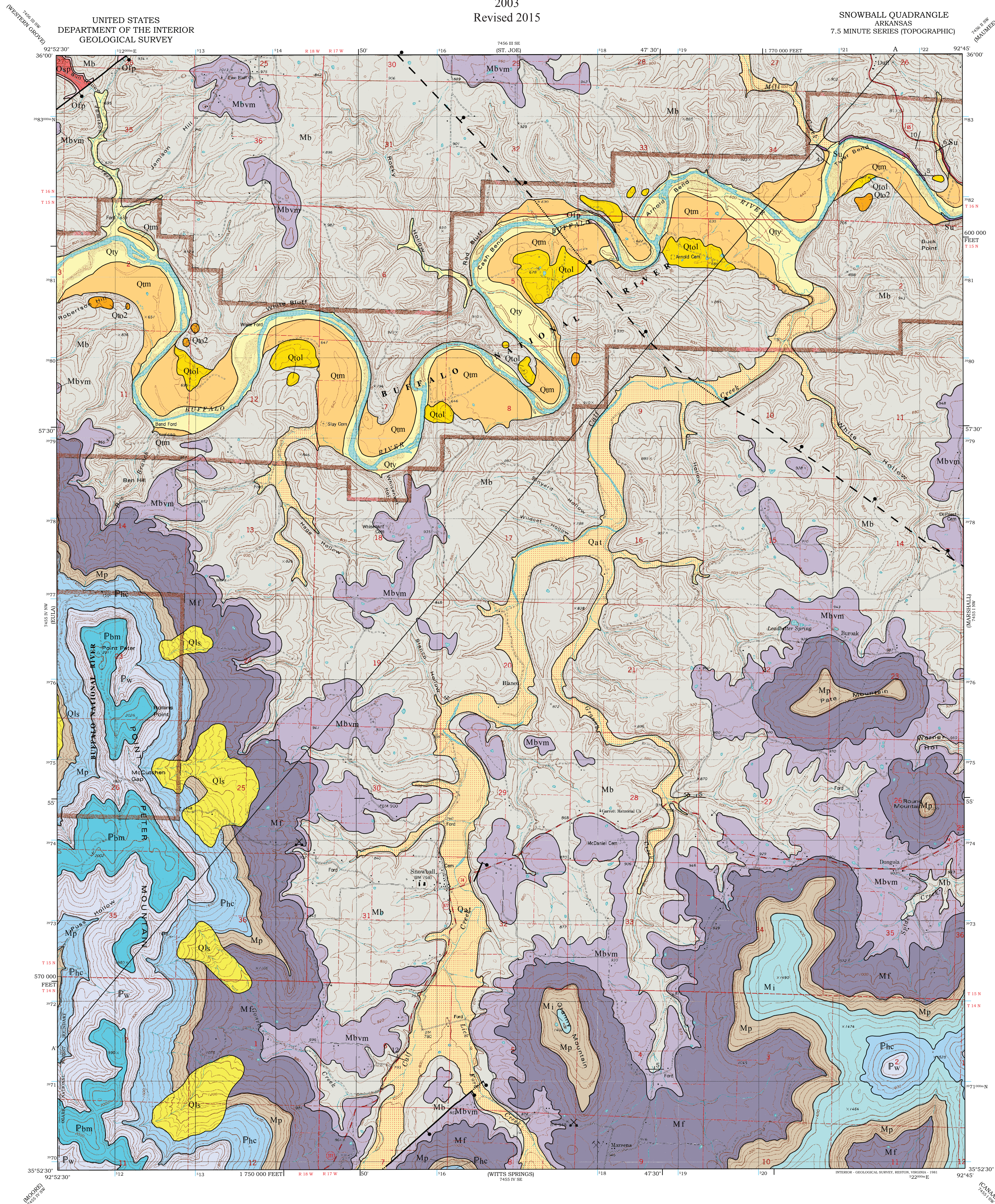


# Geologic Map of the Snowball Quadrangle, Searcy County, Arkansas

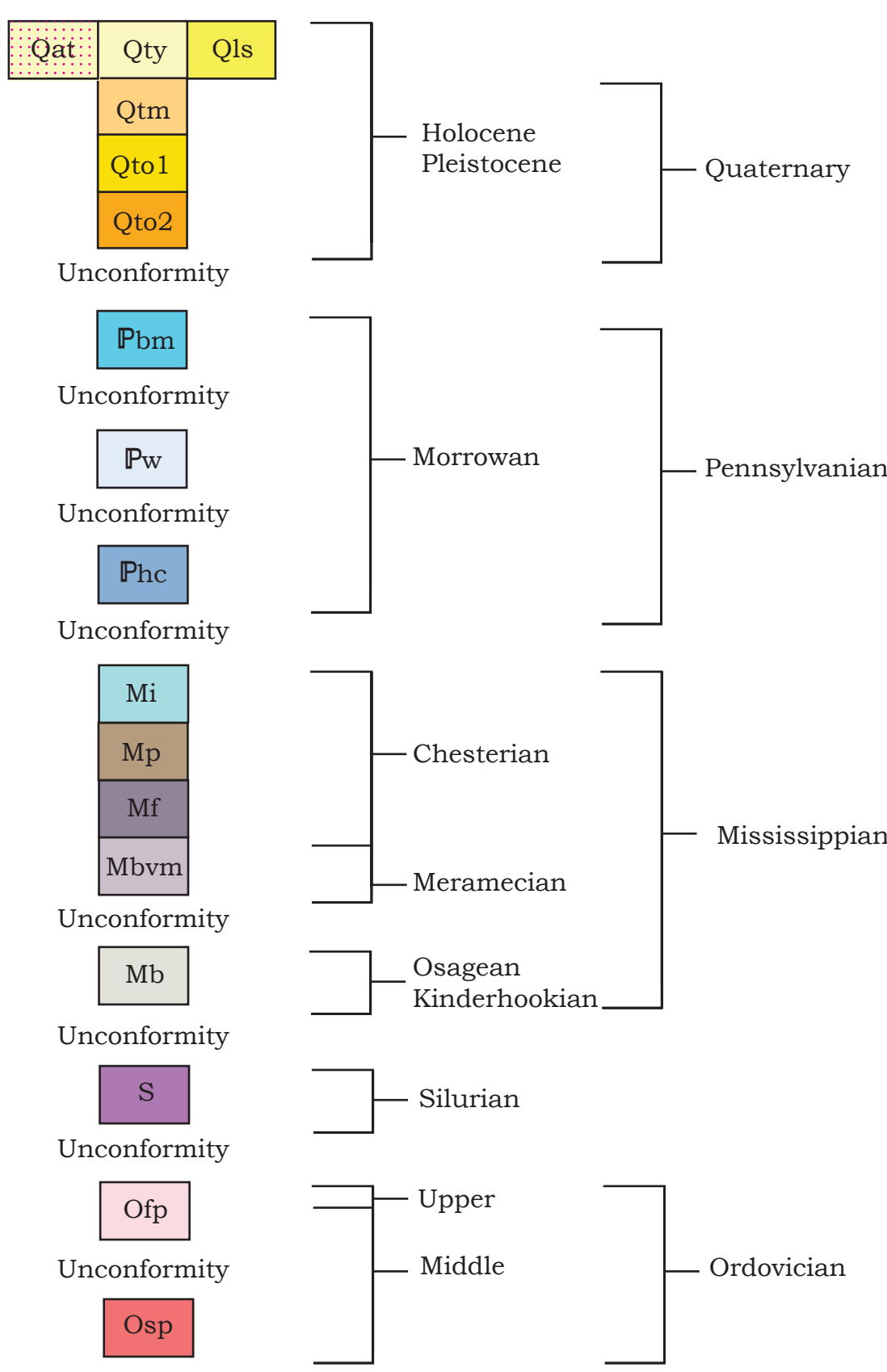
Angela K. Chandler and Scott M. Ausbrooks  
2003

Revised 2015

SNOWBALL QUADRANGLE  
ARKANSAS  
7.5 MINUTE SERIES (TOPOGRAPHIC)



## Correlation of Map Units



## Introduction

This map illustrates the surface geology of the Snowball quadrangle. This quadrangle was previously mapped at a 1:62,500 scale by Glick and Prazin in 1965 and Haley 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 17.5 miles of the Buffalo National River are located in this quadrangle and are managed by the National Park Service.

