U.S. Department of the Interior
National Park Service
Natural Resource Stewardship and Science Directorate
Geologic Resources Division

Mammoth Cave National Park and Abraham Lincoln Birthplace National Historical Park

GRI Ancillary Map Information Document

Produced to accompany the Geologic Resources Inventory (GRI) Digital Geologic Data for Mammoth Cave National Park and Abraham Lincoln Birthplace National Historical Park

maca_abli_geology.pdf

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Geologic Resources Inventory Map Document for Mammoth Cave National Park

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Geologic Resources Inventory Map Document

Mammoth Cave National Park and Abraham Lincoln Birthplace National Historical Park, Kentucky

Document to Accompany Digital Geologic-GIS Data

maca_abli_geology.pdf

Version: 9/27/2022

This document has been developed to accompany the digital geologic-GIS data developed by the Geologic Resources Inventory (GRI) program for Mammoth Cave National Park (MACA), as well as for Abraham Lincoln Birthplace National Historical Park (ABLI).

Attempts have been made to reproduce all aspects of the original source products, including the geologic units and their descriptions, geologic cross sections, the geologic report, references and all other pertinent images and information contained in the original publication.

This document contains the following information:

1) **About the NPS Geologic Resources Inventory Program** – A brief summary of the Geologic Resources Inventory (GRI) Program and its products. Included are web links to the GRI GIS data model, and to the GRI products page where digital geologic-GIS datasets, scoping reports and geology reports are available for download. In addition, web links to the NPS Data Store and GRI program home page, as well as contact information for the GRI coordinator, are also present.

2) **GRI Digital Maps and Source Map Citations** – A listing of all GRI digital geologic-GIS maps produced for this project along with sources used in their completion. In addition, a brief explanation of how each source map was used is provided.

3) **Map Unit List** – A listing of all geologic map units present on maps for this project, generally listed from youngest to oldest.

4) **Map Unit Descriptions** – Descriptions for all geologic map units. If a unit is present on multiple source maps the unit is listed with its source geologic unit symbol, unit name and unit age followed by the unit's description for each source map.

5) **Geologic Cross Sections** – Geologic cross section graphics with source geologic cross section abbreviations.

6) **Ancillary Source Map Information** – Additional source map information presented by source map.

7) **GRI Digital Data Credits** – GRI digital geologic-GIS data and ancillary map information document production credits.

For information about using GRI digital geologic-GIS data contact:

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About the NPS Geologic Resources Inventory Program

Background

The Geologic Resources Inventory (GRI) provides geologic map data and pertinent geologic information to support resource management and science-informed decision making in more than 270 natural resource parks throughout the National Park System. Geologic resources for management consideration include both the processes that act upon the Earth and the features formed as a result of these processes. Geologic processes include: erosion and sedimentation; seismic, volcanic, and geothermal activity; glaciation, rockfalls, landslides, and shoreline change. Geologic features include mountains, canyons, natural arches and bridges, minerals, rocks, fossils, cave and karst systems, beaches, dunes, glaciers, volcanoes, and faults.

The GRI is one of 12 inventories funded by the National Park Service (NPS) Inventory and Monitoring Program. The Geologic Resources Division of the NPS Natural Resource Stewardship and Science Directorate administers the GRI. The NPS Geologic Resources Division partners with the Colorado State University Department of Geosciences to produce GRI products. Many additional partners participate in the GRI process by contributing source maps or reviewing products.

The GRI team undertakes three tasks for each park in the Inventory and Monitoring program: (1) conduct a scoping meeting and provide a summary document, (2) provide digital geologic map data in a geographic information system (GIS) format, and (3) provide a GRI report. These products are designed and written for nongeoscientists.

Products

Scoping Meetings: These park-specific meetings bring together local geologic experts and park staff to inventory and review available geologic data and discuss geologic resource management issues. A summary document is prepared for each meeting that identifies a plan to provide digital map data for the park.

Digital Geologic Maps: Digital geologic maps reproduce all aspects of traditional paper maps, including notes, legend, and cross sections. Bedrock, surficial, and special purpose maps such as coastal or geologic hazard maps may be used by the GRI to create digital Geographic Information Systems (GIS) data and meet park needs. These digital GIS data allow geologic information to be easily viewed and analyzed in conjunction with a wide range of other resource management information data.

For detailed information regarding GIS parameters such as data attribute field definitions, attribute field codes, value definitions, and rules that govern relationships found in the data, refer to the NPS Geology-GIS Data Model document available at: https://www.nps.gov/articles/gri-geodatabase-model.htm

Geologic Reports: GRI reports synthesize discussions from the original scoping meeting, follow up conference call(s), and subsequent research. Chapters of each report discuss the geologic setting of the park, distinctive geologic features and processes within the park, highlight geologic issues facing resource managers, and describe the geologic history leading to the present-day landscape. Each report also includes a poster illustrating these GRI digital geologic-GIS data.

For a complete listing of GRI products visit the GRI publications webpage: https://go.nps.gov/gripubs. GRI digital geologic-GIS data is also available online at the NPS Data Store: https://irma.nps.gov/DataStore/Search/Quick. To find GRI data for a specific park or parks select the appropriate park(s), enter “GRI” as a Search Text term, and then select the Search button.

For more information about the Geologic Resources Inventory Program visit the GRI webpage: https://www.nps.gov/subjects/geology/gri.htm. At the bottom of that webpage is a "Contact Us" link if you need additional information. You may also directly contact the program coordinator:

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The Geologic Resources Inventory (GRI) program is funded by the National Park Service (NPS) Inventory and Monitoring (I&M) Division. Learn more about I&M and the 12 baseline inventories at the I&M webpage: https://www.nps.gov/im/inventories.htm.

GRI Digital Maps and Source Map Citations

The GRI digital geologic-GIS maps for Mammoth Cave National Park, Kentucky (MACA) and Abraham Lincoln Birthplace National Historical Park were originally derived from unpublished data for the Beaver Dam and Campbellsville 30' x 60' quadrangles, and digitally vectorized geological quadrangle data (DVGQ) for the Austin, Bowling Green South, Glasgow South, Hodgenville, Lucas, Meador, Polkville, Summer Shade and Temple Hill 7.5' quadrangles, all provided by the Kentucky Geologic Survey (KGS). Upon review of these map data, the GRI determined that detail was lost when compared to the original USGS Geologic Quadrangle (GQ) source maps used by the KGS. Therefore, the GRI has updated the KGS provided data (added/edited feature geometries and attribution) to better communicate the detail depicted in the original USGS GQ maps. Furthermore, for some quadrangles the KGS has added additional data (geologic marker bed lines) than what is shown on the USGS GQ maps. KGS DVGQ source citations for this additional data are shown below associated with their respective quadrangle.

The GRI digital geologic-GIS maps for Mammoth Cave National Park, Kentucky (MACA):

Digital Geologic-GIS Map of Mammoth Cave National Park and Vicinity, Kentucky (*GRI MapCode MACA*)

> Kentucky Geological Survey, 2022, Kentucky Oil and Gas Well Location Shapefile: Kentucky Geological Survey Oil and Gas Well Search, accessed 04/2022 at https://www.uky.edu/KGS/emsweb/data/kyogshape.html, scale 1:100,000. (*GRI Source Map ID 76333*).

Only partial extent of this source map was used, however, all geologic features within that extent were captured. See the Index Map for additional information.

Note: the GRI Digital Geologic-GIS Map of Mammoth Cave National Park and Vicinity was constructed from the above oil and gas map source and the below maps with their respective map sources.

Digital Geologic-GIS Map of the Austin Quadrangle, Kentucky (*GRI MapCode AUST*)

> Moore, S.L., 1961, Geology of the Austin Quadrangle, Kentucky: U.S. Geological Survey, Geologic Quadrangle Map GQ-173, scale 1:24,000 (Austin Quadrangle). (*GRI Source Map ID 2761*).

The full extent of the source map was used, and all geologic features within this extent were captured.

Digital Geologic-GIS Map of the Bee Spring Quadrangle, Kentucky (*GRI MapCode BESP*)

> Gildersleeve, Benjamin, 1968, Geologic Map of the Bee Spring Quadrangle, Edmonson and Grayson Counties, Kentucky: U.S. Geological Survey, Geologic Quadrangle Map GQ-757, scale 1:24,000 (Bee Spring Quadrangle). (*GRI Source Map ID 1156*).

The full extent of the source map was used, and all geologic features within this extent were captured.

Digital Geologic-GIS Map of the Bowling Green North Quadrangle, Kentucky (*GRI MapCode BGNO*)

> Shawe, F.R., 1963, Geology of the Bowling Green North Quadrangle, Kentucky: U.S. Geological Survey, Geologic Quadrangle Map GQ-234, scale 1:24,000 (Bowling Green North Quadrangle). (*GRI Source Map ID 2770*).

The full extent of the source map was used, and all geologic features within this extent were captured.

Digital Geologic-GIS Map of the Bowling Green South Quadrangle, Kentucky (*GRI MapCode BGSO*)

Thompson, M.F., 2003, Spatial Database of the Bowling Green South Quadrangle, Kentucky: Kentucky Geological Survey, Digitally Vectorized Geologic Quadrangle Data DVGQ-12_235, scale 1:24,000. (*GRI Source Map ID 69793*).

The full extent of the source map was used, however, only linear geologic unit features were captured.

Shawe, F.R., 1963, Geology of the Bowling Green South Quadrangle, Kentucky: U.S. Geological Survey, Geologic Quadrangle Map GQ-235, scale 1:24,000 (Bowling Green South Quadrangle). (*GRI Source Map ID 2771*).

The full extent of the source map was used, and all geologic features within this extent were captured.

Digital Geologic-GIS Map of the Bristow Quadrangle, Kentucky (*GRI MapCode BRTW*)

Toth, K.S., 2006, Spatial Database of the Bristow Quadrangle, Kentucky: Kentucky Geological Survey, Digitally Vectorized Geological Quadrangle Data DVGQ-12_216, scale 1:24,000.. (*GRI Source Map ID 74471*).

The full extent of the source map was used, however, only linear geologic unit features were captured.

Gildersleeve, Benjamin, 1963, Geology of the Bristow Quadrangle, Kentucky: U.S. Geological Survey, Geologic Quadrangle Map GQ-216, scale 1:24,000 (Bristow Quadrangle). (*GRI Source Map ID 2746*).

The full extent of the source map was used, and all geologic features within this extent were captured.

Digital Geologic-GIS Map of the Brownsville Quadrangle, Kentucky (*GRI MapCode BRWV*)

Gildersleeve, Benjamin, 1965, Geology of the Brownsville Quadrangle, Kentucky: U.S. Geological Survey, Geologic Quadrangle Map GQ-411, scale 1:24,000 (Brownsville Quadrangle). (*GRI Source Map ID 1157*).

The full extent of the source map was used, and all geologic features within this extent were captured.

Digital Geologic-GIS Map of the Canmer Quadrangle, Kentucky (*GRI MapCode CANM*)

Crawford, M.M., 2006, Spatial Database of the Canmer Quadrangle, Hart County, Kentucky: Kentucky Geological Survey, Digitally Vectorized Geological Quadrangle Data DVGQ-12_816, scale 1:24,000. (*GRI Source Map ID 74458*).

The full extent of the source map was used, however, only linear geologic unit features were captured.

Miller, R.C., 1969, Geologic Map of the Canmer Quadrangle, Hart County, Kentucky: U.S. Geological Survey, Geologic Quadrangle Map GQ-816, scale 1:24,000 (Canmer Quadrangle). (*GRI Source Map ID 2754*).

The full extent of the source map was used, and all geologic features within this extent were captured.

Digital Geologic-GIS Map of the Center Quadrangle, Kentucky (*GRI MapCode CENT*)

Thompson, M.F., 2006, Spatial Database of the Center Quadrangle, south-central Kentucky: Kentucky Geological Survey, Digitally Vectorized Geological Quadrangle Data DVGQ-12_693, scale 1:24,000. (*GRI Source Map ID 74462*).

The full extent of the source map was used, however, only linear geologic unit features were captured.

Miller, R.C., and Moore, S.L., 1967, Geologic Map of the Center Quadrangle, south-central Kentucky: U.S. Geological Survey, Geologic Quadrangle Map GQ-693, scale 1:24,000 (Center Quadrangle). (*GRI Source Map ID 2755*).

The full extent of the source map was used, and all geologic features within this extent were captured.

Digital Geologic-GIS Map of the Cub Run Quadrangle, Kentucky (*GRI MapCode CURU*)

Sandberg, C.A., and Bowles, C.G., 1965, Geology of the Cub Run Quadrangle, Kentucky: U.S. Geological Survey, Geologic Quadrangle Map GQ-386, scale 1:24,000 (Cub Run Quadrangle). (*GRI Source Map ID 1158*).

The full extent of the source map was used, and all geologic features within this extent were captured.

Digital Geologic-GIS Map of the Glasgow North Quadrangle, Kentucky (*GRI MapCode GLNO*)

Mullins, J.E., 2006, Spatial Database of the Glasgow North Quadrangle, Kentucky: Kentucky Geological Survey, Digitally Vectorized Geological Quadrangle Data DVGQ-12_339, scale 1:24,000. (*GRI Source Map ID 74470*).

The full extent of the source map was used, however, only linear geologic unit features were captured.

Haynes, D.D., 1964, Geology of the Glasgow North Quadrangle, Kentucky: U.S. Geological Survey, Geologic Quadrangle Map GQ-339, scale 1:24,000 (Glasgow North Quadrangle). (*GRI Source Map ID 1159*).

The full extent of the source map was used, and all geologic features within this extent were captured.

Digital Geologic-GIS Map of the Glasgow South Quadrangle, Kentucky (*GRI MapCode GLSO*)

Moore, S.L., and Miller, R.C., 1965, Geology of the Glasgow South Quadrangle, Barren County, Kentucky: U.S. Geological Survey, Geologic Quadrangle Map GQ-416, scale 1:24,000 (Glasgow South Quadrangle). (*GRI Source Map ID 2763*).

The full extent of the source map was used, and all geologic features within this extent were captured.

Digital Geologic-GIS Map of the Hadley Quadrangle, Kentucky (*GRI MapCode HADY*)

Rainey, H.C., 1963, Geology of the Hadley Quadrangle, Kentucky: U.S. Geological Survey, Geologic Quadrangle Map GQ-237, scale 1:24,000 (Hadley Quadrangle). (*GRI Source Map ID 2766*).

The full extent of the source map was used, and all geologic features within this extent were captured.

Digital Geologic-GIS Map of the Hammonville Quadrangle, Kentucky (*GRI MapCode HAMM*)

Moore, F.B., 1972, Geologic Map of the Hammonville Quadrangle, Larue and Hart Counties, Kentucky: U.S. Geological Survey, Geologic Quadrangle Map GQ-1051, scale 1:24,000 (Hammonville Quadrangle). (*GRI Source Map ID 2757*).

The full extent of the source map was used, and all geologic features within this extent were captured.

Digital Geologic-GIS Map of the Hiseville Quadrangle, Kentucky (*GRI MapCode HISE*)

Ashcraft, M.C., 2006, Spatial Database of the Hiseville Quadrangle, Kentucky: Kentucky Geological Survey, Digitally Vectorized Geological Quadrangle Data DVGQ-12_401, scale 1:24,000. (*GRI Source Map ID 74469*).

The full extent of the source map was used, however, only linear geologic unit features were captured.

Haynes, D.D., 1965, Geology of the Hiseville Quadrangle, Kentucky: U.S. Geological Survey, Geologic Quadrangle Map GQ-401, scale 1:24,000 (Hiseville Quadrangle). (*GRI Source Map ID 2750*).

The full extent of the source map was used, and all geologic features within this extent were captured.

Digital Geologic-GIS Map of Abraham Lincoln Birthplace National Historical Park and Vicinity, Kentucky (*GRI MapCode ABLI*)

Moore, F.B., 1968, Geologic Map of the Hodgenville Quadrangle, Larue and Nelson Counties, Kentucky: U.S. Geological Survey, Geologic Quadrangle Map GQ-749, scale 1:24,000 (Hodgenville Quadrangle). (*GRI Source Map ID 2200*).

The full extent of the source map was used, and all geologic features within this extent were captured.

Digital Geologic-GIS Map of the Horse Cave Quadrangle, Kentucky (*GRI MapCode HOCA*)

Smith, P.C., 2006, Spatial Database of the Horse Cave Quadrangle, Barren and Hart Counties, Kentucky: Kentucky Geological Survey, Digitally Vectorized Geological Quadrangle Data DVGQ-12_558, scale 1:24,000. (*GRI Source Map ID 74464*).

The full extent of the source map was used, however, only linear geologic unit features were captured.

Haynes, D.D., 1966, Geologic Map of the Horse Cave Quadrangle, Barren and Hart Counties, Kentucky: U.S. Geological Survey, Geologic Quadrangle Map GQ-558, scale 1:24,000 (Horse Cave Quadrangle). (*GRI Source Map ID 1160*).

The full extent of the source map was used, and all geologic features within this extent were captured.

Digital Geologic-GIS Map of the Hudgins Quadrangle, Kentucky (*GRI MapCode HUDG*)

Petersen, C., 2006, Spatial Database of the Hudgins Quadrangle, Green and Hart Counties, Kentucky: Kentucky Geological Survey, Digitally Vectorized Geological Quadrangle Data DVGQ-12_834, scale 1:24,000. (*GRI Source Map ID 74457*).

The full extent of the source map was used, however, only linear geologic unit features were captured.

Miller, R.C., and Moore, S.L., 1969, Geologic Map of the Hudgins Quadrangle, Green and Hart Counties, Kentucky: U.S. Geological Survey, Geologic Quadrangle Map GQ-834, scale 1:24,000 (Hudgins Quadrangle). (*GRI Source Map ID 7341*).

The full extent of the source map was used, and all geologic features within this extent were captured.

Digital Geologic-GIS Map of the Lucas Quadrangle, Kentucky (*GRI MapCode LUCA*)

Haynes, D.D., 1963, Geology of the Lucas Quadrangle, Kentucky: U.S. Geological Survey, Geologic Quadrangle Map GQ-251, scale 1:24,000 (Lucas Quadrangle). (*GRI Source Map ID 2752*).

The full extent of the source map was used, and all geologic features within this extent were captured.

Digital Geologic-GIS Map of the Magnolia Quadrangle, Kentucky (*GRI MapCode MAGN*)

Moore, F.B., 1975, Geologic Map of the Magnolia Quadrangle, central Kentucky: U.S. Geological Survey, Geologic Quadrangle Map GQ-1280, scale 1:24,000 (Magnolia Quadrangle). (*GRI Source Map ID 2756*).

The full extent of the source map was used, and all geologic features within this extent were captured.

Digital Geologic-GIS Map of the Mammoth Cave Quadrangle, Kentucky (*GRI MapCode MACV*)

Haynes, D.D., 1964, Geology of the Mammoth Cave Quadrangle, Kentucky: U.S. Geological Survey, Geologic Quadrangle Map GQ-351, scale 1:24,000 (Mammoth Cave Quadrangle). (*GRI Source Map ID 1546*).

The full extent of the source map was used, and all geologic features within this extent were captured.

Digital Geologic-GIS Map of the Meador Quadrangle, Kentucky (*GRI MapCode MEAD*)

Nelson, W.H., 1963, Geology of the Meador Quadrangle, Kentucky: U.S. Geological Survey, Geologic Quadrangle Map GQ-288, scale 1:24,000 (Meador Quadrangle). (*GRI Source Map ID 2765*).

The full extent of the source map was used, and all geologic features within this extent were captured.

Digital Geologic-GIS Map of the Millerstown Quadrangle, Kentucky (*GRI MapCode MLTW*)

Moore, F.B., 1965, Geology of the Millerstown Quadrangle, Kentucky: U.S. Geological Survey, Geologic Quadrangle Map GQ-417, scale 1:24,000 (Millerstown Quadrangle). (*GRI Source Map ID 2759*).

The full extent of the source map was used, and all geologic features within this extent were captured.

Digital Geologic-GIS Map of the Morgantown Quadrangle, Kentucky (*GRI MapCode MRGA*)

Gildersleeve, Benjamin, 1972, Geologic Map of the Morgantown Quadrangle, Butler and Warren Counties, Kentucky: U.S. Geological Survey, Geologic Quadrangle Map GQ-1040, scale 1:24,000 (Morgantown Quadrangle). (*GRI Source Map ID 15793*).

The full extent of the source map was used, and all geologic features within this extent were captured.

Digital Geologic-GIS Map of the Munfordville Quadrangle, Kentucky (*GRI MapCode MUNF*)

Mullins, J.E., 2006, Spatial Database of the Munfordville Quadrangle, Hart County, Kentucky: Kentucky Geological Survey, Digitally Vectorized Geological Quadrangle Data DVGQ-12_1055, scale 1:24,000. (*GRI Source Map ID 74459*).

The full extent of the source map was used, however, only linear geologic unit features were captured.

Moore, S.L., 1973, Geologic Map of the Munfordville Quadrangle, Hart County, Kentucky: U.S. Geological Survey, Geologic Quadrangle Map GQ-1055, scale 1:24,000 (Munfordville Quadrangle). (*GRI Source Map ID 1161*).

The full extent of the source map was used, and all geologic features within this extent were captured.

Digital Geologic-GIS Map of the Nolin Reservoir Quadrangle, Kentucky (*GRI MapCode NORE*)

Gildersleeve, Benjamin, 1971, Geologic Map of the Nolin Reservoir Quadrangle, western Kentucky: U.S. Geological Survey, Geologic Quadrangle Map GQ-895, scale 1:24,000 (Nolin Reservoir Quadrangle). (*GRI Source Map ID 1162*).

The full extent of the source map was used, and all geologic features within this extent were captured.

Digital Geologic-GIS Map of the Park City Quadrangle, Kentucky (*GRI MapCode PACI*)

Thompson, M.F., 2006, Spatial Database of the Park City Quadrangle, Kentucky: Kentucky Geological Survey, Digitally Vectorized Geological Quadrangle Data DVGQ-12_183, scale 1:24,000. (*GRI Source Map ID 74441*).

The full extent of the source map was used, however, only linear geologic unit features were captured.

Haynes, D.D., 1962, Geology of the Park City Quadrangle, Kentucky: U.S. Geological Survey, Geologic Quadrangle Map GQ-183, scale 1:24,000 (Park City Quadrangle). (*GRI Source Map ID 1163*).

The full extent of the source map was used, and all geologic features within this extent were captured.

Digital Geologic-GIS Map of the Park Quadrangle, Kentucky (*GRI MapCode PRKK*)

Thompson, M.F., 2006, Spatial Database of the Park Quadrangle, south-central Kentucky: Kentucky Geological Survey, Digitally Vectorized Geological Quadrangle Data DVGQ-12_634, scale 1:24,000. (*GRI Source Map ID 74463*).

The full extent of the source map was used, however, only linear geologic unit features were captured.

Moore, S.L., and Haynes, D.D., 1967, Geologic Map of the Park Quadrangle, south-central Kentucky: U.S. Geological Survey, Geologic Quadrangle Map GQ-634, scale 1:24,000 (Park Quadrangle). (*GRI Source Map ID 2762*).

The full extent of the source map was used, and all geologic features within this extent were captured.

Digital Geologic-GIS Map of the Polkville Quadrangle, Kentucky (*GRI MapCode POLK*)

Gildersleeve, Benjamin, 1962, Geology of the Polkville Quadrangle, Kentucky: U.S. Geological Survey, Geologic Quadrangle Map GQ-194, scale 1:24,000 (Polkville Quadrangle). (*GRI Source Map ID 2747*).

The full extent of the source map was used, and all geologic features within this extent were captured.

Digital Geologic-GIS Map of the Ready Quadrangle, Kentucky (*GRI MapCode READ*)

Gildersleeve, Benjamin, 1975, Geologic Map of the Ready Quadrangle, western Kentucky: U.S. Geological Survey, Geologic Quadrangle Map GQ-1263, scale 1:24,000 (Ready Quadrangle). (*GRI Source Map ID 2745*).

The full extent of the source map was used, and all geologic features within this extent were captured.

Digital Geologic-GIS Map of the Reedyville Quadrangle, Kentucky (*GRI MapCode REED*)

Shawe, F.R., 1966, Geologic Map of the Reedyville Quadrangle, western Kentucky: U.S. Geological Survey, Geologic Quadrangle Map GQ-520, scale 1:24,000 (Reedyville Quadrangle). (*GRI Source Map ID 2769*).

The full extent of the source map was used, and all geologic features within this extent were captured.

Digital Geologic-GIS Map of the Rhoda Quadrangle, Kentucky (*GRI MapCode RHOD*)

Klemic, Harry, 1963, Geology of the Rhoda Quadrangle, Kentucky: U.S. Geological Survey, Geologic Quadrangle Map GQ-219, scale 1:24,000 (Rhoda Quadrangle). (*GRI Source Map ID 1164*).

The full extent of the source map was used, and all geologic features within this extent were captured.

Digital Geologic-GIS Map of the Riverside Quadrangle, Kentucky (*GRI MapCode RVRS*)

Shawe, F.R., 1968, Geologic Map of the Riverside Quadrangle, Butler and Warren Counties, Kentucky: U.S. Geological Survey, Geologic Quadrangle Map GQ-736, scale 1:24,000 (Riverside Quadrangle). (*GRI Source Map ID 2768*).

The full extent of the source map was used, and all geologic features within this extent were captured.

Digital Geologic-GIS Map of the Smiths Grove Quadrangle, Kentucky (*GRI MapCode SMGR*)

Thompson, M.F., 2006, Spatial Database of the Smiths Grove Quadrangle, Kentucky: Kentucky Geological Survey, Digitally Vectorized Geological Quadrangle Data DVGQ-12_357, scale 1:24,000. (*GRI Source Map ID 74442*).

The full extent of the source map was used, however, only linear geologic unit features were captured.

Richards, Paul W., 1964, Geology of the Smiths Grove Quadrangle, Kentucky: U.S. Geological Survey, Geologic Quadrangle Map GQ-357, scale 1:24,000 (Smiths Grove Quadrangle). (*GRI Source Map ID 1165*).

The full extent of the source map was used, and all geologic features within this extent were captured.

Digital Geologic-GIS Map of the Sulphur Well Quadrangle, Kentucky (*GRI MapCode SUWE*)

Petersen, C., 2006, Spatial Database of the Sulphur Well Quadrangle, Metcalfe and Green Counties, Kentucky: Kentucky Geological Survey, Digitally Vectorized Geological Quadrangle Data DVGQ-12_555, scale 1:24,000. (*GRI Source Map ID 74468*).

The full extent of the source map was used, however, only linear geologic unit features were captured.

Cattermole, J.M., 1966, Geologic Map of the Sulphur Well Quadrangle, Metcalfe and Green Counties, Kentucky: U.S. Geological Survey, Geologic Quadrangle Map GQ-555, scale 1:24,000 (Sulphur Well Quadrangle). (*GRI Source Map ID 2742*).

The full extent of the source map was used, and all geologic features within this extent were captured.

Digital Geologic-GIS Map of the Summer Shade Quadrangle, Kentucky (*GRI MapCode SUSH*)

Hail, W.J., 1964, Geology of the Summer Shade Quadrangle, Kentucky: U.S. Geological Survey, Geologic Quadrangle Map GQ-308, scale 1:24,000 (Summer Shade Quadrangle). (*GRI Source Map ID 2749*).

The full extent of the source map was used, and all geologic features within this extent were captured.

Digital Geologic-GIS Map of the Temple Hill Quadrangle, Kentucky (*GRI MapCode TEHI*)

Moore, S.L., and Miller, R.C., 1965, Geology of the Temple Hill Quadrangle, Barren County, Kentucky: U.S. Geological Survey, Geologic Quadrangle Map GQ-402, scale 1:24,000 (Temple Hill Quadrangle). (*GRI Source Map ID 2764*).

The full extent of the source map was used, and all geologic features within this extent were captured.

Digital Geologic-GIS Map of the Upton Quadrangle, Kentucky (*GRI MapCode UPTO*)

Moore, F.B., 1972, Geologic Map of the Upton Quadrangle, central Kentucky: U.S. Geological Survey, Geologic Quadrangle Map GQ-1000, scale 1:24,000 (Upton Quadrangle). (*GRI Source Map ID 2758*).

The full extent of the source map was used, and all geologic features within this extent were captured.

Digital Geologic-GIS Map of the Welchs Creek Quadrangle, Kentucky (*GRI MapCode WECR*)

> Gildersleeve, Benjamin, 1976, Geologic Map of the Welchs Creek Quadrangle, Butler and Grayson Counties, Kentucky: U.S. Geological Survey, Geologic Quadrangle Map GQ-1339, scale 1:24,000 (Welchs Creek Quadrangle). (*GRI Source Map ID 2744*).

The full extent of the source map was used, and all geologic features within this extent were captured.

In addition the the digital geologic-GIS maps, the GRI also produced the followed digital geohazard-GIS map:

Digital Geohazard-GIS Map of Mammoth Cave National Park and Vicinity, Kentucky (*GRI MapCode MACA*)

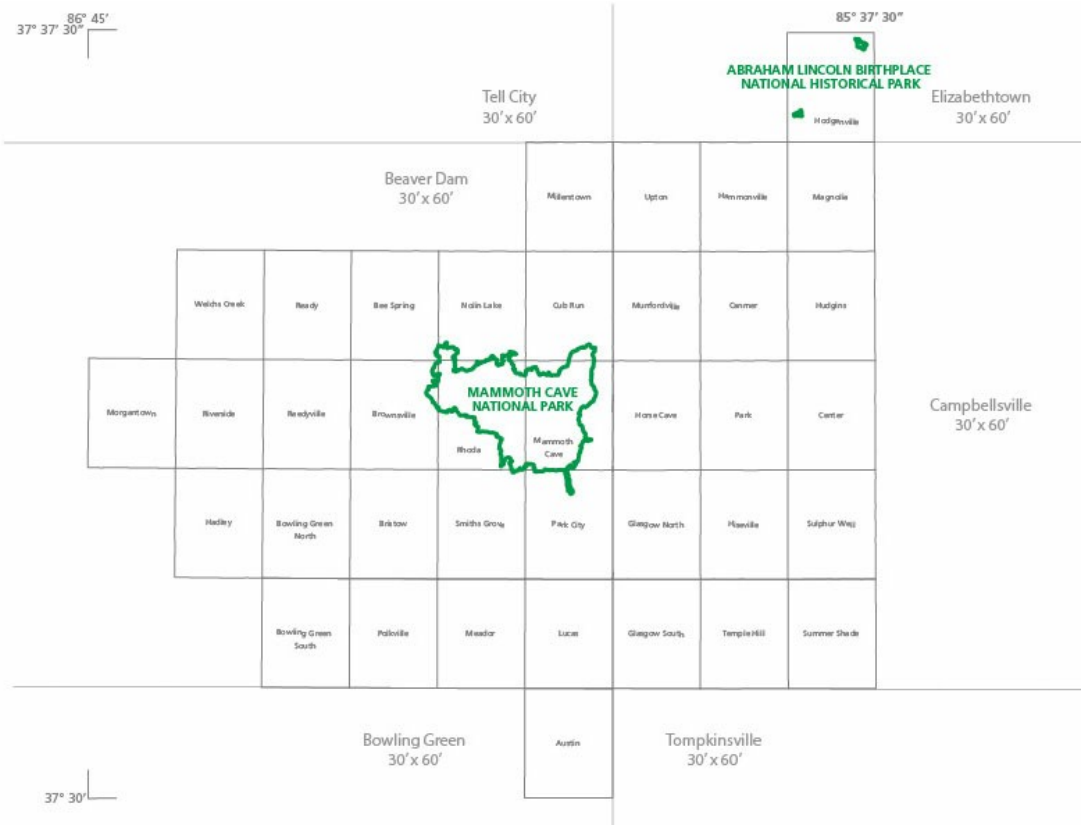
The map was produced from the following source map.

> Paylor, Randall L., Florea, Lee, Caudill, Michael, and Currens, James C., 2003, A GIS Sinkhole Coverage for the Karst Areas of Kentucky: Kentucky Geological Survey, unpublished digital data, scale 1:24,000. (*GRI Source Map ID 74479*).

Only partial extent of this source map was used, however, all geologic features within that extent were captured. See the Index Map for additional information.

Index Map

The following index map displays the extents of the GRI digital geologic-GIS maps produced for Mammoth Cave National Park (MACA) and Abraham Lincoln Birthplace National Historical Park. The boundaries for Mammoth Cave National Park and Abraham Lincoln Birthplace National Historical Park (as of June 2022) are outlined in green. The extent of the data for Mammoth Cave National Park covers all 7.5' quadrangle shown. The extent of Abraham Lincoln Birthplace National Historical Park is the Hogdenville Quadrangle.



Index map by Shea Slonkosky (Colorado State University)

Map Unit List

The geologic units present in the digital geologic-GIS data produced for Mammoth Cave National Park, Kentucky (MACA) and Abraham Lincoln Birthplace National Historical Park (ABLI) are listed below. Units are listed with their assigned unit symbol and unit name (e.g., Qaf - Artificial fill). Units are listed from youngest to oldest. Information about each geologic unit is also presented in the GRI Geologic Unit Information (MACAUNIT) table included with the GRI digital geologic-GIS data. Some source unit symbols, names and/or ages may have been changed in this document and in the GRI digital geologic-GIS data. This was done if a unit was considered to be the same unit as one or more units on other source maps used for this project, and these unit symbols, names and/or ages differed. In this case a single unit symbol and name, and the unit's now recognized age, was adopted. Unit symbols, names and/or ages in unit descriptions, correlation figures or other source map figures were not edited. If a unit symbol, name or age was changed by the GRI the unit's source map symbol, name and/or age appears with the unit's source map description.

Cenozoic Era

Quaternary Period

Qaf - Artificial fill
Ql - Landslide deposits
Qal - Alluvium
Qay - Younger alluvium
Qao - Older alluvium

Quaternary and Tertiary Periods

QTt - Terrace deposits
QTg - Terrace gravel

Paleozoic Era

Pennsylvanian Period

PNtc - Tradewater and Caseyville Formations
PNls - Tradewater and Caseyville Formations, unnamed limestone bed
PNd - Dunbar coal bed
PNa - Tradewater and Caseyville Formations, Aberdeen coal bed
PNf - Tradewater and Caseyville Formations, Foster coal bed
PNam - Tradewater and Caseyville Formations, Amos coal bed
PNc - Tradewater and Caseyville Formations, unnamed coal bed(s)
PNn - Tradewater and Caseyville Formations, Main Nolin coal bed
PNmc - Tradewater and Caseyville Formations, Mining City coal bed
PN4a - Tradewater and Caseyville Formations, No. 4a coal bed
PNcum - Tradewater and Caseyville Formations, Curlew Limestone Member and marker coal bed
PN4 - Tradewater and Caseyville Formations, No. 4 coal bed
PNca - Caseyville Formation

Mississippian Period

Ml - Leitchfield Formation, undivided
Mlu - Leitchfield Formation, upper member
Mll - Leitchfield Formation, lower sandstone member
Mls - Leitchfield Formation, top of limestone marker
Mcl - Leitchfield Formation, Clore Limestone

Mpt - Leitchfield Formation, Palestine Sandstone
Mme - Menard Limestone
Mwl - Leitchfield Formation, Waltersburg Sandstone
Mlv - Leitchfield Formation, Vienna Limestone Member
Mts - Leitchfield Formation, Tar Springs Sandstone
Mgd - Glen Dean Limestone
Mh - Hardinsburg Sandstone
Mgh - Golconda Formation, Haney Limestone Member
Mgb - Golconda Formation, Big Clifty Sandstone Member
Mgc - Golconda Formation, Beech Creek Limestone Member
Mg - Girkin Formation, undivided
Mgu - Girkin Formation, upper member
Mgm - Girkin Formation, middle member
Mgl - Girkin Formation, lower member
Mr - Reelsville Limestone
Msa - Sample Sandstone
Mbp - Beaver Bend and Paoli Limestones
Msg - Ste. Genevieve Limestone, upper part
Mulr - Ste. Genevieve Limestone, upper part, and top of Lost River (?) Chert of Elrod (1899)
Mlr - Ste. Genevieve Limestone, Lost River Chert
Mglsl - Ste. Genevieve, lower part, and St. Louis Limestones
Msl - St. Louis Limestone
Ms - Salem Limestone, undivided
Msw - Salem and Warsaw Limestones
Mds - Salem and Warsaw Limestones, dolomitic siltstone
Mfp - Fort Payne Formation, undivided
Mfpl - Fort Payne Formation. limestone
Mhl - Harrodsburg Limestone, limestone lens
Mb - Borden Formation, undivided
Mbm - Borden Formation, Muldraugh Member, includes Harrodsburg Limestone at top
Mbls - Borden Formation, limestone
Mbs - Borden Formation, shale member

Devonian Period
Dc - Chattanooga Shale
Dsj - Equivalents of Sellersburg and Jeffersonville (?) Limestones

Silurian Period
Sl - Laurel Dolomite

Map Unit Descriptions

Descriptions of all geologic map units, generally listed from youngest to oldest, are presented below. Please refer to individual source map stratigraphic sections within the Ancillary Source Map Information section of this document to view geologic unit thicknesses and other stratigraphic information.

Slumped Areas

Several quadrangles within the Digital Geologic-GIS Map of Mammoth Cave National Park contain areas of slumped material associated with karst processes. The areas are depicted as a stipple pattern overlays on respective USGS Geologic Quadrangle maps and are stored as areas in the Slumped Areas featureclass (SLA) within the GRI maps for Mammoth Cave National Park. Descriptions for the slumped areas are listed below.

