GEOLOGICAL SURVEY

Geologic Map of the Stuart Quadrangle Fulton and Sharp Counties, Arkansas

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2021
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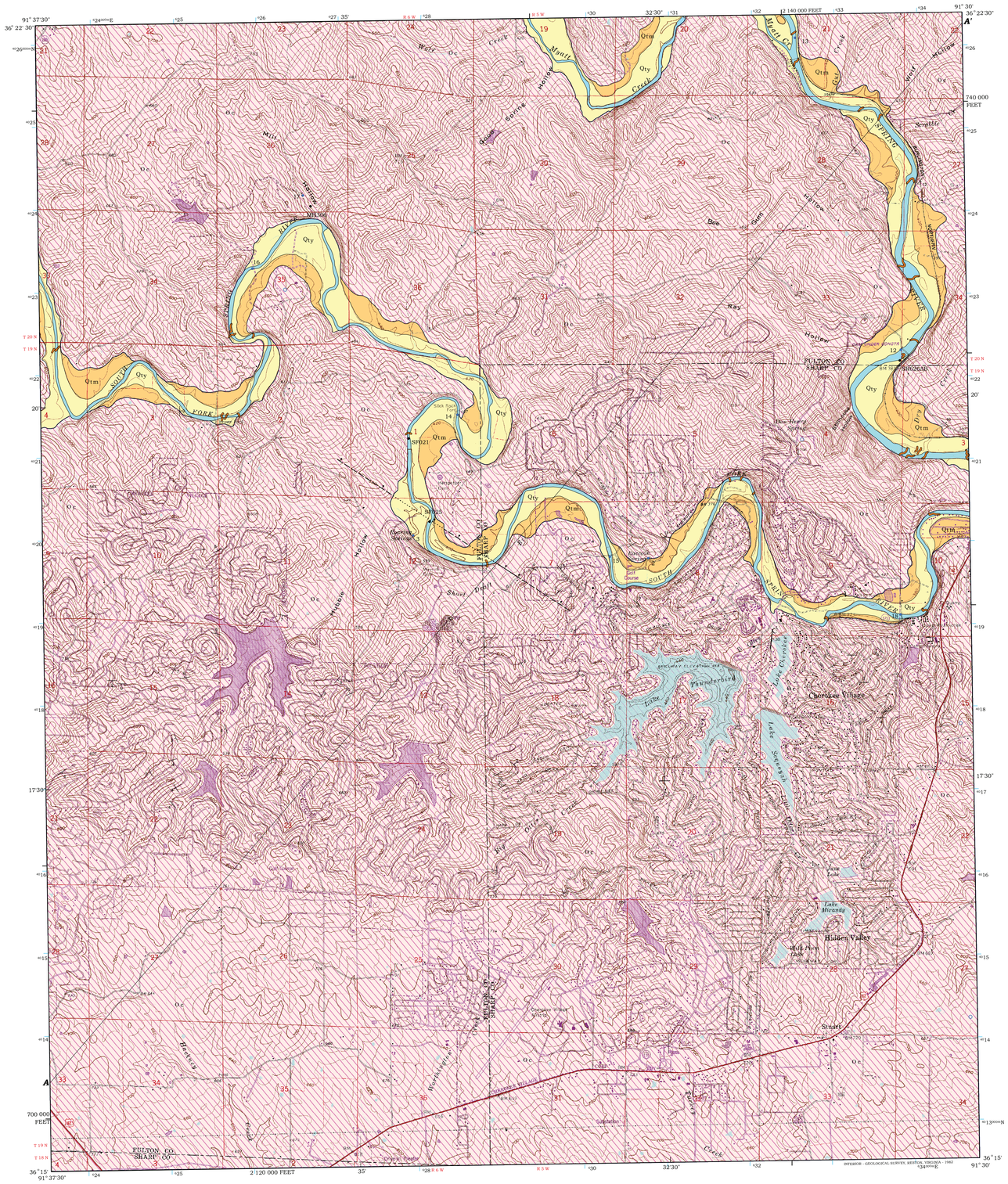
Digital Geologic Quadrangle Map
Stuart Quadrangle, Arkansas
DGM-AR-00832



The topographic base is a collarless Digital Raster Graphic (DRG). The DRG is a scanned image of a U.S. Geological Survey standard series topographic map published in 1962. It was photorevised from aerial photographs in 1981. 1981 revisions have not been field checked.