Approximately 1700 feet (518 meters) of Middle Ordovician to Morrowan-age strata crop out in this area. The Middle Ordovician St. Peter Sandstone is present only in the northwest-ern corner of the map where it is upthrown by a fault. 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 knobs and slopes on the edge of the Boston Mountains escarpment in the southern half of 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 (24-49 meters) feet above the river in most meander bends. Very old terrace deposits are preserved locally approximately 200 feet (61 meters) above the river.

## Description of Map Units

- Qls** **Landslide deposits (Quaternary)** - Mostly blocks of sandstone derived from Morrowan units. Also contains shale slumps from Morrowan and upper Mississippian units.
- Qat** **Alluvium and terrace deposits (Quaternary)** - Unconsolidated clay, silt, sand, and gravel including deposits on one or more terrace levels in small streams and tributaries to the Buffalo River. Approximately 5-20 ft. (1.5-6 m) is exposed in gravel bars along creeks and tributaries to the Buffalo River.
- Qty** **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.
- Qtm** **Medial terrace and alluvial deposits (Quaternary)** - Unconsolidated clay, silt, sand, gravel, and cobbles along the Buffalo River. The contact with the underlying young terrace is located at a tier that is approximately 15-20 ft. (4-6 m) high and usually coincides with the edge of the riparian zone along the river. This terrace is located approximately 40 ft. (12 m) above the river and ranges in thickness from 20-60 ft. (6-18 m).

- Qto1** **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 chert and sandstone. It is located approximately 80-100 ft. (24-30 m) above the river and ranges up to 160 ft. (48 m) above the river. Thickness unknown.
- Qto2** **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. It is located approximately 200 ft. (60 m) above the river. Thickness unknown.
- Pbm** **Bloyd Formation (Lower Pennsylvanian, Morrowan)** - In this quadrangle, the individual members within the Bloyd Formation cannot be recognized because the Brenwood and Keeler Limestones are either missing or have become shaly and sandy. There are no "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. The upper part of the Bloyd is not present in this quadrangle. The lower part of the Bloyd is equivalent to the Wits Springs Formation in this area. Approximately 240-340 ft. (73-103 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 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 brood 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 the base of this sandstone. Unconformable with the lower part of the Bloyd Formation or the Wits Springs Formation. Approximately 80-120 ft. (24-36 m) thick.
- Fw** **Wits Springs Formation (Lower Pennsylvanian, Morrowan)** - A blocky sandstone unlike the Prairie Grove is present above the Cane Hill. The Prairie Grove is equivalent to the base of the Wits Springs Formation. The Wits 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. The Wits Springs Formation can be divided into two parts: a main body and a lower sandstone. The lower sandstone was not mapped separately due to a 40 foot contour interval. Approximately 140-360 ft. (42-109 m) thick.

**Main body** - Consists mostly of thin- to medium-bedded sandstone and interbedded clay shale. The sand is very fine- to medium-grained and commonly ripple-bedded near the top of the unit. Calcareous fine- to medium-grained fossiliferous sandstones with sub-angular to rounded grains are present and contain clay pebble clasts and fine to coarse quartz pebbles. Gray on fresh surfaces but weathers brown or dark gray.

**Lower sandstone** - A massive coarse-grained iron-cemented sandstone with sub-angular to sub-rounded quartz grains. Sometimes friable. White to yellow on fresh surfaces but weathers light brown. Contains plant fragments, iron banding, stylolites, and peck marks. This unit has a blocky appearance and forms a prominent bluff on the east side of Point Peter Mountain. A dark gray shale pebble conglomerate is present at the base of the sandstone. Unconformable with the Cane Hill Member of the Hale Formation. 0-approx. 30 ft. (0-9 m) thick.