Slumped sandstone, shale and conglomerate-
Sand, poorly indurated sandstone blocks, shale largely weathered to silty clay, and gravel; derived from rocks of Late Mississippian and Early Pennsylvanian age which have slumped into cavities in underlying units. The sand is of three kinds. In the northern part of the quadrangle it is fine and probably came from the Big Clifty Sandstone Member of the Golconda Formation and, to a lesser extent, from the Hardinsburg Sandstone. Sparse chert pebbles are from the Haney Limestone Member of the Golconda Formation. South of Bacon Creek, medium sand is common and locally contains many well-rounded white quartz pebbles. This sand is derived from deposits in a channel of Pennsylvanian age; although the channel is poorly defined in this quadrangle, it is well defined to the west and southwest (down-channel) in the Cub Run (Sandberg and Bowles, 1965) and Millerstown (Moore, 1965) quadrangles. Fine sand in the southern part of the quadrangle may be derived from rocks of either Mississippian or Pennsylvanian age. Shale, weathered to clay, has been squeezed from beds into voids between jumbled sandstone blocks. Description from source map: Hammonville Quadrangle

Slumped sandstone, shale and conglomerate and residual soil-
Sand, clay, and gravel derived from slumped sandstone, shale, and conglomerate intermixed in all proportions with cherty red clay soil mostly from deeply weathered Ste. Genevieve and St. Louis Limestones. Description from source map: Hammonville Quadrangle

Slumped sandstone, shale and conglomerate-
In the northwest and north-central parts of the quadrangle limestone of the Girkin Formation. Ste. Genevieve Limestone and St. Louis Limestone is covered by slumped blocks of conglomerate, sandstone, and shale. The conglomerate is Early Pennsylvanian in age and the sandstone and shale are mostly Early Pennsylvanian in age with minor amounts of sandstone of Late Mississippian age. The slumping of these rocks probably occurred during Tertiary time after extensive solution of the Mississippian limestones formed caverns along and below the unconformable contact at the base of the Lower Pennsylvanian Caseyville Formation. During the same period most of the overlying Pennsylvanian rocks were removed by erosion and the weakened roof rocks slumped into the underlying caverns in the Mississippian limestones. Conglomerate consists of well rounded quartz pebbles and cobbles in a light-reddish-gray, fine-grained, angular to subangular quartz matrix. Sandstone is light reddish gray, fine to medium grained, and in part crossbedded. Shale is light to medium gray. Description from source map: Hudgins Quadrangle

Slumped sandstone, shale and conglomerate-
Sand, poorly indurated sandstone blocks, shale mostly weathered to clay, and gravel; derived from rocks of Mississippian and Pennsylvanian age which have slumped into solution cavities in underlying units. The sand is of two kinds. North of a line connecting Magnolia with Gatton the sand is fine and came from the Big Clifty Member of the Golconda Formation and, to a lesser extent, from the Hardinsburg

Sandstone, both of Mississippian age. Neither unit occurs in place within this quadrangle, but both crop out in place down dip to the west. Sparse chert pebbles in the sand probably are from the Haney Limestone Member of the Golconda Formation, which separates the two units named above. South of the Magnolia-Gatton line much of the sand is medium and locally contains many well-rounded white quartz pebbles. This sand is derived from deposits in a poorly defined channel of Pennsylvanian age a channel which becomes well defined to the southwest (down-channel) in the Cub Run (Sandberg and Bowles, 1965) and Millerstown (Moore, 1965) quadrangles. At places clay weathered from shale has been squeezed out of beds to fill voids between jumbled sandstone blocks. Description from source map: Magnolia Quadrangle

Slumped sandstone, shale, and conglomerate and residual soil-
Sand, clay, and gravel derived from slumped sandstone, shale, and conglomerate, intermixed in all proportions with cherty red clay soil mostly from deeply weathered Ste. Genevieve and St. Louis Limestones. Patches of sand were found in several places near the north border in the eastern third of the quadrangle. This unit, therefore, probably extends a short distance into the Hodgenville quadrangle (Moore, 1968) adjacent to the north, although no exposures were seen during mapping of that quadrangle. Description from source map: Magnolia Quadrangle

Slumped sandstone, conglomerate, and shale-
In the central, northern, and northeastern parts of the quadrangle large areas are blanketed by slumped sandstone, conglomerate, and shale of Pennsylvanian and Mississippian age. The slumped material ranges from small shale particles to large jumbled blocks of sandstone and conglomerate. The unit formed by collapse into an extensive network of solution caverns developed in Mississippian limestone of the Girkin Formation and the Ste. Genevieve Limestone along and below unconformable contact at base of the Caseyville Formation of Pennsylvanian age. At the time of collapse most of the overlying Pennsylvanian rocks, except for a thin veneer of bedrock and residuum, had probably been removed by erosion. Collapse could have started at the end of Mississippian time and is continuing at present; however, stratigraphic relations with the overlying unit indicate the principle development was probably during Tertiary. Description from source map: Munfordville Quadrangle

Slumped sandstone-
Jumbled blocks of sandstone, brownish; composed of fine to medium quartz grains; fractures re-cemented and some appear to be slickensided; source of this sandstone thought to be the Big Clifty Sandstone Member of the Golconda Formation (Late Mississippian age) which, in some previous geomorphic cycle, formed the roof of a cave that collapsed, dropping the sandstone about 275 feet below its true stratigraphic position. Description from source map: Sulphur Well Quadrangle

Slumped sandstone and shale-
Sand, sandstone, shale, and clay: Sand, poorly indurated sandstone blocks, and shale largely weathered to clay; intermixed, especially near base, with residual chert-bearing soil derived from limestone. Unit derived from rocks of Mississippian and Pennsylvanian age which have slumped into solution cavities in the Ste. Genevieve Limestone and, to a lesser extent, in the Paoli, Beaver Bend, and Reelsville Limestones and the Beech Creek Limestone Member of the Golconda Formation. The sand is of two kinds. In northern part of quadrangle and locally in southern part it is fine to very fine and in northern part probably came from the Big Clifty Sandstone Member of the Golconda Formation and possibly from the Hardinsburg Sandstone, both of Chester age. In southern part of quadrangle some of the sand is of medium grain size and locally contains well-rounded white quartz pebbles. This sand is derived from deposits in poorly defined channel of Pennsylvanian age. The channel is well defined to the southwest (down-channel) in the Cub Run quadrangle (Sandberg and Bowles, 1965). Fine sand in southern part of the quadrangle is derived from rocks of either Mississippian or Pennsylvanian age. Description from source map: Upton Quadrangle

Qaf - Artificial fill (Recent? No age given)

af - Artificial fill (Recent? No age given)
Manmade fill. Description from source maps: Nolin Reservoir Quadrangle and Reedyville Quadrangle

Ql - Landslide deposits (Recent)

Ql - Landslide deposits (Recent)
Sandstone blocks in crushed shale and sandstone matrix; mapped only where not dissected to bedrock. Description from source map: Reedyville Quadrangle

Qal - Alluvium (Holocene)

Qa - Alluvium (Quaternary)
Unconsolidated poorly sorted clay, sand, and gravel deposits in larger stream valleys. Description from source map: Austin Quadrangle

Qal - Alluvium (Quaternary)
Clay, silt, sand, and gravel; poorly sorted; mapped only in larger stream valleys. Description from source map: Bee Spring Quadrangle

Qal - Alluvium (Quaternary)
Clay, silt, sand, and gravel: Very poorly sorted in bed of Barren River and in larger creek valleys; bedded clay, silt and minor amounts of sand beneath the flood plain of Barren River. Description from source map: Bowling Green North Quadrangle

Qal - Alluvium (Quaternary)
Clay, silt, sand, and gravel: Very poorly sorted, in stream beds. Bedded clay, silt and minor amounts of sand beneath flood plains of Barren River and Drakes Creek. Description from source map: Bowling Green South Quadrangle

Qal - Alluvium (Recent)
Clay. silt, sand, and gravel; poorly sorted; mapped only in larger stream valleys. Description from source map: Brownsville Quadrangle

Qal - Alluvium (Quaternary)
Clay, silt, sand, and gravel in bed of Green River and in larger creek valleys; very poorly sorted and in part crudely crossbedded. Description from source map: Canmer Quadrangle

Qal - Alluvium (Quaternary)
Gravel, sand, silt, and clay; in larger stream valleys. Description from source map: Center Quadrangle

Qal - Alluvium (Quaternary)
Gravel, sand, silt, and clay deposits mapped only in valleys of Nolin River, Dog Creek, and Cub Run. Description from source map: Cub Run Quadrangle

Qal - Alluvium (Quaternary)
Clay, silt, crossbedded sand, and crossbedded gravel; unconsolidated and poorly sorted Description from source map: Glasgow North Quadrangle

Qal - Alluvium (Quaternary)
Clay, sand, and gravel, poorly sorted; in larger stream valleys. Description from source map: Glasgow South Quadrangle

Qal - Alluvium (Quaternary)
Clay, silt, sand, and gravel, underlying flood plains along Barren and Gasper Rivers and their tributaries. Description from source map: Hadley Quadrangle

Qal - Alluvium (Quaternary)
Sand, silt, clay, and gravel in varying proportions; poorly sorted. Sand and silt derived largely from slumped sandstone, clay largely from weathered limestone. Gravel consists of subangular pebbles of chert and limestone derived from limestone of the Golconda and older formations, and rounded quartz pebbles from slumped Pennsylvanian conglomerate. Mapped only in larger stream valleys. Description from source map: Hammonville Quadrangle

Qal - Alluvium (Quaternary)
Sand, silt, and clay; brown, gray, and dark-gray, poorly sorted. Description from source map: Hiseville Quadrangle

Qal - Alluvium (Quaternary)
Silt, clay, gravel, and sand; unconsolidated silt clay mixed with lesser amounts of gravel sand. Gravel consists of chert and silicified stone Unit occurs in mappable quantities along larger streams. Description from source map: Hodgenville Quadrangle

Qal - Alluvium (Quaternary)
Clay, silt, sand, and gravel in bed of Green River and in larger creek valleys; very poorly sorted and in part crudely crossbedded. Description from source map: Hudgins Quadrangle

Qal - Alluvium (Quaternary)
Clay, silt, sand, and gravel; unconsolidated and poorly sorted. Description from source map: Lucas Quadrangle

Qal - Alluvium (Quaternary)
Sand, silt, clay, and gravel in varying proportions; poorly sorted. Sand and silt derived from areas covered by slumped sandstone, clay from weathered limestone and shale. Gravel consists of pebble-size chert and limestone fragments from limestone areas and rounded quartz pebbles from area containing slumped conglomerate of Pennsylvanian age. Mapped only in larger stream valleys. Description from source map: Magnolia Quadrangle

Qal - Alluvium (Quaternary)
Sand, locally crossbedded, silt, and clay, poorly sorted; locally contains gravel lenses of rounded to well-rounded quartz and chert pebbles and cobbles. Sand, clay, and silt are brown, gray, and dark gray. Description from source map: Mammoth Cave Quadrangle

Qal - Alluvium (Quaternary)
Clay, silt, sand, and rock fragments; unconsolidated, poorly sorted. Description from source map: Meador Quadrangle

Qal - Alluvium (Quaternary)
Sand, silt, and clay; poorly sorted; commonly mixed with colluvium at edge away from streams; only larger areas shown. Description from source map: Millerstown Quadrangle

Qal - Alluvium (Holocene)

Clay, silt, sand, and gravel; poorly sorted; unconsolidated. Description from source map: Morgantown Quadrangle

Qal - Alluvium (Holocene)
Along Green River valley, mostly silt, clay, sand, and gravel; poorly sorted and in part crudely crossbedded. Along Bacon Creek, Rader Hollow, and the valleys south and southeast of Bonnieville, mostly pebbles, granules, and sand-sized quartz in a quartz silt and clay matrix derived from weathered and slumped sandstone, conglomerate, and shale that blankets hills and valley slopes. Description from source map: Munfordville Quadrangle

Qal - Alluvium (Quaternary)
Clay, silt, sand, and gravel; poorly sorted; mapped only in larger stream valleys. Locally streams have cut through alluvium and flow on bedrock. Description from source map: Nolin Reservoir Quadrangle

Qal - Alluvium (Quaternary)
Clay, sand, and gravel, poorly sorted, mapped only in larger stream valleys. Description from source map: Park City Quadrangle

Qal - Alluvium (Quaternary)
Clay, sand, and gravel. Description from source map: Polkville Quadrangle

Qal - Alluvium (Holocene)
Sand, silt, and gravel; poorly sorted. Sand, yellowish-brown, fine to coarse quartz, locally micaceous, clayey. Silt, various shades of brown and gray, micaceous, clayey. Gravel, welt-rounded quartz pebbles, mostly less than 1 1/2 inches in diameter. Thickness based on drill-hole data. Contacts approximately located.

Note, below this unit is a thin bed (0-2 1/2 feet) of Pleistocene loess that is not mapped but has a description on this map source's stratigraphic section:
Silt, yellowish-orange to grayish-brown, contains small amounts of clay and fine quartz sand; non-stratified; noncalcareous. Occurs as irregular surface deposits; poorly exposed in low banks along secondary roads. Descriptions from source map: Ready Quadrangle

Qal - Alluvium (Recent)
Clay, silt, sand, and gravel; poorly sorted; mapped only in larger stream valleys. Description from source map: Reedyville Quadrangle

Qal - Alluvium (Quaternary)
Clay, silt, sand, and gravel: Clay and silt, brown; sand, white to yellow; gravel, white to gray. Along major rivers, clay and silt occur as high as 30 feet above normal water level. Description from source map: Rhoda Quadrangle

Qal - Alluvium (Recent)
Clay, silt, sand, and gravel; poorly sorted; mapped only in larger stream valleys. Description from source map: Riverside Quadrangle

Qal - Alluvium (Quaternary)
Gravel, sand and sift: gravel, mostly derived from nearby siltstone, sandstone, and limestone; angular, generally less than 4 inches diameter, at base of alluvium in layers mostly not more than 2 feet thick; sand or silty sand above gravel grades upwards into variably clayey iron-stained silt. Description from source map: Smiths Grove Quadrangle

Qal - Alluvium (Quaternary)

Fine sand, silt, and clay; locally contains gravel lenses composed of pebbles of chert, limestone, and siltstone. Description from source map: Sulphur Well Quadrangle

Qal - Alluvium (Quaternary)
Clay, sand, and gravel; mostly poorly consolidated floodplain deposits along the larger streams. Description from source map: Summer Shade Quadrangle

Qal - Alluvium (Quaternary)
Clay, silt, sand, and gravel deposits in the larger stream valleys. Description from source map: Temple Hill Quadrangle

Qal - Alluvium (Quaternary)
Sand, silt, and clay: Fine to very fine sand with lesser amounts of silt and clay and scattered chert and limestone fragments, poorly sorted; locally mixed with colluvium in marginal areas. Description from source map: Upton Quadrangle

Qal - Alluvium (Holocene)
Sand, silt, clay, and gravel: Sand, yellowish-brown, fine to coarse quartz, micaceous, clayey. Silt, various shades of brown and gray, micaceous, clayey. Clay, light-brown to yellowish-brown. Gravel, well-rounded quartz pebbles. Thickness based on drill-hole data. Contacts approximately located.

Note: Below this unit is a thin bed (0-3 feet) of Pleistocene loess that is not mapped but has a description on this map source's stratigraphic section: Silt, yellowish-orange to grayish-brown, contains small amounts of fine quartz sand and clay; non- stratified; noncalcareous. Occurs as irregular surface deposits; poorly exposed in low banks along roads. Description from source map: Welchs Creek Quadrangle

Qay - Younger alluvium (Recent and Pleistocene)

Qay - Younger alluvium (Pleistocene and Recent)
Sand, gravel, silt, and clay; poorly sorted. Sand, silt, and clay locally contain gravel lenses of rounded to well rounded limestone, quartz, and chert pebbles and cobbles, that are locally crossbedded. Sand, silt, and clay are brown, gray, and dark gray. Gravel pebbles and cobbles are grayish white, gray, and reddish to dark brown. Description from source map: Horse Cave Quadrangle

Qao - Older alluvium (Recent and Pleistocene)

Qao - Older alluvium (Pleistocene and Recent)
Conglomerate and gravel; locally conglomerate and gravel lenses of chert and sparse silicified fossils occur as much as 100 feet above present river level. Description from source map: Horse Cave Quadrangle

QTt - Terrace deposits (Pleistocene and/or Pliocene (?))

QTt - Terrace deposits (Pliocene or Pleistocene)
Gravel, sand, and silt: Gravel, predominantly rounded silicified limestone pebbles (many contain fragments of fossils of Mississippian age), sandstone pebbles, and, in lesser abundance, jasper and quartz pebbles. Variable amounts of yellowish-brown sand and silt. Deposits occur in vicinity of Bear

Creek at altitudes between 530 and 570 feet, and west of Caney Hollow at altitudes between 630 and 670 feet. Description from source map: Brownsville Quadrangle

QTt - Terrace deposits (Pliocene or Pleistocene)
Sandstone boulders; cobbles and pebbles of silicified Mississippian limestone, sandstone, and quartzite; pebbles of quartz, silicified fragments of fossils and geodes; variable amounts of yellowish-brown quartz sand and silt; minor amounts of light-brown and pink clay; poorly sorted. Locally gravel is cemented by iron oxide. Boulders, large cobbles, and sandstone pebbles are present in subordinate amounts. The deposits occur at altitudes ranging from 420 to 655 feet. All contacts are approximately located. Description from source map: Morgantown Quadrangle

QTt - Terrace deposits (Pliocene (?) and Pleistocene)
Gravel, along lower slopes of Green River valley consists of granules, pebbles, cobbles, and a few boulders of the following: chert, silicified limestone, silicified fossils (lithostrotionoid corals, bryozoans, crinoid columnals), jasper, sandstone, and quartz in a matrix of quartz sand and silt with minor amounts of clay. Unit poorly sorted, generally unconsolidated, crudely crossbedded; basal 1 to 2 feet is locally cemented in lenses by hydrous iron oxide. Occurs on erosional surface developed on Ste. Genevieve Limestone. Description from source map: Munfordville Quadrangle

QTt - Terrace deposits (Pliocene or Pleistocene (?))
Gravel, sand, silt, and minor clay; generally poorly sorted; locally faintly bedded; poorly indurated; thin lenses of hard hematite-cemented gravel noted in two places. Characterized by gravel containing pebbles of silicified Mississippian limestone that locally contain fossils. Jasper and quartz pebbles common; scarce cobbles and pebbles of sandstone. Occurs at altitudes of 490 to 550 feet and 590 to 670 feet. Description from source map: Reedyville Quadrangle

QTt - Terrace deposits (Pliocene or Pleistocene (?))
Silt, sand, gravel, and minor clay; generally poorly sorted; locally faintly crossbedded; poorly indurated; thin lenses of hard hematite -cemented gravel noted at a few places. Characterized by gravels containing pebbles of silicified Mississippian limestone that locally contain fossils. Jasper and quartz pebbles common; scarce cobbles and pebbles of sandstone. Occurs at altitudes ranging from 425 to 625 feet. Description from source map: Riverside Quadrangle

QTg - Terrace gravel (Quaternary and Tertiary (?))

QTg - Terrace gravel (Tertiary (?) and Quaternary)
Gravel, locally caps hills in eastern and northeastern parts of quadrangle, consists of about 30 to 40 percent well-rounded spherical and ellipsoidal quartz granules and pebbles ranging from about 3mm to 25mm in diameter with a median size of about 10mm in a matrix of quartz sand and silt, minor amounts of clay; poorly to moderately sorted, poorly consolidated to unconsolidated, crudely to strongly crossbedded; contains widely scattered boulders and cobbles of ferruginous quartz conglomerate and minor amounts of ortho-quartzite pebbles of Pennsylvanian age (Potter and Siever, 1956, p. 241). Basal 1 to 5 feet is locally cemented into irregular layers and lenses by hydrous iron oxide. Unit is extremely porous and is resistant to erosion. Outcrop areas are remnants of an ancient river deposit. The position of the exposures, ranging from about 330 feet to about 400 feet above the present floodplain of the Green River, indicate an age probably as old as Tertiary. Description from source map: Munfordville Quadrangle

PNtc - Tradewater and Caseyville Formations (Middle and Lower Pennsylvanian)

IPtc - Tradewater and Caseyville Formations (Lower and Middle Pennsylvanian)
Upper Section-
Interbedded sandstone, siltstone, shale, and coal: Sandstone, white where fresh, iron-stained various shades of brown and moderate reddish brown; very fine to medium grained; very thin to very thick bedded, locally crossbedded. Siltstone, white to yellowish-gray; weathers brown and yellowish brown; laminated to very thin bedded. Shale, silty in central and western parts of quadrangle, light-gray to dark-gray and black; weathers yellowish gray. Coal, exclusive of thin layers of very carbonaceous shale, locally present in two beds; upper coal, 4 to 10 inches thick, and lower coal, 6 to 8 inches thick, may be equivalents respectively of No. 1b and No. 1a coals of Western Kentucky coal basin.

Middle Sections-
Sandstone, white to light-gray, iron-stained brown and pink, very fine to coarse-grained; contains few rounded quartz pebbles and granules; thin to thick bedded, locally crossbedded; grades laterally into interbedded sandstone, siltstone, and shale of overlying unit. Unit is Bee Spring Sandstone as used by Moore (1877).

Shale, sandstone, and coal: Shale, dark-gray, medium-gray; weathers yellowish orange; grades laterally into, and interfingers with, sandstone of overlying unit. Coal present in two beds: upper bed, 7 to 1.0 inches thick, near top of unit; lower bed is Main Nolin coal as used by Weller (1927, p.221).

Lower Section-
Conglomerate, sandstone and shale: Conglomerate and sandstone, white where fresh, iron-stained yellowish orange to moderate red and moderate reddish-brown; thin to thick bedded, in part crossbedded. Sandstone, locally asphaltic, very fine to coarse-grained; weathers dark gray to medium gray where asphaltic. Conglomerate, composed of well-rounded granules and pebbles of quartz in a sandstone matrix; pebbles predominantly less than ½ inch in major diameter; grades laterally into sandstone. Shale, medium light-gray, sandy; weathers yellowish orange. Unit fills deep southwestward-trending channel across quadrangle; in outcrop base rests successively upon Vienna Limestone, Tar Springs Sandstone, Glen Dean Limestone, Hardinsburg Sandstone, and Haney Limestone Member of Golconda Formation.
Description from source map: Bee Spring Quadrangle

IPtc - Tradewater and Caseyville Formations (Lower and Middle Pennsylvanian)
Upper Section-
Interbedded sandstone and shale and coal: Thin-bedded bluish-gray sandy shale interbedded with thin beds of brown sandstone. Shale weathers light brown. Locally, 18-inch coal bed near base.

Middle Section-
Sandstone, brown, coarse-grained; contains few rounded quartz pebbles and granules, massive, crossbedded, asphaltic in places, only locally present; best exposed in northwestern part of quadrangle. Unit is Bee Spring Sandstone as used by Moore (1884).
Shale, sandstone, and coal: Shale, dark-gray, sandy, locally grades laterally into thin beds of sandstone. At least three beds of coal have been called the “Main Nolin” coal at prospects and mines in Brownsville quadrangle.

Lower Section-
Sandstone and conglomerate: Sandstone, locally asphaltic, light-to dark-brown; weathers light gray where asphaltic, fine- to very coarse grained; massive conspicuously crossbedded sandstone forms cliffs. Massive conglomerate containing rounded white quartz pebbles is common at base, locally conglomeratic in upper part. Unit fills westward trending channel from Pine Creek across the northern

part of quadrangle and a large subsidiary channel extending from the southwestern part of the quadrangle northeastward to the vicinity of Pine Creek. Description from source map: Brownsville Quadrangle

IPtc - Tradewater and Caseyville Formations (Lower and Middle Pennsylvanian)
Conglomerate, sandstone, siltstone, and shale: Conglomerate is light reddish brown, brown, and very light gray, poorly sorted, crossbedded; consists of well rounded ellipsoidal quartz pebbles and cobbles ranging from a few millimeters to as much as 3 inches in major diameter in a fine- to medium-grained quartz granule matrix; locally 5- to l0-foot thick asphaltic zones occur near base of conglomerate. Sandstone is light gray to moderate yellowish brown, fine to very coarse grained, thin to thick bedded and crossbedded; consists of fine to very coarse angular to subrounded quartz grains moderately well cemented by silica and minor amounts of limonite; locally contains lenses and interbeds of pebble conglomerate. Siltstone and shale are light gray to moderate yellowish brown; commonly contain lenses and interbeds of light- to medium-gray, fine- to very fine grained sandstone. In northern part of quadrangle approximately 100 feet of coarse conglomerate and sandstone occur in lower part of a channel. Southward the basal conglomerate grades laterally into fine- and very fine grained crossbedded sandstone with a few lenses and interbeds of conglomerate. In northwestern part of quadrangle unit rests uncomfortably on lower beds of Haney Limestone Member and in central and eastern parts on the Big Clifty Sandstone Member of the Golconda Formation. Description from source map: Canmer Quadrangle

IPtc - Tradewater and Caseyville Formations (Lower and Middle Pennsylvanian)
Upper Section-
Sandstone, siltstone, shale, limestone, underclay, and coal: Sandstone, light- to medium-gray; weathers yellowish brown and pink; fine to medium grained; micaceous: very thin to very thick bedded, locally crossbedded; locally interbedded with siltstone and shale. Siltstone, light- to medium-gray; weathers yellowish gray; laminated to very thin bedded; generally interbedded with shale. Shale, light- to dark-gray; weathers yellowish gray to yellowish brown: locally carbonaceous and silty; in places contains nodules of siderite. Limestone, light- to medium-gray; very fine to coarse grained; fossiliferous; ranges from 6 to 14 inches in thickness; locally consists of two thin beds separated by shale; grades laterally into interbedded shale and siltstone; at some localities directly overlies Mining City coal bed; locally separated from Mining City coal bed by shale as much as 5 feet thick. Underclay, gray; locally associated with Mining City coal bed. Unnamed coal bed, poorly exposed; reported by local coal miners to be 0 to 18 inches thick; identified at only one locality, 11/2 miles southwest of Morgantown. Mining City coal bed of Crider (1915. p.165, 178), poorly exposed, locally absent, measured thicknesses range from 18 to 48 inches: reported by local coal miners to be as much as 54 inches thick.

Middle Section-
Sandstone, siltstone, shale, limestone, underclay, and coal. Shale immediately above upper limestone bed characteristically gray and maroon. Curlew Limestone Member occurs as two beds separated by shale interval which ranges from 6 to 48 inches in thickness. Well exposed in strip mine areas. Upper limestone bed fine- to coarse- grained; decalcified and silicified at many localities and yields rectangular blocks of fossiliferous chert; ranges from 1 to 10 feet in thickness; average thickness about 4 to 5 feet; locally absent. Lower limestone, fine-grained, fossiliferous; average thickness of 3 to 4 feet. The "marker coal bed" of local miners is well exposed in strip mine areas; averages 6 inches but may be as much as 10 inches thick; at one locality the "marker coal bed" is directly overlain by the upper limestone bed; elsewhere this coal bed occurs 4 to 14 feet below the top of the upper limestone bed; probably equivalent to Cates coal bed as defined by McFarlan (1943, p. 274). No. 4 coal bed is poorly exposed; average thickness reported as 36 inches by local coal miners. Equivalent to Topmiller coal bed and Dunbar coal bed of Crider (1915, p. 175). Equivalent to No. 4 coal bed of Western Kentucky coal basin (Kehn and others, 1967). No. 4a coal bed exposed at strip mine in Pipe Spring Hollow. Local miners report coal at this horizon in holes drilled to locate No. 4 coal bed. Probably equivalent to unnamed coal bed of Crider (1915, p. 165) 40 feet below Mining City coal bed.

Lower Section-
Interbedded sandstone, siltstone, shale, and coal as above. Sandstone, thin- to very thick bedded; locally conglomeratic and crossbedded in lower part of unit; well exposed in bluffs at Woodbury. Silty shale in lower part of unit green and gray to dark gray; carbonaceous at some localities; locally contains nodules of siderite. Coal, poorly exposed; thin and lenticular at most localities, consequently nomenclature and correlations were not determined. Unit contains at least three unnamed coal beds; uppermost unnamed coal bed, reported by local coal miners to be as much as 36 inches thick, may be equivalent to the Foster coal bed as mapped in the Riverside quadrangle adjacent to the east (Shawe, 1968). Base unconformable. Description from source map: Morgantown Quadrangle

IPtc - Tradewater and Caseyville Formations (Lower and Middle Pennsylvanian)
Upper Section-
Interbedded shale, siltstone, sandstone, and coal: Shale and siltstone. white to yellowish-gray; weather brown to light olive gray and medium dark gray; laminated to very thin bedded. Sandstone, white where fresh, iron-stained brown and moderate reddish brown; very fine to medium grained; very thin to thick bedded. Coal, thin and of only local occurrence. Unit poorly exposed except in roadcuts.

Middle Sections-
Sandstone, white to light-gray, iron-stained brown and pink, very fine to coarse-grained, slightly asphaltic locally; contains rounded quartz pebbles and granules; thin to thick bedded, locally crossbedded; grades into overlying and underlying units. Unit is Bee Spring Sandstone as used by Moore (1877, p. 21, 32); not as well exposed as in adjacent Bee Spring quadrangle (Gildersleeve, 1968).

Shale, sandstone, siltstone, and coal: Shale, medium-gray, dark-gray; weathers yellowish orange; grades into, and interfingers with, sandstone of overlying unit. Coal present in four beds: uppermost bed, about 10 inches thick, principally in northern part of quadrangle; lowermost bed is Main Nolin coal as used by Weller (1927, p. 221), averages about 36 inches where exposed in outcrops and at small abandoned mines; approximate horizons of two thin intervening coals of local occurrence shown in column.

Lower Section-
Sandstone, conglomerate, shale, and coal: Sandstone and conglomerate, white where fresh, iron-stained yellowish orange to moderate red and moderate reddish brown; very thin to very thick bedded, in part crossbedded. Sandstone weathers dark gray to medium gray where locally asphaltic. Conglomerate consists of beds, stringers, and lenses of well-rounded granules and pebbles of clear to milky quartz, commonly frosted and iron-stained, in a matrix of fine to very coarse quartz sand; pebbles are as much as 1 1/2 to 2 inches across, predominantly 1/4 to 1/2 inch in major diameter; grades into sandstone. Shale, medium- light-gray, weathers yellowish orange, light gray, and reddish gray; commonly sandy; plates of selenite and small nodules of pyrite in exposure at Nolin Dam. Coal, thin and of only local occurrence about 20 to 30 feet below Main Nolin coal bed. Description from source map: Nolin Reservoir Quadrangle

IPtc - Tradewater and Caseyville Formations (Lower and Middle Pennsylvanian)
Shale, siltstone, sandstone, coal and underclay: Shale, light- to dark- and olive-gray, weathers yellowish gray, yellowish orange, and yellowish brown; locally clayey, locally carbonaceous and silty. Siltstone, light-gray to medium-dark-gray, weathers brown and yellowish brown; laminated to very thin bedded. Sandstone, white or gray where fresh, iron-stained various shades of pink, light red, brown, and moderate reddish brown; fine grained; very thin to very thick bedded, locally crossbedded; friable on weathered surfaces. Thin sandstone beds locally interbedded with shale. Coal, soft, platy, in thin beds, poorly exposed; lenticular at most localities, consequently nomenclature and correlations were not determined. Underclay, light-gray, 1 to 2 inches thick, present locally. Description from source map: Ready Quadrangle

IPtc - Tradewater and Caseyville Formations (Lower and Middle Pennsylvanian)
Upper Section-
Interbedded sandstone, siltstone, shale, coal, clay, and limestone: Sandstone, white to grayish-yellow; weathers yellowish gray and various shades of brown and reddish brown; very fine to coarse grained, micaceous in places; laminated to very thick bedded, thicker units crossbedded in places. Siltstone, white to grayish-yellow; weathers yellowish gray and various shades of brown and yellowish brown; laminated to thin bedded; micaceous in places. Shale, locally silty, very light gray to black, yellowish-gray to grayish-yellow where silty. Gray and black shale weathers to slightly lighter colors; silty shale weathers to slightly darker colors. Coal, present in at least three beds, one near top, one near middle, and one at or just above base of exposed section. Thickness ranges from less than 10 to about 25 inches. Highest coal may be Foster coal (Mullins and others, 1963, p. 10); lowest coal is probably equivalent to No. 1a coal of Western Kentucky coal basin. A few beds of brown and gray clay, up to 2 feet thick, reported in drill-hole logs. Gray underclay 0 to 10 inches thick reported by local coal miners. Brown limestone reported in drill-hole logs. Top of unit not present.

Middle Sections-
Sandstone, gray to grayish-yellow; weathers to various shades of yellowish brown, reddish brown, and brown; fine to very coarse grained; includes granule conglomerate in places, locally micaceous; very thick bedded and crossbedded; grades laterally into very thin to thin-bedded medium- to coarse-grained sandstone, asphaltic. Inter-fingers with and grades laterally into interbedded sandstone, siltstone, and shale of overlying unit. Unit is Bee Spring Sandstone as used by Moore (1884).

Shale, sandstone, siltstone, coal, and clay: Shale, silty in places, light- gray to black, yellowish-gray to grayish-yellow where silty. Gray and black shale weathers to slightly lighter colors, silty shale weathers to slightly darker colors. Sandstone, white to grayish-yellow; weathers to yellowish gray and various shades of brown and reddish brown; very fine to coarse grained; laminated to very thick bedded; micaceous in places. Siltstone, white to grayish-yellow; weathers to yellowish gray and various shades of brown and yellowish brown; laminated to thin bedded; micaceous in places. Coal, present in two beds, upper bed 2 to 30 feet below top of unit, lower bed 15 to 30 feet below upper coal; thickness of upper coal 6 to 20 inches, lower coal 10 to 36 inches. Lower coal is probably Main Nolin coal bed (Mullins and others, 1963, p. 10). Underclay, gray; 0 to 7 inches reported by local coal miners.

Lower Section-
Sandstone, conglomerate, siltstone, and shale: Sandstone, very fine to coarse-grained; micaceous or conglomeratic locally; thin to very thick bedded and crossbedded with long sweeping festoon beds. Grades into conglomerate containing granules, pebbles, and a few boulders of white quartz. Sandstone and conglomerate, very light gray to grayish-yellow; weather to various shades of reddish brown and brown, locally asphaltic. Limestone-cemented limestone conglomerate noted at a few places where unit lies on upper part of Vienna Limestone. Siltstone, white to grayish-yellow; weathers yellowish gray and various shades of brown and yellowish brown; laminated to thin bedded; micaceous in places. Shale, silty in places, medium-gray to black, yellowish-gray to grayish-yellow where silty. Gray and black shale weathers to slightly lighter colors and silty shale weathers to slightly darker colors. Sandstone and conglomeratic sandstone are predominant lithologies. Base unconformable and in outcrop rests successively upon Menard Limestone, Waltersburg Sandstone, Vienna hole drilled for oil on Big Reedy Creek about 2 miles southwest of Limestone, Tar Springs Sandstone, and Glen Dean Limestone. A Reedyville indicates base rests on or just below top of Big Clifty Sandstone Member of Golconda Formation. Description from source map: Reedyville Quadrangle

IPtc - Tradewater and Caseyville Formations (Lower and Middle Pennsylvanian)
Upper Section-
Shale, carbonaceous, dark-gray; weathers medium light gray. Crops out only at Johnson Cemetery in northwest part of quadrangle.

Middle Sections-
Limestone, olive-gray; weathers moderate yellowish brown; coarsely bioclastic with many brachiopod and crinoid fragments; thin bedded; weathers slabby. Crops out only at Johnson Cemetery in northwest part of quadrangle. May be equivalent of Curlew Limestone Member of Tradewater Formation in western Kentucky (T. M. Kehn, U.S.G.S., written communication, 1966).

Interbedded sandstone, shale, coal, and clay: Sandstone, white to grayish-yellow; weathers yellowish gray to various shades of brown and reddish brown; very fine to coarse grained, micaceous in places; laminated to thick bedded, crossbedded in places; weathers platy to massive. Shale, carbonaceous, silty in places; dark gray to grayish black, yellowish gray to grayish yellow where silty; dark-gray and grayish-black shale weathers to slightly lighter colors and silty shale weathers to slightly darker colors. Coal, poorly exposed; reported by local sources to be as much as 44 inches thick. Equivalent to Dunbar coal bed (Mullins and others, 1963, p. 9, 23) and may be equivalent to the No. 4 coal bed of the western Kentucky coal basin (T. M. Kehn, U.S.G.S., written communication, 1966). Clay, gray underclay as much as a few inches thick reported by local coal miners.

Interbedded sandstone, siltstone, shale, coal, and clay: Sandstone, white to grayish-yellow; weathers yellowish gray to various shades of brown and reddish brown; very fine to coarse grained, locally micaceous; laminated to thick bedded, locally crossbedded; weathers platy to massive. Siltstone, white to grayish-yellow; weathers yellowish gray to moderate yellow; laminated to thin bedded; weathers platy to slabby. Shale, locally silty or carbonaceous, dark-gray to grayish-black, yellowish-gray to grayish-yellow where silty; dark-gray and grayish-black shale weathers to slightly lighter colors and silty shale weathers to slightly darker colors, Coal, poorly exposed; reported by local sources to be up to 30 inches thick. Equivalent to Aberdeen coal bed (Mullins and others, 1963, p. 9). Clay, gray underclay a few inches thick reported by local coal miners.

Interbedded sandstone, siltstone, shale, coal, and clay; same as above. Coal, poorly exposed: reported as much as 36 inches thick by local coal miners. Equivalent to Foster coal bed (Mullins and others, 1963. p. 9, 23). Clay, gray underclay a few inches thick reported by local coal miners.

Interbedded sandstone, siltstone, shale, coal, and clay; same as above, Coal, poorly exposed; reported as much as 30 inches thick by local coal miners, Equivalent to Amos coal bed (Mullins and others, 1963, p. 9, 23). Clay, gray underclay a few inches thick reported by local coal miners.

Interbedded sandstone, siltstone, shale, coal, and clay; same as above. Coal, poorly exposed; reported as much as 48 inches thick by local coal miners: unnamed. Clay, gray underclay a few inches thick reported by local coal miners.

Interbedded sandstone, siltstone, shale, coal, and clay; same as above. Unit may be base of Tradewater Formation.

Sandstone. gray to grayish-yellow; weathers to various shades of yellowish brown, reddish brown, and brown; fine to very coarse grained: includes granule-conglomerate in places, locally micaceous; very thick bedded and crossbedded; grades laterally into very thin to thin-bedded, medium- to coarse-grained sandstone. Interfingers with and grades laterally into interbedded sandstone, siltstone, and shale of overlying unit. Unit is Bee Spring Sandstone as used by Moore (1884).

Shale, sandstone, siltstone, coal and clay: Shale generally carbonaceous, silty in places, light- gray to black; yellowish gray to grayish yellow where silty. Gray and black shale weathers to slightly lighter colors, silty shale weathers to slightly darker colors. Sandstone, white to grayish-yellow; weathers to yellowish gray and various shades of brown and reddish brown; very fine to coarse grained; laminated to very thick bedded; micaceous in places. Siltstone, white to grayish-yellow; weathers to yellowish gray and various shades of brown and yellowish brown; laminated to thin bedded; locally micaceous. Coal

present in two beds: one near top is unnamed; lower coal, 0 to 25 feet above base of unit, is probably Main Nolin coal bed (Mullins and others, 1963, p. 10). Clay, gray, locally present as underclay beneath both coals and may thicken to as much as 4 feet beneath the Main Nolin coal.

