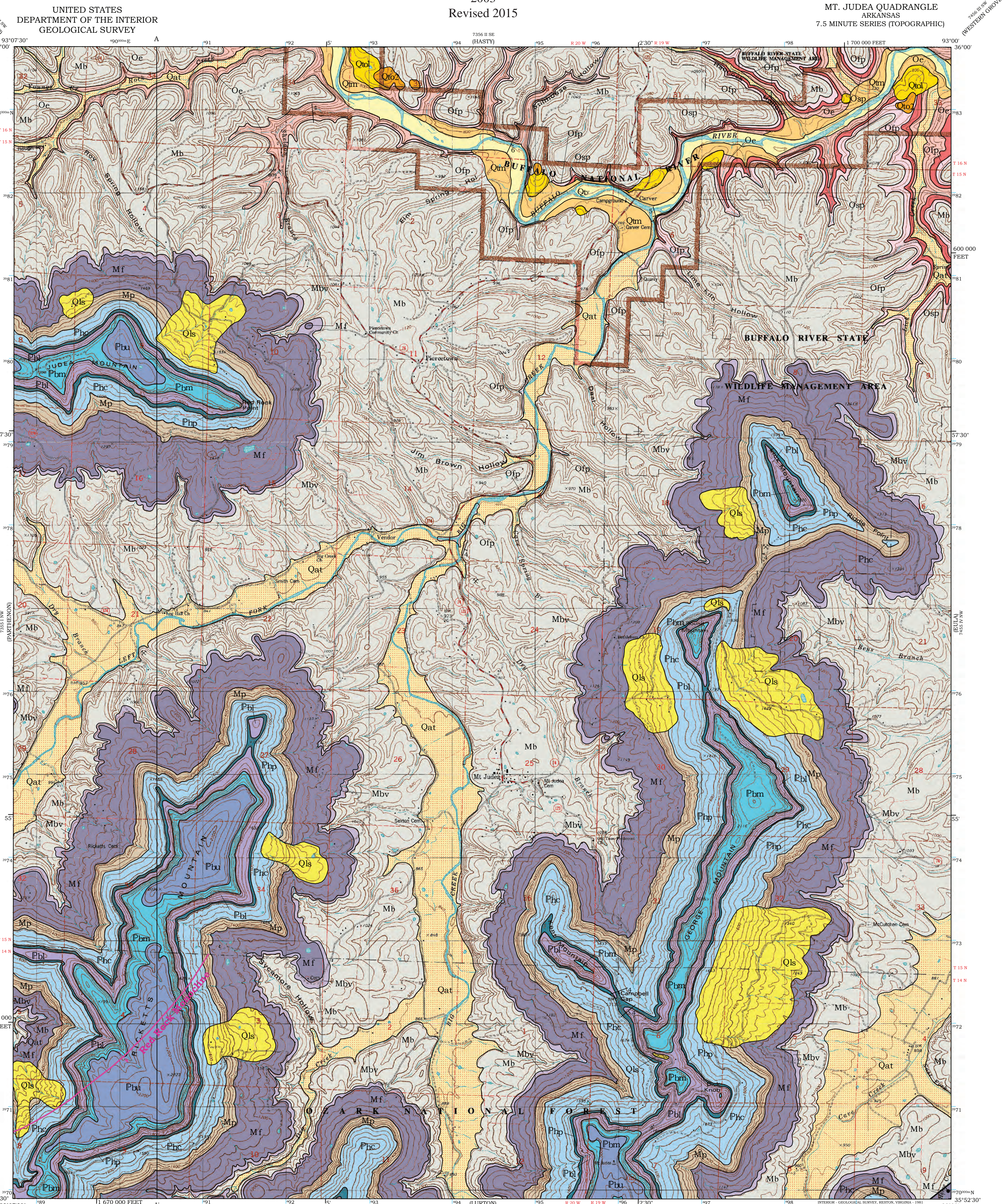


# Geologic Map of the Mt. Judea Quadrangle, Newton County, Arkansas

