GEOLOGIC MAP OF THE PARTHENON QUADRANGLE, NEWTON COUNTY, ARKANSAS

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2003
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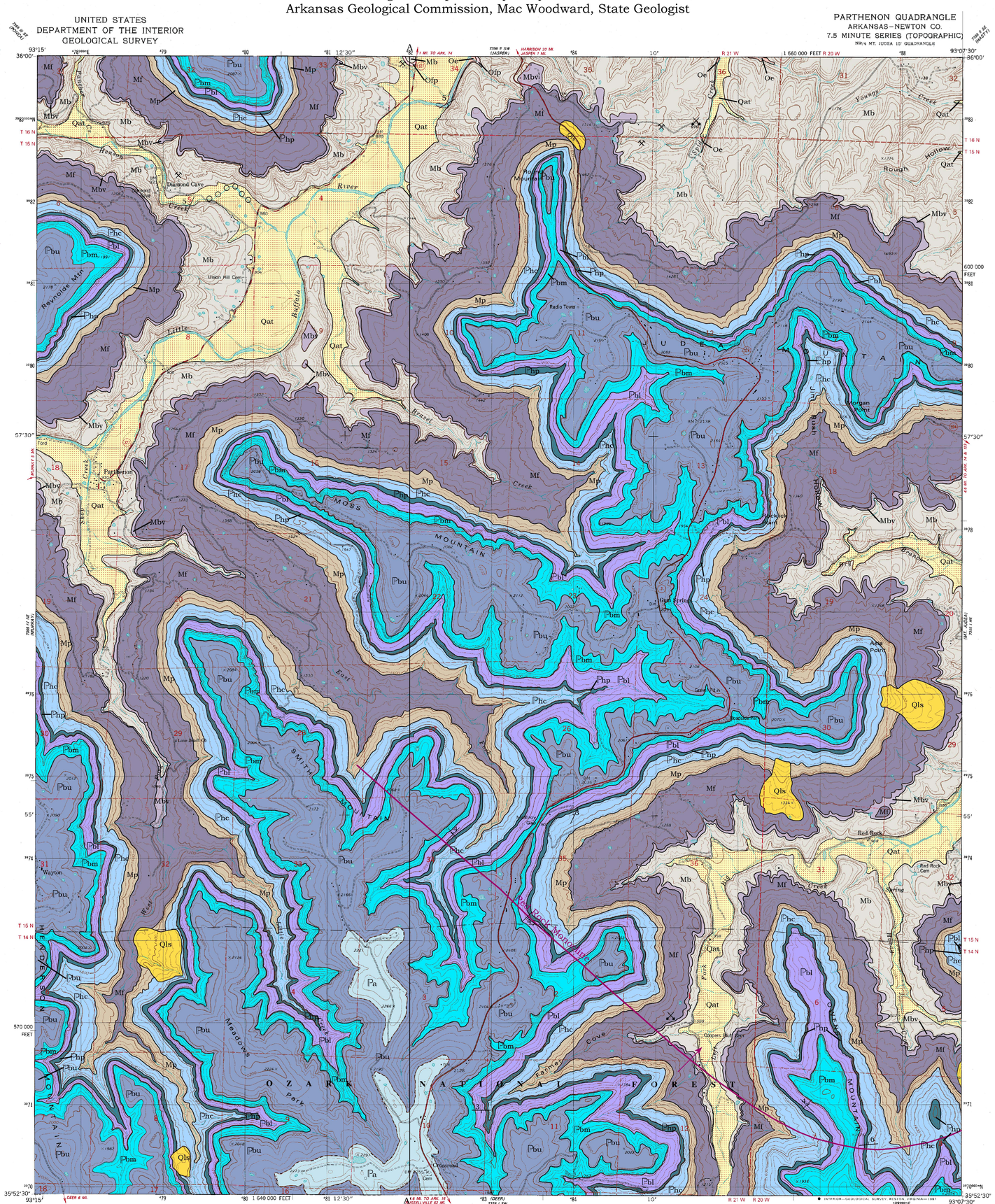


Correlation of Map Units

Qat, Qls	Holocene and Pleistocene		Quaternary
Unconformity			
Pa	Atokan		
Pbu, Pbm	Morrowan		Pennsylvanian
Unconformity			
Pbl, Php	Morrowan		Pennsylvanian
Unconformity			
Phc	Morrowan		Pennsylvanian
Unconformity			
Mp	Chesterian		Mississippian
Mf	Meramecian		Mississippian
Mbv	Meramecian		Mississippian
Unconformity			
Mb	Osagean and Kinderhookian		Mississippian
Unconformity			
Ofp	Upper Ordovician		Ordovician
	Middle Ordovician		Ordovician
Unconformity			
Oe	Middle Ordovician		Ordovician

Description of Map Units

Qls **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.

Pa **Atoka Formation (Middle Pennsylvanian, Atokan)** - Consists of black to tan shales, with interbedded very thin to thin ripple-bedded micaceous siltstones, and fine to very fine-grained sandstones with sub-rounded to rounded grains. The sandstones are tan to buff colored on fresh and weathered surfaces 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 120 ft. (37 m) thick.