Lower Section-
Sandstone, conglomerate, siltstone, and shale: Sandstone, very fine to coarse-grained; micaceous or conglomeratic in places; thin to very thick bedded and crossbedded with long festoon beds. Grades into conglomerate containing granules, pebbles, and a few cobbles of white quartz. Sandstone and conglomerate, very light gray to grayish-yellow; weather to various shades of reddish brown and brown, locally asphaltic. Limestone conglomerate noted at one place where unit lies on lower part of Menard Limestone. Siltstone, white to grayish-yellow; weathers yellowish gray and various shades of brown and yellowish brown; laminated to thin bedded, locally micaceous. Shale, carbonaceous or silty in places, medium-gray to black; yellowish gray to grayish yellow where silty. Gray and black shale weathers to slightly lighter colors and silty shale weathers to slightly darker colors. Base unconformable. Description from source map: Riverside Quadrangle

IPtc - Tradewater and Caseyville Formations (Lower and Middle Pennsylvanian)
Upper Section-
Interbedded shale, siltstone, sandstone, coal, limestone, and underclay: Shale, light- to medium-gray and olive-gray, weathers yellowish gray and yellowish brown; generally fissile, locally carbonaceous or silty; in places interbedded with thin sandstone beds. Siltstone, light- to medium-gray, weathers brown and yellowish brown; micaceous; laminated to very thin bedded; commonly interbedded with shale. Sandstone, light-gray, weathers grayish yellow, brown, and yellowish brown; fine grained, very thin to very thick bedded, locally crossbedded. Coal, soft, platy, generally in thin beds, poorly exposed. Aberdeen and Foster coal beds equivalent to same named coal beds as mapped in the Riverside quadrangle adjacent to the south (Shawe, 1968), and as mapped in the Flener quadrangle adjacent to the west (Gildersleeve, 1972). Amos coal bed equivalent to Amos coal bed as mapped in the Riverside quadrangle (Shawe, 1968). A 60-inch-thick coal bed 323 feet above the base of the Vienna Limestone Member of the Leitchfield Formation was recorded in a drill hole approximately three-quarters of a mile northeast of the village of Welchs Creek (Carter coordinates sec. 17, K-36). Limestone, dark-gray, fine-grained to micrograined, medium-bedded; crops out at one locality along west boundary of quadrangle. Underclay, fight-greenish-gray; locally as much as 3 to 5 feet thick on Bryant Ridge in northeastern part of quadrangle.

Lower Section-
Shale, sandstone, and coal: Unit not exposed; data from drill-hole records, which do not give detailed descriptions of rock types. Several coal beds have been reported in lower part of unit, but extent, thickness, and quality of coal are unknown. Description from source map: Welchs Creek Quadrangle

PNls - Tradewater and Caseyville Formations, unnamed limestone bed (Middle and Lower Pennsylvanian)

ls - Tradewater and Caseyville Formations, limestone (Lower and Middle Pennsylvanian)
Limestone, olive-gray; weathers moderate yellowish brown; coarsely bioclastic with many brachiopod and crinoid fragments; thin bedded; weathers slabby. Crops out only at Johnson Cemetery in northwest part of quadrangle. May be equivalent of Curlew Limestone Member of Tradewater Formation in western Kentucky (T. M. Kehn, U.S.G.S., written communication, 1966). Description from source map: Riverside Quadrangle

ls - Tradewater and Caseyville Formations, unnamed limestone bed (Lower and Middle Pennsylvanian)

Limestone, dark-gray, fine-grained to micrograined, medium-bedded; crops out at one locality along west boundary of quadrangle. Description from source map: Welchs Creek Quadrangle

PNd - Tradewater and Caseyville Formations, Dunbar coal bed (Middle and Lower Pennsylvanian)

d - Tradewater and Caseyville Formations, Dunbar coal bed (Lower and Middle Pennsylvanian)
Coal, poorly exposed; reported by local sources to be as much as 44 inches thick. Equivalent to Dunbar coal bed (Mullins and others, 1963, p. 9, 23) and may be equivalent to the No. 4 coal bed of the western Kentucky coal basin (T. M. Kehn, U.S.G.S., written communication, 1966). Description from source map: Riverside Quadrangle

PNa - Tradewater and Caseyville Formations, Aberdeen coal bed (Middle and Lower Pennsylvanian)

a - Tradewater and Caseyville Formations, Aberdeen coal bed (Lower and Middle Pennsylvanian)
Coal, poorly exposed; reported by local sources to be up to 30 inches thick. Equivalent to Aberdeen coal bed (Mullins and others, 1963, p. 9). Description from source map: Riverside Quadrangle

a - Tradewater and Caseyville Formations, Aberdeen coal bed (Lower and Middle Pennsylvanian)
No description provided. Description from source map: Welchs Creek Quadrangle

PNf - Tradewater and Caseyville Formations, Foster coal bed (Middle and Lower Pennsylvanian)

f - Tradewater and Caseyville Formations, Foster coal bed (Lower and Middle Pennsylvanian)
Coal, poorly exposed: reported as much as 36 inches thick by local coal miners. Equivalent to Foster coal bed (Mullins and others, 1963. p. 9, 23). Description from source map: Riverside Quadrangle

f - Tradewater and Caseyville Formations, Foster coal bed (Lower and Middle Pennsylvanian)
No description provided. Description from source map: Welchs Creek Quadrangle

PNam - Tradewater and Caseyville Formations, Amos coal bed (Middle and Lower Pennsylvanian)

am - Tradewater and Caseyville Formations, Amos coal bed (Lower and Middle Pennsylvanian)
Coal, poorly exposed; reported as much as 30 inches thick by local coal miners, Equivalent to Amos coal bed (Mullins and others, 1963, p. 9, 23). Description from source map: Riverside Quadrangle

am - Tradewater and Caseyville Formations, Amos coal bed (Lower and Middle Pennsylvanian)
No description provided. Description from source map: Welchs Creek Quadrangle

PNc - Tradewater and Caseyville Formations, unnamed coal bed(s) (Middle and Lower Pennsylvanian)

c - Tradewater and Caseyville Formations, unnamed coal bed (Lower and Middle Pennsylvanian)
No description provided. Description from source map: Nolin Reservoir Quadrangle

c - Tradewater and Caseyville Formations, unnamed coal beds (Lower and Middle Pennsylvanian)
Coal, soft, platy, in thin beds, poorly exposed; lenticular at most localities, consequently nomenclature and correlations were not determined. Description from source map: Ready Quadrangle

c - Tradewater and Caseyville Formations, unnamed coal bed (Lower and Middle Pennsylvanian)
No description provided. Description from source map: Reedyville Quadrangle

c - Tradewater and Caseyville Formations, unnamed coal bed (Lower and Middle Pennsylvanian)
Coal, poorly exposed; reported as much as 48 inches thick by local coal miners: unnamed. Description from source map: Riverside Quadrangle

c - Tradewater and Caseyville Formations, unnamed coal bed (Lower and Middle Pennsylvanian)
No description provided. Description from source map: Welchs Creek Quadrangle

PNn - Tradewater and Caseyville Formations, Main Nolin coal bed (Middle and Lower Pennsylvanian)

n - Tradewater and Caseyville Formations, Main Nolin coal bed (Lower and Middle Pennsylvanian)
Lower bed is Main Nolin coal as used by Weller (1927, p.221). Description from source map: Bee Spring Quadrangle

n - Tradewater and Caseyville Formations, Main Nolin coal bed (Lower and Middle Pennsylvanian)
Lowermost bed is Main Nolin coal as used by Weller (1927, p. 221), averages about 36 inches where exposed in outcrops and at small abandoned mines. Description from source map: Nolin Reservoir Quadrangle

n - Tradewater and Caseyville Formations, Main Nolin coal bed (Lower and Middle Pennsylvanian)
Lower coal, 0 to 25 feet above base of unit, is probably Main Nolin coal bed (Mullins and others, 1963, p. 10). Description from source map: Riverside Quadrangle

PNmc - Tradewater and Caseyville Formations, Mining City coal bed (Middle and Lower Pennsylvanian)

mc - Tradewater and Caseyville Formations, Mining City coal bed (Lower and Middle Pennsylvanian)
No description provided. Description from source map: Morgantown Quadrangle

PN4a - Tradewater and Caseyville Formations, No. 4a coal bed (Middle and Lower Pennsylvanian)

4a - Tradewater and Caseyville Formations, No. 4a coal bed (Lower and Middle Pennsylvanian)
No. 4a coal bed exposed at strip mine in Pipe Spring Hollow. Local miners report coal at this horizon in holes drilled to locate No. 4 coal bed. Probably equivalent to unnamed coal bed of Crider (1915, p. 165) 40 feet below Mining City coal bed. Description from source map: Morgantown Quadrangle

PNcum - Tradewater and Caseyville Formations, Curlew Limestone Member and marker coal bed (Middle and Lower Pennsylvanian)

cu, m - Tradewater and Caseyville Formations, Curlew Limestone Member and "marker coal bed" (Lower and Middle Pennsylvanian)
No description provided. Description from source map: Morgantown Quadrangle

PN4 - Tradewater and Caseyville Formations, No. 4 coal bed (Middle and Lower Pennsylvanian)

4 - Tradewater and Caseyville Formations, No. 4 coal bed (Lower and Middle Pennsylvanian)
No. 4 coal bed is poorly exposed; average thickness reported as 36 inches by local coal miners. Equivalent to Topmiller coal bed and Dunbar coal bed of Crider (1915, p. 175). Equivalent to No. 4 coal bed of Western Kentucky coal basin (Kehn and others, 1967). Description from source map: Morgantown Quadrangle

PNca - Caseyville Formation (Lower Pennsylvanian)

IPca - Caseyville Formation (Lower Pennsylvanian)
Sandstone and conglomerate: Sandstone, fine- to coarse-grained, conglomerate in places; white to light reddish brown; weathers dark brown; generally massive, locally crossbedded; sparsely fossiliferous with poorly preserved plant remains. Sand grains are frosted clear quartz. Where conglomeratic, dark-brown weathered surfaces are speckled white by pebbles and granules of white opaque vein quartz 0.1 to 1.0 inch in diameter. Occupies valley or river channel that was cut to within 55 feet of base of underlying formation, Top is not present and original thickness is unknown. Exposures are scarce; formation is largely inferred from large blocks of conglomeratic sandstone debris that cover hillsides. Description from source map: Bowling Green North Quadrangle

IPca - Caseyville Formation (Lower Pennsylvanian)
Sandstone, fine- to coarse-grained, massive; conglomeratic and crossbedded locally. Exposed surfaces are generally dark brown and iron stained. Fresh surfaces are lighter brown and, in a few places, white.

Rounded pebbles of white frosted quartz are locally abundant; most of them vary in maximum diameter from 0.1 to 0.9 inch and average less than 0.5 inch. Poorly preserved impressions of plant stems occur in both conglomerate and sandstone. An asphaltic zone of very limited extent, about 20 feet above base of formation, is exposed in a small prospect 1,100 feet north of Pine Grove Church. Basal contact is unconformable. Description from source map: Bristow Quadrangle

IPca - Caseyville Formation (Lower Pennsylvanian)
Sandstone and conglomerate, white, yellowish-gray, yellowish-orange, moderate-reddish-orange, and grayish-orange. limonitic and hematitic, thick- to very thick bedded; in part thickly crossbedded. Medium- to coarse-grained conglomeratic sandstone interbedded with pebble conglomerate predominates in deep main channel trending northeast through town of Cub Run. Beds and lenses of pebble and cobble conglomerate common in several shallow tributary channels on north side of main channel, north of town of Cub Run. Truncates Leitchfield Formation, Glen Dean Limestone, Hardinsburg Sandstone, and Haney Limestone Member of Golconda Formation within main channel and rests unconformably on Big Clifty Sandstone Member of Golconda Formation in its deepest parts. Description from source map: Cub Run Quadrangle

IPca - Caseyville Formation (Lower Pennsylvanian)
Sandstone and conglomerate: Sandstone, fine-grained to conglomeratic; brown, buff, and white on fresh surfaces, iron-stained dark brown, black, red, and yellow on weathered surfaces; in part friable, crossbedded, and massive. Conglomerate occurs throughout; mostly lenticular; contains rounded, frosted white quartz pebbles less than ¼ to ½ inch in diameter; basal conglomerate contains gray limestone fragments. Plant stem impressions occur throughout. Formation forms high bluffs and caps prominent hills in northern and western parts of quadrangle Base is generally concealed; basal contact is unconformable and locally marked by conglomerate deposited in channels; springs are common at contact. Description from source map: Hadley Quadrangle

IPca - Caseyville Formation (Lower Pennsylvanian)
Conglomerate, sandstone, and siltstone: Cobble and pebble conglomerate interbedded with pebbly to granular sandstone in lower part; largely sandstone in upper part. Conglomerate consists of cobbles, up to 3 inches in diameter, pebbles and granules of white and very light gray quartz and quartzite; reddish-brown and black siliceous and manganiferous cement. Sandstone, white, yellowish-gray, yellowish-orange, and grayish-orange, thick-bedded to massive, fine- to very coarse grained, conglomeratic, locally crossbedded, limonite- and hematite-stained grains and matrix. Siltstone occurs as thin partings and seams. Formation sparsely fossiliferous with poorly preserved plant remains. Contact with underlying Glen Dean Limestone unconformable. Locally truncates Glen Dean Limestone and rests unconformably on Hardinsburg Sandstone. Description from source map: Mammoth Cave Quadrangle

IPca - Caseyville Formation (Lower Pennsylvanian)
Sandstone, light-brown to grayish-brown, fine- to coarse-grained, locally conglomeratic, very thick bedded to very thickly crossbedded, heavily iron stained locally. Lower part contains asphalt impregnated layers as much as 18 feet thick near western border. Conglomerate and coarse-grained sand stone appear more heavily impregnated than finer grained sandstone. Forms moderate to steep slopes or massive cliffs. Rests unconformably on and fills channels in the underlying Leitchfield Formation and, locally rests on the Glen Dean Limestone. Lower contact generally covered with sandstone float. Description from source map: Millerstown Quadrangle

IPca - Caseyville Formation (Lower Pennsylvanian)
Conglomerate, sandstone, siltstone, and shale: Conglomerate, light-reddish-brown, light- brown, and light-gray, poorly sorted, in part crossbedded; consists of well-rounded spherical and ellipsoidal granules and pebbles of quartz in a matrix of fine- to medium-grained quartz; pebbles are as much as 30mm across. Sandstone, light-gray to yellowish-gray and yellowish-brown, fine- to medium-grained, thin- to thick-bedded, consists of angular to subrounded quartz grains moderately well cemented by silica and

minor amounts of limonite. Siltstone and shale are light gray to moderate yellowish brown, commonly contain lenses and interbeds of light- to medium-gray, fine- to very fine grained sandstone. Locally a 5- to 10-foot-thick zone of asphaltic conglomerate occurs near base. Description from source map: Munfordville Quadrangle

IPca - Caseyville Formation (Lower Pennsylvanian)
Sandstone, conglomerate, siltstone, and shale: Sandstone, pale-yellow to medium-brown, massive to medium-bedded, fine- to very coarse- grained, locally conglomeratic; commonly contains casts of roots and stems, and iron oxide-cemented sandstone concretions in form of nodules, sinuous layers, and cellular structures. Conglomerate, light- brown, massive to thin-bedded; contains fine to coarse pebbles, mostly of milk-white quartz, some of gray quartzite. Siltstone and shale, light- gray and brown; in thin beds and partings. In northwestern part of quadrangle, massive coarse conglomerate and sandstone fill deep channel; elsewhere, conglomerate occurs in thick to thin layers and lenses. Formation caps highest hills; forms deeply undercut cliffs in northwestern part of area. Large slump blocks and talus commonly conceal base. Well-exposed, easily accessible section of Caseyville is on ridge at Dawes, about 2 miles east-northeast of Rhoda. Description from source map: Rhoda Quadrangle

IPca - Caseyville Formation (Lower Pennsylvanian)
Sandstone, light-brown to grayish-brown, fine- to coarse-grained, locally conglomeratic, very thick bedded, locally crossbedded, locally highly stained by iron-oxides. Occurs as an outlier on the northern side of a Pennsylvanian channel deposit more completely preserved in the Millerstown quadrangle to the west (Moore, 1965a) and in the Cub Run quadrangle to the southwest (Sandberg and Bowles, 1965). Description from source map: Upton Quadrangle

Ml - Leitchfield Formation, undivided (Mississippian)

Ml - Leitchfield Formation (Mississippian (Chester))
Limestone, shale, and sandstone: Limestone, blue-gray, very light gray, medium-gray; very fine grained to coarsely crystalline; commonly argillaceous and dolomitic; thin to thick bedded; locally fossiliferous with brachiopods, blastoids, crinoid stems, bryozoans; some beds weather to light gray platy rubble; weathered surfaces of other beds are yellowish brown, smooth and rounded; dark gray to black ropy, blocky, and scraggly chert on weathered outcrops at a few localities. Shale, medium-gray, yellowish-green, grayish-green; thinly laminated to laminated; weathers yellowish gray. Sandstone; small outcrops of thin-bedded sandstone at flood plain level on the north fork of Nappers Branch and art the east side of Bear Creek midway between Sunfish and Bee Spring are tentatively identified as representing the Waltersburg Sandstone. Elsewhere in the quadrangle the Waltersburg was not identified in outcrop because the formation is cut out by the channel filled with beds of Pennsylvanian age. Lithologically the dark-gray to black shale exposed in the upper parts of the streams which head upon either side of the “Bee Spring Divide” are indistinguishable from dark shales of Mississippian age. At some localities the lower parts of these shales may represent the Waltersburg Sandstone. Description from source map: Bee Spring Quadrangle

Ml - Leitchfield Formation (Upper Mississippian)
Shale, green, gray-green, and red; minor amounts of interbedded limestone and sandstone. Brown-weathering, very fine-grained impure limestone is poorly exposed about 30 feet above base. At a locality 2,100 feet north of Pine Grove Church fine-grained gray limestone, 5 to possibly 15 feet thick, occurs near top of formation and a bed of sands stone 4 inches thick occurs approximately 20 feet above base. Outcrops are scarce. Description from source map: Bristow Quadrangle

Ml - Leitchfield Formation (Upper Mississippian)
Shale, limestone, and sandstone: Shale, green, grayish-green, bluish- gray, and red; interbedded with

thin limestone beds at irregular intervals in upper part of formation. Limestone, dark-gray on fresh surfaces, weathers brown, predominantly very fine to fine-grained, forms massive bed 30 to 40 feet above base and is as thick as 15 feet; probably equivalent to Vienna Limestone; where 4 feet or less in thickness, indistinguishable from other thin beds of limestone interbedded with shale. Sandstone at base of formation, brown, fine- to medium-grained; grades laterally into sandy shale within short distances; contains fragments of brachiopods and bryozoans at a locality 1.3 miles northwest of Wingfield School; locally as thick as 10 feet; probably equivalent to Tar Springs Formation. Unit poorly exposed. Description from source map: Brownsville Quadrangle

Ml - Leitchfield Formation (Upper Mississippian)
Upper Section-
Shale, greenish-gray and medium-gray: contains thin interbeds of yellowish-gray and medium-gray siltstone and sandstone and dark- yellowish-orange fragmental limestone. Base of unit is bed of dark-yellowish-orange limestone as much as 7 feet thick, containing 2 to 7 inches of bedded chert in upper part. This limestone, which lies 25 to 45 feet above base of Leitchfield Formation, probably is equivalent to Vienna Limestone. Unit is present only on high hills in northwestern and west-central parts of quadrangle. It generally is poorly exposed and forms steep slopes covered by talus from overlying Caseyville Formation.

Lower Section-
Shale and sandstone: Shale, greenish-gray and medium-gray; interbedded with yellowish-gray and yellowish-orange siltstone and thin lenses of dark-yellowish-orange limestone. Sandstone, medium-gray, very fine to fine-grained, slightly calcareous, thin- to medium-bedded. Lower part interfingers westward with beds of sandstone, probably equivalent to sandstone of Tar Springs Formation. Unit present only on high hills in northwestern and west-central parts of quadrangle, and commonly it is partly concealed by talus from Caseyville Formation. Description from source map: Cub Run Quadrangle

Ml - Leitchfield Formation (Upper Mississippian)
Shale, sandstone, and limestone: Shale, gray and grayish-green, locally silty and in part fissile. Sandstone, fine-grained, brown; occurs in thin, irregular beds; makes up basal 31 feet of formation in exposure about 1.1 miles west of Benleo at road elevation 589; is probably equivalent to Tar Springs Sandstone. Limestone, light-tan to brown, gray; lower limestone is fossiliferous. Topography is subdued, outcrops are scarce. Description from source map: Hadley Quadrangle

Ml - Leitchfield Formation (Upper Mississippian)
Shale, limestone, and sandstone: Shale is greenish gray, dark gray, and locally maroon, clayey to silty; comprises bulk of formation. A persistent limestone, light-olive-gray to brownish-gray, medium- to coarse-grained, argillaceous in part, fossil fragmental in part, 5 to 8 feet thick, equivalent to the Vienna Limestone, occurs 20 to 45 feet above base; contains a distinctive fossiliferous oolitic chert. At base of unit a bed of grayish-orange fine-grained silty limestone, 8 inches to 4 feet thick, is present in numerous places. A limestone, 2 to 3 feet thick, about 80 to 90 feet above the Vienna equivalent is commonly covered or has been removed by erosion prior to deposition of the Caseyville. Sandstone is yellowish brown to dark gray, fine to very fine grained, thin bedded, generally in layers less than 5 feet thick. Formation forms moderate slopes with few outcrops. Description from source map: Millerstown Quadrangle

Ml - Leitchfield Formation (Mississippian (Chester))
Upper Section-
Shale, siltstone, limestone, and sandstone: Shale, grayish-green to dark-green, locally moderate red. Siltstone, light-olive: laminated to very thin bedded. Limestone, light-gray to medium-gray; fine to coarse grained; very thin to thin bedded; locally fossiliferous. Sandstone, grayish-yellow, fine-grained, thin- to medium-bedded. Entire unit not well exposed at any one locality. This unit includes equivalents of rocks mapped by Shawe (1968) as Clore Limestone and Palestine Sandstone in the Riverside quadrangle.

Middle Section-
Shale, limestone, and siltstone: Shale, green, grayish-red, grayish-green, and dark-gray; locally interbedded with thin beds of light-gray argillaceous limestone and olive-gray siltstone; lowermost 20 feet of unit characteristically dark-gray clay shale. Limestone, light-gray to dark-yellowish-orange; very thin to medium bedded; locally fossiliferous; locally argillaceous. Unit poorly exposed; includes equivalents of rocks mapped as Waltersburg Sandstone and all but uppermost Menard Limestone in the Riverside quadrangle (Shawe, 1968).

Lower Section-
Sandstone, siltstone, and shale: Sandstone, medium-gray to grayish-yellow, fine-grained. thin- bedded: lower beds grade upward into light-olive siltstone and yellowish-green to grayish-red shale; locally upper beds grade laterally into siltstone and dark-gray shale. Unit equivalent to rocks mapped as Tar Springs Sandstone in Riverside quadrangle (Shawe. 1968).
Description from source map: Morgantown Quadrangle

Ml - Leitchfield Formation (Mississippian (Chester))
Shale, limestone, and siltstone: Shale, green, grayish-green, grayish-red, and dark-gray: present throughout unit; in lower part interbedded with thin beds of limestone and siltstone. Limestone, light-gray to medium-dark-gray, dark-yellowish-orange: very fine grained to coarsely crystalline: very thin to medium bedded: locally fossiliferous. Unit includes equivalents of Waltersburg Sandstone, Menard Limestone and, possibly, Palestine Sandstone, A bed of dark-yellowish limestone about 30 feet above base of unit probably equivalent of lowest limestone bed of the Menard Limestone. Description from source map: Nolin Reservoir Quadrangle

Ml - Leitchfield Formation (Mississippian (Chester))
Upper Section-
Shale and sandstone: Shale, medium-gray to grayish-green. Sandy, laminated. Sandstone, white, fine-grained, thin- to medium-bedded, iron- stained various shades of brown. Unit crops out at one locality at Ready-Bee Spring quadrangle boundary.

Lower Section-
Interbedded limestone and shale, and limestone: Unit not exposed: meager data from drill-hole records indicate that dominant lithologies are shale and limestone. Description from source map: Ready Quadrangle

Ml - Leitchfield Formation (Upper Mississippian)
Shale and siltstone, green and gray-green, soft. Weathers to pale-green or yellowish soil that is plastic when wet. Generally concealed; inferred in many places on basis of stratigraphic thickness and sparse float. Base conformable. Exposed in gullies on north side of State Route 70 southwest of Houchins Ferry. Description from source map: Rhoda Quadrangle

Mlu - Leitchfield Formation, upper member (Upper Mississippian)

Mlu - Leitchfield Formation, upper member (Upper Mississippian)
Shale, sandstone, and limestone: Shale, silty, dark-gray to greenish-gray, weathers light gray, light brown, and tan. Sandstone, fine- to medium-grained, buff, weathers brown. Limestone, crinoidal, gray, weathers gray and very light gray. Almost entirely covered with colluvium. Exposed only in one roadcut just north of Iva Church. Description from source map: Bowling Green North Quadrangle

Mll - Leitchfield Formation, lower sandstone member (Upper Mississippian)

Mll - Leitchfield Formation, lower sandstone member (Upper Mississippian)
Sandstone, fine- to medium-grained light-tan to white, thin-bedded to massive, locally crossbedded; mostly friable, weathers light reddish brown to pink and forms smooth, rolling topography; in a few places well indurated, weathers dark brown and forms bluffs 6 or 7 feet high. Composed of frosted grains of clear quartz and small amounts of clay matrix; a few mica grains scattered throughout. Fossil plant material is present in a few places. Description from source map: Bowling Green North Quadrangle

Mls - Leitchfield Formation, top of limestone marker (Mississippian)

ls - Leitchfield Formation, top of limestone marker (Mississippian (Chester))
Limestone, light-gray to medium-dark-gray; fine grained to coarsely crystalline; thin to thick bedded; locally contains fragments of crinoid stems, brachiopods, and bryozoans. Well exposed. Unit is equivalent to uppermost 10 to 25 feet of Menard Limestone as mapped in the Riverside quadrangle (Shawe, 1968). Description from source map: Morgantown Quadrangle

Mcl - Leitchfield Formation, Clore Limestone (Mississippian)

Mcl - Clore Limestone (Mississippian (Chester))
Limestone and shale: Limestone, slightly dolomitic and argillaceous, rarely silty; light to medium gray and light olive gray; weathers medium to medium dark gray; finely detrital to dense and aphanitic; thin arid wavy bedded; weathers rubbly. Locally contains numerous small smooth-shelled brachiopods. Shale, grayish-green, as thin partings. Description from source map: Riverside Quadrangle

Mpt - Leitchfield Formation, Palestine Sandstone (Mississippian)

Mpt - Palestine Sandstone (Mississippian (Chester))
Sandstone, siltstone, and clay shale: Sandstone, grayish-yellow to yellowish-gray; weathers to various shades of reddish brown; very fine to fine grained; thin and even bedded; weathers slabby to blocky. Siltstone, pale-olive to light-olive; weathers grayish olive; laminated to very thin bedded. Clay shale, grayish-green to dark-yellowish-green, locally mottled with dusky red; weathers to slightly darker shades. Nowhere in quadrangle is entire unit exposed at the same locality; thickness range obtained from drill-hole data. Description from source map: Riverside Quadrangle

Mme - Menard Limestone (Mississippian)

Mme - Menard Limestone (Mississippian (Chester))
Upper Section-
Shale, grayish-green to dark-yellowish-green mottled with dusky red; very poorly exposed. Top not present

Lower Section-
Limestone, dark-olive-gray to brownish-black; weathers dark yellowish orange, thinly laminated to laminated, silty; weathers massive. Description from source map: Reedyville Quadrangle

Mme - Menard Limestone (Mississippian (Chester))

Upper Section-
Limestone and clay shale: Limestone, locally dolomitic and argillaceous; medium gray to light brownish gray; weathers medium dark gray to yellowish gray; very coarse grained bioclastic to dense and aphanitic; thin to thick bedded, generally thinner bedded in upper part; weathers slabby to massive. Locally fossiliferous containing numerous bryozoan, crinoid, blastoid and brachiopod fragments. Clay shale, grayish-green, as thin partings.

Middle Sections-
Clay shale, slightly silty in places, locally manly; dusky red and grayish green to dark yellowish green, mottled in places with dusky red; thinly laminated; weathers papery thin and to a plastic clay. Dusky-red variety forms a rather persistent layer, locally silty, 0 to 4 feet thick, in upper part of unit. Unit pinches out locally so that limestones above and below merge into single unit. Unit very poorly exposed.

Limestone, dolomitic in places, argillaceous, locally silty; medium gray, light brownish gray, and light olive gray; weathers medium dark gray to dark yellowish orange; very coarse grained bioclastic to dense and aphanitic, finer sizes predominate. Thin to thick bedded; weathers platy to massive.

Clay shale, locally silty, marly in places, grayish-green to dark-yellowish-green, locally mottled with dusky red; thinly laminated; weathers papery thin and to a green plastic clay.

Lower Section-
Limestone, dolomite, and siltstone: Limestone, locally silty and argillaceous, medium-gray to light-olive-gray; weathers medium dark gray to dark yellowish orange; very coarse grained bioclastic to dense and aphanitic; thin to thick bedded; weathers rubbly to massive. Dolomite, argillaceous in places, generally silty, olive-gray to light-olive-gray; weathers dark yellowish orange; thin to thick bedded; weathers rubbly to massive. Siltstone, dolomitic and argillaceous, light-olive-gray; weathers dark yellowish orange; thin to thick bedded; weathers massive. Unit grades laterally from limestone to dolomite to siltstone; silt content increases with increase in dolomite and clay content. Unit is cherty in places and is locally fossiliferous with fragments of crinoids, blastoids, brachiopods and gastropods. Interval of Menard Limestone to the top of the Glen Dean Limestone is equivalent to the Leitchfield Formation in the Hadley quadrangle adjacent to the south (Rainey, 1963). Description from source map: Riverside Quadrangle

Mwl - Leitchfield Formation, Waltersburg Sandstone (Mississippian)

Mwl - Waltersburg Sandstone (Mississippian (Chester))
Shale and sandstone: Shale, gray to grayish-green and dark-yellowish- green, greenish hues mottled with dusky red in places; very poorly exposed. Sandstone, grayish-yellow to yellowish-gray; weathers to slightly darker color; very fine to fine grained, laminated to very thin bedded; weathers to rhombic plates. Unit is predominantly shale. Equivalent to part of Leitchfield Formation in Brownsville quadrangle to the east (Gildersleeve, 1965). Description from source map: Reedyville Quadrangle

Mwl - Waltersburg Sandstone (Mississippian (Chester))
Shale and sandstone: Shale, carbonaceous, gray to black, and clay shale, locally marly, grayish- green to dark-yellowish-green; gray and black shale weathers to slightly lighter colors; greenish hues locally mottled with dusky red; very poorly exposed. Sandstone, grayish- yellow to yellowish-gray, weathers to slightly darker shades; very fine to fine grained, laminated to thin bedded; weathers to rhombic plates. Description from source map: Riverside Quadrangle

Mlv - Leitchfield Formation, Vienna Limestone Member (Mississippian)

Mv - Leitchfield Formation, Vienna Limestone (Mississippian (Chester))
Limestone, light-gray to medium-gray; dense and very fine grained to coarse grained; thin bedded; sparingly fossiliferous; most beds smooth and brown on weathered surfaces. Locally position of unit identified by angular fragments of residual chert. Description from source map: Bee Spring Quadrangle

v - Leitchfield Formation, probable equivalent of Vienna Limestone (Upper Mississippian)
Base of unit is bed of dark-yellowish-orange limestone as much as 7 feet thick, containing 2 to 7 inches of bedded chert in upper part. This limestone, which lies 25 to 45 feet above base of Leitchfield Formation, probably is equivalent to Vienna Limestone. Unit is present only on high hills in northwestern and west-central parts of quadrangle. It generally is poorly exposed and forms steep slopes covered by talus from overlying Caseyville Formation. Description from source map: Cub Run Quadrangle

v - Leitchfield Formation, top of equivalent of Vienna Limestone (Upper Mississippian)
A persistent limestone, light-olive-gray to brownish-gray, medium- to coarse-grained, argillaceous in part, fossil fragmental in part, 5 to 8 feet thick, equivalent to the Vienna Limestone, occurs 20 to 45 feet above base; contains a distinctive fossiliferous oolitic chert. Description from source map: Millerstown Quadrangle

Mlv - Leitchfield Formation, Vienna Limestone Member (Mississippian (Chester))
Limestone, light-gray to medium-dark-gray, fine- to coarse-grained, thick-bedded; sparse fragments of crinoid stems, brachiopods, and horn corals; very poorly exposed. At most localities position of unit identified by angular blocks of dense white chert containing internal and external molds of fossil fragments. Description from source map: Morgantown Quadrangle

Mlv - Leitchfield Formation, Vienna Limestone Member (Mississippian (Chester))
Limestone, light-gray to medium-dark-gray, dense and very fine grained to coarse-grained: predominantly medium to thick bedded; sparse fossil fragments include brachiopods, horn corals, crinoid stems. Characteristically, weathered surfaces are smooth and brown with scraggly chert present locally. Top of unit consistently about 40 feet above top of Glen Dean Limestone. Locally, position of unit identified by angular blocks of dense chert, commonly oolitic, containing internal and external molds of fossil fragments. Description from source map: Nolin Reservoir Quadrangle

Mv - Vienna Limestone (Mississippian (Chester))
Upper Section-
Limestone, light-gray to light-brownish-gray; weathers medium gray to light olive gray; thin to thick bedded; generally cherty, locally vuggy.

Middle Section-
Limestone, dark-gray to brownish-black; weathers moderate yellowish brown, very thick bedded; weathers massive. This and overlying unit are equivalent to part of upper member of Leitchfield Formation in Bowling Green North quadrangle adjacent to the south (Shawe, 1963) and to the limestone of the Leitchfield Formation in Brownsville quadrangle to the east (Gildersleeve, 1965). Description from source map: Reedyville Quadrangle

Mv - Vienna Limestone (Mississippian (Chester))
Limestone, argillaceous in places; locally dolomitic; very light gray to light brownish gray and olive gray to brownish gray; weathers medium gray to light olive gray and moderate yellowish brown; fine grained, dense, and aphanitic to coarse grained bioclastic; laminated to thick bedded; weathers flaggy to massive. Generally cherty, locally vuggy. Description from source map: Riverside Quadrangle

Mts - Leitchfield Formation, Tar Springs Sandstone (Mississippian)

Mts - Leitchfield Formation, Tar Springs Sandstone (Mississippian (Chester))
Shale, sandstone, and limestone: Shale, medium-gray, greenish-gray, yellowish-green, grayish-red; weathers pate olive; grades laterally into sandstone. Sandstone, fine-grained, very thin beds; few outcrops. Limestone, light-gray, medium-gray; fine grained to coarsely crystalline; contains fragments of crinoid stems, bryozoans, and brachiopods; present as discontinuous lenses 0 to 10 inches thick; not well exposed. Description from source map: Bee Spring Quadrangle

Mts - Tar Springs Sandstone (Mississippian (Chester))
Shale, sandstone, siltstone, and limestone: Shale, gray to grayish-green and dark-yellowish-green, greenish hues locally mottled with dusky red; contains a few thin lenses of light- to medium-gray limestone; very poorly exposed. Sandstone, grayish-yellow and yellowish-gray to almost white; weathers to various shades of reddish brown and brown, thin to very thick bedded, locally crossbedded. Siltstone, pale-olive to light-olive; weathers grayish olive, laminated to very thin bedded. Formation is characterized by very rapid lateral changes in lithology but is predominantly shale. Equivalent in part to upper and lower members of Leitchfield Formation in Bowling Green North quadrangle and to the Leitchfield Formation below the limestone in the Brownsville quadrangle (Gildersleeve, 1963). Description from source map: Reedyville Quadrangle

Mts - Tar Springs Sandstone (Mississippian (Chester))
Shale, siltstone, sandstone and limestone. Shale, carbonaceous, gray to black, and clay shale, grayish-green to dark-yellowish-green; gray to black shale weathers to slightly lighter shades, greenish shale locally mottled with dusky red; contains a few thin lenses of light- to medium-gray limestone; very poorly exposed. Siltstone, pale-olive to light-olive; weathers grayish olive; laminated to very thin bedded. Sandstone, grayish-yellow and yellowish-gray to almost white; weathers to various shades of brown and reddish brown; very fine to medium grained; thin to very thick bedded, locally crossbedded. Sandstone or siltstone, where present, usually at or near base. Description from source map: Riverside Quadrangle

Mgd - Glen Dean Limestone (Mississippian)

Mgd - Glen Dean Limestone (Mississippian (Chester))
Limestone and shale: Limestone, light-gray, medium-gray, bluish-gray; fine grained to coarsely crystalline; locally dark gray and dense with conchoidal fracture; thin to very thick bedded; upper beds commonly weather to rubble; dark-gray scraggly chert on weathered surfaces at some localities; local concentrations of crinoid stems, brachiopods, bryozoans, corals, and blastoids. Shale, greenish-gray, weathers gray; present as partings and thin beds mainly in upper part of unit; not well exposed. Description from source map: Bee Spring Quadrangle

Mgd - Glen Dean Limestone (Upper Mississippian)
Limestone, finely to very coarsely crystalline, rarely lithographic; light, to medium-gray; weathers darker gray except in areas of deep weathering, where residual fragments may be nearly white; massive to thin bedded; very rarely argillaceous. Generally fossiliferous with abundant crinoid, brachiopod, mollusk, horn coral, and bryozoan fragments. *Archimedes* sp. and the fused intrabasal plates of *Agassizocrinus* sp. are particularly conspicuous in places. In some places, composed almost entirely of very small crinoid stem fragments and has an oolitic appearance. Poorly exposed; in many areas can be detected only by silicified fossils and small fragments of silicified limestone in soil. Description from source map: Bowling Green North Quadrangle

Mgd - Glen Dean Limestone (Upper Mississippian)
Limestone, gray, fine- to very coarse grained; minor clayey beds. Locally very fossiliferous and contains numerous bryozoans, crinoid stems, and fragments of horn corals and brachiopods. Not well exposed,

so upper and lower contacts cannot be closely located. Description from source map: Bristow Quadrangle

Mgd - Glen Dean Limestone (Upper Mississippian)
Limestone and shale: Limestone, grays fine- to coarse-grained, medium- to thick-bedded; black tabular chert rare in lower part; locally very fossiliferous with abundant bryozoans, crinoid stems, horn corals, and brachiopods. Shale, gray, weathers light gray or buff; occurs as thin partings and as beds as much as a foot thick in upper part; locally few thin layers of green shale in lower part. Description from source map: Brownsville Quadrangle

Mgd - Glen Dean Limestone (Upper Mississippian)
Limestone and shale: Limestone, light-gray to medium-dark-gray; contains lenses of greenish-gray calcareous shale; in part fossil-fragmental; thin bedded to very thick bedded. Medial bed of greenish-gray calcareous shale, 10 to 15 feet thick, interbedded with siltstone and dark-gray shale, divides limestone into upper and lower massive units. Greenish-gray calcareous shale as much as 15 feet thick, containing thin beds, lenses, and laminae of limestone locally overlies upper massive limestone. Description from source map: Cub Run Quadrangle

Mgd - Glen Dean Limestone (Upper Mississippian)
Limestone and shale: Limestone, fine-grained to sublithographic, and detrital limestone (calcarenite); gray to light gray; weathers almost white; thin-bedded to massive, locally crossbedded; locally oolitic, crinoidal, or abundantly fossiliferous. Fossils include brachiopods and *Archimedes* sp., *Agassizocrinus* sp. Upper part commonly covered; where exposed includes 5 to 7 feet of gray shale containing bryozoans, which in places is overlain by thin beds of yellowish-brown fossiliferous limestone. Basal contact commonly marked by springs. Description from source map: Hadley Quadrangle

Mgd - Glen Dean Limestone (Upper Mississippian)
Limestone and shale: Limestone, light-gray to medium-dark-gray, finely to medium-crystalline, thin-bedded to massive, locally argillaceous; consists of abundant fossil fragments and entire casts in a sparry calcite matrix, locally matrix is microcrystalline calcite; weathers medium gray to dark gray. Lenses and partings of greenish- gray calcareous shale more abundant in upper part. Formation poorly exposed. Description from source map: Mammoth Cave Quadrangle

Mgd - Glen Dean Limestone (Upper Mississippian)
Limestone and shale: Limestone is light olive gray to medium gray, medium to coarse grained, fossil fragmental, argillaceous, especially near top. Clay shale is medium gray to medium light gray; occurs as a single bed as much as 5 feet thick near middle of formation and in thinner layers interbedded with limestone in uppermost 10 to 15 feet. Forms moderate slopes of blocky limestone outcrops; shale and upper argillaceous limestone generally covered or possibly missing in many areas. Description from source map: Millerstown Quadrangle

Mgd - Glen Dean Limestone (Mississippian (Chester))
Limestone and shale: Limestone, light-gray, bluish- gray, medium-dark-gray; fine grained to coarsely crystalline; rarely dense; thin to thick bedded; locally argillaceous and cherty; very fossiliferous locally with abundant bryozoans, crinoid stems, blastoids, horn corals, and brachiopods. Shale, greenish-gray, weathers gray; present as thin partings and as interbeds with thin beds of limestone in upper and lower parts of unit. Description from source map: Morgantown Quadrangle

Mgd - Glen Dean Limestone (Mississippian (Chester))
Upper Section-
Limestone and shale: Limestone, light-gray to medium-olive-gray, fine-grained, thin- to medium-bedded, interbedded with fossil-fragmental limestone, light-olive-gray, coarse- grained, medium- to thick-bedded, crossbedded; medium-gray calcareous shale partings.