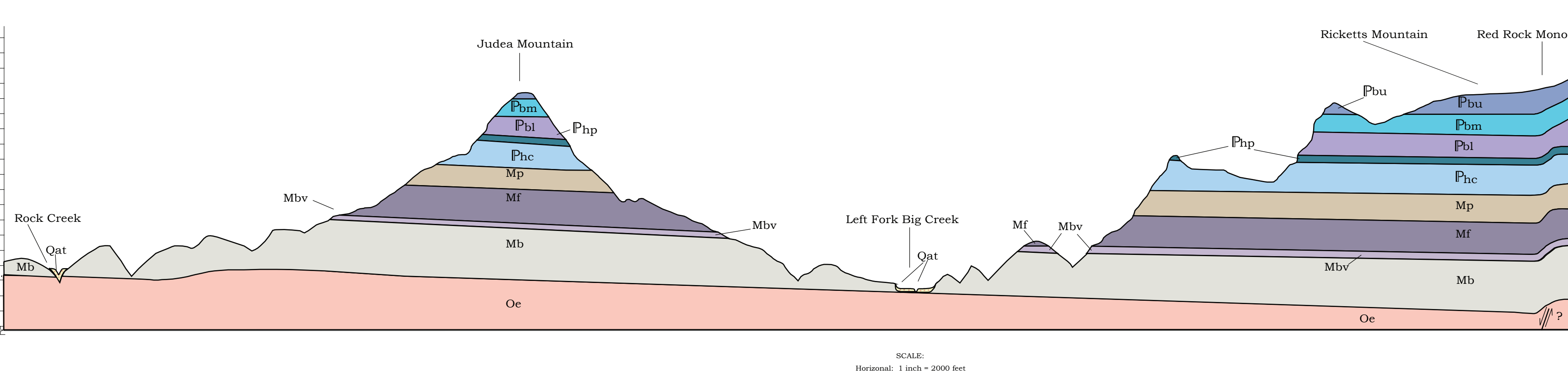
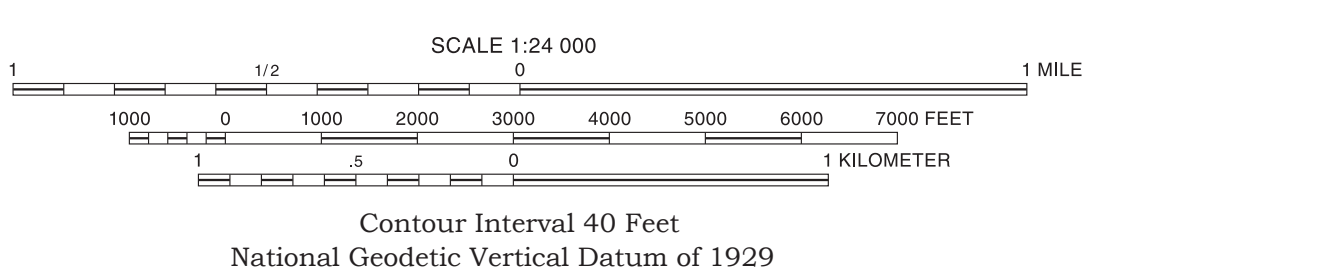
Angela K. Chandler and Scott M. Ausbrooks  
2015