Pbu **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. Approximately 130-450 ft. thick.

Upper part - Consists of interbedded thin ripple-bedded to thick micaceous sandstones and shales above the "middle Bloyd sandstone". 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, load features, and ball and pillow structures. Approximately 200-240 ft. 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 the base of this sandstone. The "middle Bloyd sandstone" is unconformable with the lower part of the Bloyd Formation. Approximately 50-160 ft. thick.

Pbl **Lower part** - Mostly seen below the "middle Bloyd sandstone" are interbedded very thin to thin ripple-bedded micaceous siltstones and sandstones that are fine to medium-grained, however, 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 surface but weathers light-brown with a rounded profile. Throughout the lower part is black fissile clay shales to silty shales interbedded with thin to thick-bedded fossiliferous carbonate to sandy carbonate layers. The carbonate zones vary from red to gray on fresh and weathered surface and can be mottled. Sometimes the fossiliferous sandy zones 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. Approximately 80-150 ft. thick.

Hale Formation (Lower Pennsylvanian, Morrowan) - The Hale Formation consists of two Members; the Prairie Grove Member and the underlying Cane Hill Member. Approximately 160 - 320 ft. thick.

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 a fresh surface 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 contains clasts of shale, siltstone, and sandstone as large as almost one foot in diameter. One green feldspar fragment was found from this interval. The Prairie Grove Member is unconformable with the Cane Hill Member. Approximately 40 - 80 ft. thick.

Phc **Cane Hill Member** - A gray to black fissile clay to silty shale that contains iron nodules and small limonitic box work fragments. Varies from black to dark-gray on fresh surface to light-gray and light-orange-brown on weathered surface. 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 of the Cane Hill at one locality. The Cane Hill Member is unconformable with the Pitkin Limestone. Approximately 120 - 240 ft. thick.

Mp **Pitkin Limestone (Upper Mississippian, Chesterian)** - A fine to coarsely crystalline often fossiliferous limestone containing crinoidal fragments, *Archimedes* bryozoans, gastropods, coral (rugose and colonial), and ooliths. Varies from light-gray to dark-gray on fresh surface but, usually weathers light or medium-gray. Medium to massive-bedded. Often has a petroliferous odor on freshly broken surfaces. A black clay 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 box work fragments. No fossils were found from this shale interval. The contact of this shale with the Cane Hill was not seen. The Pitkin Limestone is conformable with the Fayetteville Shale. Approximately 80 - 160 ft. thick.

Mf **Fayetteville Shale (Upper Mississippian, Chesterian)** - A black fissile clay shale. Alternating beds of micrite with shale occur in the upper portion of the formation to the contact with the overlying Pitkin Limestone. Black chert can be found within the micrite. 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. One locality yielded small limonitic ammonoids in the lower portion of the shale. The Fayetteville Shale is conformable with the underlying Batesville Sandstone. Approximately 120 - 240 ft. thick.

Mbv **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 surface. 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. The Batesville Sandstone is unconformable with the Boone Formation. Approximately 5 - 20 ft. thick.

Hindsville Limestone Member - A thin-bedded, fine to coarsely crystalline limestone. Light to dark gray on fresh surface but generally weathers to a light-gray or brown. Usually has a strong petroliferous odor on freshly broken surface. The limestones are fossiliferous and/or oolitic, contain pyrite and are sometimes 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.

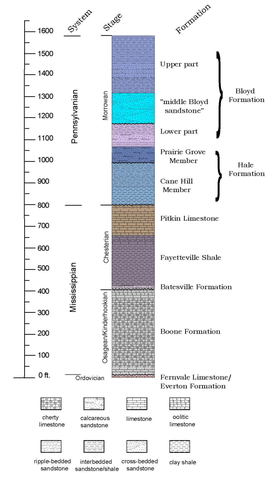
Mb **Boone Formation (Lower Mississippian, Osagean and Kinderhookian)** - Coarse-grained fossiliferous and fine-grained limestones interbedded with anastomosing and bedded chert. Light to medium-gray on fresh surface but usually weathers dark-gray. The chert varies in color from light-gray to dark-gray. Springs and sinkholes are abundant. In this area the Boone Formation exhibits an undulating topography that tends to form steep hillsides separated by ravine-like drainages. Approximately 120 - 400 ft. thick.
Short Creek Oolite - A thin to massive cross-bedded, oolitic crinozoan biosparite or oolitic biomicrite. White to gray on fresh and weathered surface. Can be easily recognized by a chalky appearance and in some places a concave weathering profile. Some intervals are durable due to calcite cement, while other intervals are friable. The Short Creek Oolite is present along the Left Fork of Big Creek in Sec 1, T14N, R21W, and on the hillside in Sec 31, T15N, R20W. This oolitic interval occurs from approximately 5 feet to 80 feet below the top of the Boone Formation. Approximately 5-15 ft. 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 surface. Usually weathers medium to dark-gray. The St. Joe Limestone is present along the Little Buffalo River in Sections 33 and 34, T16N, R21W, along Henson Creek in Section 5, T15N, R21W, and Spider Creek. Approximately 20-30 ft. 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 surface with a salt and pepper appearance but sometimes blotchy due to iron staining. Weathers tan to white. Thin to thick-bedded but most often seen as float. Contains phosphate pebbles and angular white and light-gray chert fragments. The thickest outcrop occurs along Henson Creek where it weathers white and contains sandstone pipes thus resembling the St. Peter Sandstone. This unit yields abundant conodonts. The basal sandstone is unconformable with the Fernvale Limestone. Approximately 6 in. -10 ft. thick.