**Hale Formation (Lower Pennsylvanian, Morrowan)** - The Hale Formation consists of two members: the Prairie Grove Member and the Cane Hill Member. Only the Cane Hill Member is present in this quadrangle. The base of the Wits Springs Formation is equivalent to the Prairie Grove Member.

**Cane Hill Member** - A gray to black fissile clay to silty shale containing iron nodules and small limonitic box work fragments. Varies from black to darkgray on fresh surfaces and light gray and light orange-brown on weathered surfaces. Thin-bedded ripple-marked sandstones and sandstones are present above the clay shale. Trace fossils are abundant. Unconformable with the Imo interval. Approximately 160-200 ft. (48-60 m) thick.

**Imo interval (Upper Mississippian, Chesterian)** - Consists of limestones interbedded with clay shale. The limestones are fossiliferous and reddish on weathered surfaces. The shale is dark gray on fresh and weathered surfaces. A 5-20 ft. (1.5-6 m) thick sandstone is present at the base of the unit. It is thin- to thick bedded, fine grained, cross-bedded, and contains stylolites, plant fragments, and iron banding. Conformable with the Pitkin Limestone. Approximately 160 ft. (48 m) thick.

**Pitkin Limestone (Upper Mississippian, Chesterian)** - A fine- to coarsely-crystalline often fossiliferous limestone containing crinoidal fragments, *Archimedes beyousi*, gastropods, coral (rugose and colonial), and oolites. Varies from light gray to dark gray on fresh surfaces but typically weathers light or medium gray. Medium to massive bedded. Commonly has a petrolierous odor on freshly broken surfaces. A black shale is present at the top of the Pitkin just beneath the Imo interval at a few localities. No fossils were found from this shale interval. Conformable with the Fayetteville Shale. Approximately 140-180 ft. (42-54 m) thick.

**Fayetteville Shale (Upper Mississippian, Chesterian)** - A black fissile clay shale. Alternating beds of micritic with shale occur in the upper portion of the formation. Black chert is common the micritic. The micritic beds in the upper portion of this unit form resistant and sometimes steep ledges. Septarian concretions are present near the base of the shale. Very thin, fine-grained sandstones are interbedded within the lower portion of the shale. The Fayetteville Shale is conformable with the underlying Batesville Sandstone. Approximately 200-240 ft. (60-73 m) thick.

**Batesville Formation (Upper Mississippian, Chesterian)** - A very fine to medium-grained, sub-angular, moderately sorted, iron-cemented sandstone. Thin to medium bedded. Light brown to cream-colored on fresh surface. Weathers light to dark gray. The Batesville Sandstone is unconformable with the Boone Formation. Approximately 10-60 ft. (3-18 m) thick.

**Hindsville Limestone Member** - A thin-bedded, fine to coarsely-crystalline limestone. Light to dark gray on fresh surfaces but generally weathers light gray or brown. Typically has a strong petrolierous odor on freshly broken surface. The limestones are fossiliferous and/or oolitic, contain prrite and are locally interbedded with thin layers of clay shale and thin beds of siltstone to fine-grained sandstone.

**Moorefield Formation (Upper Mississippian, Meramecian)** - Silty shales with interbedded very thin to thin siltstones. The shaly zones are usually dark gray to black on fresh surfaces but weather gray-green. The siltstones are dark gray to brown on fresh surfaces but weather light gray to buff color. 0-approx. 10 ft. (3 m) thick.

**Boone Formation (Lower Mississippian, Osagean and Kinderhookian)** - Coarse-grained fossiliferous and fine-grained limestones interbedded with arenaceous and bedded chert. Light to medium gray on fresh surfaces but weathers dark gray. The chert varies in color from light gray to dark gray. Springs and sinkholes are abundant. The Boone Formation exhibits an undulating topography that tends to form steep hillsides separated by ravine-like drainages. Approximately 120-400 ft. (36-122 m) thick.