Revised 2015

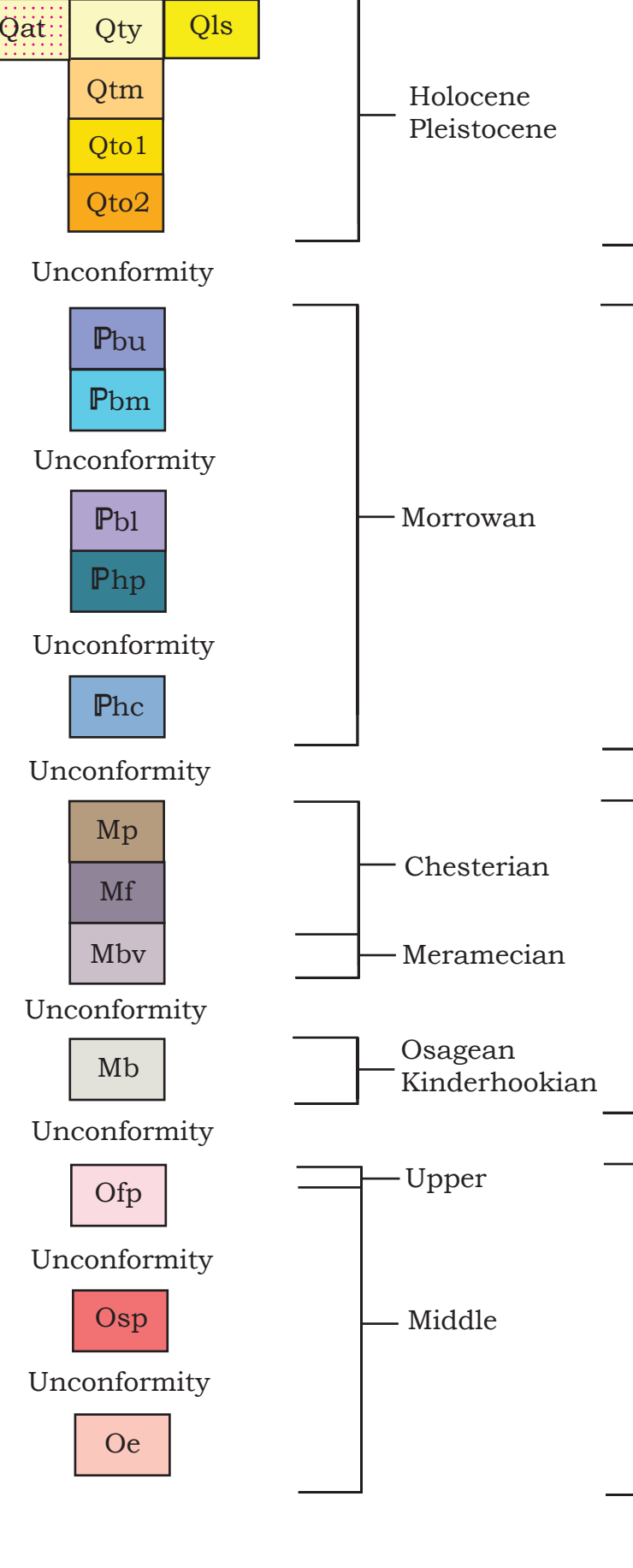
MT. JUDEA QUADRANGLE  
ARIZONA  
7.5 MINUTE SERIES (TOPOGRAPHIC)



The topographic base is a colorized Digital Raster Graphic (DRG). The DRG is a scanned image of a U.S. Geological Survey standard series topographic map published in 1980.  
10,000-foot grid based on Arkansas coordinate system, north zone.  
100-meter Universal Transverse Mercator grid ticks, zone 15 shown in blue, 1927 North American Datum.



## Correlation of Map Units



## Introduction

This map illustrates the surface geology of the Mt. Judea quadrangle. This quadrangle was previously mapped at 1:62,500 scale by Glick, in 1976, for the Geologic Map of Arkansas. From 2002-2003, this quadrangle was mapped for the National Cooperative Geologic Mapping Program through STATEMAP. During 2014-2015, the terrace deposits along the Buffalo National River were mapped with funding provided by the National Park Service. Approximately six miles of the Buffalo National River are located in this quadrangle and are managed by the National Park Service.  
Approximately 2100 feet (618 meters) of Middle Ordovician Morrowan-age strata crop out in this area. The Middle Ordovician St. Peter Sandstone is present only in the northeastern corner of the map. Middle and Upper Ordovician and Silurian limestones are present locally along the Buffalo National River. The Lower Mississippian Boone Formation forms the Springfield Plateau surface on the majority of the quadrangle. Upper Mississippian to Morrowan sandstone, shale, and limestone form steep sided mountains on the edge of the Boston Mountains escarpment in the quadrangle.  
Quaternary terrace and alluvium deposits are present in the valley of the Buffalo National River and its tributaries. Two terrace levels are well developed along the river: a younger and a medial. Older terraces are located 80-160 feet (24-49 meters) above the river in most meander bends. Locally, very old terrace deposits are preserved approximately 200 feet (61 meters) above the river.