Middle Section-
Shale, light-greenish-gray, interbedded with medium-gray calcareous shale.

Lower Section-
Limestone, fossil-fragmental, medium-gray, coarse-grained, thick-bedded, in part crossbedded. Description from source map: Munfordville Quadrangle

Mgd - Glen Dean Limestone (Mississippian (Chester))
Limestone and shale: Limestone, light-gray, bluish- gray, medium-dark-gray; fine grained to coarsely crystalline; locally, dark gray and dense; thin to very thick bedded; upper beds commonly argillaceous and weather to rubble; dark-gray ropy and scraggly chert on weathered surfaces at some localities; very fossiliferous locally with abundant bryozoans, crinoid stems, blastoids, horn corals, and brachiopods. Shale, greenish-gray, weathers gray; present as thin partings and interbedded with thin beds of limestone in upper part of unit. Description from source map: Nolin Reservoir Quadrangle

Mgd - Glen Dean Limestone (Mississippian (Chester))
Limestone and shale: Limestone, light- to medium-gray; weathers medium gray to medium dark gray except in areas of deep weathering where residual fragments are very light gray to almost white; finely to very coarsely detrital; rarely oolitic; rarely dense and lithographic; argillaceous and cherty in places; thin to very thick bedded, upper part generally thinner bedded than lower part. Generally fossiliferous with crinoids, blastoids, brachiopods, and bryozoans; in some places composed almost entirely of very small crinoidal fragments giving appearance of an oolitic limestone. Shale, greenish- gray to grayish-green; occurs as thin units in upper part of formation. Description from source map: Reedyville Quadrangle

Mgd - Glen Dean Limestone (Upper Mississippian)
Limestone and shale: Limestone, gray, weathers tan; thin to medium bedded, finely to coarsely crystalline and detrital, argillaceous, fossiliferous. Shale, gray, as thin partings. Thin blocky fragments of white chert or silicified limestone occur locally in residuum. Base conformable. Thickness where not overlain by Caseyville is generally 60 to 70 feet. Well exposed along road about half a mile southwest of Beaver Dam Church in southwestern part of quadrangle and in quarry about half a mile northwest of Rhoda. Description from source map: Rhoda Quadrangle

Mgd - Glen Dean Limestone (Mississippian (Chester))
Limestone and clay shale. Limestone, locally dolomitic near top, light- to medium-gray: weathers medium gray to medium dark gray: finely to very coarsely detrital, rarely oolitic, rarely dense and lithographic, locally argillaceous and cherty; thin to very thick bedded. upper part generally thinner bedded; rarely crossbedded. Fossiliferous. Locally, limestone is composed almost entirely of very small crinoid stern fragments and has oolitic appearance. Clay shale, greenish-gray to grayish-green, in thin interbeds in upper part of unit. Description from source map: Riverside Quadrangle

Mh - Hardinsburg Sandstone (Mississippian)

Mh - Hardinsburg Sandstone (Mississippian (Chester))
Sandstone, white on fresh surfaces; weathers grayish orange; very fine to fine grained; thin to very thick bedded, in part crossbedded. Description from source map: Bee Spring Quadrangle

Mh - Hardinsburg Sandstone (Upper Mississippian)
Sandstone and shale: Sandstone, fine- to medium-grained, light-tan to white, thin-bedded to massive, locally crossbedded, friable to well-indurated; where well-indurated, weathers dark brown; where friable, weathers reddish brown and pink; locally silty and argillaceous. Silty shale found throughout and locally

constitutes most of formation; weathers tan and reddish brown. Mollusk and brachiopod casts and fossil plant fragments are present locally. Thin coal seams have been reported near top, and minor amounts of asphalt have been reported. Description from source map: Bowling Green North Quadrangle

Mh - Hardinsburg Sandstone (Upper Mississippian)
Sandstone, medium-grained; in beds a few inches to a foot or more thick; commonly crossbedded and iron stained; in most places weakly cemented and very friable. Hardinsburg forms massive unit at only a few localities along larger creek valleys. In some localities, lower beds are weathered to mottled red and white clayey-sand residuum, which in places contains blocks of weathered sandstone imbedded at various angles. Small pellets of limonite are common, especially where Hardinsburg is weathered to soft mass of sand. Description from source map: Bristow Quadrangle

Mh - Hardinsburg Sandstone (Upper Mississippian)
Sandstone and shale: Sandstone, light-tan to brown, very fine to medium-grained, thin- to thick-bedded, commonly iron-stained and crossbedded, locally asphaltic, massive at a few localities. Sandy shale, yellowish-green; interbedded with thin beds of sandstone near top of formation in southwestern part of quadrangle. Description from source map: Brownsville Quadrangle

Mh - Hardinsburg Sandstone (Upper Mississippian)
Sandstone, yellowish-gray, white, and yellowish-brown, limonitic, medium-bedded to very thick bedded, slabby to massive; weakly crossbedded in part Upper 5 feet locally is laminated light-gray siltstone. Basal 10 feet locally is medium-gray shale interlaminated with siltstone; rarely it is white clay shale. Forms wide benches on many divides in northern half of quadrangle. Along sides of benches large blocks of Hardinsburg Sandstone locally have false dips of 20° to 60° because of tilting or collapse resulting from dissolution of underlying Haney Limestone Member of Golconda Formation. Description from source map: Cub Run Quadrangle

Mh - Hardinsburg Sandstone (Upper Mississippian)
Sandstone, shale, and conglomerate: Sandstone, fine- to medium-grained, tan to reddish-brown, in part friable and crossbedded; beds range from 1 inch to 1 foot in thickness and weather into rectangular blocks. Shale, gray; weathers to yellow, reddish brown, and light tan; is interbedded discontinuously with sandstone at base and in upper half. Lower 6 to 20 feet forms ledges in valleys but also underlies extensive flats. Conglomerate with dark-brown calcareous sand matrix containing sub-angular to subrounded pebbles of shale, limestone, and siltstone, occurs near base of formation in one area west of road junction about 1 1/2 miles south of Rolling Spring Church; conglomerate is 5 to 7 feet thick and grades along strike into sandstone. Basal contact is locally discordant.
Description from source map: Hadley Quadrangle

Mh - Hardinsburg Sandstone (Mississippian (Chester))
Sandstone residuum, caps one hill in southwestern part of quadrangle. In the Upton quadrangle adjacent to the west, unit is very pale orange, pale yellow, or dark-yellowish-orange, very fine to fine-grained, well-sorted, thin- to very thin bedded sandstone (Moore, 1972). Description from source map: Hammonville Quadrangle

Mh - Hardinsburg Sandstone (Mississippian (Chester))
Sandstone, yellowish-brown, very fine to fine-grained. limonite-stained, friable. Occurs as small sandstone boulders and pebbles in a sandy and clayey soil. Present on only one hill along the western edge of quadrangle. Description from source map: Horse Cave Quadrangle

Mh - Hardinsburg Sandstone (Upper Mississippian)
Sandstone and interlaminated siltstone and shale: Sandstone, very light gray and yellowish-brown to reddish-brown, very fine to fine- grained, mostly subrounded to rounded quartz, thin- to thick-bedded, locally thinly laminated, gently to strongly crossbedded locally, uppermost part parallel bedded, well

indurated on fresh exposure, friable where weathered, limonite present on grains and in spaces between grains. Interbedded, medium-gray and light-brown siltstone and shale occur in basal part. Fractures and joints between blocks of slumped and contorted sandstone commonly filled with red clay containing silicified fossil fragments. Basal contact conformable. Description from source map: Mammoth Cave Quadrangle

Mh - Hardinsburg Sandstone (Upper Mississippian)
Sandstone, grayish-yellow to dark-yellowish-orange, fine- to very fine grained, generally well-sorted, argillaceous in part, especially near top and base; locally contains thin gray to greenish-gray shale at top or base; thin to very thick bedded, locally very thickly crossbedded or thin bedded and ripple marked, well to poorly cemented; weathers light to dark yellowish-brown; contains numerous small iron concretions. Locally forms massive cliffs but more generally forms broad, rolling uplands or caps rounded hills and noses. Basal contact sharp. Description from source map: Millerstown Quadrangle

Mh - Hardinsburg Sandstone (Mississippian (Chester))
Sandstone, yellowish-gray, fine- to medium-grained; very thin bedded; very poorly exposed. Contacts are approximately located. Description from source map: Morgantown Quadrangle

Mh - Hardinsburg Sandstone (Mississippian (Chester))
Sandstone and siltstone: Sandstone, light-yellowish-gray to light-reddish-brown, fine- to medium-grained, thin- to thick-bedded; consists of quartz grains cemented by silica and minor amounts of limonite; weathers slabby. Upper 5 to 10 feet of unit is medium gray siltstone. Basal 5 to 7 feet grades from very fine grained sandstone through siltstone into calcareous siltstone. Description from source map: Munfordville Quadrangle

Mh - Hardinsburg Sandstone (Mississippian (Chester))
Sandstone and shale: Sandstone, light-gray, yellowish-brown, light-brown; weathers grayish orange; very fine to fine grained, silty; very thin to thick bedded at top and base, even bedded to weakly crossbedded. Sandy shale, Carbonaceous in southeast part of quadrangle, yellowish-green to olive-gray; locally as much as 10 feet thick at top of formation; interbedded with thin beds of sandstone at some localities. Description from source map: Nolin Reservoir Quadrangle

Mh - Hardinsburg Sandstone (Mississippian (Chester))
Sandstone and shale: Sandstone, grayish-yellow and yellowish-gray to almost white; weathers to various shades of reddish brown and brown, fine to medium grained, thin- to very thick bedded, locally crossbedded; locally asphaltic; weathers flaggy to massive. Shale, silty, medium- gray to light-brownish-gray; weathers grayish yellow; found near top and bottom of formation. Description from source map: Reedyville Quadrangle

Mh - Hardinsburg Sandstone (Upper Mississippian)
Sandstone, siltstone, and shale: Sandstone, pale-yellowish-white to medium-brown, thick-bedded to thinly laminated, moderately well cemented with iron oxides, some thin beds well cemented; commonly contains pebble-size concretions of iron oxide-cemented sandstone. Siltstone and shale, medium-brown to light-tan or gray, occur mainly in lower part and in places make up as much as half of formation. Forms ledges; thick blocks of slumped or contorted sandstone with fractures filled with red clay are common. Base conformable. Thickness where not overlain by Caseyville commonly about 25 to 45 feet. Well-exposed on north slope of ridge just south of Houchins Ferry. Description from source map: Rhoda Quadrangle

Mh - Hardinsburg Sandstone (Mississippian (Chester))
Sandstone, grayish-yellow and yellowish-gray to almost white: weathers to various shades of reddish brown and brown; fine to medium grained. Thin to very thick bedded, locally crossbedded: weathers flaggy to massive. Description from source map: Riverside Quadrangle

Mh - Hardinsburg Sandstone (Upper Mississippian)
Sandstone, light-gray to reddish-brown and light-brown, very fine and fine-grained, mostly angular to subrounded quartz, friable; basal part may be locally shaly; limonite common in most beds as film on grains or filling of spaces between grains; thin- to thick-bedded in part crossbedded, poorly exposed; beds at and near the surface are commonly broken and folded as a result of collapse or settling of sandstone as limestone beneath is dissolved and removed by ground water; formation generally more iron stained (reddish brown) in outcrops than Big Clifty Sandstone Member of Golconda Formation. Description from source map: Smiths Grove Quadrangle

Mh - Hardinsburg Sandstone (Mississippian (Chester))
Sandstone, very pale orange, pale-yellow, dark-yellowish-orange, very fine to fine-grained, well- sorted; in beds less than an inch to several feet thick. Exposed in a few places west of Lone Star where it forms small cliffs; generally weathered to sand which caps hills in southwestern part of quadrangle. Base of unit locally may have been lowered as much as 20 feet near Lone Star as a result of solution of underlying limestone. Description from source map: Upton Quadrangle

Mgh - Golconda Formation, Haney Limestone Member (Mississippian)

Mgh - Golconda Formation, Haney Limestone Member (Mississippian (Chester))
Limestone, light-gray to medium-gray, fine- to coarse-grained; at a few localities white and oolitic at base; upper part of unit predominantly thick bedded; locally fossiliferous, chiefly fragments of crinoid stems and horn corals. Description from source map: Bee Spring Quadrangle

Mgh - Golconda Formation, Haney Limestone Member (Upper Mississippian)
Limestone, finely to coarsely crystalline, locally argillaceous; rarely lithographic; light- to medium-gray, weathers slightly darker except in areas of deep weathering, where residual fragments may be nearly white; massive to thin bedded. Generally fossiliferous with abundant crinoid, brachiopod, mollusk, horn coral and bryozoan fragments; *Archimedes* sp. and fused infrabasal plates of *Agassizocrinus* sp, are particularly conspicuous in places; locally composed almost entirely of very small crinoid stems and other fossil fragments and has the appearance of oolite. Poorly exposed; in most areas can be detected only by silicified fossils and small silicified limestone fragments in soil or by a mottled gray and red residual clay; generally concealed by float from Hardinsburg Sandstone. In field, the only practical way to differentiate between Haney and Glen Dean is by their relative position in the stratigraphic sequence. Description from source map: Bowling Green North Quadrangle

Mgh - Golconda Formation, Haney Limestone Member (Upper Mississippian)
Limestone, light- to dark-gray, fine- to coarse-grained, medium- to thick- bedded, Best exposed along larger creek valleys; elsewhere represented mainly by red clay residuum containing fragments of fossils (principally crinoid stems, horn corals and bryozoans), slabby blocks of porous silicified fragmental limestone (calcarenite), and, in places, dense gray chert. The porous blocks are yellow-tan and lighter in weight than the chert. Upper boundary is not well defined. Where member is represented largely by residuum, lower boundary is either concealed or marked by a zone of mottled red-gray sandy clay similar to residuum at base of Hardinsburg Sandstone. Description from source map: Bristow Quadrangle

Mgh - Golconda Formation, Haney Limestone Member (Upper Mississippian)
Limestone, light- to dark-gray, fine- to coarse-grained, medium- to thick-bedded, fossiliferous; at a few localities white and oolitic at base. Description from source map: Brownsville Quadrangle

Mgh - Golconda Formation, Haney Limestone Member (Mississippian (Chester))

Limestone residuum consisting mostly of weathered chert nodules and angular fragments in a plastic clay matrix (McGrain, 1960, p. 6); chert is dense, white to pale blue and reddish gray, iron-stained, breaks with a conchoidal fracture. Description from source map: Canmer Quadrangle

Mgh - Golconda Formation, Haney Limestone Member (Upper Mississippian)
Limestone, medium-gray, siliceous, cherty; in part oolitic; thin to thick bedded. Bed of dark-yellowish-orange silty limestone or silty limestone breccia, 5 feet thick, locally present in upper part. Forms steep slopes or cliffs with springs at base along sides of main valleys. On gentle slopes in divide areas, and on the sides of many tributary streams the member is mostly dissolved, and it has yielded a residual red clay soil, 5 to 10 feet thick, containing abundant chert and silicified-fossil fragments and scattered blocks of unweathered limestone. Description from source map: Cub Run Quadrangle

Mgh - Golconda Formation, Haney Limestone Member (Upper Mississippian)
Limestone, fine- to coarse-grained, and detrital limestone (calcarenite); light to dark gray, weathers almost white; fossiliferous, crinoidal; in part oolitic; contains discontinuous layer of nodular chert about 16 feet below top. Fossils include large *Archimedes* sp. and *Pentremites okawensis* Weller. Resembles Glen Dean Limestone but is commonly thinner. Forms low ledges in valleys and gulches; where capped with Hardinsburg Sandstone, member is commonly thinned by solution and represented by mottled red and gray clayey residuum containing silicified fragments of crinoid stems, horn corals, and bryozoans. Base generally concealed, but contact is marked by springs and by a bench formed on underlying unit. Description from source map: Hadley Quadrangle

Mgh - Golconda Formation, Haney Limestone Member (Mississippian (Chester))
Limestone, light- to dark-gray, fine- to coarse-grained, medium- to thick- bedded. Best exposed along larger creek valleys; elsewhere represented mainly by red clay residuum containing fragments of fossils (principally crinoid stems, horn corals, and bryozoans), slabby blocks of porous silicified fragmental limestone (calcarenite), and, in places, dense gray chert. The porous blocks are yellow-tan and lighter in weight than the chert. Upper boundary is not well defined. Where member is represented largely by residuum, lower boundary is either concealed or marked by a zone of mottled red-gray sandy clay similar to residuum at base of Hardinsburg Sandstone. Description from source map: Hammonville Quadrangle

Mgh - Golconda Formation, Haney Limestone Member (Mississippian (Chester))
Limestone, occurs only as scattered float or within reddish- brown clayey soil which also contains sparse silicified fossil fragments, mostly crinoid stem plates, and porous white thin blocky chert. In adjoining Mammoth Cave quadrangle limestone is light olive gray, medium gray, and light brown, finely to medium crystalline, thin to thick bedded, and consists of fossil fragments cemented by sparry calcite or microcrystalline calcite, locally cherty: weathers light gray. Description from source map: Horse Cave Quadrangle

Mgh - Golconda Formation, Haney Limestone Member (Upper Mississippian)
Limestone, light-olive-gray, medium-gray, and light-brown, finely to medium-crystalline, thin- to thick-bedded; consists of fossil fragments cemented by sparry calcite or microcrystalline calcite, weathers light gray; thin lenses and partings of gray shale occur throughout unit. Microcrystalline calcite more abundant as cementing material in basal part. Locally cherty. Extensively thinned due to removal of carbonate by percolating ground water resulting in collapse and slumping of overlying Hardinsburg Sandstone. Poorly exposed. In many places the only evidence of the former presence of limestone is reddish-brown residual clay containing silicified fossil fragments, mostly crinoid stem plates, and porous white thin blocky chert. Description from source map: Mammoth Cave Quadrangle

Mgh - Golconda Formation, Haney Limestone Member (Upper Mississippian)
Limestone, light-gray to light-olive-gray, medium- to coarse-grained, cherty, oolitic near top. Forms blocky cliffs or steep covered slopes along valley sides; near tops of hills reduced by weathering to

residuum 50 of red clay soil containing small rectangular chert fragments and silicified fossil remains. Limestone is highly soluble, commonly resulting in slumping of the Hardinsburg Sandstone into solution cavities in the Haney. Numerous springs and seeps occur at base. Description from source map: Millerstown Quadrangle

Mgh - Golconda Formation, Haney Limestone Member (Mississippian (Chester))
Upper 15 to 20 feet of unit is a medium olive gray, fine to medium grained, thin to thick bedded limestone, interbedded with light- to medium-gray clastic cherty oolitic limestone. Lower 10 to 15 feet of unit is a light to medium olive gray; fossil-fragmental limestone. In northeastern and eastern parts of quadrangle unit occurs below the unconformable contact at base of Caseyville Formation and is represented by a 15-foot-thick layer of light-reddish-gray residual clay containing silicified fossils and nodules of chert. Description from source map: Munfordville Quadrangle

Mgh - Golconda Formation, Haney Limestone Member (Mississippian (Chester))
Limestone, light-gray, medium-dark-gray, fine-to coarse-grained; predominantly thick bedded; locally fossiliferous, chiefly fragments of bryozoans, crinoid stems, and horn corals. Description from source map: Nolin Reservoir Quadrangle

Mgh - Golconda Formation, Haney Limestone Member (Mississippian (Chester))
Limestone, light- to medium-gray: weathers medium light gray to medium dark gray except in areas of deep weathering where residual fragments are very light gray to almost white, thin to very thick bedded, finely to coarsely detrital, rarely oolitic, rarely dense and lithographic, locally argillaceous or cherty. Generally fossiliferous with crinoids, blastoids, brachiopods, and bryozoans: in some places composed almost entirely of very small crinoidal stem fragments giving appearance of an oolitic limestone Description from source map: Reedyville Quadrangle

Mgh - Golconda Formation, Haney Limestone Member (Upper Mississippian)
Limestone and shale: Limestone, gray, thick- to thin-bedded, fine- to coarse-grained; locally argillaceous; detrital; in part oolitic. Shale, gray to black; occurs mainly in lower part. Weathers to light-gray limestone and residuum of gray and red clay containing white silicified fossils and blocky fragments of porous chert or silicified limestone. Base conformable. Thickness where not overlain by Caseyville ranges from about 10 to 45 feet. Extensively thinned by solution; pitted with numerous sinks containing slumped sandstone, as on west side of State Route 101 at road junction about half a mile south of Rhoda. Description from source map: Rhoda Quadrangle

Mgh - Golconda Formation, Haney Limestone Member (Upper Mississippian)
Limestone, yellowish-gray to light-olive-gray or yellowish-brown, weathers light to medium gray; composed largely of partly rounded and cemented fossil fragments mostly less than one-tenth inch diameter; beds mostly less than 1 foot thick, locally cherty. Unit exposed in few places; most of limestone has been removed from near surface by percolating ground water leaving a residual clay a few feet thick containing silicified fossil fragments, mostly crinoid stems. Thickness in column is of unweathered bedrock. Description from source map: Smiths Grove Quadrangle

Mgh - Golconda Formation, Haney Limestone Member (Mississippian (Chester))
Limestone, light-olive-gray, medium- to coarse- grained, chert-bearing, oolitic near top, fossiliferous. Forms cliffs in places but near tops of hills and ridges entire unit is generally reduced by weathering to 5 to 10 feet of red clay residuum containing small white chert blocks and silicified fossils. Springs and seeps are common at base. Description from source map: Upton Quadrangle

Mgb - Golconda Formation, Big Clifty Sandstone Member (Mississippian)

Mgb - Golconda Formation, Big Clifty Sandstone Member (Mississippian (Chester))
Sandstone and shale: Sandstone, white to grayish-orange, very fine to fine-grained; thin to thick bedded, in part crossbedded. Shale in upper part, dark-gray to grayish-black; not well exposed. Description from source map: Bee Spring Quadrangle

Mgb - Golconda Formation, Big Clifty Sandstone Member (Upper Mississippian)
Sandstone and shale: Sandstone, fine-grained, white to light-reddish-brown; weathers dark brown; thin bedded to massive, crossbedded in places; well indurated and forms massive cliffs and bluffs; rarely friable and deeply weathered. Shale, gray, green; weathers to shades of gray; in part light tan, silty; deeply weathered. Silty shale and shale generally at top or bottom but may occur throughout; locally shale constitutes all of member. Partially carbonized plant fragments and casts of brachiopods and mollusks abundant locally; rarely, scattered thin seams of coal near top. Description from source map: Bowling Green North Quadrangle

Mgb - Golconda Formation, Big Clifty Sandstone Member (Upper Mississippian)
Sandstone and shale: Sandstone, fine- to medium-grained, massive and strongly crossbedded, stained brown by iron oxide. Locally, dark-gray shale, green shale, and (or) carbonaceous shale at or near top. Shale varies in thickness from a few inches to as much as 22 feet and cannot be traced far along strike. Description from source map: Bristow Quadrangle

Mgb - Golconda Formation, Big Clifty Sandstone Member (Upper Mississippian)
Sandstone and shale: Sandstone, light- to dark-brown, fine- to medium-grained, predominantly thick-bedded and massive, crossbedded, locally asphaltic. Shale, grayish-green, in upper part, but present also near base; locally as much as 6 feet of carbonaceous and pyritiferous shale near top containing fragments of plant leaves and stems. Description from source map: Brownsville Quadrangle

Mgb - Golconda Formation, Big Clifty Sandstone Member (Mississippian (Chester))
Upper Section-
Sandstone intercalated with siltstone and shale. Sandstone is very light gray to yellowish and reddish gray, fine grained, thin bedded with interbeds and lenses of yellowish-gray siltstone and greenish-gray and dusky-red shale.

Lower Section-
Sandstone and shale: Sandstone very light gray yellowish- gray, and moderate-reddish-brown, very fine to fine-grained, medium- to very thick bedded; in part crossbedded; consists of well rounded to subrounded quartz grains cemented by silica and minor amounts of limonite. Locally gray shale in beds 6 inches to *2* feet thick occurs at base. Unit forms prominent ledges and cliffs. Description from source map: Canmer Quadrangle

Mgb - Golconda Formation, Big Clifty Sandstone Member (Upper Mississippian)
Shale and sandstone: Shale, greenish-gray, medium-gray, and grayish- red; interlaminated with yellowish-gray siltstone and interbedded with carbonaceous shale and coal, yellowish-gray siltstone, and yellowish-gray to yellowish-brown fine to medium-grained sandstone. Coal bed, 6 to 12 inches thick, containing balls of marcasite, generally is present at top of highest bed of carbonaceous shale and commonly caps member. Medium-bedded sandstone, 5 feet thick, locally is present at top and near base of member. Lenses of massive, strongly crossbedded sandstone, as much as 25 feet thick, containing abundant *Lepidodendron* trunks, commonly are present in middle of member. In southeast corner of quadrangle, sandstone channels to base of member and contains torrential crossbeds which dip steeply southwestward. Dark-gray limestone, 2 feet thick containing abundant *Agassizocrinus* sp. and horn corals, is present along Cane Run within greenish-gray shale 2 feet above base. Member forms bottoms and sides of many small valleys and caps a few low divides. Member is thinnest in northern part

of quadrangle where it is predominantly shale and thickest in southern part where it is predominantly sandstone. Apparent abnormal thinning of member 1½ miles southeast of Broad Ford School probably results from undercutting by Nolin River and consequent collapse of overlying cliff of Haney Limestone Member onto basal beds of Big Clifty. Description from source map: Cub Run Quadrangle

Mgb - Big Clifty Sandstone Member of the Golconda Formation (Upper Mississippian)
Sandstone, shale, and interbedded sandstone and shale: Sandstone, gray, light-brown to reddish-brown, fine-grained, massive to thin-bedded; locally argillaceous near top; locally cross bedded; forms Cliffs Shale, gray and green; as much as 10 feet occurs locally at base; forms slopes; generally covered by large blocks of sandstone from overlying beds. Interbedded sandstone and shale: gray and light-brown to reddish-brown fine-grained sandstone; gray and green shale; occurs at base, commonly forms slope covered with talus. Basal contact obscured by sandstone talus from overlying Big Clifty. Description from source map: Glasgow North Quadrangle

Mgb - Golconda Formation, Big Clifty Sandstone Member (Upper Mississippian)
Sandstone, shale, and siltstone: Sandstone, very fine to fine-grained, tan to brown, almost entirely crossbedded; iron stained. Shale, gray-green, 2 to 16 feet thick, occurs at top; dark-gray shale 3 to 14 feet thick occurs at bottom and is interbedded with sandstone and siltstone in lower 5 to 6 feet. Member forms vertical cliffs 50 feet high along valleys and caps hills in most of area south of Barren River. Springs common at top of lower shale. Description from source map: Hadley Quadrangle

Mgb - Golconda Formation, Big Clifty Sandstone Member (Mississippian (Chester))
Sandstone and shale: Sandstone, fine- to medium-grained, massive and strongly crossbedded, stained brown by iron oxide. Locally, dark-gray shale, green shale, and (or) carbonaceous shale at or near top. Shale varies in thickness from a few inches to as much as 22 feet, and cannot be traced far along strike. Description from source map: Hammonville Quadrangle

Mgb - Golconda Formation, Big Clifty Sandstone Member (Mississippian (Chester))
Sandstone, shale, and interbedded sandstone and shale: Sandstone, grayish-white, light-yellowish- to reddish-brown and tan; very fine to medium grained quartz, subangular to rounded, limonite stained, thin bedded to massive, locally crossbedded; weathers yellowish brown and brown; forms cliffs. Locally very dark gray, gray, green. and light-brown shale occurs as beds, seams, and partings. Locally shale occurs at base and top. Interbedded sandstone and shale more abundant at and near top of unit. Basal part of unit commonly forms talus-covered slope. Description from source map: Horse Cave Quadrangle

Mgb - Big Clifty Sandstone Member of the Golconda Formation (Upper Mississippian)
Sandstone, very light gray, yellowish-gray, and moderate-reddish-brown, very fine to fine-grained, medium- to very thick bedded; consists of well rounded to subrounded quartz grains cemented by silica and minor amounts of limonite. Occurs only on Maxey Knob. Description from source map: Hudgins Quadrangle

Mgb - Golconda Formation, Big Clifty Sandstone Member (Upper Mississippian)
Sandstone, shale, and interbedded sandstone and shale: Sandstone, grayish-white, light-yellowish-brown, tan, and buff, very fine to medium-grained quartz, subangular to rounded, limonite stained, thin-bedded to massive, locally crossbedded, locally contains thin green shale partings, weathers yellowish brown and brown; forms cliffs. Locally very dark gray, gray, green, and light-brown shale occurs in middle and at base of unit. In places basal shale contains green, gray, and light-brown siltstone lenses. Unit commonly forms slope covered with talus. Interbedded white and yellowish-brown fine- to medium- fine-grained sandstone and green shale common in upper part, forms slopes. Basal contact generally covered by sandstone talus. Description from source map: Mammoth Cave Quadrangle

Mgb - Golconda Formation, Big Clifty Sandstone Member (Upper Mississippian)
Sandstone, siltstone, and shale: Sandstone is very pale orange to light brown, fine grained, generally

well sorted, thin to very thick bedded, commonly thickly crossbedded; grades laterally into and is interbedded with yellowish-gray siltstone and gray clay shale. Uppermost and lowermost 10 to 15 feet commonly siltstone and gray clay shale, although massive sandstone locally rests on the Beech Creek Limestone Member. Upper shale and siltstone locally contain a thin coaly layer. Unit forms massive cliffs in north-central part of quadrangle; elsewhere is poorly exposed on steep to moderate slopes. Description from source map: Millerstown Quadrangle

Mgb - Golconda Formation, Big Clifty Sandstone Member (Mississippian (Chester))
Sandstone, siltstone, and shale: In eastern, southern, and central parts of quadrangle, unit is made up of upper and lower sequences of thick-bedded, in part crossbedded, very light gray to light-reddish-gray, fine- to medium-grained sandstone, separated by a 5- to 10-foot thick zone of interlayered medium-gray siltstone and shale. In western part of quadrangle lower 35 to 40 feet of unit consists of interstratified medium-dark-gray siltstone, light- to medium-reddish-gray, thin- to medium-bedded sandstone, and a few medium-gray shale partings. Locally upper 5 to 7 feet of unit is light-gray silty shale and siltstone. Description from source map: Munfordville Quadrangle

Mgb - Golconda Formation, Big Clifty Sandstone Member (Mississippian (Chester))
Sandstone, siltstone, and shale: Sandstone, white to grayish-orange, very fine to fine-grained: thin to very thick bedded, in part crossbedded. Siltstone, limy, yellowish-gray; very thin bedded; occurs locally near top of unit. Shale in upper part, dark-gray to grayish-black and green; locally carbonaceous and as much as 20 feet thick. Description from source map: Nolin Reservoir Quadrangle

Mgb - Big Clifty Sandstone Member of Golconda Formation (Upper Mississippian)
Sandstone, light- to dark-brown, well-cemented, fine-to medium-grained, massive and strongly crossbedded; locally as much as 15 feet of gray or green shale at or near top; in places lower 10 to 15 feet is argillaceous. Sparse brachiopod and pelecypod casts are present in some beds. Where exposures are good, contact with the underlying Girkin Formation is distinct, but throughout most of the area the contact is obscured by debris formed through weathering of argillaceous sandstone of the Big Clifty and argillaceous limestone or shale of the Girkin. Description from source map: Park City Quadrangle

Mgb - Big Clifty Sandstone Member of the Golconda Formation (Mississippian (Chester))
Sandstone, very light gray to yellowish- and reddish-gray, fine-grained; consists of subangular to rounded quartz grains; thick bedded and in part crossbedded. Lower 50 feet of unit crops out as massive cliffs and ledges; upper 50 feet is shaly sandstone and weathers to a sandy soil. Top removed by erosion. Description from source map: Park Quadrangle

Mgb - Golconda Formation, Big Clifty Sandstone Member (Mississippian (Chester))
Sandstone and shale. Sandstone, grayish-yellow and yellowish-gray to almost white; weathers to various shades of reddish brown and brown, fine to medium grained, thin to very thick bedded, crossbedded in places; generally massive weathering. Shale, silty, medium-gray to light-brownish-gray; weathers grayish yellow; occurs as thin lenses throughout member. Description from source map: Reedyville Quadrangle

Mgb - Golconda Formation, Big Clifty Sandstone Member (Upper Mississippian)
Sandstone, siltstone, and shale: Sandstone and siltstone, yellowish-white to medium-brown, massive to thin-bedded, crossbedded, silty to medium-grained; locally asphaltic in zones 5 to 20 feet thick. Shale and siltstone, tan, green, slate-gray; as much as 10 feet thick at top of member and 30 feet thick at bottom. Discontinuous coaly shale as much as 6 inches thick at top in one locality. Thickness where not overlain by Caseyville ranges from 70 feet in southeast to about 50 feet in northwest. Where member is all sandstone, it is thinner than average. Base conformable. Typical cliffs formed by Big Clifty occur near Rhoda, where State Route 101 crosses Beaver Dam Creek. Description from source map: Rhoda Quadrangle

Mgb - Golconda Formation, Big Clifty Sandstone Member (Upper Mississippian)
Upper Section-
Sandstone and shale.

Middle Section-
Sandstone, light-gray to brownish-gray, very fine and fine-grained, mostly angular to subrounded, grains nearly all quartz, variably limonitic, weathers gray and brownish gray; thin- to thick-bedded, locally massive or crossbedded; cliff former, makes escarpment called The Knobs.

Lower Section-
Shale, gray to greenish-gray, locally at base, 4 feet maximum observed thickness; where shale is missing, sandstone may be shaly; upper part of member locally shaly; base of formation concealed in most of area by sandstone debris. Description from source map: Smiths Grove Quadrangle

Mgb - Golconda Formation, Big Clifty Sandstone Member (Mississippian (Chester))
Sandstone, siltstone, and shale: Sandstone is very pale orange to light brown, fine grained, well sorted, thin to very thick bedded, commonly thickly crossbedded in lower part; forms cliffs and steep slopes. Siltstone or silty shale generally weathers to form a covered interval at top of member. Shale is greenish gray, medium gray; in lower half of unit rarely exposed, absent in many places. Lower contact generally obscured by rubble zone 20 to 30 feet thick. Description from source map: Upton Quadrangle

Mgc - Golconda Formation, Beech Creek Limestone Member (Mississippian)

Mgc - Golconda Formation, Beech Creek Limestone Member (Mississippian (Chester))
Limestone, brownish-gray, coarse-grained, brachiopod-rich. The distinctive beds of this unit crop out in only a few places. As noted by Moore (1972) the greenish-gray shale that normally underlies this limestone in the Upton quadrangle, adjacent to the west, becomes more limy eastward and probably becomes mostly limestone in the Hammonville quadrangle. No evidence of the shale was found. As most places in the quadrangle, the limestone beneath the Big Clifty Sandstone Member cannot be distinguished from Reelsville Limestone, Sample Sandstone, and Beaver Bend and Paoli Limestone are equivalent to he Girkin Formation as mapped in Canmer quadrangle adjacent to the south (Miller, 1969). Includes equivalent of Elwren Sandstone of Malott (1919). Description from source map: Hammonville Quadrangle

Mgc - Golconda Formation, Beech Creek Limestone Member (Upper Mississippian)
Limestone, light-olive-gray to light-brownish-gray, medium- to coarse-grained, thick-bedded, fossil-fragmental. A brachiopod-rich [*Inflatia inflata* (McChesney), formerly *Productus inflatus*] layer, 6 inches or less thick, near top is distinctive, but the abundance of brachiopods in this layer decreases southward in the quadrangle. Forms steep slope with a bench at top. Commonly covered by debris from overlying Big Cliffy Sandstone Member Description from source map: Millerstown Quadrangle

Mgc - Golconda Formation, Beech Creek Limestone Member (Mississippian (Chester))
Limestone, olive-gray; weathers light gray, coarsely detrital, very thick bedded; base not exposed. Exposures in northwestern part of Bowling Green North quadrangle (Shawe, 1963), the log of a drill hole in north-central part of Bowling Green North quadrangle (McFarlan and others, 1955, pl. 4), and information from a drill hole in south- central part of Reedyville quadrangle indicate unit is underlain by the Cypress Sandstone (Elwren Sandstone of Malott. 1919) in this area. Member equivalent to upper part of Girkin Formation in parts of Bowling Green North quadrangle (Shawe, 1963) and Brownsville quadrangle (Gildersleeve, 1965). Description from source map: Reedyville Quadrangle

Mgc - Golconda Formation, Beech Creek Limestone Member (Mississippian (Chester))
Limestone, light-olive-gray, light-brownish-gray, fine- to coarse-grained. Beds rich in productid brachiopods near top and base, distinctive of unit in quadrangles to west (Moore, 1965a) and northwest (Moore, 1964), are poorly developed or absent in many places. Unit generally covered by rubble or, in places, possibly completely removed by solution.

