedded shale. A predominantly shale interval containing Mississippian-aged fossils overlies the Pitkin Limestone south of a monocline in southern half of the quadrangle. The name assigned to this interval is somewhat unsettled. Gordon was first to propose the name "Ino Formation" for this interval. He later withdrew the name (Gordon, 1964) as a result of concurrent mapping and publication by Glick et al., 1964. Glick included the Mississippian-aged rock above the Pitkin in the Pennsylvanian-aged Cane Hill Member of the Hale Formation, and raised the Cane Hill to formation rank. The Cane Hill Formation was officially recognized and approved by the Geologic Names Committee in 1963, but has seldom been used since that time. However, the name "Ino Formation" has been and still is unofficially applied to this interval by the geologic community as seen in various publications (Kroger et al., 2004; McFarland, 1998; Manger, 1988; Saunders, 1973). For purposes of this map the fossiliferous unit overlying the Pitkin Limestone and beneath the first distinguishable Cane Hill sandstone is mapped as the Ino Member of the Pitkin Limestone. The Cane Hill is mapped as a Member of the Hale Formation on this quadrangle.

**Fayetteville Shale (Upper Mississippian, Chesterian)** - is a thin to massive-bedded, fine to coarse-grained, often oolitic, micaceous or bioclastic limestone with occasional interbedded black, fissile clay shale. Typically contains abundant calcite veinings and fragments, the bryozoan *Reticularia*, and *Tyloschuchia*, brachiopods, crinoids, gastropods, and trilobites. Ranges from dark-gray to light-gray on fresh surfaces and typically weathers light or medium-gray but becomes tan near the surface. The limestone often has a petrofluoriferous odor when freshly broken. An interbedded shale is present in the upper 50 - 70 feet (15 - 21 meters) of the formation near the southern edge of the outcrop belt just north of the confluence of Piney Branch and Sulphur Springs Hollow with Bear Creek. This shale consists of gray to black, blocky, fissile, calcareous clay shale with interbedded limestone concretions which is overlain by the typical limestone as described above. No fossils were found in this interval. The Fayetteville Shale is conformable with the Batesville Shale. Thickness ranges approximately 40 - 260 feet (12 - 79 meters).