**St. Joe Limestone Member** - A medium-grained thin-bedded crinoidal limestone containing very thin shaly limestones. Dark-gray to reddish in color but sometimes with green mottling on fresh surfaces. Commonly weathers medium to dark gray. Locally contains phosphatic nodules near the lower contact. Approximately 5-10 ft. (1.5-3 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 with a salt and pepper appearance but locally blotchy due to iron staining. Weathers tan to white. Thin to thick bedded and typically seen as float. Contains phosphate pebbles and angular white and light gray chert fragments. This unit yields abundant conodonts. Unconformable with the Fervale Limestone or Silurian units. 0-approximately 1 ft. (0.3 m) thick.

**Undifferentiated (Silurian)** - A reddish-gray coarsely-crystalline limestone and gray fossiliferous medium- crystalline limestone. Thin to medium bedded with stylolites along bedding planes. The reddish-gray coarsely-crystalline limestone contains calcite vugs and green-clay partings and plugs. 0-approx. 15 ft. (0-4 m) thick exposed.

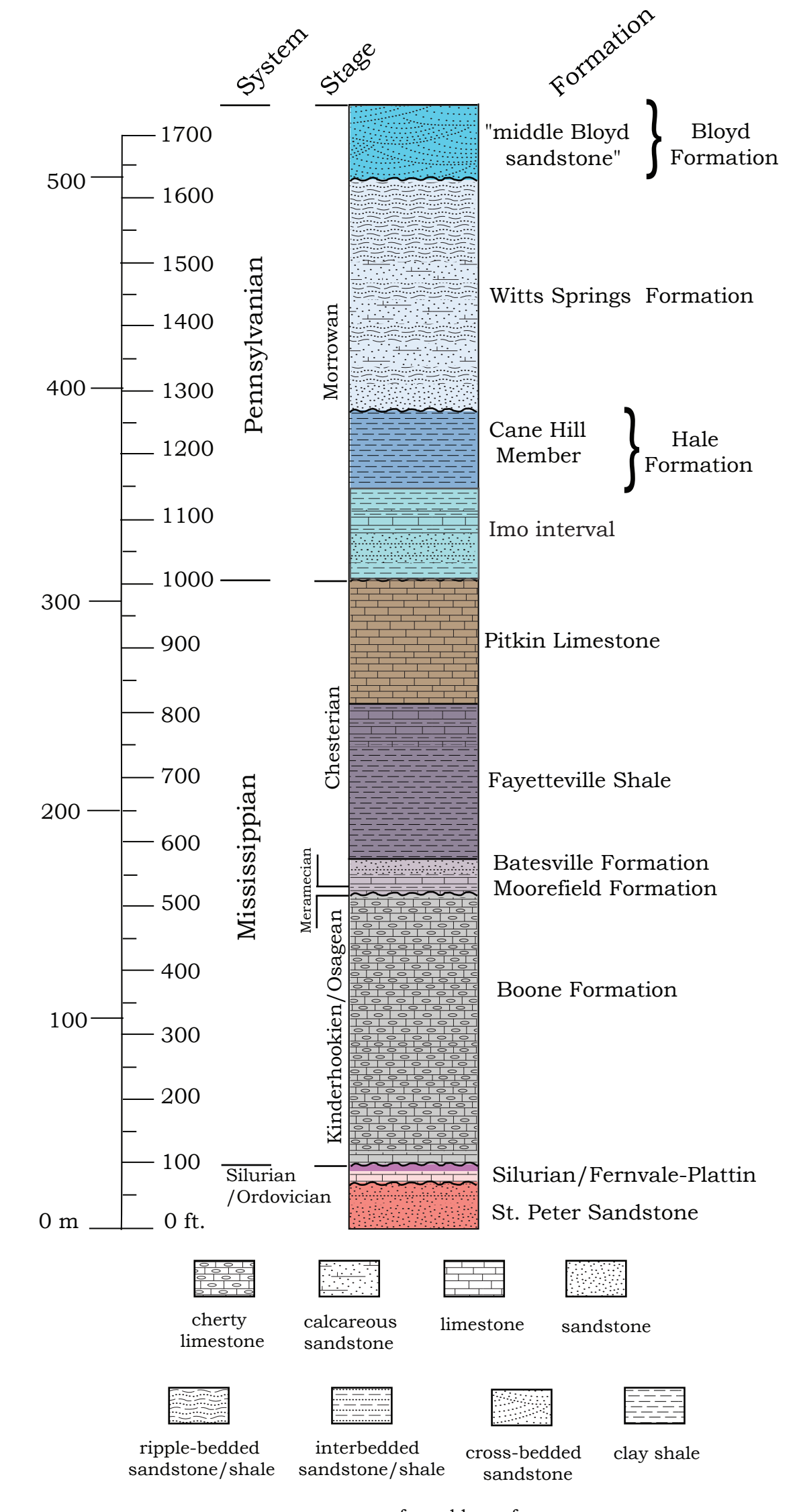
**Fervale Limestone (Upper Ordovician)** - A medium- to coarsely-crystalline crinoidal limestone. Medium to thick to massive bedded. White to light gray with a pink to reddish tint or mottling on fresh surfaces but weathers dark gray. Contains snailshells, barrel-shaped crinoids, and brachiopods that are accentuated on a weathered surface. Commonly contains pyrite. Locally cross-bedded when beds are massive. Commonly weathers to rounded masses that are usually friable. 0-approx. 5 ft. (0-1.5 m) thick.