## Description of Map Units

- Qt** **Landslide deposits (Quaternary)** - Blocks of sandstone derived from the Morrowan units. Along roads, the landslides are mostly in shale units either in the Fayetteville Shale or Cane Hill Member of the Hale Formation.
- Qat** **Alluvium and terrace deposits (Quaternary)** - Unconsolidated clay, silt, sand, and gravel including deposits on one or more terrace levels.
- Qm** **Young terrace and active channel deposits (Quaternary)** - Unconsolidated clay, silt, sand, and gravel in gravel bars and sandy point bar deposits along the Buffalo River. Primarily clay, silt, and sand in youngest terrace above the river. The tops of terraces are generally hummocky and tree-covered but can be flat and commonly dissected by tributaries. Approximately 20-30 ft. (6-9 m) thick.
- Qm1** **Medial terrace and alluvial deposits (Quaternary)** - Unconsolidated clay, silt, sand, gravel, and cobbles along the Buffalo River. The contact with the underlying terrace is located at a riser that is approximately 15-20 ft. (4-6 m) high and usually coincides with the edge of the riparian zone approximately 40 ft. (12 m) above the river. Ranges in thickness from 20-60 ft. (6-18 m).
- Qo1** **Old terrace and alluvial deposits (Quaternary)** - Unconsolidated gravel deposits on ridges above the Buffalo River. Deposit consists of coarse sand to cobble-sized sub-angular to rounded sandstone and chert. Located approximately 80-100 ft. (24-30 m) above the river and ranges up to 160 ft. (49 m) above the river. Thickness unknown.
- Qo2** **Very old terrace and alluvial deposits (Quaternary)** - Unconsolidated gravel deposits on ridges above the Buffalo River. Deposit consists of coarse sand to cobble-sized sub-angular to rounded sandstone and chert. Located approximately 200 ft. (60 m) above the river. Thickness unknown.

## Introduction

### Bloyd Formation (Lower Pennsylvanian, Morrowan)

In this quadrangle, the individual members within the Bloyd Formation cannot be recognized because the 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 members as recognized in the type section in northeast 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).  
**Upper part** - Consists of interbedded thin ripple-bedded to thick micaceous sandstones and 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, loof features, and ball and pillow structures. Conformable with the "middle Bloyd sandstone", approximately 200-240 ft. (60-73 m) thick.  
**middle Bloyd sandstone** - A thin to massive bedded, 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 surfaces but weathers brown to orange-brown due to iron content. The cross-bedded packages can be up to three feet thick and locally overturned. Contains abundant leopold fossils and rounded quartz pebbles. Forms a prominent bluff throughout this quadrangle and separates the upper and lower parts of the Bloyd Formation. A pebble clast conglomerate is present at the base of this sandstone. Unconformable with the lower part of the Bloyd Formation. Approximately 80-160 ft. (24-48 m) thick.  
**Lower part** - Consists of interbedded very thin to thin-ripple bedded micaceous silstones and sandstones that are fine to medium-grained. A very thin- to thick-bedded fossiliferous, sandy, fine-grained limestone is present beneath the "middle Bloyd sandstone" at a few locations. This limestone is gray on fresh surfaces but weathers light brown with a rounded profile. Black fissile clay to silty shales interbedded with thin- to thick-bedded fossiliferous sandstone to sandy limestone layers are present throughout the unit. The limestone layers vary from red to gray on fresh and weathered surfaces and can be mottled. Locally the fossiliferous sandy layers look "rotten" due to decalcification. The sand in medium-grained and sub-angular. The basal contact of the Bloyd Formation is placed below a shaly unit that is conformable with the underlying massive calcareous sandstone of the Prairie Grove Member of the Hale Formation. Approximately 120-160 ft. (36-48 m) thick.

### Hale Formation (Lower Pennsylvanian, Morrowan)

The Hale Formation consists of two members: the Prairie Grove and the Cane Hill. Approximately 160-220 ft. (48-67 m) thick.  
**Prairie Grove Member** - A fine to coarse grained quartz sandstone with varying amounts of carbonate, crinoid 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 is a prominent bluff-former that often contains cross-beds 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 includes clasts of shale, siltstone, and sandstone, as large as one foot in diameter. One green feldspar fragment was found from this interval. Unconformable with the Cane Hill Member. Approximately 40-60 ft. (12-18 m) thick.  
**Cane Hill Member** - A gray to black, fissile, clay to silty shale containing iron nodules and small limonitic concretion fragments. Varies from black to dark gray on fresh surfaces to light gray and light orange-brown on weathered surfaces. Thin-bedded ripple-marked siltstones and sandstones are present above the clay shale. Trace fossils are abundant. A one foot thick conglomerate containing black pebble clasts, fossil fragments, and clay clasts is present at the base on a locally. Unconformable with the Pitkin Limestone. Approximately 120-240 ft. (36-73 m) thick.