Ofp **Fernvale 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 surface but weathers dark-gray. Contains nautiloids, barrel-shaped crinoids, and brachiopods that are accentuated on a weathered surface. Often contains pyrite. Sometimes cross-bedded when beds are massive. On a weathered slope the Fernvale Limestone occurs as rounded masses that are usually friable. This limestone is present in Hudson Quarry in Section 34, T16N, R21W, along Hwy 327. The Fernvale Limestone is unconformable with the Plattin Limestone. 0- approx. 10 ft. thick.
Plattin Limestone (Middle Ordovician) - A micritic limestone that sometimes displays a sugary texture. Light-gray to dark-gray on fresh surface and weathers white to dark-gray. Very thin to thick-bedded. Contains stylolites and rounded quartz grains. This section does not resemble typical micritic Plattin Limestone, however it contains a conodont fauna similar to the Plattin Limestone, (Repetski and Leslie, 2003, personal communication). Approximately 6 to 8 ft. thick.

Oe **Everton Formation (Middle Ordovician)** - Very fine to fine-grained crystalline to sandy and limy 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 usually weathers light-gray. Only exposed in the bottom of Hudson Quarry in Section 34, T16N, R21W, along Hwy 327, the Little Buffalo River in Section 34, T16N, R21W, and in Spider Creek. Approximately 5 - 10 ft. exposed.

Stratigraphic Column



Symbols

- Contact
- Contact - inferred
- Oolite outcrop
- Quarry
- Gravel pit
- Monocline
- Strike and dip of inclined bedding (10)

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 5 meters south and 16 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 selected fence and field lines where generally visible on aerial photographs. This information is unchecked

UTM GRID AND 1980 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

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

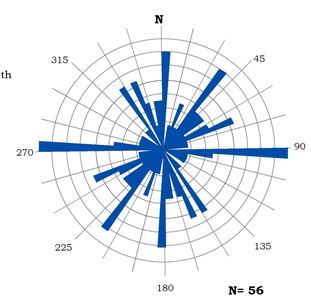
ROAD CLASSIFICATION

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

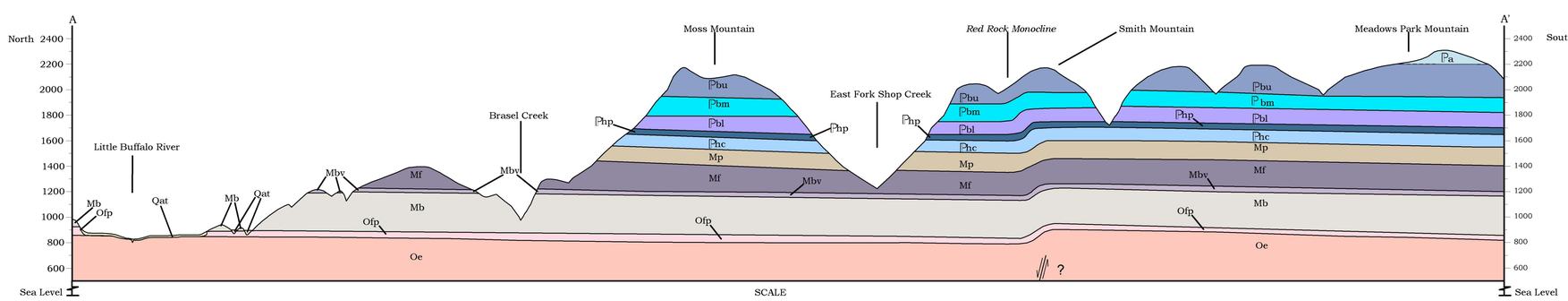
ARKANSAS
QUADRANGLE LOCATION

PARTHENON, ARK.
NW/4 MT. JUDEA 15' QUADRANGLE
N3552.5–W9307.5/7.5
1980
DMA 7355 I NW–SERIES V884

Joint Frequency



Rose diagram of strike frequency of joints recorded in the Parthenon Qaudrangle.



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

References

Glick, E.E., 1976 , Geologic map of the Mt. Judea Quadrangle, 15-minute series: Arkansas Geological Commission Geologic Worksheet, 1 sheet.

Hudson, M.R., Murray, K.E., and Pezzutti, D, 2001, Geology of the Jasper Quadrangle Newton and Boone Counties, Arkansas: U.S.G.S. Miscellaneous Field Studies Map MF-2356.

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