**Platina Limestone (Middle Ordovician)** - A thin- to thick-bedded micritic limestone that locally displays a sugary texture. Light gray to dark gray on fresh surfaces and weathers white to dark gray. A dolomitic interval is present at the top of the formation. Unconformable with the St. Peter Sandstone in this quadrangle. Approximately 5-15 ft. (1.5-4 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 a light gray-green to brown. Green shale clasts are present which weather to give the sandstone a green color. Contains a calcite cement but when leached leaves sandstone friable. The quartz grains are rounded. Green siltstones and shales are interbedded with the sandstone. Contains vertical trace fossils referred to as *Scolites* by Adams et al., 1904, that weather to resemble circles in cross-section view. Unconformable with the Everton Formation. Approximately 80 ft. (24 m) thick.

- Mf** **Fayetteville Shale (Upper Mississippian, Chesterian)** - A black fissile clay shale. Alternating beds of micritic with shale occur in the upper portion of the formation. Black chert is common the micritic. The micritic beds in the upper portion of this unit form resistant and sometimes steep ledges. Septarian concretions are present near the base of the shale. Very thin, fine-grained sandstones are interbedded within the lower portion of the shale. The Fayetteville Shale is conformable with the underlying Batesville Sandstone. Approximately 200-240 ft. (60-73 m) thick.
- Mbvm** **Batesville Formation (Upper Mississippian, Chesterian)** - A very fine to medium-grained, sub-angular, moderately sorted, iron-cemented sandstone. Thin to medium bedded. Light brown to cream-colored on fresh surface. Weathers light to dark gray. The Batesville Sandstone is unconformable with the Boone Formation. Approximately 10-60 ft. (3-18 m) thick.
- Mb** **Hindsville Limestone Member** - A thin-bedded, fine to coarsely-crystalline limestone. Light to dark gray on fresh surfaces but generally weathers light gray or brown. Typically has a strong petrolierous odor on freshly broken surface. The limestones are fossiliferous and/or oolitic, contain prrite and are locally interbedded with thin layers of clay shale and thin beds of siltstone to fine-grained sandstone.
- Mb** **Moorefield Formation (Upper Mississippian, Meramecian)** - Silty shales with interbedded very thin to thin siltstones. The shaly zones are usually dark gray to black on fresh surfaces but weather gray-green. The siltstones are dark gray to brown on fresh surfaces but weather light gray to buff color. 0-approx. 10 ft. (3 m) thick.
- Mb** **Boone Formation (Lower Mississippian, Osagean and Kinderhookian)** - Coarse-grained fossiliferous and fine-grained limestones interbedded with arenaceous and bedded chert. Light to medium gray on fresh surfaces but weathers dark gray. The chert varies in color from light gray to dark gray. Springs and sinkholes are abundant. The Boone Formation exhibits an undulating topography that tends to form steep hillsides separated by ravine-like drainages. Approximately 120-400 ft. (36-122 m) thick.