Includes Equivalent of Elwren Sandstone of Malott (1919):
Shale, greenish-gray to gray, rarely exposed; may grade to argillaceous limestone at eastern border; similar gradation to limestone to the south occurs in the adjacent Millerstown quadrangle (Moore, 1965a). Easternmost exposures of shale are at Falling Springs and along the ridge extending south therefrom.

Description from source map: Upton Quadrangle

Mg - Girkin Formation, undivided (Mississippian)

Mg - Girkin Formation (Upper Mississippian)
Limestone, sandstone, and shale: Limestone, dense to coarsely crystalline, locally argillaceous, oolitic, fossiliferous, detrital; gray to white and tan, weathers medium gray to very light gray; massive to thin bedded. Dense, crystalline, oolitic, and coquinoid beds tend to be thicker than argillaceous beds; oolitic and coquinoid beds are light gray to white; argillaceous beds light gray to light tan; other varieties are various shades of medium to light gray. Sparse chert and numerous quartz nodules near base. Sandstone, shale, and very argillaceous limestone, greenish-gray, thin-bedded, O-15 feet thick, from about 5 to about 30 feet below top in northwest corner of quadrangle; any combination of these three rock types may be present; zone is probably equivalent to Elwren Sandstone of Malott (1919). Limestone, medium-gray, dense and massive to crystalline and platy, fossiliferous, 0 to about 15 feet thick, is found above the green beds and may be equivalent to Beech Creek Limestone Member of Golconda Formation. Fossils are *Productus inflatus* in this zone and the colonial caninoid coral *Lithodrumus veryi* Greene in a zone 20-40 feet thick in basal part of formation. Limestone breccia 0-5 feet thick is present at base at a very few localities. Girkin may be separated from Ste. Genevieve by an unconformity (Weller, 1927). Description from source map: Bowling Green North Quadrangle

Mg - Girkin Formation (Upper Mississippian)
Limestone, finely to coarsely crystalline, slightly argillaceous in places, medium- to very thick-bedded, gray to light-gray. Crystalline varieties are gray and weather slightly darker; argillaceous varieties are gray to light gray on fresh and weathered surfaces but where exposed to sun are bleached white. Formation may unconformably overlie Ste. Genevieve (Weller, 1927); is distinguished from it by a more massive character and lack of *Platycrinites* bearing beds of oolitic limestone. Description from source map: Bowling Green South Quadrangle

Mg - Girkin Formation (Upper Mississippian)
Limestone, light-gray and dense to dark-gray and very coarse grained; white to dark-gray oolitic beds are conspicuous and locally contain chert. Lithology variable along upper boundary. Near top is a discontinuous zone of coarse-grained limestone containing *Productus inflatus* McChesney and other brachiopods. At some localities, a few feet of shale occurs between the Productus zone and the Big Clifty. Along much of The Knobs escarpment there is a partly covered slope (an interval of 15 to 20 feet vertically) between outcrops of the Big Clifty and a persistent zone of light-gray to tan lithographic limestone; small scattered outcrops of shale occur in this zone Simple and compound clusters of small quartz crystals are characteristic of the Girkin. Lower beds are indistinguishable lithologically from underlying Ste. Genevieve Limestone, and lower contact cannot be located precisely; it has been drawn between the highest stratigraphic occurrence of *Platycrinites*, diagnostic fossil of the Ste. Genevieve,

and the lowest stratigraphic occurrence of *Caninia veryi* (Greene), which is diagnostic of the Girkin. There is little evidence for the unconformity recognized at this stratigraphic level in western Kentucky and elsewhere. Description from source map: Bristow Quadrangle

Mg - Girkin Formation (Upper Mississippian)
Limestone, light- to dark-gray, dense to very coarse grained, in places argillaceous. Near top is a discontinuous zone of coarse-grained limestone containing *Inflatia inflata* (McChesriey) and other brachiopods. Description from source map: Brownsville Quadrangle

Mg - Girkin Formation (Mississippian (Chester))
Upper Section-
Shale, gray to grayish-green. Occurs in northern part of quadrangle; probably equivalent to Elwren Sandstone of Malott (1919).

Middle Sections-
Limestone, light-olive-gray, commonly coarse- to very coarse grained, locally dense to very fine grained, thick-bedded: consists of crossbedded oolitic bioclastic material interbedded with dense limestone. Locally tight-gray argillaceous limestone beds 0 to 25 feet thick occur at top of unit.

Shale and siltstone: Shale is light to medium gray; siltstone is yellowish gray and brownish gray. Occurs 60 to 70 feet below upper contact. Probably equivalent to Sample Sandstone.

Lower Section-
Limestone, light- to medium-gray and light-reddish-brown to medium-olive-gray, thick-bedded with a few thin laminated beds, mostly coarse bioclastic material with a few dense beds, in part oolitic, fossiliferous; contains a few quartz rosettes and geodes and dark-gray chert nodules.. Dense beds are dolomitic limestone, dusky-yellow, thins to medium-bedded. Sandy limestone (detrital), light- to medium-olive gray, thin- to thick-bedded and crossbedded, occurs in lower 10 feet and 20 to 30 feet above base. Lowermost bed is locally a limestone breccia, medium-dark-gray dense limestone. In northern part of quadrangle formation is concealed in most places by stumped sandstone and shale of probable Late Mississippian and Early Pennsylvanian ages. Description from source map: Canmer Quadrangle

Mg - Girkin Formation (Upper Mississippian)
Limestone, medium-light-gray, coarse- to very coarse grained; consists of angular to subrounded fossil fragments in a fine-grained clastic matrix; thick bedded, in part crossbedded. Exposed only on crest of Pilot Knob. Top removed by erosion. Description from source map: Center Quadrangle

Mg - Girkin Formation (Upper Mississippian)
See descriptions associated with this source map for the Girkin Formation, upper member (Mgu), Girkin Formation, middle member (Mgm) and Girkin Formation, lower member (Mgl) Description from source map: Cub Run Quadrangle

Mg - Girkin Formation (Upper Mississippian)
Limestone, light-gray to gray, and light-brown to yellowish-brown, dense to very coarsely crystalline, thin- to very thick bedded, fossiliferous, occurs throughout formation; very light gray to dark-gray and light-brown oolitic limestone occurs throughout formation but more abundant near and at base; buff to light-brown dense to lithographic limestone, more abundant in basal part and at base; gray to light-brown argillaceous limestone occurs at top. Beds and lenses of bluish-gray, dark-gray, and reddish-gray chert up to 8 inches thick occur in basal part. Simple and compound clusters of small quartz crystals are characteristic of lower part. Lower beds are nearly indistinguishable lithologically from underlying Ste. Genevieve Limestone. Base conformable. Description from source map: Glasgow North Quadrangle

Mg - Girkin Formation (Upper Mississippian)

Limestone and shale: Limestone, coarse-grained, oolitic and detrital in lower part, sublithographic near base, gray to light gray, weathers brown to white; occurs in beds 1 inch to 6 feet thick; in part crinoidal, crossbedded, cherty. Uppermost 2 feet is distinctive bed of brown limestone with abundant *Inflatia inflata* (McChesney). Lower part is brown detrital limestone (calcarenite) and light-gray oolitic limestone, contains dark- gray chert nodules. Clay shale, gray, about 5 feet thick, exposed 32 feet below top in southwest corner of quadrangle; may be equivalent to Sample Sandstone. Limestone breccia exposed in a roadside ditch 0.7 mile west of Glen Lily Church may indicate that basal contact is unconformable, but formation is lithologically indistinguishable from Ste. Genevieve Limestone; contact is placed between highest stratigraphic occurrence of *Platycrinites* and lowest occurrence of *Lithodrumus veryi* Greene. Description from source map: Hadley Quadrangle

Mg - Girkin Formation (Upper Mississippian)
Four types of limestone occur within formation, and they interfinger with and grade into each other. 1. Limestone, medium-light-gray, brownish-gray, and medium-gray, thin-bedded to massive, locally argillaceous; consists of fossil fragments cemented by microcrystalline calcite; constitutes up to 30 percent or more of formation. 2. Limestone (calcarenite), medium-gray to dark-gray, very fine to coarse-grained, thin- to thick-bedded; consists of limestone and dolomitic limestone grains cemented by finely to coarsely crystalline calcite and microcrystalline calcite; weathers gray to very dark gray; constitutes less than 10 percent of formation. 3. Limestone (calcilutite), very light gray, gray, and light-tan to buff, dense to very finely crystalline, thin-bedded to massive; weathers brownish gray, gray, and dark tan, locally cherty; constitutes up to 50 percent of formation. 4. Limestone, oolitic, white to very light gray and gray, thin- to thick- bedded, locally crossbedded; weathers mottled gray and white; comprises 10 to 30 percent of formation. Simple and compound clusters of small quartz crystals as well as beds and lenses of bluish-gray, dark-gray, and reddish-gray chert up to 6 inches thick are characteristic of lower part of formation. Basal contact conformable. Description from source map: Hiseville Quadrangle

Mg - Girkin Formation (Mississippian (Chester))
Limestone, shale, and siltstone: Limestone. light-olive-gray to medium-gray, very fine to medium-grained; thin to thick bedded to massive; cemented by microcrystalline calcite; contains sparse fossil fragments, lenses of dark-gray chert, and limonite-stained vugs; weathers light yellowish gray and gray. Limestone (calcarenite), medium-gray to very dark gray. very fine to coarse-grained, thin- to thick-bedded, locally crossbedded: consists of limestone and dolomitic limestone grains cemented by sparry calcite and microcrystalline calcite; weathers gray to very dark gray; becomes very friable with removal of cementing material. Limestone (calcilutite), very light gray, gray, light-tan to yellowish-tan, and buff, very fine to finely crystalline; thin bedded to massive; locally silty, microcrystalline calcite cement and inclusions: weathers brownish gray, gray, and dark tan; almost everywhere occurs immediately above lower contact. Limestone, oolitic, white to very light gray and gray, fine- to medium-grained. thin to thick-bedded, locally crossbedded: weathers mottled gray and white. Limestone, gray, medium-gray, and yellowish-brown. thin to medium-bedded, gently cross-bedded; composed of subrounded to rounded, fine to coarse limestone and dolomitic limestone grains with sparse granules up to 4 mm in diameter, in a matrix of sparry and micro-crystalline calcite; weathers orangish brown, yellowish brown, and gray; commonly occurs near basal contact but has been locally found higher in formation. Locally green and grayish-green shale occurs immediately below upper contact and thin beds occur irregularly throughout formation. Interbedded gray and green silty shale and brownish-green calcareous silt-stone occur locally in uppermost part of formation. Simple and compound clusters of small quartz crystals as well as beds and lenses of bluish-gray, dark-gray, and reddish-gray chert as much as 6 inches thick are characteristic of lower part of formation. Basal contact apparently conformable. Description from source map: Horse Cave Quadrangle

Mg - Girkin Formation (Upper Mississippian)
Limestone and chert: Limestone, very light gray to medium- gray, dense to coarse-grained, oolitic, medium- to thick- bedded, in part crossbedded; locally argillaceous and dolomitic. Dolomitic limestone is dusky yellow to moderate olive brown, dense to very fine grained, medium bedded. Argillaceous

limestone is light gray to light olive gray, thin bedded, oolitic. In places upper 2 to 10 feet of unit is a brecciated, medium-gray, dense limestone. A persistent layer of fossiliferous chert 2 to 5 feet thick occurs about 10 to 20 feet above base of formation; contains abundant fenestellid bryozoans, horn corals, and several species of brachiopods. Chert is probably equivalent to Lost River Chert of Elrod (1899). On fresh surface chert is very light gray to light yellowish gray, weathers to light reddish gray; occurs as irregular beds 2 inches to about 1 foot thick. Chert nodules are scattered throughout formation and are light to dark gray. Upper contact mapped at top of uppermost bed containing Platycrinites. Description from source map: Hudgins Quadrangle

Mg - Girkin Formation (Upper Mississippian)
Limestone, shale, and siltstone: Limestone, medium-light-gray, brownish-gray, and medium-gray, finely to medium-crystalline, thin-bedded to massive; consists of fossil fragments cemented by microcrystalline calcite; locally in upper part of formation unit contains thin, one foot or less, lenses of green shale: weathers light yellowish gray and gray. Limestone (calcarenite), medium-gray to very dark gray, very fine to coarse-grained, thin to thick-bedded, locally crossbedded; consists of limestone and dolomitic-limestone grains cemented by sparry calcite and microcrystalline calcite; weathers gray to very dark gray. Limestone (calcilutite), very light gray, gray, and light-tan to buff, aphanitic to finely crystalline, thin-bedded to massive, locally silty; microcrystalline calcite cement and inclusions; weathers brownish gray, gray, and dark tan. Limestone (calcarenite), oolitic, white to very light gray and gray, fine-grained, thin- to thick-bedded, locally crossbedded; composed of fossil fragments and limestone and dolomitic limestone grains; weathers mottled gray and white. Limestone, medium-gray and gray, medium- to coarsely crystalline, thin- to medium-bedded, locally silty; consists of fossil fragments and entire casts in a matrix of sparry calcite; weathers orangish brown and gray; locally and in the very uppermost part of formation unit contains *Inflatia inflata* (McChesney) and may be equivalent to Beech Creek Limestone Member of Golconda Formation. Limestone, gray, medium-gray, and yellowish-brown, thin- to medium-bedded, gently crossbedded; composed of subrounded to rounded, fine to coarse limestone and dolomitic -limestone grains with sparse granules up to 4 mm in diameter, in a matrix of sparry and microcrystalline calcite, weathers orangish brown, yellowish brown, and gray; commonly occurs immediately above basal contact but has been locally found higher in formation. Locally green and grayish-green shale occurs immediately below upper contact. Interbedded gray and green silty shale and brownish-green calcareous siltstone occur locally in uppermost part of formation and contain abundant fossils and sparse lenses and nodules of gray and grayish-blue chert. Characteristic of lower part of formation are simple and compound clusters of small quartz crystals as well as beds and lenses of bluish-gray, dark-gray, and reddish-gray chert up to 8 inches thick. Basal contact apparently conformable. Description from source map: Mammoth Cave Quadrangle

Mg - Girkin Formation (Mississippian (Chester))
Upper Section-
Shale, gray to greenish-gray, 1 to 3 feet thick in central part of quadrangle. Unit thickens to about 5 to 8 feet to north and west where it grades into laminated light- to medium- gray siltstone. Equivalent to Elwren Sandstone of Malott (1919).

Middle Sections-
Limestone, interbedded fossil-fragmental and microcrystalline: Fossil-fragmental limestone, oolitic, light-olive-gray, coarse- to very coarse-grained, medium- to thick-bedded, in part crossbedded; microcrystalline limestone is light yellowish gray and thin to medium bedded.

Limestone, shale, and siltstone: In eastern and central parts of quadrangle unit is 1 to 4 feet thick and consists of light- to medium-gray shale interbedded with light- to medium- yellowish-gray siltstone. Unit thickens northward to about 8 to 10 feet and grades through medium-gray siltstone into light-yellowish-gray sandy limestone. Occurs about 50 to 60 feet below upper contact of Girkin Formation and is equivalent to the Sample Sandstone (Moore, 1965). Not recognized in southern part of quadrangle.

Lower Section-
Limestone, fossil-fragmental, light- to medium-gray and light-olive-gray, coarse- to very coarse grained, in part oolitic, thick-bedded, contains abundant quartz rosettes, quartz geodes, and dark-purplish-gray chert nodules; interbedded with dusky yellow, thin- to medium-bedded, microcrystalline, dolomitic limestone, and laminated light- to medium- olive-gray, thin-bedded and in part crossbedded sandy limestone. Base is just above highest occurrence of *Platycrinites*. Description from source map: Munfordville Quadrangle

Mg - Girkin Formation (Mississippian (Chester))
Limestone, light-gray to dark-gray; dense to coarsely crystalline: thin bedded to medium bedded. Description from source map: Nolin Reservoir Quadrangle

Mg - Girkin Formation (Upper Mississippian)
Limestone, buff to light-gray, dense, and dark-gray very coarsely crystalline; beds of white to dark-gray oolitic limestone occur throughout formation but are more abundant in lower part; gray shale or argillaceous limestone as much as 15 feet thick occurs locally at top. Simple and compound clusters of small quartz crystals are characteristic of the lower part. Lower beds are nearly indistinguishable lithologically from the underlying Ste. Genevieve Limestone. The contact between these two formations was drawn above the highest stratigraphic occurrence of stems of Platycrinites, a fossil crinoid not known in Mississippian rocks above the Ste. Genevieve Limestone. In the quadrangle there is little evidence of an unconformity between the Girkin Formation and the Ste. Genevieve Limestone. Description from source map: Park City Quadrangle

Mg - Girkin Formation (Mississippian (Chester))
Limestone and oolitic limestone: Limestone (calcarenite), light- to medium- light-gray, coarse- to very coarse grained; consists of angular to sub- rounded fossil fragments 1 to 5 mm across in microcrystalline matrix; thick bedded, locally crossbedded and very fossiliferous; makes up lower part of unit. Limestone, oolitic, medium-dark- gray, medium-grained, thick-bedded; crops out as slabby and flaggy ledges. Very fine grained to dense, thick-bedded, medium-light-gray limestone occurs in upper part of unit. Upper 10 to 20 feet of unit is light-brown clastic limestone similar to calcarenite in lower part of unit. Description from source map: Park Quadrangle

Mg - Girkin Formation (Upper Mississippian)
Limestone and shale: Limestone, light- to dark-gray, thick-bedded to thin-bedded or shaly, coarsely crystalline to aphanitic; in part argillaceous; some beds oolitic, coarsely detrital, cherty, geodal, or fossiliferous. Thin bed near top in many localities contains numerous fossils of *Productus inflatus* McChesney and other brachiopods. Thick limestone beds in lower 30 feet contain dark-gray chert and white geodes that are lined with drusy quartz and filled with coarsely crystalline calcite. Shale, gray, green, or tan; ranges from 3 feet in thickness to a discontinuous parting; occurs locally near top. Base conformable. Well exposed at Cedar Sink, about 11/2 miles north-northeast of Pig, in southeastern part of quadrangle. Description from source map: Rhoda Quadrangle

Mg - Girkin Formation (Upper Mississippian)
Limestone, very light gray to light-olive-gray, dense (aphanitic) to coarsely crystalline (containing fossil fragments): light-gray to light- brownish-gray oolitic limestone common in lower part, rare in upper part: few thin layers of dark-gray to dark-blue chert nodules locally throughout unit; upper part may be locally shaly; generally evenly bedded, exposed on moderately steep slopes beneath rim of Big Clifty Sandstone Member. Basal contact difficult to locate, seemingly gradational. Description from source map: Smiths Grove Quadrangle

Mgu - Girkin Formation, upper member (Upper Mississippian)

Mgu - Girkin Formation, upper member (Upper Mississippian)
Limestone, medium-light-gray to medium-dark-gray, thin-bedded to very thick bedded. Contains medial and basal beds of shale. Member mapped in northern part of quadrangle, where four units in descending order are recognized:

Upper Section-
Limestone, largely microcrystalline to very finely crystalline, sparsely fossiliferous. Upper 5 feet is very coarsely fragmental crinoidal limestone that weathers yellowish brown and contains abundant *Agassizocrinus* sp., horn corals, and spiriferid and productid brachiopods. Thickness ranges from 15 to 25 feet Equivalent to Beech Creek Limestone Member of Golconda Formation.

Middle Sections-
Limestone, yellowish-gray, argillaceous, 1 to 6 feet thick; underlain by greenish-gray shale, I. to 2 feet thick. Thickness decreases southward from 8 feet to 2 feet. Equivalent to Elwren Sandstone of Malott (1919).

Limestone, largely cryptocrystalline to very finely crystalline, sparsely fossiliferous. Thickness ranges from 15 to 30 feet. Equivalent to Reelsville Limestone.

Lower Section-
Sandstone, yellowish-gray, weathers grayish red, with some greenish- gray shale at base. Sandstone present only along north edge of quadrangle; it grades southward through greenish-gray shale interbedded with yellowish-gray sandy limestone to greenish-gray shale. Contains abundant silicified calyxes of *Talarocrinus* sp. and *Agassizocrinus* sp. Thickness decreases southward from 8 feet to less than a foot Equivalent to Sample Sandstone.

Description from source map: Cub Run Quadrangle

Mgm - Girkin Formation, middle member (Upper Mississippian)

Mgm - Girkin Formation, middle member (Upper Mississippian)
Limestone, medium-dark-gray to white; commonly oolitic in upper part; medium bedded to very thick bedded. In part equivalent to Beaver Bend Limestone Member mapped in northern part of quadrangle. Represents several incomplete depositional cycles, similar to complete depositional cycle represented by lower member of Girkin. Dark-gray to black tabular or nodular chert commonly present *20* to 30 feet above base. Colonies of the coral. *Lithodrumus veryi* Greene present throughout but most abundant in two zones, one just below chert and the other just above basal bed. *Talarocrinus* sp. present throughout but decrease in size and abundance downward. Basal bed is crossbedded light-olive-gray and olive-gray speckled sandy clastic limestone (calcarenite), 1 to 4 feet thick; calcarenite consists of very fine to medium rounded grains of limestone, derived from crinoids, echinoids, and other fossils, fine to medium reworked grains of black chert and medium-dark-gray dense limestone, and very fine subangular grains of quartz. Local hiatus or unconformity within middle member in north-central part of quadrangle is suggested by its abrupt thinning due to absence of medial beds. Description from source map: Cub Run Quadrangle

Mgl - Girkin Formation, lower member (Upper Mississippian)

Mgl - Girkin Formation, lower member (Upper Mississippian)
Limestone, medium-dark-gray to white, medium-bedded to very thick bedded. In part equivalent to Paoli Limestone. Member mapped in northern part of quadrangle, where it consists of 5 persistent lithologic units. From top to base, these units and their average thicknesses are: (1) medium-gray to medium-dark-gray dense limestone and limestone intraformational breccia, containing round accretive armored nodules of black fragmental chert, 4 feet; (2) medium-light-gray cryptocrystalline to microcrystalline limestone, weathering to light-gray smooth surface, 8 feet; (3) light-gray microcrystalline to coarsely crystalline, fragmental to oolitic fossiliferous limestone weathering to light-gray rough surface and containing abundant *Talarocrinus* sp. calyxes and scarce fragmentary *Platycrinites* sp. columnals, 7 feet; (4) yellowish-gray, pale-yellowish-orange, and white dense limestone weathering to very light gray smooth surface and containing small *Talarocrinus* sp. calyxes, 11 feet; (5) crossbedded light-olive-gray and olive-gray speckled sandy clastic limestone (calcarenite), composed of fine to coarse rounded grains of limestone, derived from crinoids, echinoids, and other fossils, fine to coarse reworked grains of medium-dark-gray dense limestone, and fine to very fine subangular grains of quartz and containing reworked granules and pebbles of black chert and medium-dark-gray dense limestone at base, 5 feet.

This sequence represents complete depositional cycle of type that also characterized deposition of middle member of Girkin Formation and upper part of Ste. Genevieve Limestone. Description from source map: Cub Run Quadrangle

Mr - Reelsville Limestone (Mississippian)

Mr - Reelsville Limestone (Mississippian (Chester))
Limestone, light-olive-gray to light-gray, fine- to medium-grained, locally oolitic or shaly at base, poorly fossiliferous, hard, resistant; forms steep to moderate slopes with blocky outcrops. Lower contact is gradational. Description from source map: Hammonville Quadrangle

Mr - Reelsville Limestone (Upper Mississippian)
Limestone, light-olive-gray to light-gray, fine- to medium-grained, oolitic at base, poorly fossiliferous, hard, resistant; forms cliffs or steep to moderate slopes of blocky outcrops. Top forms a prominent bench; lower contact is gradational. Description from source map: Millerstown Quadrangle

Mr - Reelsville Limestone (Mississippian (Chester))
Limestone, light-olive-gray to light-gray, fine- to medium-grained, hard, resistant, locally oolitic at base, poorly fossiliferous; forms steep to moderate slopes. Top forms a prominent bench; lower contact is gradational, commonly marked by springs and seeps. Description from source map: Upton Quadrangle

Msa - Sample Sandstone (Mississippian)

Msa - Sample Sandstone (Mississippian (Chester))
Sandstone, yellowish-brown to grayish-yellow, fine-grained; very poorly exposed. Crops out in three areas: (1) on the west and northwest sides of Three Springs Knob, (2) in the Veach and Gore Stump Knobs area, and (3) on the south and west sides of Warren Knob. One exposure n the southeast side of Gore Stump Knob showed about 1 foot of clay with brownish shale flakes. A spring and a seep, respectively, are near tops of exposures on northwest side of Three Springs Knob and southeast of Gore Stump Knob. Description from source map: Hammonville Quadrangle

Msa - Sample Sandstone (Upper Mississippian)

Sandstone, siltstone, and shale: Sandstone is yellowish brown, fine grained, thin to very thick bedded, locally crossbedded. Siltstone is light brown, shaly, fossiliferous in part, contains thin limy layers in places. Clay shale is gray, weathers to a greenish cast. Formation is highly variable in lithology; grades from predominantly sandstone forming low cliffs where thick to sandy or argillaceous limestone where thin. In places formation may be absent. Generally poorly exposed; commonly represented by a shaly interval overlying a bench at top of Beaver Bend Limestone. Description from source map: Millerstown Quadrangle

Msa - Sample Sandstone (Mississippian (Chester))
Sandstone and shale: Sandstone is moderate yellowish brown to grayish yellow, fine grained, in beds as much as 5 feet thick; thickest in a tongue- shaped body 2 miles wide extending from one mile south of Upton to more than a mile southwest of Falling Springs Church. Shale is greenish gray to medium dark gray, locally silty. Outside area of tongue, composition of unit is variable, with sandstone generally thinner bedded and grading to silty or limy shales which contain scattered limestone lenses. In places unit may be represented by a brownish-yellow, sandy limestone. Description from source map: Upton Quadrangle

Mbp - Beaver Bend and Paoli Limestones (Mississippian)

Mbp - Beaver Bend and Paoli Limestones (Mississippian (Chester))
Limestone, light-gray, light-olive-gray, yellowish-gray, very fine to coarse-grained, oolitic in part, locally cherty. Crossbedded, sandy limestone composed largely of medium-grained, rounded fossil fragments, in beds generally less than 5 feet thick, is common at base and about 30 feet above base; quartz rosettes also occur near base. Fossils are moderately abundant, notably *Talarocrinus sp.* and *Lithodrumus veryi* Greene; most abundant in upper 15 to 20 feet. Description from source map: Hammonville Quadrangle

Mbp - Beaver Bend and Paoli Limestones (Mississippian)
Limestone, light-gray, light-olive-gray, yellowish-gray, very fine to coarse-grained, oolitic in part, locally cherty. Crossbedded sandy limestone composed largely of medium- grained rounded fossil fragments, in beds generally less than 5 feet thick, is common at base and about 30 feet above base; quartz rosettes also occur near base. Fossils are moderately abundant, notably *Talarocrinus sp.* and *Lithodrumus veryi* Greene; most abundant in upper 15 to 20 feet. Unit is completely covered with slumped sandstone, shale, and conglomerate within the quadrangle; described from exposures in the Hammonville quadrangle (Moore, 1972) adjacent to the west. Equivalent to lower part of the Girkin Formation as mapped by Miller and Moore (1969) in the Hudgins quadrangle adjacent to the south. Description from source map: Magnolia Quadrangle

Mbp - Beaver Bend and Paoli Limestones (Upper Mississippian)
Limestone, medium- to light-gray and yellowish-gray, sublithographic to coarse-grained, oolitic in part, thin-to thick-bedded; contains thin shale units. Upper part generally lighter colored, coarser grained, and thinner bedded. Calcite geodes occur in the uppermost 10 to 15 feet which is highly oolitic in places. Lower part contains light colored tabular chert and, near base, quartz rosettes. Crossbedded sandy pelletal limestone generally less than 5 feet thick is commonly present at base and about 30 feet above base. Fossils generally moderately abundant; most abundant in top 15 to 20 feet. Presence of *Talarocrinus* sp. and *Lithodrumus veryi* Greene (formerly *Campophyllum gasperense* Butts) distinguishes this unit from the underlying Ste. Genevieve Limestone. Description from source map: Millerstown Quadrangle

Mbp - Beaver Bend and Paoli Limestones (Mississippian (Chester))
Limestone, light-gray, light-olive-gray, yellowish- gray, sublithographic to coarse-grained. Top 15 to 20

feet of unit commonly light colored, coarse grained, oolitic; oolitic limestone near base is finer grained with oolites generally indistinct except when wet. Lower part of unit contains moderate to sparse layers of tabular chert. Crossbedded sandy pelletal limestone generally less than 5 feet thick is common at base and about 30 feet above base; quartz rosettes also occur near base. Fossils are moderately abundant most abundant in top 15 to 20 feet. Unit distinguished from underlying Ste. Genevieve Limestone by presence of *Talarocrinus sp.* and *Lithodrumus veryi* Greene. Description from source map: Upton Quadrangle

Msg - Ste. Genevieve Limestone, upper part (Mississippian)

Msg - Ste. Genevieve Limestone (Upper Mississippian)
Limestone, predominantly oolitic; some crystalline, argillaceous, and fossiliferous, detrital interbeds; in part cherty; gray to white, weathers slightly darker; where exposed to much direct sunlight, weathered rock may be white, commonly speckled red-brown by iron oxide stain; mostly thick bedded and massive, but ranges to thin bedded. oolitic limestone crossbedded in places; mostly thicker bedded and lighter colored than other rocks. Fossils of *Platycrinites* occur throughout and fossils of *Lithostrotion (Siphonodendron) genevievensis* Easton occur in upper half. Chert occurs as thin beds and stringers, particularly near base, and rarely as nodules; bedded chert is fossiliferous; chert is gray to black and weathers white and red-brown; it is blocky weathering, particularly near base, where large weathered blocks as much as 2 feet long and I foot thick are common in residual soil overlying Ste. Genevieve rocks. Description from source map: Bowling Green North Quadrangle

Msg - Ste. Genevieve Limestone (Upper Mississippian)
Limestone, predominantly oolitic; some fine- to medium-crystalline, argillaceous, coarse detrital; in part cherty; gray to white, slightly darker where weathered; where exposed to abundant direct sunlight, weathered rock is white, commonly spotted with reddish-brown iron oxide stain; thin to thick bedded. oolitic limestones are crossbedded in places, and are generally thicker bedded and lighter colored than other lithologies. Fossiliferous; *Platycrinites* throughout and *Lithostrotion* (*Siphonodendron*) genevievensis Easton in upper half. Chert is plentiful in beds and stringers near base, rarely present as nodules; chert beds are fossiliferous. Chert is gray to black and weathers white, cream, and red-brown; weathers blocky, particularly near base, where large weathered blocks of chert as much as 2 feet long and 1 foot thick are common in soil residue. Description from source map: Bowling Green South Quadrangle

Msg - Ste. Genevieve Limestone (Upper Mississippian)
Limestone, white to light-gray, thick-bedded, oolitic; interbedded with non-oolitic, light-gray lithographic to coarse-grained limestone. Little chert can be seen in outcrops but, on weathering, the formation yields much fossiliferous chert. Poorly exposed; weathered residuum contains iron-stained, somewhat porous, angular, tabular, and blocky chert fragments. Some chert blocks are a foot thick and as much as 2 feet long. Description from source map: Bristow Quadrangle

Msg - Ste. Genevieve Limestone (Mississippian (Meramec))
Limestone and chert; Limestone, very light gray to medium-gray, dense to coarse-grained, oolitic, medium- to thick-bedded in part crossbedded; locally dolomitic and argillaceous. Dolomitic limestone is dusky yellow to moderate olive brown, dense to very fine grained, medium bedded. Argillaceous limestone is light gray to light olive gray, thin bedded, oolitic. In places upper 2 to 10 feet of unit is a brecciated medium-dark-gray, dense limestone. In western and southwestern parts of quadrangle a persistent layer of fossiliferous chert 5 to 10 feet thick occurs 10 to 20 feet above base of formation; contains abundant fenestellid bryozoans, horn corals, and several species of brachiopods (especially *Orthotetes).* Probably equivalent to Lost River Chert of Elrod (1899). In eastern and northeastern parts of quadrangle layers of similar fossiliferous chert occur from 10 to 90 feet above base of formation. On fresh

surfaces chert Is very light gray to light yellowish gray; weathers to light reddish gray; occurs as irregular beds 2 inches to about 1 foot thick. Chert nodules are sparsely scattered throughout formation and are light to dark gray. In western and central parts of quadrangle a 1- to 2-foot-thick bed of limestone conglomerate occurs at top of unit consists of well rounded light- to medium-gray limestone pebbles and cobbles in a matrix of rounded calcareous grains ranging from silt size to the diameter of the smaller pebbles. In eastern part of quadrangle a light-yellowish- gray calcareous shale occurs at same horizon. Upper contact mapped at highest occurrence of *Platycrinites.* In northern part of quadrangle upper part of unit is mostly concealed by slumped sandstone and shale of probable Late Mississippian and Early Pennsylvanian ages. Description from source map: Canmer Quadrangle

Msg - Ste. Genevieve Limestone (Upper Mississippian)
Upper Section-
Limestone, oolitic, very light gray to light-gray, coarse- to very coarse grained; consists of angular to subrounded fossil fragments in a microcrystalline matrix; thick bedded, in part cross bedded and very fossiliferous. Beds of dolomitic limestone in upper 25 feet of unit are light yellowish brown to medium brown, very fine grained to dense; contain widely scattered nodules of dark-bluish black chert.

Middle Section-
Limestone light-olive-gray, fine-grained; consists of oolites in a microcrystalline matrix; interbedded with a persistent 15- to 20-foot thick layer of very light gray, coarse- to very coarse grained oolitic, clastic, cherty limestone.