## Fayetteville Shale (Upper Mississippian, Chesterian)

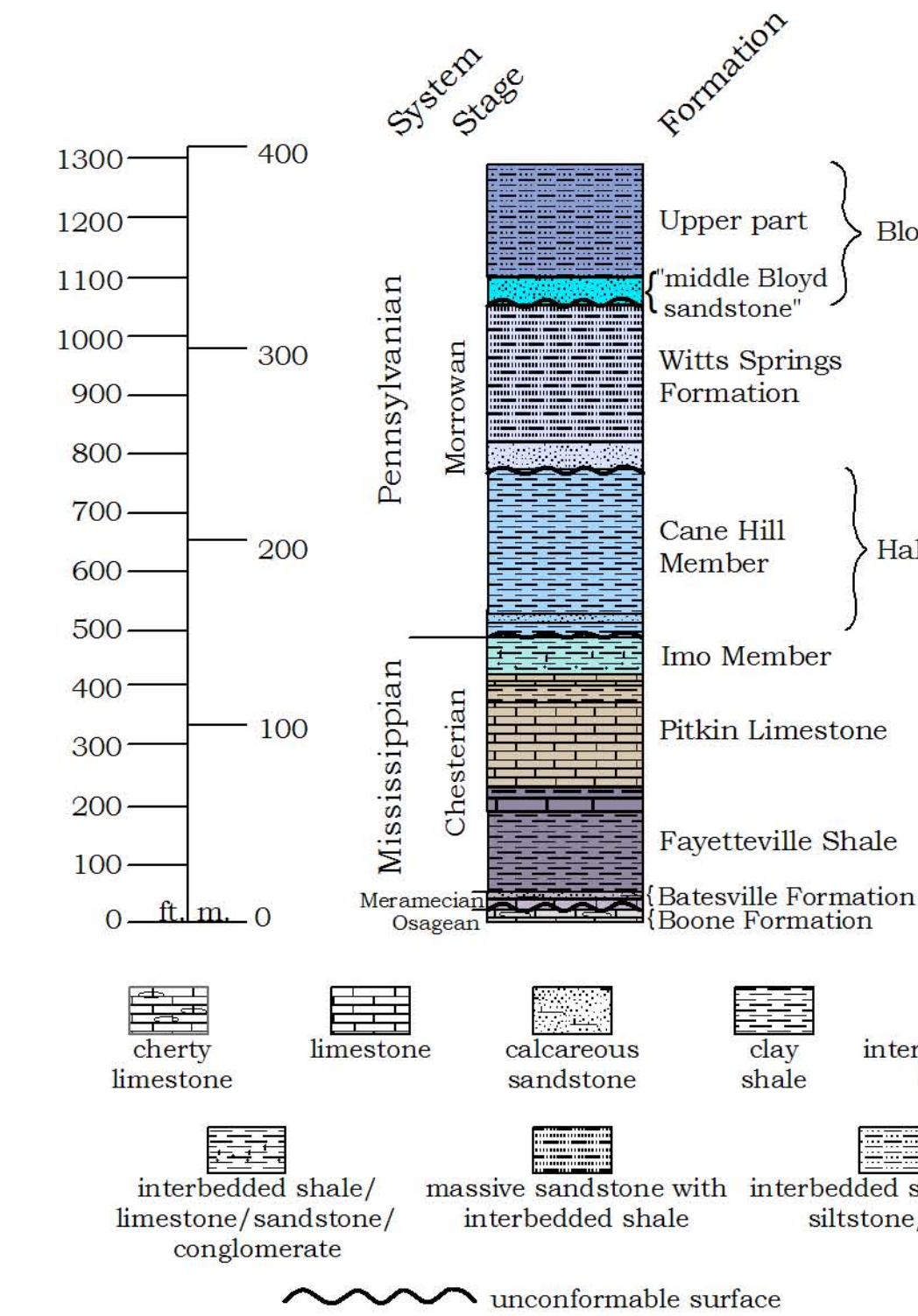
A black, fissile clay shale which becomes increasingly dominated by interbedded thin to medium-bedded, gray to dark-gray, fine-grained (micritic) limestone in the upper twenty feet of the formation to the conformable contact with the overlying Pitkin Limestone. The micritic beds typically contain black chert, are sparsely fossiliferous, have a petrofluoriferous odor when broken, and often form resistant and sometimes steeply bedded. Septarian concretions are present in the upper and lower parts of the formation in this quadrangle. The Fayetteville Shale is conformable with the underlying Batesville Sandstone. Approximately 120 to 280 feet thick (37 - 85 meters).

**Batesville Formation (Upper Mississippian, Meramecian)** - A very fine to medium-grained, sub-angular, moderately sorted, iron-cemented sandstone which is generally thin to medium-bedded, and is cross-bedded in some areas. Light-brown to cream-colored on fresh surfaces, it will typically weather light to dark-gray. The Batesville Sandstone is unconformable with the Boone Formation. Ranges approximately 40 - 80 feet (12 - 24 meters) in thickness.

**Boone Formation (Lower Mississippian, Osagean)** - Coarse to fine-grained, fossiliferous limestone interbedded with amorphous and bedded chert. Light to medium-gray on fresh surfaces, but usually weathers dark-gray. The chert varies in color from white to dark-gray. Abundant crinoid fragments are often seen on weathered surfaces. Karst features such as solution joints, small caves, springs, and disappearing streams are also evident. The Boone only occurs at the northern edge of this quadrangle where as much as 40 feet (12 meters) is exposed.