- Mb** **St. Joe Limestone Member** - A medium-grained thin-bedded crinoidal limestone containing very thin shaly limestones. Dark-gray to reddish in color but sometimes with green mottling on fresh surfaces. Commonly weathers medium to dark gray. Locally contains phosphatic nodules near the lower contact. Approximately 5-10 ft. (1.5-3 m) thick.
- Mb** **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 with a salt and pepper appearance but locally blotchy due to iron staining. Weathers tan to white. Thin to thick bedded and typically seen as float. Contains phosphate pebbles and angular white and light gray chert fragments. This unit yields abundant conodonts. Unconformable with the Fervale Limestone or Silurian units. 0-approximately 1 ft. (0.3 m) thick.
- S** **Undifferentiated (Silurian)** - A reddish-gray coarsely-crystalline limestone and gray fossiliferous medium- crystalline limestone. Thin to medium bedded with stylolites along bedding planes. The reddish-gray coarsely-crystalline limestone contains calcite vugs and green-clay partings and plugs. 0-approx. 15 ft. (0-4 m) thick exposed.
- Otp** **Fervale Limestone (Upper Ordovician)** - A medium- to coarsely-crystalline crinoidal limestone. Medium to thick to massive bedded. White to light gray with a pink to reddish tint or mottling on fresh surfaces but weathers dark gray. Contains snailshells, barrel-shaped crinoids, and brachiopods that are accentuated on a weathered surface. Commonly contains pyrite. Locally cross-bedded when beds are massive. Commonly weathers to rounded masses that are usually friable. 0-approx. 5 ft. (0-1.5 m) thick.
- Osp** **Platina Limestone (Middle Ordovician)** - A thin- to thick-bedded micritic limestone that locally displays a sugary texture. Light gray to dark gray on fresh surfaces and weathers white to dark gray. A dolomitic interval is present at the top of the formation. Unconformable with the St. Peter Sandstone in this quadrangle. Approximately 5-15 ft. (1.5-4 m) thick.
- Osp** **St. Peter Sandstone (Middle Ordovician)** - A thin- to thick-bedded very fine- to fine-grained sandstone. White to green on fresh surfaces but weathers a light gray-green to brown. Green shale clasts are present which weather to give the sandstone a green color. Contains a calcite cement but when leached leaves sandstone friable. The quartz grains are rounded. Green siltstones and shales are interbedded with the sandstone. Contains vertical trace fossils referred to as *Scolites* by Adams et al., 1904, that weather to resemble circles in cross-section view. Unconformable with the Everton Formation. Approximately 80 ft. (24 m) thick.

## Stratigraphic Column



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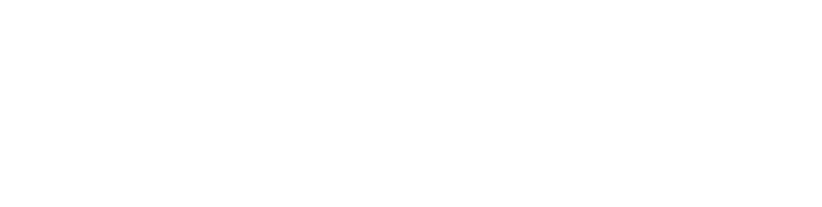
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Map and cross-section digitized by Walter K. Mayfield, Jerry W. Clark, and Brian Kehner.