10,000-foot grid based on Arkansas coordinate system, north zone.

1,000-meter Universal Transverse Mercator grid ticks, zone 15, shown in blue.

APPROXIMATE MEAN DECLINATION, 2020

SCALE 1:24000

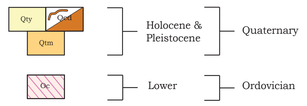
1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 KILOMETER

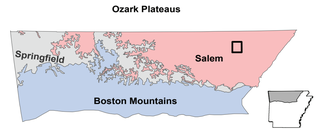
Contour Interval 20 Feet
National Geodetic Vertical Datum of 1929

Quadrangle Location

Secondary highway
Light duty road
Unimproved road

Correlation of Map Units





Location of Stuart quadrangle within the Ozark Plateaus

Introduction

This map depicts the bedrock and surficial geology of the Stuart quadrangle, a 7.5-minute series USGS topographic base. In this area, approximately 350-430 feet (107-131 meters) of Lower Ordovician carbonate and clastic rocks are exposed. The quadrangle is situated on the Salem Plateau, the northernmost of three broad plateau surfaces in northern Arkansas known as the Ozark Plateaus Province, part of the Interior Highlands Physiographic Region. The Salem Plateau developed by differential erosion of Paleozoic sedimentary units deposited on the flanks of the Ozark Dome, a structural high centered in southeast Missouri that formed due to volcanic activity during the Precambrian.

The major drainages within the mapping area include Spring River, Myatt Creek, and South Fork Spring River. Dolostone exposures along the Spring River and the South Fork Spring River display various dip orientations, which taken together can be characterized as broadly undulating.

Carbonate deposits in the form of channel wide tufa dams in several places are a distinguishing feature of Spring River. Approximately 15 tufa dams have developed on the 6 mile (9.65 kilometer) stretch of Spring River on the Stuart quadrangle. The tufa dams create rapids and falls along the course of the river and locally, small vegetated islands have developed which are completely covered by tufa growth. Smaller dams have developed in some tributaries to the Spring River such as the South Fork Spring River. South Fork Spring River features 15 tufa dams along its 16.25 mile (26 kilometer) course on the Stuart quadrangle. Water samples were taken monthly at springs and selected locations along the Spring River and South Fork Spring River. Chemical analysis of these samples will clarify the role that changes in water chemistry plays in the growth of the tufa deposits in terms of size and frequency (Table 1). Collection and interpretation of the data is ongoing. Also, 5 samples were collected from the tufa dams and terraces for carbon-14 dating.

Previous mapping in this area includes a geologic worksheet by E. E. Glick in 1974. The current mapping project is based primarily on data collected from field observations made between July, 2020 and May, 2021. These data, along with site locations, were recorded in a geodatabase on a portable data collector/global positioning satellite receiver. Representative rock samples were collected to aid in classification and for future petrographic and stratigraphic studies.

Description of Map Units

Young terrace and active channel deposits (Quaternary) - unconsolidated clay, silt, sand and gravel in gravel bars and sandy point bar deposits along Spring River and the South Fork Spring River. The tops of terraces are generally flat but can be hummocky and disected by tributaries. Approximately 5-20 feet (1.5-6 meters) thick. Carbon-14 dating indicates that these deposits are approximately 170 years old along South Fork Spring River.