### Pitkin Limestone (Upper Mississippian, Chesterian)

A fine to coarsely crystalline, often fossiliferous limestone containing crinoid fragments, *Archimedes* bryozoa, gastropods, coral (rugose and colonial), and oolites. Varies from light gray to dark gray on fresh surfaces but usually weathers light or medium gray. Medium to massive-bedded. Others has a petreliferous color on freshly broken surfaces. A black shale occurs at the top of the Pitkin just beneath the Cane Hill Member of the Hale Formation at a few localities. It is distinctive from the Cane Hill in that it is not silty and does not contain bowyer fragments. No fossils were found from this shale interval. Conformable with the Fayetteville Shale. Approximately 160 ft. (48 m) thick.

### Fayetteville Shale (Upper Mississippian, Chesterian)

A black fissile clay shale. Alternating beds of marlite and shale are present in the upper portion of the formation. Black chert is common in the matrix. The marlite beds in the upper portion of this unit form resistant and steep ledges. Septarian concretions are present near the base of the shale. This sandstone dikes are exposed near a small spring along County Road 249 near the center of Sec. 8, T15N, R19W. Conformable with the underlying Batesville Sandstone. Approximately 200-280 ft. (60-85 m) thick.

### Batesville Formation (Upper Mississippian, Meramecian)

A very fine- to medium-grained, sub-angular, moderately sorted, iron-cemented sandstone. Thin to medium bedded. Light brown to cream colored on fresh surfaces. Weathers light to dark gray. Minor amounts of sandstone are present in this quadrangle. This interval is mostly made up of the Hindsville Limestone Member.  
**Hindsville Limestone Member** - Consists of thin-bedded, fine to coarsely crystalline limestone. Light to dark gray on fresh surfaces but generally weathers light gray or brown. Commonly has a strong petreliferous color on freshly broken surfaces. The limestones are fossiliferous and/or oolitic, contain pyrite, and are locally interbedded with thin layers of clay shale and thin beds of siltstone to fine-grained sandstone. A breccia containing angular chert and limestone fragments is present at the base of this interval in some localities. Unconformable with the Boone Formation. Approximately 20 ft. (15-6 m) thick.

### Boone Formation (Lower Mississippian, Osagean and Kinderhookian)

Coarse-grained fossiliferous and fine-grained limestones interbedded with alternating and bedded chert. Light to medium gray on fresh surfaces but commonly weathers dark gray. The chert varies in color from light gray to dark gray. Springs and sinkholes are abundant. Exhibits an undulating topography that forms steep hillsides separated by rain-like drainages. Approximately 120-400 ft. (36-121 m) thick.  
**Short Creek Oolite** - A thin to massive-bedded, cross-bedded, oolitic crinoidan bioherm and oolitic biomatrix. White to gray on fresh and weathered surfaces. Easily recognized by its chalky appearance and by a concave weathering profile. Various intervals are durable due to a calcite cement, while other intervals are friable. Around 35 ft. (10 m) of this unit is quarried at Mt. Judea Quarry and mixed with chert limestone for road aggregate. Approximately 120-400 ft. (36-121 m) thick.  
**St. Joe Limestone Member** - A medium-grained thin-bedded crinoid limestone with interbedded very thin-bedded shaly limestones. Dark gray to reddish in color but locally contains green mottling on fresh surfaces. Commonly weathers medium to dark gray. Locally, phosphate nodules are present near the lower contact. The St. Joe Limestone is present along the Buffalo River and Big Creek and their drainages south to Vendor in the central portion of the quadrangle. Approximately 10-30 ft. (3-9 m) thick.  
**Basal sandstone** - A fine to medium-grained, moderately sorted, sub-rounded to rounded, iron- or quartz-cemented sandstone. White to light gray and tan on fresh surfaces but commonly bleached due to iron staining. Weathers tan to white. Thin to thick bedded but typically present as float. Contains phosphate pebbles and angular white and light-gray chert fragments. This unit yields abundant conodonts. Unconformable with the Fayetteville Shale. Approximately 5-35 ft. (1.5-10 m) thick.