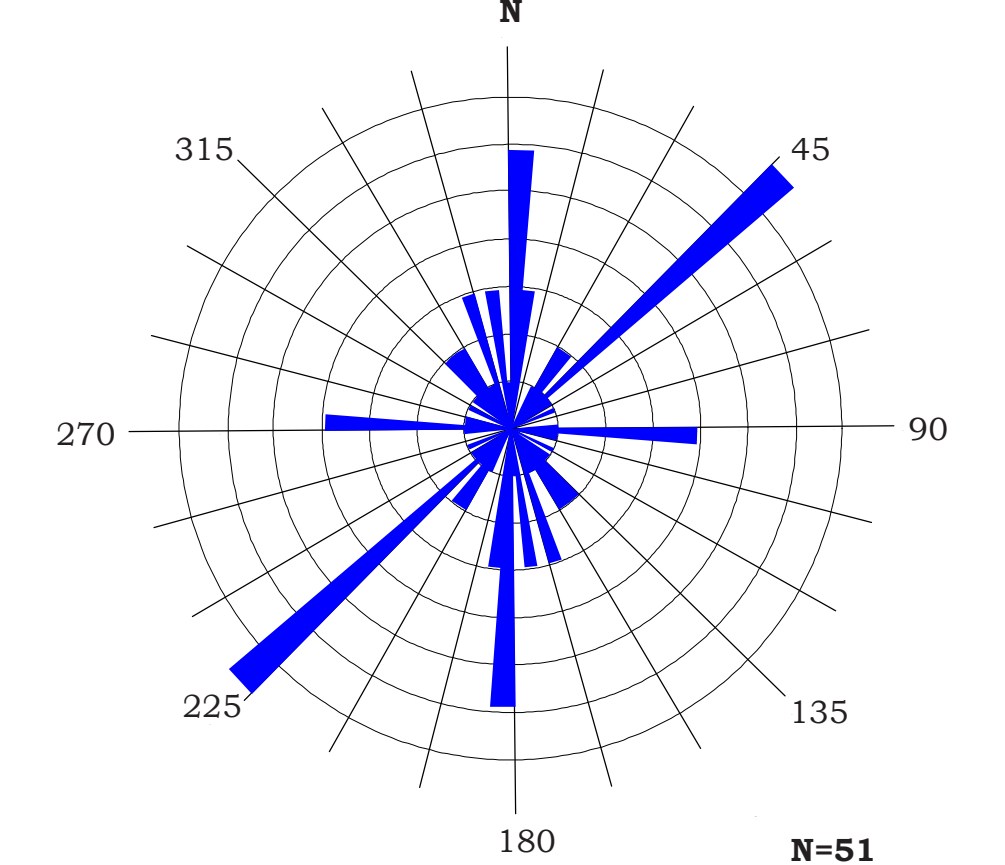
## Symbols

- Contact
- Normal fault - ball and bar on downthrown side. Dashed where inferred. Dotted where concealed.
- Inclined bedded showing strike and dip
- Gravel pit
- Quarry

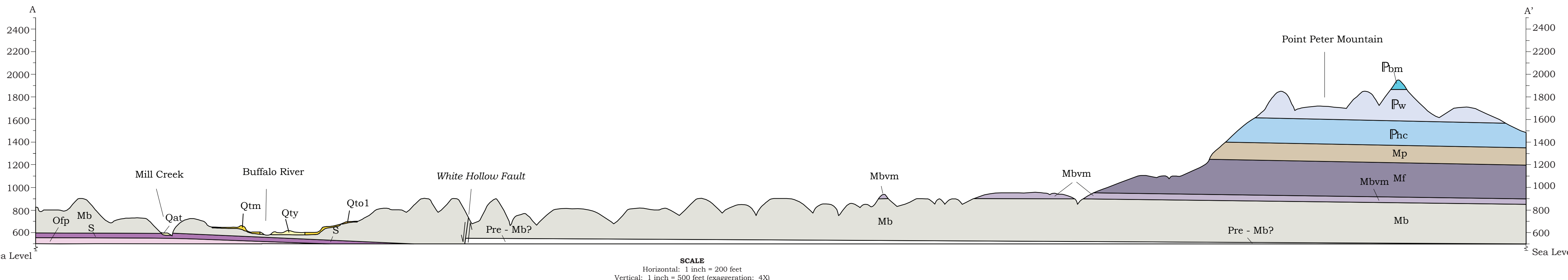
Topographic map of the Snowball quadrangle showing location of data collection points.



## Joint Frequency



Rose diagram of strike frequency of joints recorded within the Snowball quadrangle.



Horizontal: 1 inch = 200 feet  
Vertical: 1 inch = 500 feet (exaggeration: 4X)