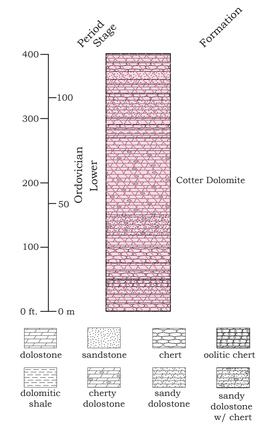
Medial terrace and alluvial deposits (Quaternary) - unconsolidated clay, silt and sand in a higher terrace along Spring River and South Fork Spring River. It is approximately 15-40 feet (4.5-12 meters) above the river and ranges in thickness from 10-30 feet (3-9 meters). Carbon-14 dating indicates that these deposits are approximately 4,480 years old along the Spring River.

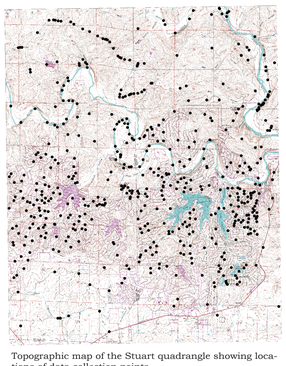
Carbonate deposits (tufa dams) (Quaternary) - dissolved calcium carbonate precipitating in Spring River and its major tributaries as coatings and buildups on alluvial gravel and organic debris. Carbon-14 dating indicates that these deposits are between 2000 and 4700 years old. Tufa dams form along reaches where gravel, mostly chert and dolostone, becomes trapped behind undulating exposures of fractured dolostone. This initiates the turbulent flow conditions necessary for precipitation to begin. As deposits thicken by accretion, these conditions are perpetuated by the formation of cascades and drops, which vary from 1 to 4 feet (0.3 to 1.2 meters) in height, and eventually span the entire river. The largest of these dams is approximately 450 feet (137 meters) across. The thickness of the coatings is typically less than ¼ inch (6 millimeters) on major tributaries but up to 4 feet (1.8 meters) on Spring River. The carbonate material is porous and unstable, and its gravel substrate is easily undermined by stream flow. Overhangs, cavities, and collapses are common and can become hazards for recreational users.

Cotter Dolomite (Lower Ordovician) - thin to thick-bedded, very finely to coarsely crystalline, gray to buff to beige dolostone with interbedded, very thinly laminated green to gray shale, brown to reddish brown sandstone, and tan, white, gray, or blue chert . Locally, the dolostone contains networks of fine dolomite veins and small, dolomite-lined vugs. Chert nodules and thin, discontinuous chert beds are common. Higher in stratigraphic section, the dolostone becomes sandy and laminated. Discontinuous sandstone beds (up to 5 feet (1.5 meters) thick) are present at multiple intervals. Sandstone is typically orthoquartzitic and composed of fine, well-sorted, well-rounded, mature grains. It is typically well indurated by quartz-cement, but is locally iron cemented and friable. Locally, the sandstone contains ripple-beds and chert nodules, and near faults, deformation bands. Chert beds up to 5 feet (1.5 meters) thick typically crop out as brecciated boulders. It is opaque or translucent and locally oolitic. Deposits of iron ore in weathered chert and clay residue was historically mined in the area. Total thickness is approximately 350-430 feet (107-131 meters).

Downstream view of a tufa dam on the South Fork Spring River.

Stratigraphic Column



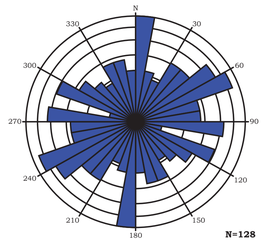


Topographic map of the Stuart quadrangle showing locations of data collection points.