### Ferraville Limestone (Upper Ordovician)

A medium- to coarsely crystalline crinoid limestone. Medium to massive bedded. White to light gray with a pink to reddish tint or mottling on fresh surfaces but weathers dark gray. Contains multicolored barrel-shaped crinoids, and brachiopods that are accentuated on a weathered surface. Often contains pyrite. Locally cross-bedded when beds are massive. Typically weathers to rounded masses that are usually friable. Unconformable with the Platina Limestone. 0- approx. 25 ft. (0-7 m) thick.  
**Platina Limestone (Middle Ordovician)** - A thin to thick-bedded micritic limestone that locally displays a suggy texture. Light to dark gray on fresh surface but weathers white to dark gray. A dolomitic interval is present at the top of the formation. Unconformable with the St. Peter Sandstone or Everton Formation in this quadrangle. 0- approx. 80 ft. (0-24 m) thick.

### St. Peter Sandstone (Middle Ordovician)

A thin to thick-bedded very fine- to fine-grained sandstone. White to green on fresh surfaces but weathers light gray to green. Locally, green shale clasts are present and weather to give the sandstone a green color. Contains a calcite cement, but where leached sandstone is friable. The quartz grains are rounded. Green siltstones and shales are interbedded with the sandstone. Contains vertical trace fossils referred to as *Scolithes* by Adams et al. (1974) that weather to resemble ledges in cross-section view. Unconformable with the Everton Formation. Approximately 0-40 ft. (0-12 m) thick.

### Everton Formation (Middle Ordovician)

Very fine- to medium-grained, crystalline to sandy, and tiny dolostones that are thin- to massive-bedded. Thin to medium-beds of fine- to medium-grained quartz sandstone are common and similar to the overlying St. Peter Sandstone. Medium to dark gray on fresh surface but typically weathers light gray. Approximately 40-140 ft. (12-42 m) is exposed.

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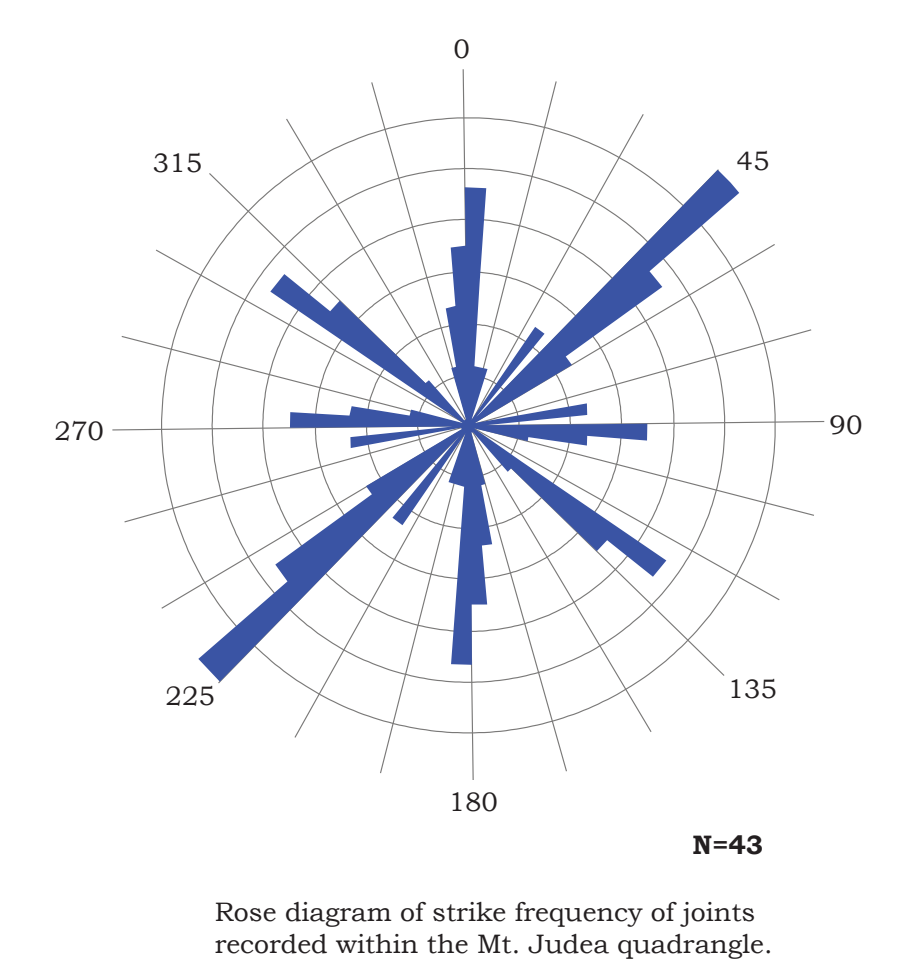
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## Symbols