Lower Section-
Limestone and chert: Limestone, medium-light-gray to light-olive-gray, fine- to medium-grained; consists of bioclastic material mostly less than 0.3 mm across; thick bedded; contains nodules, lenses, and beds of light-gray chert. *Piatycrinites* columnals occur throughout formation but most abundant in the upper clastic limestone. Description from source map: Center Quadrangle

Msg - Ste. Genevieve Limestone (Upper Mississippian)
Limestone, light-olive-gray, medium-gray to medium-dark-gray, and white; thin bedded to very thick bedded. Oolitic limestone commonly is interbedded with finely crystalline to cryptocrystalline limestone. Forms slopes containing abundant fragments of black chert. Base not exposed. Upper 20 feet in northern part of quadrangle represents single depositional cycle, similar to that of lower member of Girkin Formation, but it consists of only three lithologic units. From top to base, these units and their average thicknesses are: (1) medium-gray to medium-dark-gray dense limestone and limestone breccia containing angular fragments of limestone and chert, as much as 14 inches in length, and round armored accretive nodules, as much as 6 inches in diameter, of black fragmental chert, 4 feet; (2) light-gray to white medium-bedded oolitic limestone containing abundant *Platycrinites* sp. columnals, 6 feet; (3) yellowish-gray to light-olive-gray speckled, strongly crossbedded, fine-grained well-rounded sandy clastic limestone (calcarenite) with noncurving crossbeds, suggestive of torrential or deltaic deposition, 6 to 12 inches thick, dipping 16° to 22°, 10 feet. Description from source map: Cub Run Quadrangle

Msg - Ste. Genevieve Limestone (Upper Mississippian)
Limestone, white, very light gray to dark-gray, brownish-gray, oolitic, thin- to very thick bedded, locally very fossiliferous, occurs throughout formation; interbedded and interfingered with buff, gray to dark gray light-brown, dense to coarsely crystalline limestone, thin-bedded to massive, fossiliferous. Beds and lenses of blue and gray chert more commonly present in upper and basal parts; where argillaceous, limestone weathers to form benches and gentle slopes. White and light-gray oolitic limestone almost everywhere occurs immediately below Girkin Formation. Upper contact was placed above highest beds of oolitic limestone containing diagnostic columnals of the crinoid *Platycrinites.* Basal contact conformable with only a minor lithologic break at contact Description from source map: Glasgow North Quadrangle

Msg - Ste. Genevieve Limestone (Upper Mississippian)
Limestone, white to light-gray, coarse-grained to lithographic, oolitic, thick-bedded, cherty; chert most conspicuous as float in residual soil. Occurs in low, broad valleys; outcrops scarce. Base unexposed. Description from source map: Hadley Quadrangle

Msg - Ste. Genevieve Limestone (Mississippian (Meramec))
Limestone, white to light-gray, thick-bedded, oolitic; interbedded with non-oolitic, light-gray lithographic to coarse-grained limestone. Little chert can be seen in outcrops, but, on weathering, the formation yields much fossiliferous chert. Poorly exposed; weathered residuum contains iron-stained, somewhat porous, angular, tabular, and blocky chert fragments. Some chert blocks are a foot thick and as much as 2 feet long. Description from source map: Hammonville Quadrangle

Msg - Ste. Genevieve Limestone (Upper Mississippian)
Three types of limestone occur within formation. 1. Limestone, oolitic, white, very light gray, and gray, locally crossbedded, thin to very thick bedded; locally contains beds and lenses of blue and bluish- gray chert; occurs throughout formation and constitutes up to 80 percent of formation. 2. Limestone (calcarenite) buff, light-gray, and medium-gray, very thin to thick-bedded, locally gently to strongly crossbedded, composed of very fine to coarse subrounded and rounded limestone and dolomitic limestone grains, granules, and pebbles, some as large as 6 mm in diameter, in a matrix of finely to coarsely crystalline and microcrystalline calcite; in places fossiliferous, weathers gray to very light gray; constitutes minor part of formation but a major part of upper one-fourth of formation. 3. Limestone, tan, light-brown, and gray; consists of fossil fragments in a finely to coarsely crystalline calcite matrix, thin- to thick-bedded; locally contains oolites and thin beds of bluish-gray chert; weathers gray and brownish gray; comprises up to 30 percent of formation and grades into other units. Beds of light-brown dolomite less than 5 feet thick occur locally in middle and lower parts of formation. Light- gray finely crystalline silty limestone and calcareous shale occur in places. Basal contact conformable. Description from source map: Hiseville Quadrangle

Msg - Ste. Genevieve Limestone (Mississippian (Meramec))
Limestone, oolitic, white, very light gray, and gray, locally crossbedded, thin- to very thick bedded; locally contains beds and lenses, normally less than 4 inches thick, of blue, bluish-gray, and reddish-gray chert, locally silty; occurs throughout formation. Limestone (calcarenite), buff, light- gray, and medium-gray; composed of very fine to coarse subrounded and rounded limestone and dolomitic limestone grains, granules, and pebbles, some as large as 6 mm in diameter, in a matrix of sparry and microcrystalline calcite; very thin to thick bedded, gently to strongly crossbedded locally, in places fossiliferous: weathers light gray to grayish white and gray; occurs near upper contact. Limestone (calcilutite), very light gray, gray, light-tan to yellowish-tan, and buff, very fine to finely crystalline, thin-bedded to massive; locally silty, microcrystalline calcite cement and inclusions: weathers brownish gray, gray, and dark tan; locally weathers into slabby fragments: normally nonfossiliferous. Beds of light-brown fine-grained dolomite less than 5 feet thick, occur locally in middle and lower part of unit. Light-gray finely crystalline silty or argillaceous limestone and thin beds and seams of gray and greenish-gray shale occur locally. Thick lenses of fossiliferous chert occur locally in basal part of formation. Weathers to form karst topography. *Platycrinites* occur throughout in most limestone units; locally clusters of the fasciculate coral. *Lithostrotion* (*Siphonodendron*) *genevievensis* Easton occur in upper part of formation. Unit weathers to a reddish-brown clayey residuum containing chert and silicified fossils. Basal contact conformable. Description from source map: Horse Cave Quadrangle

Msg - Ste. Genevieve Limestone (Upper Mississippian)
Limestone and chert: Limestone, very light gray to medium- gray, dense to coarse-grained, oolitic, medium- to thick- bedded, in part crossbedded; locally argillaceous and dolomitic. Dolomitic limestone is dusky yellow to moderate olive brown, dense to very fine grained, medium bedded. Argillaceous limestone is light gray to light olive gray, thin bedded, oolitic. In places upper 2 to 10 feet of unit is a brecciated, medium-gray, dense limestone. A persistent layer of fossiliferous chert 2 to 5 feet thick

occurs about 10 to 20 feet above base of formation; contains abundant fenestellid bryozoans, horn corals, and several species of brachiopods. Chert is probably equivalent to Lost River Chert of Elrod (1899). On fresh surface chert is very light gray to light yellowish gray, weathers to light reddish gray; occurs as irregular beds 2 inches to about 1 foot thick. Chert nodules are scattered throughout formation and are light to dark gray. Upper contact mapped at top of uppermost bed containing Platycrinites. Description from source map: Hudgins Quadrangle

Msg - Ste. Genevieve Limestone (upper part) (Mississippian)
Limestone, light-olive-gray to very light gray, fine- to coarse-grained; oolitic, chert-bearing, highly fossiliferous in some layers. A highly fossiliferous chert layer, probably the Lost River (?) Chert of Elrod (1899), has been described by Ray and others (1946) as occurring about 20 to 40 feet above the base of the Ste. Genevieve Limestone. Within the quadrangle the chert occurs entirely as float, and the highest occurrence has been mapped as a marker horizon. Unit is completely covered by slumped sandstone in the quadrangle; described from exposures in the Hammonville quadrangle (Moore, 1972). Description from source map: Magnolia Quadrangle

Msg - Ste. Genevieve Limestone (Upper Mississippian)
Limestone, oolitic, white, very light gray, and gray, locally crossbedded, thin- to very thick bedded, locally contains beds and lenses, less than 4 inches thick, of blue and bluish-gray chert; occurs throughout formation. Limestone, (calcarenite) buff, light-gray, and medium-gray; composed of very fine to coarse subrounded and rounded limestone and dolomitic limestone grains, granules, and pebbles, some as large as 6 mm in diameter, in a matrix of sparry and microcrystalline calcite, very thin bedded to thick-bedded, gently to strongly crossbedded locally, in places fossiliferous, weathers light gray to grayish white and gray; occurs immediately below upper contact. Limestone, tan, light-brown, and gray, medium-crystalline, consists of fossil fragments in a sparry calcite matrix, thin- to thick-bedded, locally strongly to gently crossbedded, locally contains sparse oolites and thin beds of bluish-gray chert; weathers gray and brownish gray. Thin, less than 5 feet thick, beds of light- brown dolomite occur locally in middle and lower parts of formation. A light-gray finely crystalline silty limestone occurs locally. *Platycrinites* occur throughout; locally clusters of the large straw-like coral, *Lithostrotion* (*Siphonodendron*) *genevievensis* Easton occur in upper 60 feet. Locally unit is deeply weathered to reddish-brown clayey residuum containing chert and silicified fossils. Base of formation not exposed Description from source map: Mammoth Cave Quadrangle

Msg - Ste. Genevieve Limestone (Upper Mississippian)
Limestone, light-olive-gray to very light gray, medium- to fine-grained, oolitic, chert-bearing, moderately fossiliferous. Upper contact placed above the highest occurrence of *Platycrinites* sp. and *Lithostrotion (Siphonodendron) genevievensis* Eastone (formerly *Lithostrotion harmodites*); lower contact not exposed. Forms broad, low-lying flats with abundant sinkholes and few outcrops. Description from source map: Millerstown Quadrangle

Msg - Ste. Genevieve Limestone (Mississippian (Meramec))
Limestone, oolitic, fossil-fragmental, light- to medium-gray, medium- to thick-bedded, in part crossbedded, fossiliferous throughout, notably contains numerous *Platycrinites* fragments. Interbedded with dolomitic limestone and argillaceous limestone. Dolomitic limestone, dusky-yellow to moderate-olive-brown, microcrystalline, thin- to medium-bedded. Argillaceous limestone, light-gray to light-olive-gray, thin-bedded, and oolitic. In eastern part of quadrangle upper 10 feet of unit is made up of brecciated, medium-dark-gray, microcrystalline limestone overlain by a 2- to 3-foot-thick bed of limestone conglomerate consisting of light-medium-gray, well-rounded limestone granules and pebbles in a matrix of rounded calcareous grains ranging from silt size to very coarse. A persistent zone of silicified fossiliferous limestone 2 to 6 feet thick occurs 10 to 15 feet above base of unit. On fresh surfaces, silicified limestone is dense and light to very light gray and on weathered surfaces is light reddish gray and granular; it occurs as irregular lenses and layers 2 inches to about 1 foot thick and contains abundant fenestrate bryozoans, horn corals, and brachiopods (especially *Orthotetes*). Silicified zone

probably is Lost River Chert of Elrod (1899) (Kepferle, 1963). Light- to dark-gray chert nodules are sparsely scattered throughout unit. Description from source map: Munfordville Quadrangle

Msg - Ste. Genevieve Limestone (Upper Mississippian)
Limestone, oolitic, white to light-gray, thick-bedded; interbedded with light-gray lithographic and finely crystalline limestone: in places beds of argillaceous limestone occur in the upper part. Dark- to bluish-gray and black chert occurs as tabular masses, mostly in the lower part. Chert is not conspicuous in outcrop, but many tabular and blocky fragments of chert remain after weathering. The Ste. Genevieve overlies the St. Louis Limestone conformably with no visible lithologic break. Description from source map: Park City Quadrangle

Msg - Ste. Genevieve Limestone (Mississippian (Meramec))
Limestone and chert: Limestone, oolitic. white to light-gray, fine- to coarse- grained. medium- to very thick bedded, locally crossbedded. In central and eastern parts of quadrangle lower 10 to 15 feet of unit is light-gray very coarse grained strongly crossbedded oolitic clastic limestone containing chert laminae and lenses. Platycrinites columnals common throughout formation. In western part of quadrangle the lower 10 to 15 feet of unit is light- yellowish-gray thick-bedded limestone. Silty limestone occurs in the middle part of unit; it is medium gray, fine grained, thin bedded, and weathers to partially disaggregated flaggy and shaly ledges. Beds of dolomitic limestone in the upper 25 feet of unit are light yellowish brown to medium brown, very fine grained to dense and contain widely scattered nodules of dark-bluish-black chert. In most places in the central, northeastern, and eastern parts of the quadrangle irregular beds of fossiliferous chert occur at all levels in the unit. These beds, ranging from 0 to 5 feet in thickness, consist of a dense light-bluish-gray silicified limestone containing brachiopods, bryozoans, and solitary corals and weather to blocks of reddish-brown granular chert. In the western part of the quadrangle bedded chert is sparse or absent, except for a persistent bed 1 to 5 feet thick that occurs 10 to 15 feet above lower contact of unit. Description from source map: Park Quadrangle

Msg - Ste. Genevieve Limestone (Upper Mississippian)
Limestone, light-gray, medium- to thick-bedded, fine- to coarse-grained; in part oolitic, fossiliferous; similar to limestone of Girkin Formation. Contains inconspicuous chert that weathers to blocky, porous fragments. Top of formation is at uppermost bed containing diagnostic fossil columnals of the crinoid *Platycrinites*. Where fossils not found, contact drawn arbitrarily below lowest geode-bearing bed of Girkin. Formation well exposed in deep parts of Cedar Sink, in southeast part of quadrangle, but contains few diagnostic fossils. Description from source map: Rhoda Quadrangle

Msg - Ste. Genevieve Limestone (Upper Mississippian)
Limestone, very light gray to light-olive-gray, partly oolitic, finely to coarsely crystalline and clastic (composed of fossil fragments); commonly thick-bedded and crossbedded; nodular or bedded chert in few thin layers; few beds, in lower part in nearby areas, are shaly or dolomitic; small oval plates of crinoid stem *Platycrinites* common; clusters of pencil-like coral *Lithostrotion* (*Siphonodendron*) *genevievensis* Easton, formerly called *Lithostrotion harmodites*, (McFarlan, 1943. p. 81) locally abundant in upper 60 feet; beds of oolitic limestone weather nearly white in quarry faces; sinkholes abundant, unit weathers deeply to reddish-brown clay residuum containing silicified fossils and blocks of silicified limestone. Formation generally more oolitic and crossbedded than Girkin Formation: lower part of formation very poorly exposed in quadrangle. Description from source map: Smiths Grove Quadrangle

Msg - Ste. Genevieve Limestone (Mississippian)
Limestone, light-gray, to cream, many beds oolitic, others medium to coarsely crystalline, locally crossbedded; weathers fluted; locally lower 10 to 30 feet contains light- colored blocky dense chert. Description from source map: Sulphur Well Quadrangle

Msg - Ste. Genevieve Limestone (Mississippian (Meramec))
Limestone, light-olive-gray to very light gray, fine - to coarse-grained, oolitic in part; chert-bearing; highly

fossiliferous in certain layers. A highly fossiliferous chert layer, probably the Lost River (?) Chert of Elrod (1899), crops out in one place near Upton and occurs as float near streams in the northeast corner of the quadrangle. Other workers (Ray and others, 1946) have placed the base of the Ste. Genevieve Limestone at some 20 to 40 feet below the Lost River (?) Chert of Elrod (1899) which is a good marker horizon in quadrangles to the north (Moore, 1965h) and northwest (Moore, 1964). Upper contact drawn above highest occurrences of *Platycrinites sp.* and *Lithostrotion* (*Siphonodendron*) *genevievensis* Easton; base not exposed. Unit generally weathered to a red clayey, cherty soil as much as 30 feet thick which covers broad, low-lying areas containing sink holes and few outcrops. Description from source map: Upton Quadrangle

Mulr - Ste. Genevieve Limestone, upper part, and top of Lost River (?) Chert of Elrod (1899) (Mississippian)

lr - Ste. Genevieve Limestone (upper part), top of Lost River (?) Chert of Elrod (1899) (Mississippian (Meramec))
No description provided. Description from source map: Hammonville Quadrangle

lr - Ste. Genevieve Limestone (upper part), top of Lost River (?) Chert of Elrod (1899) (Mississippian)
A highly fossiliferous chert layer, probably the Lost River (?) Chert of Elrod (1899), has been described by Ray and others (1946) as occurring about 20 to 40 feet above the base of the Ste. Genevieve Limestone. Within the quadrangle the chert occurs entirely as float, and the highest occurrence has been mapped as a marker horizon. Description from source map: Magnolia Quadrangle

lr - Ste. Genevieve Limestone (upper part), top of Lost River (?) Chert of Elrod (1899) (Mississippian (Meramec))
No description provided. Description from source map: Upton Quadrangle

Mlr - Ste. Genevieve Limestone, Lost River Chert (Mississippian)

Mlr - Lost River Chert (Mississippian)
No description provided. Linear geologic feature from KGS DVGQ source maps for the follow 7.5' quadrangles : Bowling Green North, Bowling Green South, Bristow, Canmer, Center, Glasgow North, Hiseville, Horse Cave, Hudgins, Munfordville, Park City, Park, Smiths Grove and Sulphur Well. Citations for these map can be found on the GRI Digital Maps and Source Map Citations page.

Mglsl - Ste. Genevieve, lower part, and St. Louis Limestones (Mississippian)

Mgl - Ste. Genevieve and St. Louis Limestones (Mississippian (Meramec))
Limestone, dolomite, and shale: Limestone, yellowish- to olive- and medium-gray, very fine to medium-grained, locally dolomitic, argillaceous, or silty, sparsely fossiliferous; oolitic near top; numerous zones of nodular or tabluar chert. Dolomite, pale-yellowish-brown, fine- to very fine-grained, siliceous. Shale is light olive, calcareous, interbedded with very argillaceous limestone. This unit is exposed only in one small area along Bacon Creek; lithologic description based on exposures in the Tonieville quadrangle (Moore 1966). Description from source map: Hammonville Quadrangle

Mgl - Ste. Genevieve (lower part) and St. Louis Limestones (Mississippian)
Limestone, dolomite, and shale: Limestone, yellowish- to olive -and medium-gray, very fine to medium-

grained, locally dolomitic, clayey or silty, sparsely fossiliferous: contains numerous zones of nodular or tabular theft. Dolomite, pale-yellowish-brown, fine- to very fine grained, siliceous. Shale is light olive, calcareous, interbedded with very clayey limestone. Basal part of unit is gradational into and inter-fingered with underlying unit. Springs occur at or near base. Owing to limited exposures, unit is described from exposures in the Tonieville and Hodgenville quadrangles (Moore, 1966 and 1968). Description from source map: Magnolia Quadrangle

Msl - St. Louis Limestone (Mississippian)

Msl - St. Louis Limestone (Upper Mississippian)
Limestone, crystalline, argillaceous, some fossiliferous, detrital, some oolitic, slightly dolomitic in places, in part cherty; characteristically gray to dark gray on both fresh and weathered surfaces; thick bedded to massive. A few oolitic beds occur near top; these are gray but weather slightly lighter; they are darker than oolitic limestone in the Ste. Genevieve. The corals generally identified as *Lithstrotionella castelnaui* Hayasaka and *"Lithostrotion" protiferum* Hail occur throughout, are generally silicified, and are abundant in soil derived from the St. Louis. Chert occurs in beds, stringers, and nodules, is gray to black, and weathers white to red brown Exposed in cliff along Barren River; base not exposed and total thickness not known. Description from source map: Bowling Green North Quadrangle

Msl - St. Louis Limestone (Upper Mississippian)
Limestone, finely to coarsely crystalline; some argillaceous, minor very fossiliferous detrital beds; cherty; slightly dolomitic In places; characteristically gray to dark gray on fresh and weathered surfaces; thick bedded to massive. A few medium-gray oolitic beds near top, somewhat darker than oolitic beds in Ste Genevieve. Large rugose colonial corals commonly identified as *Lithostrotion* and *Lithostrotionella* occur throughout; generally silicified, abundant in soil. Gray to black chert occurs in numerous beds, stringers, and nodules; weathers white, cream, and various shades of reddish brown; generally less blocky-weathering than chert in Ste. Genevieve; nodular chert particularly abundant at top. Description from source map: Bowling Green South Quadrangle

Msl - St. Louis Limestone (Upper Mississippian)
Limestone, cherty, light- to dark-gray, lithographic to coarse-grained, thin- to medium-bedded. Covered in most places by thick residuum of tan to red clay containing abundant chert fragments and nodules in which are preserved the diagnostic fossils *"Lithostrotion" proliferum* Hall and *Lithostrotionella castelnaui* Hayasaka. Description from source map: Bristow Quadrangle

Msl - St. Louis Limestone (Mississippian (Meramec))
Upper Section-
Limestone, light- to medium-gray, mostly fine-grained, locally medium- and coarse-grained, medium- to thick-bedded, interbedded with a few beds of yellowish-gray dense dolomitic limestone and dolomite; contains abundant balls, nodules and amoeboidal masses of light- to dark-gray chert. Lithostrotionoid corals occur throughout St. Louis Limestone but are abundant in uppermost bed of this unit in eastern and northeastern parts of quadrangle.

Middle Section-
Limestone, siltstone, and shale: Limestone, silty yellowish- gray to light- and moderate-olive-gray, mostly dense and very fine grained with a few fine-grained beds, thin- to thick- bedded, contains abundant scraggy chert. Beds containing scraggy chert are easily weathered to a vuggy yellowish- to reddish-gray earthy mass of ragged chert stringers. Siltstone is yellowish gray to light olive gray, thinly laminated to thin bedded; shale is light yellowish gray and occurs in limestone as thin partings and as layers ranging from a few inches to as much as 3 feet thick.

Lower Section-
Limestone and siltstone: Limestone, cherty, light- to medium- olive-gray, and medium- to medium-dark-gray, fine- to medium-grained, medium- to thick-bedded; consists of angular to subangular bioclastic material mostly less than 0.5 mm across cemented by a calcareous and silty matrix. Siltstone medium-gray, occurs as layers 3 inches to 6 feet thick. A medium-gray shale layer 0 to 3 feet thick occurs at base of unit in eastern part of quadrangle. Description from source map: Canmer Quadrangle

Msl - St. Louis Limestone (Upper Mississippian)
Upper Section-
Limestone, medium- to light-gray and yellowish-gray, cherty; interbedded with a few beds of light-yellowish-gray oolitic limestone.

Middle Section-
Limestone, medium-dark-gray, very fine to fine-grained, argillaceous cherty, and silty; intercalated dolomitic and calcareous siltstone partings.

Lower Section-
Limestone, medium-dark-gray, fine-to medium-grained, cherty; consists of bioclastic material mostly less than 1 mm across in a silty matrix; medium to thick bedded; contains nodules, balls, and lenses of light-gray to reddish-gray chert. Lower 5 feet of unit is dark-gray fine-grained sandy and argillaceous limestone consisting of angular fragments of calcareous fossils and quartz in a calcite matrix; thick bedded and strongly crossbedded; locally grades into light- yellowish-brown, silty, argillaceous, cherty limestone. Lithostrotionoid corals occur throughout St. Louis Limestone. Description from source map: Center Quadrangle

Msl - St. Louis Limestone (Upper Mississippian)
Upper Section-
Limestone, light-olive-gray to dark-gray, buff, lithographic, dense to coarsely crystalline, thin- to very thick bedded, occurs throughout formation; light- to dark-gray dense to coarsely crystalline limestone, thin- to very thick bedded, in places very silty; contains sparse to very abundant beds, lenses, nodules, and stringers of chert up to 14 inches thick; light-gray silty limestone occurs throughout formation; white to gray oolitic fossiliferous limestone occurs mostly In upper part.

Lower Section-
Limestone and siltstone: Limestone, light-gray to dark-gray, olive-gray, silty, fine- to medium-crystalline, faintly to prominently laminated, contains lenses, nodules, and geodes of chert; weathers platy and slabby; light-gray limestone contains very abundant chert as nodules, stringers, and geodes; medium-light-gray to medium-gray fine- to medium-grained detrital limestone (calcarenite) occurs in basal part in beds as much as 3 feet thick but commonly much thinner. Gray to dark-gray calcareous siltstone occurs in basal part. Formation generally concealed by a tan to red clayey residual soil containing abundant chert fragments and nodules and silicified corals commonly identified as "*Lithostrotion" proliferum* Hall and *Lithostrotionella castelnaui* Hayasaka. Lower contact is gradational. Locally unit intertongues with underlying formation. Description from source map: Glasgow North Quadrangle

Msl - St. Louis Limestone (Upper Mississippian)
Limestone, cherty, medium-dark-gray to light-gray, fine- to medium-grained, medium-bedded; contains balls and nodules of chert and a few quartz geodes 1 to 3 inches in diameter. Unit contains silicified rugose colonial corals commonly called *"Lithostrotion" proliferum* Hall and *Lithostrotionella castelnaui* Hayasaka. In most places lower 5 to 15 feet of unit is light-yellowish-gray banded argillaceous limestone containing abundant lenses and discontinuous layers of banded chert. Locally basal 5 to 15 feet of unit is dark-gray fine -grained detrital limestone with a clear calcite and silt matrix which is probably a facies of the argillaceous limestone. Top removed by erosion. Description from source map: Glasgow South Quadrangle

Msl - St. Louis Limestone (Upper Mississippian)
Limestone and siltstone: Six types of limestone occur within formation. 1. Limestone, light-olive-gray to dark-gray, buff, dense to coarsely crystalline, thin- to very thick bedded, locally very silty or argillaceous; major constituent of formation; contains sparse to very abundant beds, lenses, nodules, and stringers of chert. 2. Limestone, light- gray, silty, occurs throughout formation. 3. Light-gray to dark-gray fossiliferous oolitic limestone occurs mostly in upper part; constitutes a minor part of formation, 4. Limestone, light-gray to dark-gray, olive-gray, finely to medium-crystalline, faintly to prominently laminated, silty; contains lenses, nodules, and geodes of chert, weathers platy and slabby; occurs mostly in basal part. 5. Medium-light-gray to medium-gray fine- to medium-grained detrital limestone (calcarenite) occurs in basal part in beds up to 4 feet thick but commonly much thinner. 6. Locally very dark gray fine- to medium-grained limestone, which is nearly indistinguishable from calcarenite in the underlying Salem and Warsaw, occurs at the base. Gray to very dark gray calcareous siltstone is locally present in basal part. Formation generally covered by a tan to reddish-brown residual clay soil containing abundant chert fragments and nodules and silicified corals. A conspicuous very light gray and white fossiliferous chert bed up to 2 feet thick commonly occurs immediately below the upper contact. Lower contact is gradational and locally intertongues with Salem and Warsaw Limestones. Description from source map: Hiseville Quadrangle

Msl - St. Louis Limestone (Mississippian)
Limestone and dolomite: Limestone, light-olive-gray to medium-dark-gray, yellowish-gray, very fine to medium-grained, thin- to very thick bedded, locally dolomitic, argillaceous, carbonaceous, or silty; sparsely fossiliferous; contains numerous zones of nodular or tabular chert; petroliferous odor common. Limy shale partings, 8 inches or less thick are exposed at several places. Dolomite, yellowish-gray, very fine grained, thick- to very thick bedded, silty, calcareous. A 1 to 2 foot-thick bed lithologically similar to underlying unit occurs locally 15 to 25 feet above base. Lower contact is gradational and is arbitrarily placed to include most of the darker colored, finer grained, thinner and more evenly bedded, less argillaceous or siliceous limestone beds in this unit. Springs at or near base mark top of more argillaceous limestone. Only lower 130 feet of unit exposed, chiefly along streams and in gullies. Normally weathers to red chert-rich clay soil 30 to 40 feet thick; forms karst topography. Description from source map: Hodgenville Quadrangle

Msl - St. Louis Limestone (Mississippian (Meramec))
Limestone, medium-gray to dark-gray, very fine to fine-grained, thin-bedded, locally very silty, argillaceous and sparsely oolitic; contains abundant chert blebs and nodules. Fossiliferous chert beds and lenses, locally as much as 2 feet thick, occur at or immediately below upper contact. Exposed principally along streams and in deeper sinks. Weathers to form karst topography. Formation generally covered by a tan to reddish-brown residual clay soil containing abundant chert fragments and nodules, silicified colonial corals commonly identified as *Lithostrotionella castelnaui* Hayasaka and *"Lithostrotion" proliferum* Hall, and several types of brachiopods, crinoids, horn corals, and bryozoans, mainly as casts and molds in silicified limestone. Only upper 90 feet of formation exposed. Description from source map: Horse Cave Quadrangle

Msl - St. Louis Limestone (Upper Mississippian)
Upper Section-
Limestone, light- to medium-gray, mostly fine-grained, locally medium- to coarse-grained, medium- to thick-bedded. Interbedded with a few yellowish-gray, dense, dolomitic limestone and dolomite beds; contains abundant balls, nodules, and amoeboidal masses of light- to dark-gray chert. Lithostrotionoid corals occur throughout formation.

Middle Section-
Limestone, siltstone, and shale: Limestone, yellowish-gray to moderate-olive-gray, mostly dense to very fine grained with a few fine-grained beds, thin- to thick-bedded, contains abundant scraggy chert. Beds

containing scraggy chert are easily weathered to a yellowish- to reddish-gray, vuggy, earthy mass of ragged chert stringers. Siltstone is yellowish-gray to light-olive-gray, thinly laminated to thin bedded; shale is light yellowish gray and occurs in limestone as thin partings or in beds ranging from a few inches to as much as 3 feet thick.

Lower Section-
Limestone and siltstone: Limestone, light- to medium-olive- gray, and medium- to medium-dark-gray, fine- to medium- grained, medium- to thick-bedded, consists of angular to subangular bioclastic material mostly less than 0.5 mm across cemented by a calcareous and silty matrix. A few beds of limestone contain lenses of medium- to dark-gray chert. Interbeds of siltstone are medium gray, occur as layers 3 inches to as much as 6 feet thick. A medium-gray to light-greenish-gray shale layer as much as 5 feet thick occurs locally at base of unit. Description from source map: Hudgins Quadrangle

Msl - St. Louis Limestone (Upper Mississippian)
Upper Section-
Limestone, light- to medium-gray, very. fine to medium-grained, thin- to medium-bedded; interbedded with light-olive-gray to light-gray, lithographic to dense limestone; contains sparse thin beds of medium-gray to olive-gray, medium- to coarse-grained limestone and thin-to medium-thin beds of olive-gray silty limestone.

Lower Section-
Limestone, olive-gray, silty, faintly to prominently laminated; weathers to platy and slabby surfaces; medium-dark-gray, argillaceous and shaly, thin- to thick-bedded limestone occurs only in basal part; medium-light-gray to medium-gray, detrital (calcarenite), fine- to medium-grained limestone occurs in beds as much as 4 feet thick but commonly much thinner, In places thin beds of calcarenite occur as much as 60 feet above base. Gypsum-filled fractures and gypsum- lined quartz geodes throughout lower part, Chert occurs as stringers, nodules, or thin lenses in all units. Sparse stylolites in basal part. Formation crops out along stream valleys and on steep hills; elsewhere covered by a clayey tan to red residual soil containing abundant chert fragments and silicified corals commonly identified as *"Lithostrotion" proliferum* Hall and *Lithostrotionella castelnaui* Hayasaka. Lower contact is gradational. Locally intertongues with underlying Salem and Warsaw Limestones. Only lower part present in quadrangle. Description from source map: Lucas Quadrangle

Msl - St. Louis Limestone (Upper Mississippian)
Limestone, medium-gray, yellowish-gray weathering, mostly fine- to very fine grained, locally medium- and rarely coarse- grained; locally, especially at the base, the limestone contains silt and clay, which commonly vary in abundance from one bedding lamina to the next. Minor amounts of chert in balls and irregular discontinuous layers parallel to bedding throughout formation; much of layered chert has laminae which are relict bedding. Locally contains corals, brachiopods, bryozoans, blastoids, crinoids, echinoids, and gastropods. Fine-grained largely argillaceous and silty limestone of this formation is commonly interbedded with coarse-grained clastic limestone characteristic of the underlying unit through a stratigraphic interval of about 20 feet; however, locally there is no interbedding. Contact was placed at top of the highest coarse-grained limestone. Description from source map: Meador Quadrangle

Msl - St. Louis Limestone (Mississippian (Meramec))
Limestone, siltstone, and shale: Limestone, medium- to dark-gray, very fine to fine-grained, thin- to medium-bedded; contains abundant spherical and irregularly shaped nodules of chert. Siltstone and shale, light- to medium-gray, as partings in lower part. Description from source map: Munfordville Quadrangle

Msl - St. Louis Limestone (Upper Mississippian)
Limestone, cherty, light- to dark-gray and buff, thin- to medium-bedded, lithographic and dense to coarse-grained; thin beds of argillaceous limestone occur near top and base. The St. Louis is almost

everywhere covered by a thick residuum of tan to red clay containing abundant chert fragments and nodules in which are preserved *"Lithostrotion" proliferum* Hall and *Lithostrotionella castelnaui* Hayasaka, diagnostic fossils of the St. Louis Limestone. In most places the St. Louis forms a gradational contact with the underlying Warsaw Limestone. Description from source map: Park City Quadrangle

Msl - St. Louis Limestone (Mississippian (Meramec))
Limestone and siltstone: Limestone, clastic. medium-dark-gray, fine- to medium-grained; consists of angular to subrounded bioclastic material, mostly less than 1 mm across, cemented by a calcareous, silty, and argillaceous matrix; thin to thick bedded; contains numerous nodules and balls of chert and quartz, calcite, and gypsum geodes; interbedded with very fine grained to dense light-yellowish-gray to light-gray limestone. Unit contains interbeds of light- to medium-gray calcareous and dolomitic siltstone. Formation commonly contains lithostrotionoid corals. Description from source map: Park Quadrangle

Msl - St. Louis Limestone (Upper Mississippian)
Limestone, cherty, medium- to dark-gray, predominantly fine-grained to lithographic, thin- to thick-bedded. In places thin beds of argillaceous limestone are present near the base. Locally, a 3- to 4-foot bed of medium- to dark-gray, coarse- to very-coarse crystalline detrital limestone occurs in the upper part. At a few exposures, thin zones (less than 6 inches thick) of shaly limestone are weathered to olive-green shale. Red and tan residual clays from the St. Louis Limestone contain abundant iron-stained, fossiliferous chert fragments and chert nodules. Much of the fragmental chert is somewhat porous. The nodular and subspherical cherts are most abundant in residuum of the lower beds of the St. Louis. Description from source map: Polkville Quadrangle

Msl - St. Louis Limestone (Upper Mississippian)
Limestone, variably cherty and argillaceous; few oolitic beds in upper part; exposures rare; deeply weathered, forming abundant sinkholes and reddish-brown soil containing abundant silicified fossils and blocks of silicified limestone; silicified "heads" of lithostrotionoid corals common: base not exposed. Description from source map: Smiths Grove Quadrangle

Msl - St. Louis Limestone (Mississippian)
Limestone, medium-gray to dark-gray; generally aphanitic but some beds finely crystalline; contains nodules of gray banded chert; in some areas most of middle part and one or two thick lenses in lower part of the formation are yellowish, slightly cherty, argillaceous limestone; locally the uppermost 30 feet is alternating oolitic limestone and light-gray limestone that contains lithostrotionoid corals common in the St. Louis. Upper contact mapped at the top of a blocky chert layer 2± feet thick; at base of formation the following lensing or intergrading lithologies are present locally: very fossiliferous aphanitic limestone, sandy crossbedded limestone, dark-blue crystalline limestone 5± feet thick, or yellowish argillaceous limestone. Description from source map: Sulphur Well Quadrangle

Msl - St. Louis Limestone (Upper Mississippian)
Limestone, medium-to dark-gray, fine-grained to dense; interbedded with lesser amounts of argillaceous light-yellowish-gray limestone; contains abundant light-gray to white banded nodular chert, and considerable silicified lithostrotionoid colonial corals. Lower part includes silty finely crossbedded dark-gray limestone which intergrades with silty, argillaceous light-yellowish-gray limestone; contains very minor silty calcareous shale. Locally basal few feet contains beds of coarse detrital limestone similar to those in the Salem and Warsaw Limestones. Upper part poorly exposed; only present as dark-red clay soil containing abundant fragments of light-gray chert. Description from source map: Summer Shade Quadrangle

Msl - St. Louis Limestone (Upper Mississippian)
Upper Section-
Limestone, light-brownish-gray to medium-light-gray, weathers light yellowish gray, fine-grained to dense, cherty, thin- to thick-bedded: unit contains abundant light- to medium-gray, banded nodular chert

and a few quartz geodes 1 to 3 inches in diameter. Residuum consists of reddish-brown soil containing light-brown to reddish-brown banded nodular and fragmentary chert and a sparse amount of the diagnostic silicified colonial corals commonly called *"Lithostrotion" proliferum* Hall and *Lithostrotionella castelnaui* Hayasaka, as well as a few brachiopods and bryozoans. Top removed by erosion.

Lower Section-
Limestone, detrital, medium-gray to dark-gray, fine-grained, medium- to thick-bedded, fossiliferous, crossbedded; consists of angular to subangular detrital fragments less than 0.5 mm in diameter with 10 to 15 percent quartz silt in a clear calcite matrix; occurs locally and intergrades with light-yellowish-gray argillaceous limestone. Locally is as much as 30 feet thick; thickness commonly is about 10 to 15 feet. Description from source map: Temple Hill Quadrangle

Ms - Salem Limestone, undivided (Mississippian)

Ms - Salem Limestone (Mississippian)
Limestone and shale: Limestone, light-olive-gray, light-brownish-gray, moderate yellowish brown, fine to coarse-grained, thin- to very thick bedded, locally thickly crossbedded. Fine-grained limestone is silty, argillaceous, and weathers with a shaly parting; fossils are generally sparse except in zones of abundant fenestellid bryozoans. Coarse-grained limestone, which forms most outcrops, is slightly siliceous, highly fossiliferous with crinoid columnals most abundant, thick bedded or thickly crossbedded, and has a fine laminar waviness. Shale is pale yellow brown, calcareous; probably equivalent of Somerset Shale Member of the Warsaw Formation; believed to be persistent throughout quadrangle although covered in many areas. Formation is highly variable; coarse-grained limestone grading laterally into fine-grained limestone. Coarse-grained limestone is likely to be considered “typical Salem” because of relative abundance of outcrops even though. In numerous places, it may make up less than one-half total thickness. Geodes and chert are sparse; basal limestone bed is commonly silicified and glauconitic. In east-central part of quadrangle, a 5 to 15 foot-thick yellowish-brown, very fine grained, massive, porous, silty (possibly dolomitic) limestone bed occurs at top. Unit is poorly exposed generally. Description from source map: Hodgenville Quadrangle

Ms - Salem Limestone (Mississippian)
Limestone and shale: Limestone, mostly of two types, coarse-grained and fine-grained. Coarse-grained limestone is light olive gray, light brownish gray, and moderate yellowish brown, crossbedded in part, locally silicified; highly fossiliferous, crinoid columnals most abundant fossils. Fine- grained limestone is yellowish gray, silty, locally clayey: fossils are generally sparse, some zones of abundant fenestellid bryozoans. Shale, medium-gray, silty, calcareous. fossiliferous; makes up most of lower 20 feet of formation and locally (2 1/4 miles southeast of Magnolia) may be as much as 40 feet thick. Unit generally well exposed in deeper drainages but poorly exposed elsewhere. Description from source map: Magnolia Quadrangle

Msw - Salem and Warsaw Limestones (Mississippian)

Mw - Warsaw Limestone (Upper Mississippian)
Upper Section-
Detrital limestone, yellowish-gray, coarse- to very coarse- grained, cherty, massive: contains scattered silicified crinoid stems and fragments of brachiopods which protrude from weathered surfaces. Irregular masses of silicified brown- to dark-gray fossiliferous limestone and lenses of light-gray opaline chert are common: the chert is more abundant upward. Unit is locally crossbedded and banded with light-gray argillaceous laminae. In this quadrangle the limestone has largely weathered to brownish-red soil containing blocky fragments of fossiliferous silicified brown limestone and light-gray opaline chert, but a

few ledges of only partly weathered limestone crop out locally along steep slopes.

Lower Section-
Detrital limestone, light yellowish- to brownish-gray, coarse- to very coarse-grained, massively bedded, with a few silicified fragments of brachiopods and crinoid stems protruding from weathered surfaces; locally unit is crossbedded and contains irregular masses of silicified brown fossiliferous limestone with abundant silicified cusp-shaped fragments of brachiopods and segments of crinoid stems. This detrital limestone layer, like the upper unit of the Warsaw limestones, is made up of angular to subangular sand-like fragments of calcareous fossils and is a calcarenite. The basal bed of this unit contains abundant silicified brachiopod fragments; this bed is useful as a marker horizon in outcrop and in soils. The limestone is largely weathered to reddish- brown soils; a few massive ledges crop out along steep slopes. Description from source map: Austin Quadrangle

Msw - Salem and Warsaw Limestones (Mississippian (Meramec))
Limestone and siltstone: Limestone, medium-brownish-gray and light- to medium-olive-gray, medium- to coarse-grained, medium- to thick-bedded, moderately to strongly crossbedded; consists of welt sorted angular to subangular fossil fragments cemented by minor amounts of calcareous and silty material; contains interbeds of light-yellowish-gray dolomitic siltstone and silty dolomitic limestone consisting of 20 to 40 percent angular fossil fragments in a light-yellowish-gray, microcrystalline, calcareous and silty matrix. Unit contains abundant horn coral *Hapsiphyllum*. Base not exposed. Description from source map: Canmer Quadrangle

Msw - Salem and Warsaw Limestones (Upper Mississippian)
Limestone and siltstone: Limestone (calcarenite), medium-dark-gray to grayish-brown, medium- to very coarse grained; consists of angular to subrounded fragments of crinoid stems, bryozoans, and brachiopods; thick bedded, faintly to strongly crossbedded. Siltstone, dolomitic, light-yellowish-gray to medium-gray, in part thinly laminated. Argillaceous and silty limestone, yellowish-brown; consists of about 30 to 50 percent fragments of fenestrate bryozoans, crinoid stems, and brachiopods in a calcareous and dolomitic silty matrix; locally calcarenite grades through silty limestone into dolomitic siltstone. Calcarenite beds in lower part of unit intertongue with and grade laterally into siltstone of the Fort Payne Formation. Fragments and complete specimens of horn coral *Hapsiphyllum* occur throughout limestone beds of unit, indicating an early Meramec age. In northern Kentucky this genus is very abundant in the Salem Limestone and ranges locally from Warsaw Limestone into St Louis Limestone (Helen Duncan, written communication, 1962). Description from source map: Center Quadrangle

Msw - Salem and Warsaw Limestones (Upper Mississippian)
Upper Section-
Limestone and siltstone: Limestone, light-olive-gray to medium-gray, detrital (calcarenite), fine- to medium-grained, in places cherty; interbedded and interfingered with olive-gray thin-bedded silty to very silty limestone; in places contains stringers and nodules of chert; similar in appearance to silty limestone in basal St. Louis. Bluish- gray and gray calcareous thin-bedded siltstone, weathers yellowish brown; contains sparse gypsum geodes and gypsum-lined quartz geodes.