Symbols

- Contact
- Inclined bedding showing strike and dip
- Inclined fault - showing dip value and direction
- Normal fault - ball and bar on downthrown side. Dashed where inferred. Dotted where concealed.
- A — A' Line of cross-section
- Water sample site
- Carbon-14 sample site
- Water well
- Quarry

Joint Frequency



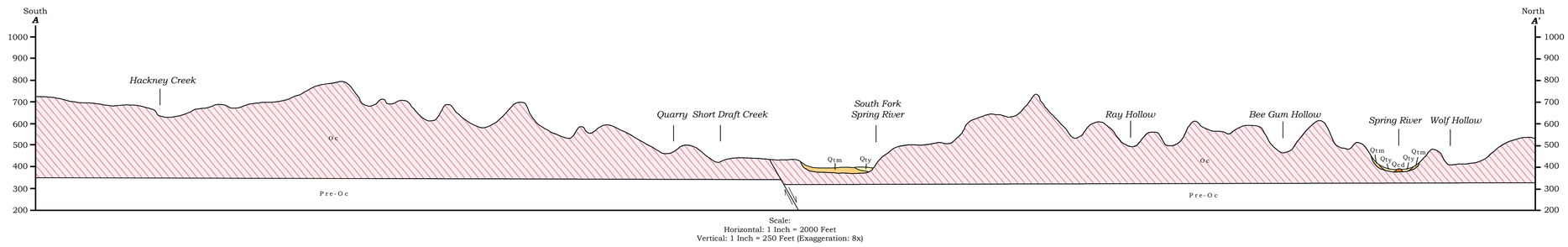
Rose diagram of strike frequency of joints recorded within the Stuart quadrangle.

Cotter exposure in a quarry on Stuart quadrangle.

Table 1: Descriptive chemical statistics from selected surficial and groundwater sites.

	Site	Water Temp (°C)	pH	Specific Conductance (uS/cm)	Calcium mg/L (Dissolved/Total)	Sulfate SO4 (mg/L)	Nitrate NO3+NO2 (mg/L)	Sampling Period (Month/Year)
1	Mammoth Spring*	15.85	7.14	416	42.9 / 49.5	4.6.0	1.15	Jul 2020-Jun 2021
2	Raccoon Spring	18.10	7.31	514	56.3 / 63.3	5.01	0.20	Jul 2020-Jun 2021
3	Roaring Spring	17.40	7.37	502	54.0 / 59.2	4.61	0.16	Jul 2020-Jun 2021
12	Biggers-SR-1	24.50	8.24	447	43.8 / 47.1	4.09	0.91	Jul 2020-Sep 2020
13	Stone-SR-1	19.60	8.23	465	45.5 / 49.7	4.03	0.73	Jul 2020-Sep 2020
14	Slick Rock-SF-1	12.60	8.44	446	44.2 / 46.3	3.47	0.08	Oct 2020-Dec 2020
15	Golf Course-SP-1	12.00	8.36	440	46.4 / 47.7	3.57	0.08	Oct 2020-Dec 2020
16	Boy Scouts-SP-1	11.00	8.24	388	44.1 / 48.8	4.26	0.20	Jan 2021-Apr 2021
17	Mill Hollow-1	15.70	7.26	644	76.7 / 90.3	5.26	0.11	Jan 2021-Apr 2021
18	Griffin Park-SP-1	24.20	7.45	393	44.2 / 60.5	3.28	0.09	May 2021
19	Hardy Bridge-SR-1	21.70	8.21	407	47.2 / 63.9	3.06	0.30	May 2021

*Not on Stuart quadrangle (Mammoth Spring quadrangle).



Scale:
Horizontal: 1 Inch = 2000 Feet
Vertical: 1 Inch = 250 Feet (Exaggeration: 8x)

References

Glick, E. E., 1974, Geologic map of the Stuart quadrangle, Arkansas: Arkansas Geological Survey, 7.5-minute series Geologic Worksheet, 1:24,000-scale, 1 sheet.

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Hedden, W. J., 1968, The geology of the Thayer area emphasizing the stratigraphy of the Cotter and Jefferson City Formations: University of Missouri-Rolla, Master's Thesis, 159 p., 14 pl.

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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 information is collected, the contacts, structures, and other features depicted on this map may be changed.

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