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## Stratigraphic Column



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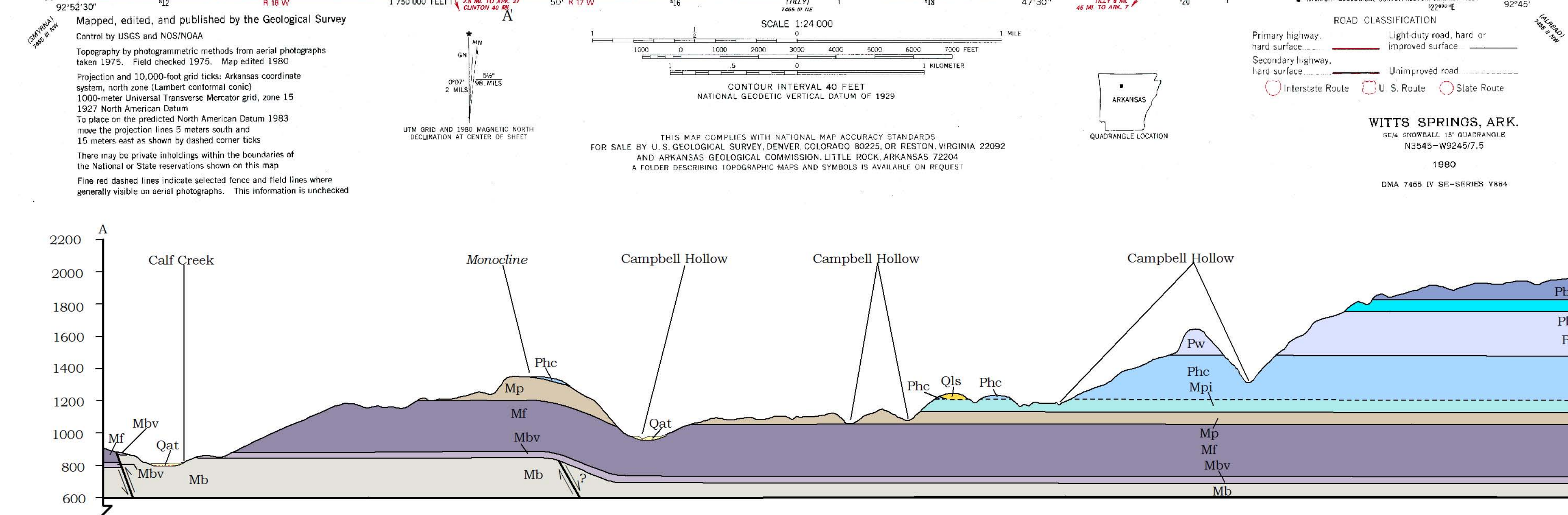
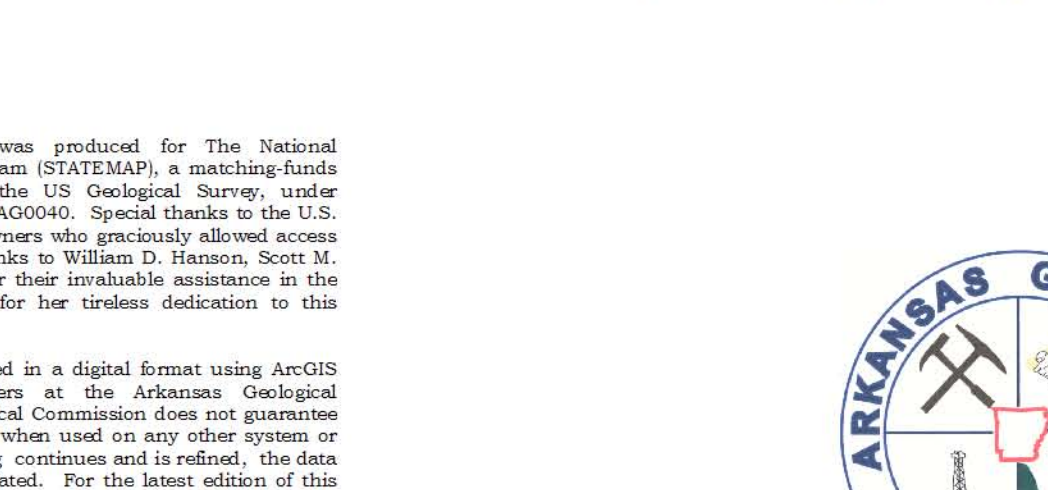
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## Joint Frequency



Maped, edited, and published by the Geological Survey  
Control by USGS and NONGMA  
Topography by photogrammetric methods from aerial photographs taken 1975. Field checked 1975. Map edited 1980  
Projection and 10,000-foot grid ticks: Arkansas coordinate system, north zone (Lambert conformal conic), zone 15  
1927 North American Datum  
To place on the predicted North American Datum 1983 move the projection lines 0 meters south and 17.0 meters east as shown by dashed corner ticks  
There may be private inholdings within the boundaries of the National of State reservations shown on this map  
The wet shaded lines indicate selected fence and field lines which generally visible on aerial photographs. This information is unbacked

ROAD CLASSIFICATION  
Primary highway - light gray road, hard or hard surface  
Secondary highway - red line  
Unimproved road - dashed line  
Interstate route - U.S. Route - State Route

WITTS SPRINGS, ARK.  
7.5 MINUTE SERIES (TOPOGRAPHIC)  
1:62,500  
1980  
DINA 7485 17 807-SERIES 1985

SCALE: 1:24,000  
Horizontal: 1 inch = 2000 feet  
Vertical: 1 inch = 500 feet (Exaggeration: 4X)