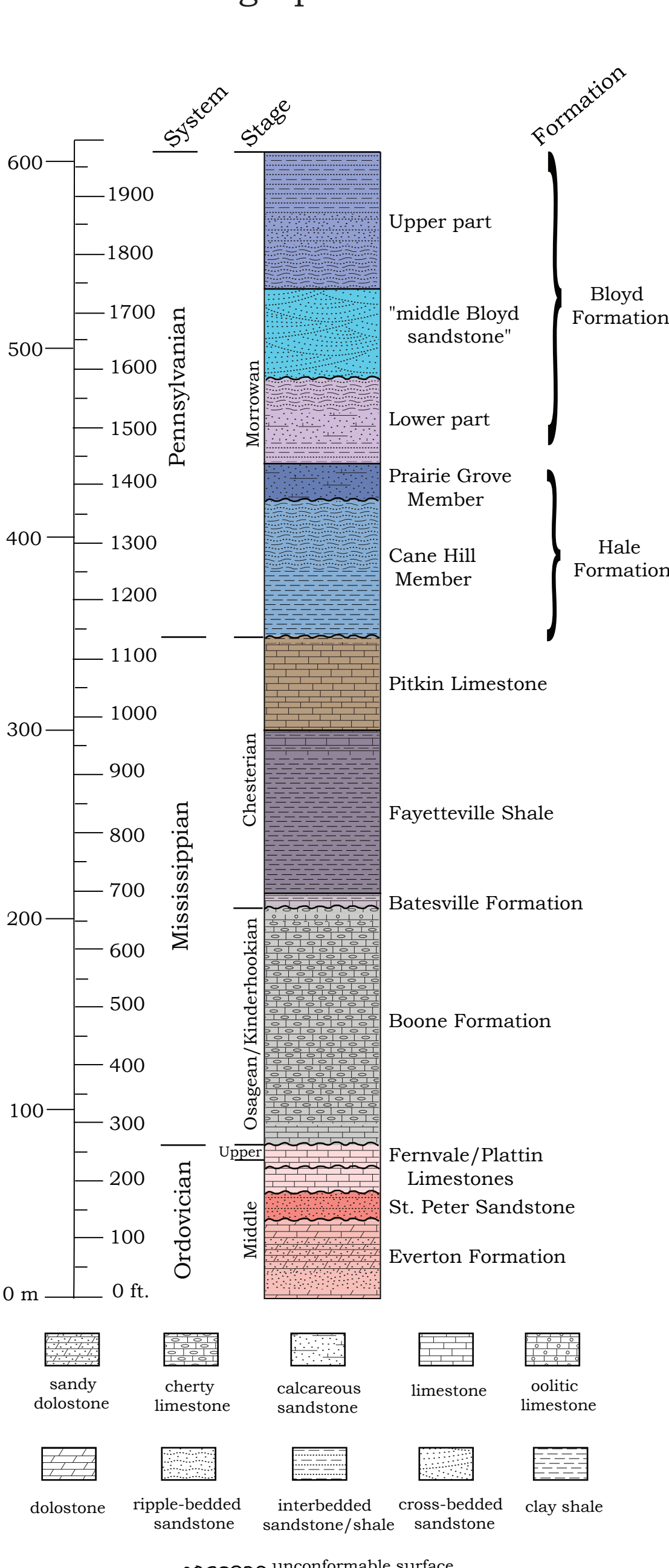
- Contact
- Normal fault - ball and bar on downthrown side. Dashed where inferred. Dotted where concealed.
- Monocline
- Inclined bedded showing strike and dip
- Quarry
- Short Creek oolite

## Joint Frequency



Rose diagram of strike frequency of joints recorded within the Mt. Judea quadrangle.

## Stratigraphic Column



Very old terrace cobbles located 200 feet (60 m) above the river in Sec. 35, T 16 N, R 20 W.

## References

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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 work continues and new data is collected, the contacts and structures depicted on this map may be changed.

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Map and cross-section digitized by Walter K. Mayfield, Jerry W. Clark, and Brian Kehler.