Middle Section-
Limestone and siltstone: Limestone, medium-gray to dark-gray, detrital (calcarenite), fine- to very coarse grained, thin-bedded to massive, in places crossbedded; consists principally of brachiopod, crinoid, and bryozoan fragments, in places may be 40 feet or more thick, more commonly interbedded and interfingered with bluish-gray and gray calcareous thin- to thick-bedded siltstone; siltstone contains abundant gypsum and quartz geodes, weathers yellowish brown and yellowish gray. The horn coral *Hapsiphyllum* sp. occurs throughout upper half of formation and locally may occur in rocks of basal part of St. Louis. It indicates an early Meramec age and has been identified by Mackenzie Gordon, Jr., in the Tracy quadrangle, (Moore, 1963).

Lower Section-
Siltstone and limestone: Siltstone, bluish-gray to gray, calcareous, thin- to medium-bedded; contains abundant calcite- and gypsum-lined geodes; in places more than 40 feet thick. Medium-light-gray to dark- gray detrital limestone (calcarenite), fine- to coarse-grained, thin- to medium-bedded, in places contains sparse chert nodules; limestone lenses, which locally may be as thick as 15 feet but are commonly less than 5 feet thick, occur throughout lower part of formation. Abundant fragments and complete specimens of spiriferid brachiopods occur in detrital limestone throughout lower part of formation. Abundant crinoid stem fragments up to ½ inch in diameter and very sparse fragments up to 1 Inch in diameter occur throughout basal 10 feet. Lower contact mapped below lowest detrital limestone containing *Spirifer lateralis* Hall and S. *washingtonensis* Weller identified in field by Mackenzie Gordon, Jr., and above silty and argillaceous dolomite containing abundant crinoid stem fragments larger than 5/8 inch in diameter. Lower contact is gradational. Description from source map: Glasgow North Quadrangle

Msw - Salem and Warsaw Limestones (Upper Mississippian)
Upper Section-
Limestone, silty limestone, and dolomitic siltstone: Limestone, detrital (calcarenite), medium-dark-gray, coarse- to very coarse grained, thick- bedded; crossbedded with faint to prominent light-gray silty and argillaceous laminae; consists of angular to subangular bioclastic material ranging from about 0.1 mm to as much as 4 cm across with a median size of about 1.2 mm. A few quartz geodes and chert nodules occur throughout unit. Locally upper 5 to 50 feet of unit consists of dark- gray silty detrital fine- to medium-grained limestone with a clear calcite and silty matrix; lithologically similar to limestone in lower part of the St. Louis Limestone.

Middle Section-
In northwestern and northern parts of quadrangle unit consists mostly of dolomitic and calcareous siltstone interbedded with some beds of detrital limestone; elsewhere in quadrangle unit is detrital limestone with a few lenses and beds of dolomitic siltstone.

Lower Section-
Limestone, detrital (calcarenite), medium-dark-gray, coarse- to very coarse grained, thick-bedded, crossbedded; similar to limestone in upper part of formation. In most places limestone at base is in sharp contact with light-gray clastic limestone at top of the Fort Payne Formation. In eastern and northeastern parts of quadrangle limestone beds in lower part of unit interfinger with or grade into dolomitic siltstone that is included in the upper part of the Fort Payne. Description from source map: Glasgow South Quadrangle

Msw - Salem and Warsaw Limestones (Upper Mississippian)
Limestone and siltstone: Limestone, light-olive-gray to medium-gray and dark-gray; detrital (calcarenite), fine- to very coarse grained, locally crossbedded, fossiliferous, in places cherty; interbedded with and interfingers into olive-gray thin-bedded silty to very silty limestone, in places contains stringers and nodules of chert; similar in appearance to silty limestone in basal St. Louis. Calcareous siltstone, bluish-gray and gray, thin- to thick-bedded, commonly inter- fingers into and interbedded with calcarenite; siltstone contains abundant gypsum, calcite, and quartz geodes; weathers yellowish brown and yellowish gray. Lower part of formation not exposed. Description from source map: Hiseville Quadrangle

Msw - Salem and Warsaw Limestones (Upper Mississippian)
Limestone, dolomitic limestone, and dolomitic siltstone: Limestone (calcarenite), medium-brownish-gray to medium- olive-gray, medium- to coarse-grained, medium- to thick- bedded, moderately to strongly crossbedded; consists of well sorted angular to subangular fossil fragments cemented by minor amounts of calcareous and silty material. Dolomitic limestone, silty, light-yellowish-gray, consists of about 20 to 40 percent fossil fragments in a light-yellowish-gray, microcrystalline, calcareous matrix. Dolomitic siltstone is light yellowish gray to medium gray and is intercalated with limestone and dolomitic limestone. The horn coral Hapsiphyllum occurs throughout unit. Description from source map: Hudgins

Quadrangle

Msw - Salem and Warsaw Limestones (Upper Mississippian)
Upper Section-
Limestone, light-olive-gray to olive-gray, detrital (calcarenite), fine- to medium-grained, thin- to medium-bedded; interbedded with olive- gray. silty, thin-bedded limestone similar in appearance to limestone in the basal part of the St. Louis. Sparse stylolites, gypsum-filled fractures, gypsum geodes, and gypsum-lined quartz geodes.

Middle Section-
Limestone and siltstone: Limestone. medium-light-gray to medium-dark- gray, detrital (calcarenite), fine- to very coarse grained, thin- to very thick bedded; consists principally of well-sorted crinoid and brachiopod fragments; sparse stylolites. Siltstone, calcareous, and silty limestone, olive-gray and dark-olive-gray, thin-bedded. Abundant gypsum-filled fractures, small gypsum geodes, and gypsum-lined quartz geodes.

Lower Section-
Limestone and siltstone: Limestone, medium-light-gray to medium- dark-gray, detrital (calcarenite), thin- to medium-bedded, well-sorted; interbedded with siltstone, calcareous and dolomitic, light-gray to medium-dark-gray, thin- to medium-bedded; abundant fossil fragments, gypsum-filled fractures, and gypsum geodes. Lower contact is below lowest detrital limestone containing *Spirifer lateralis* Hall and *Spirifer washingtonensis* Weller and above silty and argillaceous dolomite of Fort Payne Formation. Locally contact is gradational. Description from source map: Lucas Quadrangle

Msw - Salem and Warsaw Limestones (Upper Mississippian)
Upper Section-
Limestone and siltstone interbedded: Limestone, medium- gray; weathers reddish brown; massively bedded, commonly crossbedded; coarse to medium grained; composed of fragments of brachiopods, bryozoans, crinoids, and other fossils. Locally layers 1 to 12 inches thick, parallel to bedding, are partially to completely silicified; completely silicified rock is uniformly dense, but outlines of detrital grains are still visible because of color differences between relict fragments; partially silicified rock weathers to porous masses of silicified fossil fragments. Siltstone is light to medium gray; weathers yellowish gray; massive to thin bedded: argillaceous, commonly dolomitic and (or) limy; some beds composed of thin irregular laminae that are contrasting values of gray; contains scattered quartz-lined geodes 1/2 to 3 inches in diameter, some of which contain calcite and (or) gypsum encrustations.

Lower Section-
Lower contact mapped at base of the lowest bioclastic limestone characteristic of unit; in the lower 5 to 20 feet of the unit this limestone is commonly interbedded with siltstone identical with siltstone in Fort Payne Formation. Description from source map: Meador Quadrangle

Mw - Warsaw Limestones (Upper Mississippian)
Limestone, detrital (calcarenite), yellowish-gray to light-gray, fine-to very coarse grained, massive to thin-bedded; silicified crinoid stems and brachiopod fragments make up much of the rock. In the upper 15 to 20 feet, detrital limestone in thin beds is interbedded with argillaceous and very fine grained limestone similar to beds in St. Louis Limestone. Detrital limestone occurs in massive beds as much as 25 feet thick below the uppermost 15 to 20 feet. In places light-yellowish-gray to light-gray fine- to medium-grained thin-bedded argillaceous dolomite is interbedded with detrital dolomitic limestone. Only upper part is exposed within quadrangle. Description from source map: Park City Quadrangle

Msw - Salem and Warsaw Limestones (Upper Mississippian)
Upper Section-
Limestone, detrital, dark-gray, medium- to very coarse grained, thick- bedded. Locally contains light-

gray, fine-grained argillaceous dolomite. Chert occurs sporadically. Crinoid stems and fragments of brachiopods are conspicuous on weathered surfaces.

Lower Section-
Limestone, detrital, gray, coarse- to very coarse grained, sparsely cherty, thick-bedded; similar to limestones above the argillaceous dolomite. Base is not exposed in the quadrangle. Description from source map: Polkville Quadrangle

Msw - Salem and Warsaw Limestones (Mississippian)
Limestone and shale: Limestone, medium-gray to dark-grayish- blue, medium- to coarsely crystalline, moderately thick- bedded; silty or sandy limestone at top of formation locally, and sporadic sandy crossbedded limestone lenses in lower part. Shale, calcareous, brownish-gray; weathers silver gray, locally fossiliferous; in southeastern part of quadrangle lower 30± feet of formation is generally brownish-gray calcareous silty shale. Description from source map: Sulphur Well Quadrangle

Msw - Salem and Warsaw Limestones (Upper Mississippian)
Limestone, medium-gray to grayish-brown, coarse- to very coarse grained, detrital, crossbedded; some beds composed largely of fossil fragments; locally argillaceous, shaly, and cherty. Contains beds or tongues of siltstone similar to those in the Fort Payne; siltstone present locally throughout the area mostly in middle and lower parts. Upper part locally contains dark-gray silty shale and sandy to silty calcareous shale. Upper few feet locally contains argillaceous limestone beds that interfinger with fine-grained limestone similar to the lower part of the St. Louis Limestone. Limestone commonly weathers to a light-red soil. Description from source map: Summer Shade Quadrangle

Msw - Salem and Warsaw Limestones (Upper Mississippian)
Limestone and siltstone: Limestone, detrital (calcarenite), medium-gray to grayish-brown; medium- to very coarse grained, medium- to thick-bedded; unit consists of well-sorted angular to subangular calcareous fossil fragments with a size range of 0.1 mm to 5.3 mm and a median size of about 1.4 mm; unit crossbedded with faint to prominent light-gray argillaceous and silty laminae 0.1 mm to 4 mm thick. Siltstone, dolomitic, light-yellowish-gray to medium- bluish-gray, massive to thin- and evenly bedded, thinly laminated, locally calcareous; occurs in beds and lenses up to 5 feet thick. Quartz geodes 1 to 3 inches in diameter occur throughout unit. In most places limestone at the base is in sharp contact with dolomitic siltstone of the Fort Payne Formation. However, near Kino and in western part of the quadrangle basal beds of detrital limestone in the Salem and Warsaw grade laterally into dolomitic siltstone which is included in the Fort Payne Formation. Consequently, the contact in these areas is stratigraphically higher. Description from source map: Temple Hill Quadrangle

Mds - Salem and Warsaw Limestones, dolomitic siltstone (Upper Mississippian)

Mwa - Warsaw Limestone, argillaceous dolomite member (Upper Mississippian)
Upper Section-
Argillaceous dolomite, light yellowish-gray, fine- to medium- grained, thin-bedded; contains quartz geodes 1 to 10 inches across, fragments of brachiopods, Bryozoa, and crinoid stems. Locally, the dolomite is interbedded with light yellowish-gray very coarse grained massively bedded detrital dolomite (calcarenite) and light-gray argillaceous dolomite. The unit has largely weathered to light reddish-brown soil with numerous geodes, but there are sparse outcrops along valley bottoms and in road cuts. The contact with over- and underlying units is sharp except locally where interbedded argillaceous dolomite and detrital dolomitic limestone give gradational contacts

Lower Section-

Detrital limestone, light yellowish- to brownish-gray, coarse- to very coarse-grained, massively bedded, with a few silicified fragments of brachiopods and crinoid stems protruding from weathered surfaces; locally unit is crossbedded and contains irregular masses of silicified brown fossiliferous limestone with abundant silicified cusp-shaped fragments of brachiopods and segments of crinoid stems. This detrital limestone layer, like the upper unit of the Warsaw limestones, is made up of angular to subangular sand-like fragments of calcareous fossils and is a calcarenite. The basal bed of this unit contains abundant silicified brachiopod fragments; this bed is useful as a marker horizon in outcrop and in soils. The limestone is largely weathered to reddish- brown soils; a few massive ledges crop out along steep slopes. Description from source map: Austin Quadrangle

ds - Salem and Warsaw Limestones, dolomitic siltstone (Upper Mississippian)
Dolomitic siltstone, light-yellowish-gray to medium-gray, banded by light- to medium-dark-gray laminae; quartz geodes 1 to 6 inches in diameter are irregularly distributed throughout unit. Weathers along laminae to shaly and flaggy fragments and to yellowish-brown residual soil. In southern part of quadrangle this unit is well exposed and forms moderate slopes between overlying and underlying limestones; elsewhere unit is poorly exposed and cannot be mapped. Description from source map: Glasgow South Quadrangle

cs - Salem and Warsaw Limestones, calcareous siltstone (Upper Mississippian)
Siltstone, calcareous, olive-gray and dark-olive-gray, thin- to very thick bedded; abundant fossil fragments, gypsum geodes, and gypsum- filled fractures. In places as much as 40 feet thick. Commonly contains beds and lenses of calcarenite which locally constitute more than half of unit. Where this interval is predominantly calcareous siltstone, it is mapped separately. Description from source map: Lucas Quadrangle

as - Salem and Warsaw Limestones, argillaceous siltstone (Upper Mississippian) Argillaceous siltstone similar to that in the rest of the unit; commonly contains a few interbeds of bioclastic limestone. Mapped only where it forms a well-developed and well- exposed unit. Description from source map: Meador Quadrangle

ar - Salem and Warsaw Limestones, argillaceous dolomite member (Upper Mississippian)
Dolomite, argillaceous, yellowish-tan to gray, fine- to medium-grained, thin-bedded; contains quartz-lined geodes. Fragments of brachiopods, bryozoans, and crinoid stems are common. Description from source map: Polkville Quadrangle

Mfp - Fort Payne Formation, undivided (Lower Mississippian)

Mf - Fort Payne Formation (Lower Mississippian)
Upper Section-
Interbedded cherty argillaceous dolomite and detrital dolomite: argillaceous dolomite, light yellowish-gray to medium- gray. fine- to medium-grained, medium-bedded, with quartz-lined geodes 1 to 6 inches across; detrital dolomite (dolomitic calcarenite), light yellowish-gray to light-gray, consisting of massively bedded poorly sorted, coarse angular fossil fragments (brachiopod, Bryozoa, and crinoid stem) ranging from less than 1/16 inch to as much as 1/4 inch. Chert is abundant in discontinuous and connecting lenses and contains silicified segments of crinoid stems 1/4 to 3/4 inch diameter. Unit is largely weathered to reddish-brown soil that contains irregular fossiliferous chert and segments of crinoid stems of more than 1/4 inch diameter.

Middle Sections-
Argillaceous dolomite, light yellowish-gray, very fine-grained, thick-bedded; contains quartz-lined geodes 1 to 6 inches across and a few lenses of light- to medium-gray crypto- crystalline chert. Medium-gray

argillaceous laminae give faint banded appearance to rock; weathering of these layers produces flaky fragments. This part of the formation is commonly sparingly fossiliferous and contains a few silicified fragments of Bryozoa, brachiopods, and segments of crinoid stems scattered throughout beds, but locally unit may be very fossiliferous. Outcrops are numerous, and the dolomite forms cliffs and ledges along most valleys. Unit weathers to yellowish-brown soil.

Dolomite, silicified, very fine-grained- to fine-grained, thick- bedded; contains quartz-lined geodes 1 to 4 inches across. Unit generally is made up of 40 to 50 percent chert which occurs as discontinuous and interconnecting lenses. The chert is white to dark gray, cryptocrystalline, and contains a few silicified crinoid stems; locally chert is virtually absent. Unit is generally very fossiliferous and contains conspicuous silicified segments of crinoid stems as much as 3/4 inch across, though locally fossils are sparse or absent. Outcrops are numerous in low cliffs and ledges along valley slopes and as undercut ledges in stream channels. Dolomite is moderately weathered to yellowish-brown soils containing abundant lenses and blocky fragments of chert.

Lower Section-
Shale, greenish-yellow with a few indistinct light greenish-gray silicified and pyritized lenses 2 to 8 inches long; weathers to greenish-gray soil; good exposures in recesses below ledges of cherty dolomite in stream channels. The contact of the Fort Payne formation with the Chattanooga shale is sharp and seems to be conformable Description from source map: Austin Quadrangle

Mfp - Fort Payne Formation (Lower Mississippian)
Siltstone and limestone: Dolomitic siltstone similar to that of Salem and Warsaw Limestones. Upper 1 to 5 feet of formation locally is a light- to medium-gray, coarse- to very coarse grained cherty, silicified, crinoidal limestone. Description from source map: Center Quadrangle

Mfp - Fort Payne Formation (Lower Mississippian)
Dolomite, light-olive-gray to olive-gray, silty and argillaceous, weathers yellowish gray; interbedded with light-greenish-gray to medium-gray detrital limestone (calcarenite), poorly sorted, thin- to medium-bedded, in places argillaceous; abundant gypsum geodes, quartz geodes, thin chert lenses and nodules, and silicified crinoid stem fragments as much as 1 inch in diameter occur throughout upper part of formation. Lower part of formation not exposed. Description from source map: Glasgow North Quadrangle

Mfp - Fort Payne Formation (Lower Mississippian)
Dolomitic limestone, clastic limestone, and dolomitic siltstone: Dolomitic limestone, cherty, banded by light-yellowish-gray to medium-dark- gray laminae, fine- to medium-grained, medium- to thick-bedded; consists of bioclastic material mostly less than 0.5 mm across cemented by a dolomitic silt matrix; a few large fragments of crinoid stems as much as ½ inch in diameter are scattered throughout beds; contains abundant lenses, nodules, and locally thin beds of gray chert. Chert comprises 20 to 40 percent of unit as nodules and lenses consisting of cores of dark-gray chert grading through shells of medium- gray chert that retain part of the relic texture of the dolomitic limestone into a zone of light-gray silicified detrital dolomitic limestone. Clastic limestone, light-yellowish-gray to light-gray, very coarse grained, very thick bedded to massive; locally crudely crossbedded; consists of poorly sorted fragments of crinoid stems and subordinate amounts of other fossil debris ranging from about 0.2 mm to as much as 4 cm across with a median size of about 2 mm. In eastern and southeastern parts of quadrangle limestone pinches out and upper part of formation consists of dolomitic limestone and dolomitic siltstone. Dolomitic siltstone is lithologically similar to that in the Salem and Warsaw Limestones. Formation is deeply weathered to yellowish-brown residual soil containing fragments and nodules of chert, quartz geodes, and silicified segments of crinoid stems as much as 1 inch in diameter. Base not exposed. Description from source map: Glasgow South Quadrangle

Mfp - Fort Payne Formation (Lower Mississippian)

Siltstone and limestone: Dolomitic siltstone similar to that of Salem and Warsaw Limestones. Upper 1 to 5 feet of formation is light- to medium-gray, coarse- to very coarse grained, cherty, silicified, crinoidal limestone. Description from source map: Hudgins Quadrangle

Mfp - Fort Payne Formation (Lower Mississippian)
Upper Section-
Limestone and dolomite: Limestone, light-olive-gray to medium-dark gray, detrital (calcarenite), thin- to medium-bedded, poorly sorted; thin argillaceous seams; interbedded with dolomite, silty and argillaceous, light-olive-gray to olive-gray, faintly laminated; weathers yellowish gray. Abundant gypsum-filled fractures, gypsum geodes, gypsum-lined quartz geodes, and chert lenses and blebs. Contains crinoid stem fragments as much as 1 inch in diameter.

Middle Sections-
Dolomite, interbedded argillaceous and silty, light-gray to medium-dark- gray, thin-bedded; weathers flaky.

Limestone and dolomite: Limestone, medium-bluish-gray and light-gray, fine- to coarse-grained; weathers yellowish gray; interbedded with dolomite, argillaceous and silty, medium-bluish-gray and greenish- gray. Chert blebs, silicified fossil fragments, abundant calcite seams, and gypsum and quartz geodes 1 to 4 inches in diameter throughout.

Lower Section-
Dolomite, medium-bluish-gray and greenish-gray, interbedded argillaceous and silty. Lower part of formation not exposed. Description from source map: Lucas Quadrangle

Mfp - Fort Payne Formation (Lower Mississippian)
Limestone, siltstone, and shale; interbedded in widely varying proportions. Limestone is light gray, coarse to fine grained; more poorly sorted and lighter colored than bioclastic limestone in the overlying unit; contains scattered crinoid stem segments and articulated sections of stems, many of them more than 3/8 inch in diameter, which are characteristic of this formation; grades into siltstone and locally into shale, and rocks of intermediate composition are common. Siltstone is like that in overlying unit. Shale is medium gray, fissile, commonly somewhat silty. Chert, some massive and some with relict clastic texture, occurs in irregular, discontinuous layers as much as 6 inches thick, especially in the more calcareous parts of the formation. Lower half of formation not exposed. Description from source map: Meador Quadrangle

Mfp - Fort Payne Formation (Mississippian)
Shale, siltstone, and limestone: Shale and siltstone, light-gray to brownish-gray; calcareous or dolomitic matrix; contains geodes 1 to 3 inches in diameter. Limestone, gray or brown, medium-crystalline, cherty: beds 2 to 6 inches thick interbedded in the shale or siltstone; in the northeast and east-central parts of the quadrangle where limestone is mapped separately it is light gray or brown, medium to coarsely crystalline, locally crossbedded; grades or tongues laterally into shale or siltstone. Locally very fossiliferous; Including brachiopods, bryozoans, corals, and crinoids. Lower part of formation not exposed, but well data indicate total thickness of formation is 325 to 350 feet. Description from source map: Sulphur Well Quadrangle

Mfp - Fort Payne Formation (Lower Mississippian)
Interbedded siltstone, silty shale, and limestone: Siltstone, light-yellowish-gray, medium- to dark-bluish-gray, dark- grayish-brown, massive to thinly even-bedded, finely laminated, locally calcareous or dolomitic; contains sparse glauconite. Silty shale, medium-gray to light-brown, finely laminated. Siltstone and silty shale intergrade laterally and vertically. Limestone, light-gray to dark-brown, detrital; locally argillaceous; occurs in beds and lenses; contains abundant bedded and nodular chert with relict texture of the enclosing limestone. Silicified crinoid-stem fragments as much as 3/4 inch in diameter are

conspicuous in most of the limestone. Geodes, mostly quartz but some mixed quartz and calcite, scattered throughout formation. Limestone lenses several tens of feet thick are present near the top in the extreme northeastern part of the quadrangle; thinner lenses and beds are present throughout the formation elsewhere. In the southwestern part of the quadrangle some limestone beds in the upper part represent tongues of the Salem and Warsaw as mapped farther west. The Fort Payne locally thickens at the expense of the Salem and Warsaw where limestone in the lower part of the Salem and Warsaw lenses out or grades laterally into siltstone which is included in the Fort Payne. Commonly weathers to reddish-yellow or grayish-yellow soil. Description from source map: Summer Shade Quadrangle

Mfp - Fort Payne Formation (Lower Mississippian)
Upper Section-
Dolomitic siltstone and detrital limestone: Dolomitic siltstone similar to that described above in the Salem and Warsaw Limestones. Detrital limestone, yellowish-gray to light- gray, very coarse grained, thin- to medium-bedded, consists of poorly sorted angular to subangular calcareous fossil fragments, about 0.4 mm to 3.5 cm in diameter. Detrital limestone in lower part grades laterally eastward into dolomitic siltstone. Unit weathers to residuum consisting of reddish-brown clay with irregular fragments of secondary chert, chert nodules, and quartz geodes. Large crinoid stems as much as 1 1/4 inches in diameter are characteristic of limestone, with a subordinate amount of brachiopods, bryozoans, and echinoderms.

Lower Section-
Dolomite, largely silicified, light-bluish-gray, very fine to medium-grained, medium-bedded to massive; relatively unfossiliferous except for a minor amount of silicified crinoid stems about 1/4 inch in diameter; numerous quartz geodes 1 to 3 inches in diameter occur throughout; contains abundant nodules and interconnected lenses of chert and local chert layers. Chert is white to light gray, fine grained, comprises 40 to 60 percent of unit; chert retains relic clastic texture of dolomite. Unit crops out only in southwestern part of quadrangle. Base not exposed. Description from source map: Temple Hill Quadrangle

Mfpl - Fort Payne Formation. limestone (Mississippian)

ls - Fort Payne Formation, limestone (Mississippian)
Limestone, gray or brown, medium-crystalline, cherty: beds 2 to 6 inches thick interbedded in the shale or siltstone; in the northeast and east-central parts of the quadrangle where limestone is mapped separately it is light gray or brown, medium to coarsely crystalline, locally crossbedded; grades or tongues laterally into shale or siltstone. Description from source map: Sulphur Well Quadrangle

Mhl - Harrodsburg Limestone, limestone lens (Mississippian)

Mhb - Harrodsburg Limestone (Mississippian)
Limestone and siltstone: Limestone, light-gray to very light gray, yellowish-gray, coarse- to very coarse grained, thick-bedded, locally thickly crossbedded, slightly siliceous, highly fossiliferous with crinoid columnals dominant; contains green glauconite specks near top. In northern part of Quadrangle, unit is entirely crinoidal limestone which is generally free of chert and geodes and lower contact is sharp where underlain by massive siltstone. Unit thins to south and loses its homogeneous character. Crinoidal limestone forms a persistent layer in top 10 to 20 feet below, layers or lenses of siltstone alternate with limestone to form an interfingering or, in places, a gradational lower contact. In this, the contact is drawn arbitrarily to maintain pre-dominant crinoidal limestone lithology for the unit. Siltstone, light-olive-gray, drab brownish-gray, thin-bedded, calcareous, siliceous; generally in layers 5 feet or less thick; spalls on weathering. Thin beds of light-olive-gray medium-grained limestone occur in unit especially in areas of

alternating limestone and siltstone. In these areas scattered geodes are present and medium-grained limestone may be silicified in part to a bluish, textured chert. Springs are common at base of unit. Forms steep slopes with ledges, especially on south- and west-facing slopes. Description from source map: Hodgenville Quadrangle

ls - Harrodsburg Limestone, limestone lens (Mississippian)
Limestone, medium-light- to light-gray, coarse- to very coarse grained, slightly siliceous; fossiliferous, crinoid stems dominant fossils. Outcrops limited to small areas where Lynn Camp and Brush Creeks and tributaries cut the anticline in the area of the Magnolia gas storage field. Because of poor exposures, especially at base, thickness of unit not accurately determined but thought to be less than 20 feet. Unit mapped with the underlying Muldraugh Member of the Borden Formation. The 35 feet of limestone mapped at Lynn Camp Creek is probably mostly upper Muldraugh and is similar to limestone lenses found in the upper part of the Borden Formation in Hodgenville quadrangle (Moore, 1968). Description from source map: Magnolia Quadrangle

Mb - Borden Formation, undivided (Mississippian)

Mb - Borden Formation (Mississippian)
Siltstone and limestone: Siltstone is light olive gray, drab brownish gray, thin to irregularly bedded, very siliceous, dolomitic or weakly calcareous in part; contains numerous quartz-lined geodes and a few fine-grained sandstone layers or lenses; generally weathers massive, spally. Forms steep slopes (Muldraugh Escarpment) with few outcrops and steeply plunging gullies with smooth U-shaped transverse profiles. Limestone is of two types. Coarse-grained, thick-bedded, crinoidal limestone similar to the Harrodsburg Limestone occurs in lenses mostly less than 30 feet thick in the upper 60 feet of the member. Light-olive-gray, medium-to fine-grained, thin-bedded, silty limestone also occurs in upper 60 feet and, in places, occupies entire interval. Unit is irregularly silicified; silicification most notable in upper part where limestone, especially silty type, has been converted in places to bluish textured chert in zones one foot or more thick. Siltstone, also silicified, contains thin, irregular chert layers. Crinoidal limestone more resistant to silicification; may be relatively unaffected even in areas of high silicification. Limestone bodies shown on map only where encountered in mapping traverse and where at least 30 feet thick. Lower contact in most places is sharp. This unit is equivalent to the Muldraugh Member of the Borden Formation in quadrangles adjoining on north and east. The upper part where highly silicified is lithologically similar to the Muldraugh Formation at its type section (Stockdale. 1939) and to the Muldraugh Member of the Borden Formation as redefined by Weir and others (1966). However, the lower part of the unit more strongly resembles the Halls Gap Member of the Borden Formation (Weir and others, 1966) which underlies the Muldraugh Member at its type locality. Description from source map: Hodgenville Quadrangle

Mbm - Borden Formation, Muldraugh Member, includes Harrodsburg Limestone at top (Mississippian)

Mbm - Muldraugh Member of Borden Formation (Includes Harrodsburg Limestone at top) (Mississippian)
Siltstone and limestone: Siltstone, light-olive-gray, brownish- gray, siliceous; dolomitic or weakly calcareous; contains numerous geodes and a few fine-grained sandstone layers or lenses. Limestone, medium-light-to light-gray, coarse-grained, crinoidal; resembles the Harrodsburg Limestone. Crops out in small areas along Lynn Camp Creek and tributaries. Base not exposed. Unit is equivalent to upper part of Fort Payne Formation in quadrangles to the south. Description from source map: Magnolia Quadrangle

Mbls - Borden Formation, limestone (Mississippian)

ls - Borden Formation, limestone (Mississippian)
Siltstone and limestone: Siltstone is light olive gray, drab brownish gray, thin to irregularly bedded, very siliceous, dolomitic or weakly calcareous in part; contains numerous quartz-lined geodes and a few fine-grained sandstone layers or lenses; generally weathers massive, spally. Forms steep slopes (Muldraugh Escarpment) with few outcrops and steeply plunging gullies with smooth U-shaped transverse profiles. Limestone is of two types. Coarse-grained, thick-bedded, crinoidal limestone similar to the Harrodsburg Limestone occurs in lenses mostly less than 30 feet thick in the upper 60 feet of the member. Light-olive-gray, medium-to fine-grained, thin-bedded, silty limestone also occurs in upper 60 feet and, in places, occupies entire interval. Unit is irregularly silicified; silicification most notable in upper part where limestone, especially silty type, has been converted in places to bluish textured chert in zones one foot or more thick. Siltstone, also silicified, contains thin, irregular chert layers. Crinoidal limestone more resistant to silicification; may be relatively unaffected even in areas of high silicification. Limestone bodies shown on map only where encountered in mapping traverse and where at least 30 feet thick. Lower contact in most places is sharp. This unit is equivalent to the Muldraugh Member of the Borden Formation in quadrangles adjoining on north and east. The upper part where highly silicified is lithologically similar to the Muldraugh Formation at its type section (Stockdale. 1939) and to the Muldraugh Member of the Borden Formation as redefined by Weir and others (1966). However, the lower part of the unit more strongly resembles the Halls Gap Member of the Borden Formation (Weir and others, 1966) which underlies the Muldraugh Member at its type locality. Description from source map: Hodgenville Quadrangle

Mbs - Borden Formation, shale member (Mississippian)

Mbs - Borden Formation, shale member (Mississippian)
Shale, greenish-gray, locally silty in upper part, obscurely bedded, poorly indurated. Exposed only along deeply cutting streams at east edge of the quadrangle. Upper contact rises sharply to northeast at northeast corner of quadrangle. In this corner, 2- to 3-inch seam of glauconite at top is exposed along southeast side of Knob Creek. Although obscured by rubble elsewhere in quadrangle, glauconite seam is considered characteristic of top for areas adjacent to north and to east. Base not exposed. Thickness estimated from subsurface data. Description from source map: Hodgenville Quadrangle

Dc - Chattanooga Shale (Upper Devonian)

Dc - Chattanooga shale (Upper Devonian)
Shale, dark-gray, thinly laminated. The lower 10 feet of unit contains discontinuous tenses 1/4 to 6 inches thick of light- gray medium-grained sandstone. Marcasite occurs as nodules and as discontinuous laminae parallel to the laminations in the shale; locally a few aggregates of cubic pyrite are disseminated throughout unit, and freshly crushed shale has a fetid odor. In fresh exposures the shale breaks along laminations into regular Baggy fragments 1/16 to 1/2 inch in thickness and on weathered surfaces it is exposed as a mass of papery fissile fragments less than 1/26 of an inch thick. The shale is sparingly fossiliferous and contains a few impressions of worm trails and sporadic concentrations of small linguloidal brachiopods at some horizons. The Chattanooga shale is not deeply weathered and crops out in numerous exposures in stream channels and along steep valley slopes, though locally it is deeply weathered on gentler slopes to a reddish-yellow soil that completely mantles its exposures. Description from source map: Austin Quadrangle

Dsj - Equivalents of Sellersburg and Jeffersonville (?) Limestones (Middle Devonian)

Dsj - Equivalents of Sellersburg and Jeffersonville (?) limestones (Middle Devonian)
Upper Section-
Dolomite, silty, argillaceous, medium to dark-gray; 10 to 20 percent of unit consists of prismatic crystals of dolomite 1 to 4 mm across. Locally unit is made up of alternating laminations of dark-gray argillaceous and silty dolomite and medium-gray silty dolomite. Irregular aggregates as much as one inch across of dolomite crystals are scattered throughout unit. Marcasite occurs as laminae and nodules, particularly in the laminated part of the dolomite. The basal contact of this unit is unconformable.

Lower Section-
Detrital limestone, partially recrystallized, light yellowish- to brownish-gray, thick-bedded with wavy and regular laminations 1/16 to 1/2 inch thick. A few crinoid stems and conspicuous horn corals are scattered throughout unit; crinoid stems are concentrated locally. The unit occurs only in the southern part of the quadrangle and rests unconformably on the Laurel dolomite. In the northern part of the quadrangle it was either removed by erosion that preceded deposition of the Chattanooga shale or was not deposited. Description from source map: Austin Quadrangle

Sl - Laurel Dolomite (Middle Silurian)

Sl - Laurel dolomite (Middle Silurian)
Dolomite, greenish-gray- to yellowish-gray, fine- to medium- grained, with saccharoidal texture; massively bedded, with conspicuous nodular aggregates of dolomite crystals scattered throughout unit. Weathered surfaces are faintly laminated by yellowish-gray and greenish-gray slightly argillaceous bands. Base of unit is not exposed in area mapped. Description from source map: Austin Quadrangle

Geologic Cross Sections

The geologic cross sections present in the GRI digital geologic-GIS data produced for Mammoth Cave National Park, Kentucky (MACA) and Abraham Lincoln Birthplace Nation Historical Park are presented below. Note that some cross section abbreviations (e.g., A - A') may have been changed from their source map abbreviation in the GRI data so that each cross section abbreviation in the GRI data is unique. Cross section graphics were scanned at a high resolution and can be viewed opening the attached PDF associated with each cross section.

Cross Section A-A'

Cross Section A-A' (double-click link to open the embedded document).

Graphic from source map: Hodgenville Quadrangle.

Cross Section B-B'

Cross Section B-B' (double-click link to open the embedded document).

Graphic from source map: Millerstown Quadrangle. Cross section A-A' on source map.

Cross Section C-C'

Cross Section B-B' (double-click link to open the embedded document).

Graphic from source map: Upton Quadrangle. Cross section A-A' on source map.

Cross Section D-D'

Cross Section D-D' (double-click link to open the embedded document).

Graphic from source map: Hammonville Quadrangle. Cross section A-A' on source map.

Cross Section E-E'

Cross Section E-E' (double-click link to open the embedded document).

Graphic from source map: Bee Spring Quadrangle. Cross section A-A' on source map.

Cross Section F-F'

Cross Section F-F' (double-click link to open the embedded document).

Graphic from source map: Nolin Reservoir Quadrangle. Cross section A-A' on source map.

Cross Section G-G'

Cross Section G-G' (double-click link to open the embedded document).

Graphic from source map: Cub Run Quadrangle. Cross section A-A' on source map.

Cross Section H-H'

Cross Section H-H' (double-click link to open the embedded document).

Graphic from source map: Cub Run Quadrangle. Cross section B-B' on source map.

Cross Section I-I'

Cross Section I-I' (double-click link to open the embedded document).

Graphic from source map: Munfordville Quadrangle. Cross section A-A' on source map.

Cross Section J-J'

Cross Section J-J' (double-click link to open the embedded document).

Graphic from source map: Canmer Quadrangle. Cross section A-A' on source map.

Cross Section K-K'

Cross Section K-K' (double-click link to open the embedded document).

Graphic from source map: Morgantown Quadrangle. Cross section A-A' on source map.

Cross Section L-L'

Cross Section L-L' (double-click link to open the embedded document).

Graphic from source map: Riverside Quadrangle. Cross section A-A' on source map.

Cross Section M-M'

Cross Section M-M' (double-click link to open the embedded document).

Graphic from source map: Reedyville Quadrangle. Cross section A-A' on source map.

Cross Section N-N'

Cross Section N-N' (double-click link to open the embedded document).

Graphic from source map: Reedyville Quadrangle. Cross section B-B' on source map.

Cross Section O-O'

Cross Section O-O' (double-click link to open the embedded document).

Graphic from source map: Brownsville Quadrangle. Cross section A-A' on source map.

Cross Section P-P'

Cross Section P-P' (double-click link to open the embedded document).

Graphic from source map: Brownsville Quadrangle. Cross section B-B' on source map.

Cross Section Q-Q'

Cross Section Q-Q' (double-click link to open the embedded document).

Graphic from source map: Rhoda Quadrangle. Cross section A-A' on source map.

Cross Section R-R'

Cross Section R-R' (double-click link to open the embedded document).

Graphic from source map: Mammoth Cave Quadrangle. Cross section A-A' on source map.

Cross Section S-S'

Cross Section S-S' (double-click link to open the embedded document).

Graphic from source map: Horse Cave Quadrangle. Cross section A-A' on source map.

Cross Section T-T'

Cross Section T-T' (double-click link to open the embedded document).

Graphic from source map: Park Quadrangle. Cross section A-A' on source map.

Cross Section U-U'

Cross Section U-U' (double-click link to open the embedded document).

Graphic from source map: Center Quadrangle. Cross section A-A' on source map.

Cross Section V-V'

Cross Section V-V' (double-click link to open the embedded document).

Graphic from source map: Hadley Quadrangle. Cross section A-A' on source map.

Cross Section W-W'

Cross Section W-W' (double-click link to open the embedded document).

Graphic from source map: Bowling Green North Quadrangle. Cross section A-A' on source map.

Cross Section X-X'

Cross Section X-X' (double-click link to open the embedded document).

Graphic from source map: Bristow Quadrangle. Cross section A-A' on source map.

Cross Section Y-Y'

Cross Section Y-Y' (double-click link to open the embedded document).

Graphic from source map: Smiths Grove Quadrangle. Cross section A-A' on source map.

Cross Section Z-Z'

Cross Section Z-Z' (double-click link to open the embedded document).

Graphic from source map: Park City Quadrangle. Cross section A-A' on source map.

Cross Section AA-AA'

Cross Section AA-AA' (double-click link to open the embedded document).

Graphic from source map: Glasgow North Quadrangle. Cross section A-A' on source map.

Cross Section BB-BB'

Cross Section BB-BB' (double-click link to open the embedded document).

Graphic from source map: Hiseville Quadrangle. Cross section A-A' on source map.

Cross Section CC-CC'

Cross Section CC-CC' (double-click link to open the embedded document).

Graphic from source map: Sulphur Well Quadrangle. Cross section A-A' on source map.

Cross Section DD-DD'

Cross Section DD-DD' (double-click link to open the embedded document).

Graphic from source map: Bowling Green South Quadrangle. Cross section A-A' on source map.

Cross Section EE-EE'

Cross Section EE-EE' (double-click link to open the embedded document).

Graphic from source map: Polkville Quadrangle. Cross section A-A' on source map.

Cross Section FF-FF'

Cross Section FF-FF' (double-click link to open the embedded document).

Graphic from source map: Meador Quadrangle. Cross section A-A' on source map.

Cross Section GG-GG'

Cross Section GG-GG' (double-click link to open the embedded document).

Graphic from source map: Lucas Quadrangle. Cross section A-A' on source map.

Cross Section HH-HH'

Cross Section HH-HH' (double-click link to open the embedded document).

Graphic from source map: Glasgow South Quadrangle. Cross section A-A' on source map.

Cross Section II-II'

Cross Section II-II' (double-click link to open the embedded document).

Graphic from source map: Temple Hill Quadrangle. Cross section A-A' on source map.

Cross Section JJ-JJ'

Cross Section JJ-JJ' (double-click link to open the embedded document).

Graphic from source map: Summer Shade Quadrangle. Cross section A-A' on source map.

Cross Section KK-KK'

Cross Section KK-KK' (double-click link to open the embedded document).

Graphic from source map: Austin Quadrangle. Cross section A-A' on source map.

Ancillary Source Map Information

The following sections present ancillary source map information associated with sources used for this project.

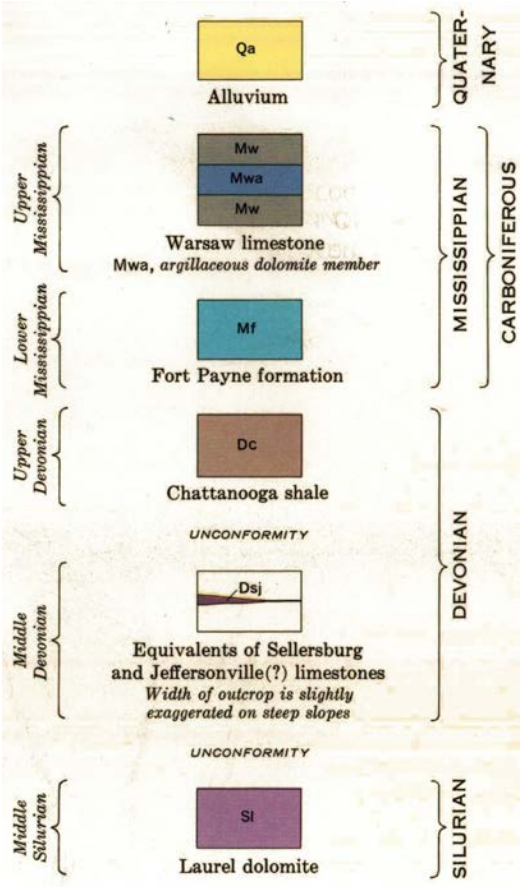
Austin Quadrangle

The formal citation for this source.

> Moore, S.L., 1961, Geology of the Austin Quadrangle, Kentucky: U.S. Geological Survey, Geologic Quadrangle Map GQ-173, scale 1:24,000 (*GRI Source Map ID 2761*).

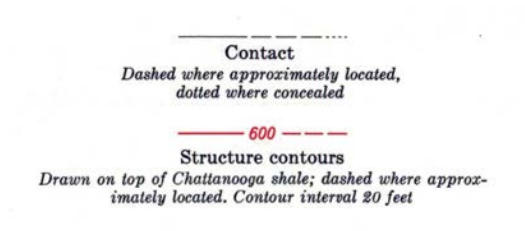
Prominent graphics and text associated with this source:

Correlation of Map Units



Graphic from source map: Austin Quadrangle

Map Legend



Graphic from source map: Austin Quadrangle

Economic Geology

Oil has been produced from several wells in the northwestern part of the Austin quadrangle, but there is no known production at present. The oil reportedly came from beds less than 200 feet below the Chattanooga shale. Oil is produced from areas adjacent to the Austin quadrangle, and the structural configuration of the surface rocks as depicted by structure contours on the accompanying map may help guide exploration within the quadrangle. In many oil and gas producing areas, upwarps of the rocks (anticlines and other structural "highs") are more favorable than downwarps. In this quadrangle there are several anticlines or domes. One of the more extensive of these structures trends and plunges irregularly from the village of Austin westward to Devasher School, thence northwestward to the western edge of the quadrangle and into the adjacent Scottsville quadrangle, where it passes into an oil-producing area in the vicinity of the town of Gainesville. Structurally high areas in the Austin quadrangle generally coincide with the topographically high areas, such as those near the old Austin High School and near Pleasant Home Church along the eastern edge of the quadrangle, and near Durham Springs Church in the southwestern part of the quadrangle. A small anticline that is believed to have a small amount of structural closure is present just south of Hicks Island in the central part of the quadrangle.

The limestone and dolomite that crop out in the quadrangle have not been exploited, and most of these rocks are too shaly or cherty for most industrial uses. The lower 50 to 60 feet of the Warsaw limestone, however, is relatively free of shale and chert and is hard and crystalline. It crops out in bluffs 10 to 20 feet high south of the Barren River in the northwest corner of the quadrangle and in thinner ledges along the headwaters of Solomon Creek near the western edge of the quadrangle. The Laurel dolomite is free of shale and relatively free of chert, but most of it underlies heavy overburden in the quadrangle.

Text from source map: Austin Quadrangle

Stratigraphic Section

Stratigraphic Section (double-click link to open the embedded document).

Graphic from source map: Austin Quadrangle

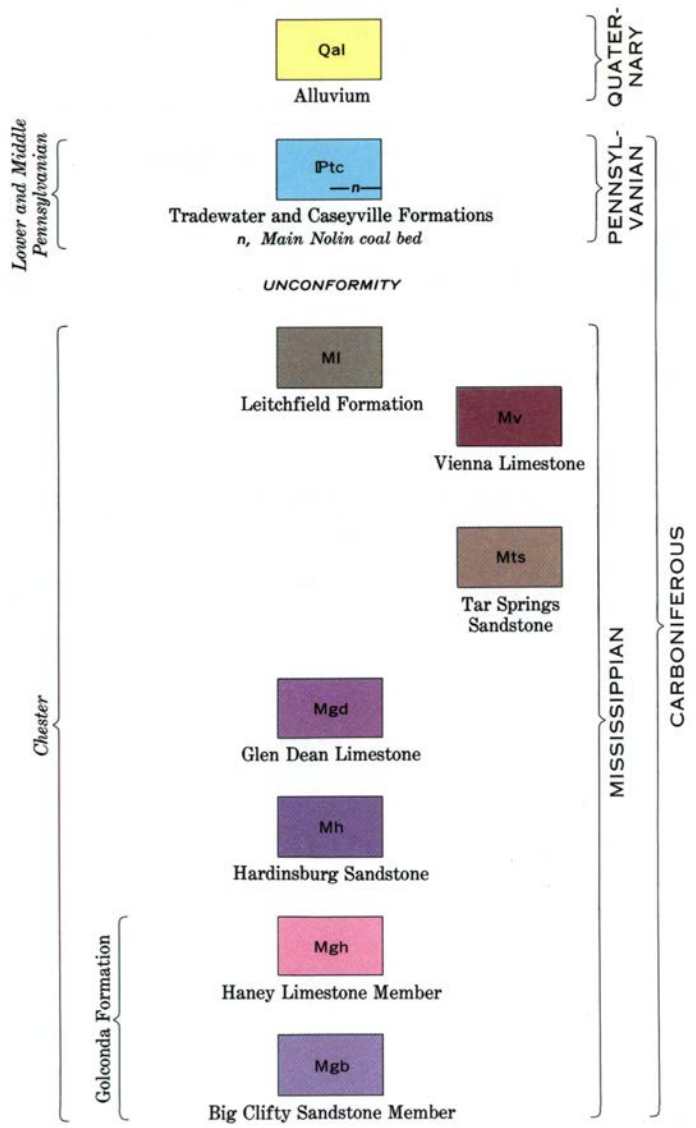
Bee Spring Quadrangle

The formal citation for this source.

> Gildersleeve, Benjamin, 1968, Geologic Map of the Bee Spring Quadrangle, Edmonson and Grayson Counties, Kentucky: U.S. Geological Survey, Geologic Quadrangle Map GQ-757, scale 1:24,000 (*GRI Source Map ID 1156*).

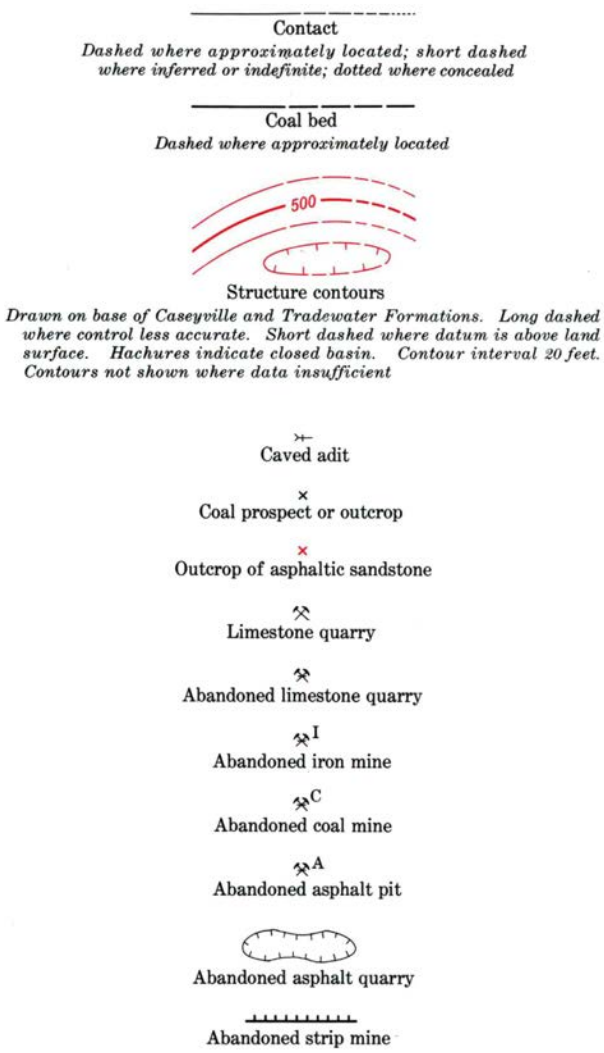
Prominent graphics and text associated with this source:

Correlation of Map Units



Graphic from source map: Bee Spring Quadrangle

Map Legend



Graphic from source map: Bee Spring Quadrangle

References

Brown, R. F., and Lambert, T. W., 1962, Availability of ground water in Allen, Barren, Edmonson, Green, Hart, Logan, Metcalf, Monroe, Simpson, and Warren Counties, Kentucky: U.S. Geol. Survey Hydrol. Inv. Atlas HA-32.

McFarlan, A. C., 1943, Geology of Kentucky: Lexington, Univ. Kentucky, 531 p.

Moore, P. N., 1877, On the geology of the Noun River district, embracing portions of Grayson, Edmonson, Hart, and Butler Counties: Kentucky Geol. Survey, new ser. v. 2, pt. 2, 56 p.

Weller, J. M., 1927, The geology of Edmonson County: Kentucky Geol. Survey, ser. 6, v. 28, 246 p.

References from source map: Bee Spring Quadrangle

Economic Geology

The Glen Dean Limestone is quarried 1 ½ miles southeast of Bee Spring at the junction of Big Branch and Dismal Creek. Large openings have been made in the high ridges on both sides of Dismal Creek. Crushed stone is produced for road metal and aggregate. A small quarry, now abandoned, was opened in limestone of the Leitchfield Formation on the east side of Bear Creek midway between Sunfish and Bee Spring.

Natural rock asphalt occurs mainly in the basal part of the Caseyville Formation. The deposits consist of fine- to medium-grained, thin- to thick bedded sandstone and conglomeratic sandstone impregnated with bitumen. Bitumen content varies from a trace to amounts sufficient to fill spaces between sand grains. The deposits thin and thicken abruptly and rich concentrations are separated by lean or barren sandstone. Surfaces of freshly broken rock are jet black and almost all the sand grains are completely coated with bitumen. Outcrops of richer parts of asphalt rock have tar-like streaks of bitumen caused by “bleeding" during hot weather. Outcrops of ‘leaner’ rock are gray to grayish black depending upon the extent to which they have been leached and bleached by weathering.

The annual state production of rock asphalt for paving material during the high record period of 1925-1930 exceeded 300,000 tons valued In excess of $2,700,000 (McFarlan 1943, p. 383).

Quarries in the Bee Spring quadrangle contributed more than half this production. The principal quarries (abandoned since about 1930) are on the north side of Beaverdam Creek at Black Gold, between Black Gold and Sweeden, at Kyrock, and on the east side of Dismal Creek, 1 ½ miles northeast of Bee Spring.

Coal has been mined from the Tradewater and Caseyville Formations; most of the production was from the Main Nolin coal bed which occurs in the lower part of the shale unit overlying the basal sandstone and conglomerate. It was exploited most extensively in the Dismal Creek area by strip mines and underground workings. In outcrop the coal bed ranges in thickness from 24 to 48 inches and averages about 30 to 36 inches thick. No coal mines were in operation in the quadrangle during the geologic mapping.

The “iron ores” of the quadrangle are of historical interest but are not economically important. Limonite and siderite deposits furnished much of the iron ore used to make cold blast iron in the Nolin Furnace (known locally as the Baker Furnace) 1 ¾ miles east of Broadway near the mouth of Davis Creek in the adjoining Nolin Reservoir (formerly Dickeys Mills) quadrangle. This furnace, built about 1846, was not operated after 1850 (written communication, C. E. Whittle, 1962). The furnace is now covered by Nolin Lake except during periods of draw down. During the recent mapping only one of the ore banks described in the literature (Moore, 1877, and Weller, 1927) was located, with the aid of local residents. No ore was found near the pit which was filled with water.

Several exploratory oil wells have been drilled in the quadrangle to depths exceeding 1,600 feet but none yielded commercial quantities of oil.

Ground water resources are described in a report by Brown and Lambert (1962).

Text from source map: Bee Spring Quadrangle

Stratigraphic Section

Stratigraphic Section (double-click link to open the embedded document).

Graphic from source map: Bee Spring Quadrangle

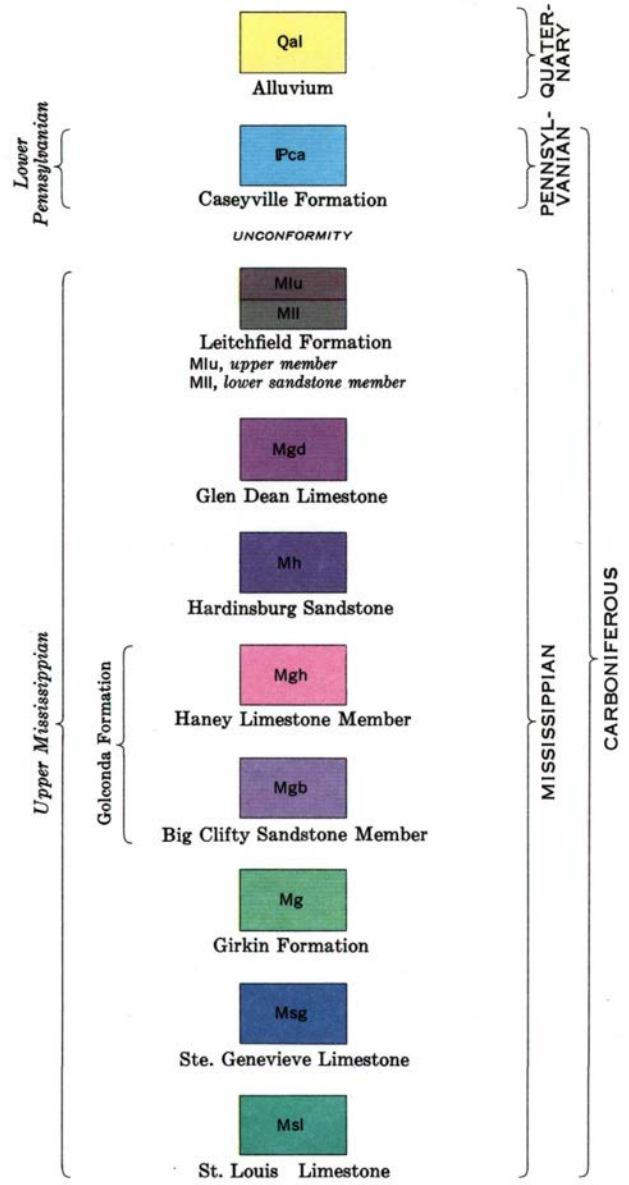
Bowling Green North Quadrangle

The formal citation for this source.

> Shawe, F.R., 1963, Geology of the Bowling Green North Quadrangle, Kentucky: U.S. Geological Survey, Geologic Quadrangle Map GQ-234, scale 1:24,000 (*GRI Source Map ID 2770*).

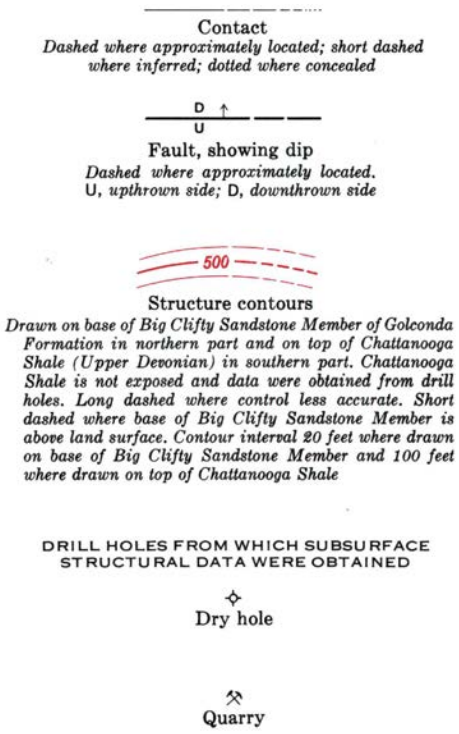
Prominent graphics and text associated with this source:

Correlation of Map Units



Graphic from source map: Bowling Green North Quadrangle

Map Legend



Graphic from source map: Bowling Green North Quadrangle

References

Malott, C. A, 1919, The “American Bottoms” region of eastern Greene County, Indiana—a type unit in southern Indiana physiography: Indiana Univ. Studies, v. 6, no. 40, 61 p.

Weller, J. M, 1927, The geology of Edmonson County: Kentucky Geol. Survey, Ser. 6, v. 28, 246 p.

References from source map: Bowling Green North Quadrangle

Economic Geology

Limestone quarrying is the most important mineral industry. During 1960 and 1961, one quarry near Bowling Green was in operation and furnished crushed and sized aggregate, building stone, and agricultural limestone for local use. The limestone is quarried principally from the Ste. Genevieve Limestone, but a little comes from the basal part of the Girkin Formation. Production is a few hundred tons daily.

Limestone has been quarried from the Glen Dean Limestone near Richardsville. Much of the Haney Limestone Member of the Golconda Formation and much of the St. Louis Limestone are also suitable for use as aggregate and agricultural limestone. Large tonnages of high-calcium limestone are available in the Ste. Genevieve Limestone and probably in the Girkin Formation. oolitic limestone from both the Ste. Genevieve and the Girkin makes good dimension stone, and many attractive buildings in Bowling Green are made from this stone.

Oil is produced from several wells in the quadrangle. Production is obtained from the Salem and Warsaw Limestones of Late Mississippian age, which lie directly beneath the St. Louis Limestone, and from three zones below the Chattanooga Shale of Late Devonian age. Little is known of the oil reservoirs; apparently most of the oil is produced from small stratigraphic traps. Most of the wells produce less than 5 barrels per day. Rarely does a well produce more, and then the higher production is short lived. The product is a lightweight oil.

During the 1920's, this area experienced an oil boom and more than a thousand wells were drilled in the area immediately north of Bowling Green. Production was mainly from three zones below the Chattanooga Shale, locally called the first, second, and third "Corniferous." The deepest zone was less than 200 feet below the base of the Chattanooga. Very few logs or production records of these wells are available.

Small amounts of coal have been mined for local consumption from the upper part of the Big Clifty Sandstone Member of the Golconda Formation. The coal occurs in thin and discontinuous seams and has a rather high ash content.

Thin beds of asphalt-bearing sandstone reportedly have been found in the Hardinsburg Sandstone near Anna. These beds are not commercial at present.

Excavations for footings in bedrock for large buildings and industrial installations may encounter cavities in the St. Louis and Ste. Genevieve Limestones. Cavities may be present at altitudes as low as 410 feet (the approximate low level of the Barren River). Some of these cavities are large; many caves in the area are known to extend thousands of feet from their entrances.

Text from source map: Bowling Green North Quadrangle

Stratigraphic Section

Stratigraphic Section (double-click link to open the embedded document).

Graphic from source map: Bowling Green North Quadrangle

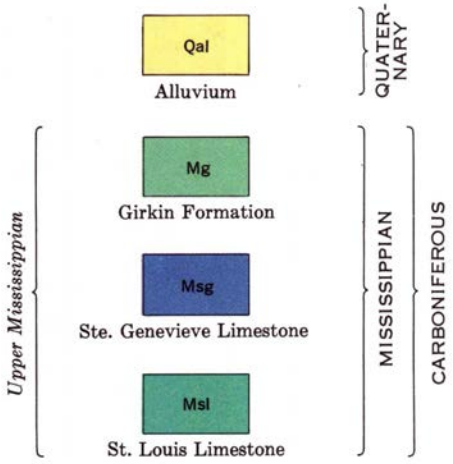
Bowling Green South Quadrangle

The formal citation for this source.

Shawe, F.R., 1963, Geology of the Bowling Green South Quadrangle, Kentucky: U.S. Geological Survey, Geologic Quadrangle Map GQ-235, scale 1:24,000 (*GRI Source Map ID 2771*).

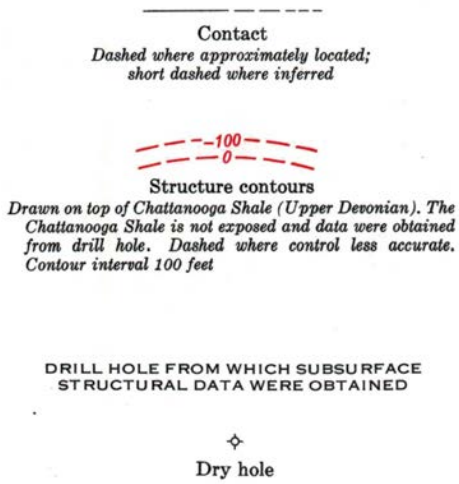
Prominent graphics and text associated with this source:

Correlation of Map Units



Graphic from source map: Bowling Green South Quadrangle

Map Legend



Graphic from source map: Bowling Green South Quadrangle

References

Weller, J. M., 1927, The geology of Edmonson County: Kentucky Geol. Survey, Ser. 6, v. 28, 246 p.

References from source map: Bowling Green South Quadrangle

Economic Geology

Oil is produced from several wells in the northwest part of the quadrangle. Very few data are available as to the nature of the oil traps; apparently production is from both structural and stratigraphic traps. Production is obtained principally from the Salem and Warsaw Limestones of Late Mississippian age and from three zones—locally called the first, second, and third “Corniferous sands” —all within about 200 feet below the base of the Chattanooga Shale of Late Devonian age. Most wells generally produce less than five barrels per day; the product is a lightweight oil.

Since about 1920, probably hundreds of wells scattered over the quadrangle have been drilled. Production from individual wells has been small and short lived.

No limestone quarries are in operation within the quadrangle, but limestone has been quarried from the Ste. Genevieve Limestone and the St. Louis Limestone for use as aggregate and agricultural limestone. Much of the limestone from these two formations is suitable for aggregate, agricultural uses, and building stone and high-calcium limestone is probably available in the Ste. Genevieve Limestone. However, much of the St. Louis and Ste. Genevieve is deeply weathered and covered by thick residual soil.

Excavations for footings in bedrock for large buildings and industrial installations may encounter cavities in the St. Louis and Ste. Genevieve Limestones. Cavities may be present at altitudes as low as 410 feet (the approximate low level of the Barren River). One cavity, the cave at Lost River, has a volume greater than 100,000 cubic feet.

Text from source map: Bowling Green South Quadrangle

Stratigraphic Section

Stratigraphic Section (double-click link to open the embedded document).

Graphic from source map: Bowling Green South Quadrangle

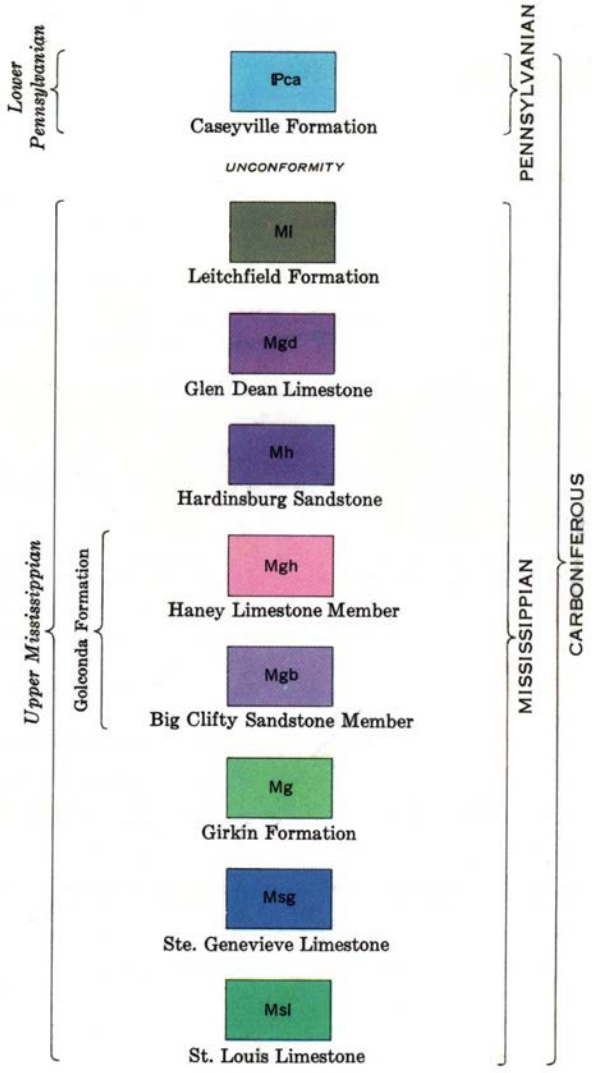
Bristow Quadrangle

The formal citation for this source.

> Gildersleeve, Benjamin, 1963, Geology of the Bristow Quadrangle, Kentucky: U.S. Geological Survey, Geologic Quadrangle Map GQ-216, scale 1:24,000 (*GRI Source Map ID 2746*).

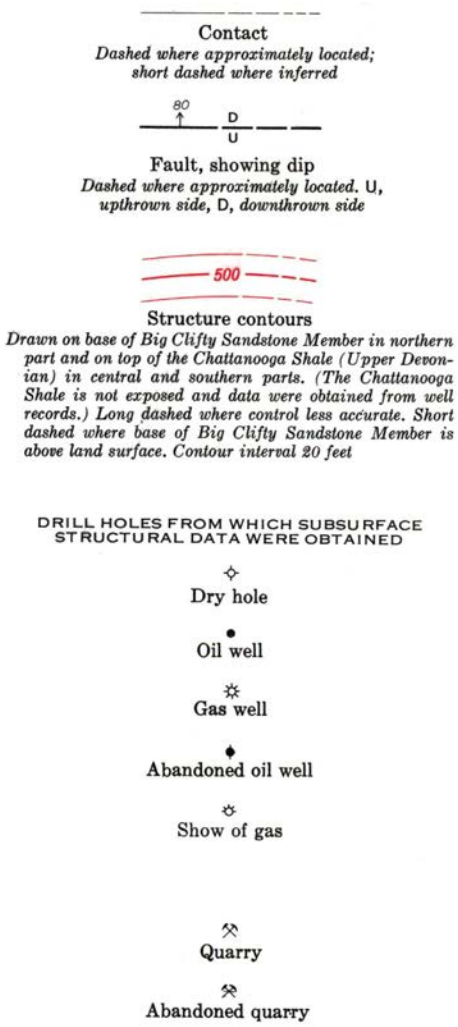
Prominent graphics and text associated with this source:

Correlation of Map Units



Graphic from source map: Bristow Quadrangle

Map Legend



Graphic from source map: Bristow Quadrangle

Economic Geology

The principal mineral resources of the quadrangle are limestone, oil, and gas. Extensive deposits of residual clay, of undetermined value, are widespread. The only active stone quarry is at the southwestern edge of the quadrangle between U.S. Highway 31 W and the Louisville and Nashville Railway. Here the St. Louis and Ste. Genevieve Limestones are quarried and crushed for road metal, agricultural lime, and building material. Formerly small quarries were worked north of U.S. Highway 31 W in limestones of the Ste. Genevieve and Girkin Formations and in the Haney Limestone Member of the Golconda Formation. A few oil wells, pumped intermittently, yield a small production from the driller's "Beaver sand" near the base of the Salem and Warsaw Limestones of Late Mississippian age. The small gas production is from rocks of Devonian or Silurian age and is consumed locally. Asphaltic sandstone in the Caseyville Formation, of very limited extent, has been prospected north of Pine Grove Church.

Text from source map: Bristow Quadrangle

Stratigraphic Section

Stratigraphic Section (double-click link to open the embedded document).

Graphic from source map: Bristow Quadrangle

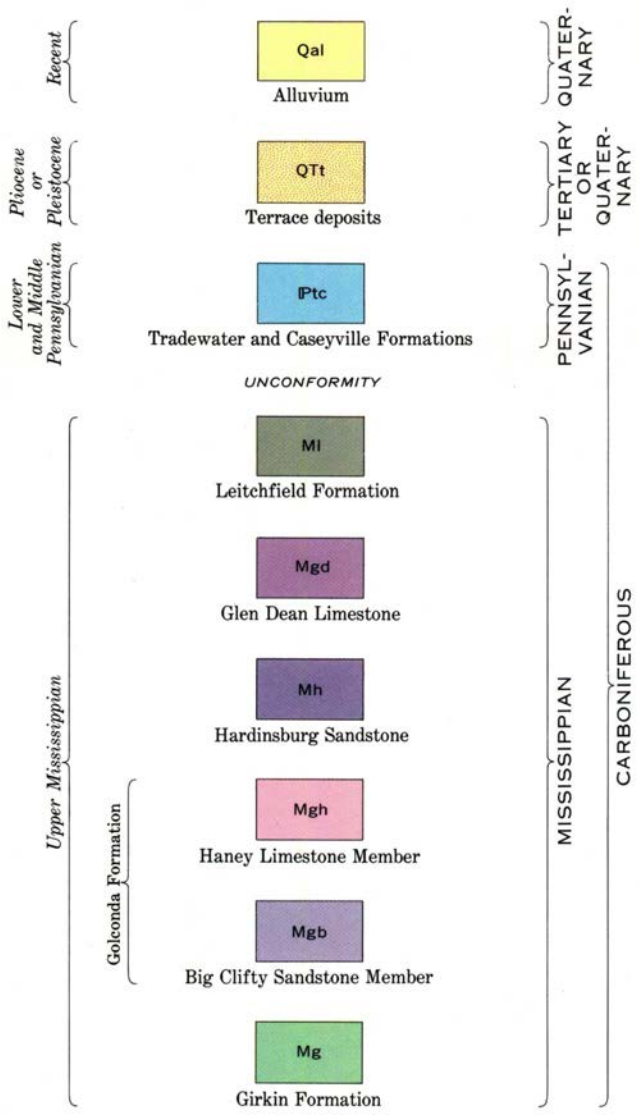
Brownsville Quadrangle

The formal citation for this source.

> Gildersleeve, Benjamin, 1965, Geology of the Brownsville Quadrangle, Kentucky: U.S. Geological Survey, Geologic Quadrangle Map GQ-411, scale 1:24,000 (*GRI Source Map ID 1157*).

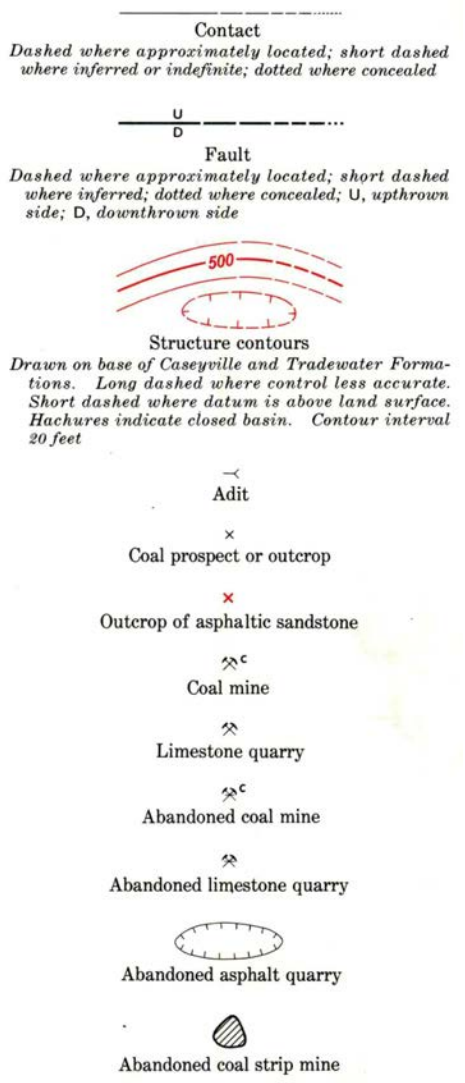
Prominent graphics and text associated with this source:

Correlation of Map Units



Graphic from source map: Brownsville Quadrangle

Map Legend



Graphic from source map: Brownsville Quadrangle

References

Moore, P. N., 1884, Report on the geology of the Nolin River district, embracing portions of Grayson, Edmonson, Hart, and Butler Counties: Kentucky Geol. Survey, Rept. Prog. 2, new ser. Western Coal Field, D, p. 8-38.

Weller, J. M., 1927, The geology of Edmonson County: Kentucky Geol. Survey, ser. 6, v. 28, 246 p.

References from source map: Brownsville Quadrangle

Economic Geology

Natural rock asphalt, which is coarse-grained sandstone impregnated with bitumen, is potentially the most important mineral resource in the quadrangle. The concentration of bitumen in the sandstone varies from a trace which colors the rock gray to amounts sufficient to fill the openings between the sand grains. According to J. M. Weller (1927), “The commercially important deposits consist of sandstone almost completely saturated with bitumen, but due largely to variation in porosity of the rock the bitumen content varies from 3% to 4% to a maximum of about 15%, the average in the important rock asphalt beds being probably in the neighborhood of about 5%.” In the quadrangle the rock asphalt deposits are erratic and more or less lenticular. The deposits thin and thicken abruptly and commonly rich concentrations are separated by lean or barren sandstone. Rock asphalt of commercial grade ranges in thickness from 10 to 90 feet (oral communication, T. S. Moody, 1963).

The rock asphalt deposits occur mainly in the upper part of the basal sandstone of the Caseyville Formation. The structure contours were drawn on the base of rocks of Pennsylvanian age to determine whether the depth or trend of channels cut into the Mississippian rocks and subsequently filled by the Caseyville Formation control the accumulation of asphalt. The relationship is suggested by the contours but cannot be determined until a large area is mapped. Locally, the Hardinsburg Sandstone and the Big Clifty Sandstone Member of the Golconda Formation are impregnated with bitumen. Outcrops of these sandstones show small amounts of bitumen, but the deposits have not been quarried for rock asphalt in the quadrangle.

Rock asphalt was quarried and mined for paving material from 1890 until 1958. All the large quarries are in the Caseyville Formation north of the Green River and are now abandoned. It is estimated that more than 1,000,000 tons of rock asphalt was produced in the quadrangle during this period (oral communication, T. J. Moody, 1963). Since 1958, private industry has been engaged in exploration and experimental work directed toward reactivating production of paving material and the feasibility of crude oil recovery from the rock asphalt deposits of Edmonson and adjacent counties.

Limestone has been quarried from the Glen Dean Limestone at Brownsville and from the Haney Limestone Member of the Golconda Formation north of the Green River near Brownsville. In 1963 limestone for road metal was obtained from a small quarry in the Glen Dean Limestone 0.6 mile northwest of Brownsville.

Small oil production is obtained from the “Corniferous” sands just beneath the Chattanooga Shale (Upper Devonian) by a few wells near Oak Grove Church which are pumped intermittently. As the contours on the base of the Pennsylvanian rocks do not reflect very closely the structures in pre-Pennsylvanian strata, structure contours have been drawn on the base of the Hardinsburg Sandstone (see small structure map).

The Main Nolin coal occurs in the shale unit which overlies the basal sandstone of the Caseyville Formation. It has been exploited on a small scale at several localities by strip mining and underground workings. Almost all of the pits and adits are caved and exposures are poor. Only one small mine was active during the period of field studies. The coal bed ranges in thickness from 18 to 24 inches at the few outcrops found, but thicknesses of 30 to 36 inches are reported at some of the mines. A coal strip mine 1½ miles west of Grassland probably was opened on the coal bed which crops out just above the Bee Spring Sandstone as used by Moore (1884) at Huff. No information is available about the quality and thickness of coal at this mine. About I mile east of this mine an 18 inch coal bed is exposed in a stream bed just below a caved pit where a small amount of coal was mined.

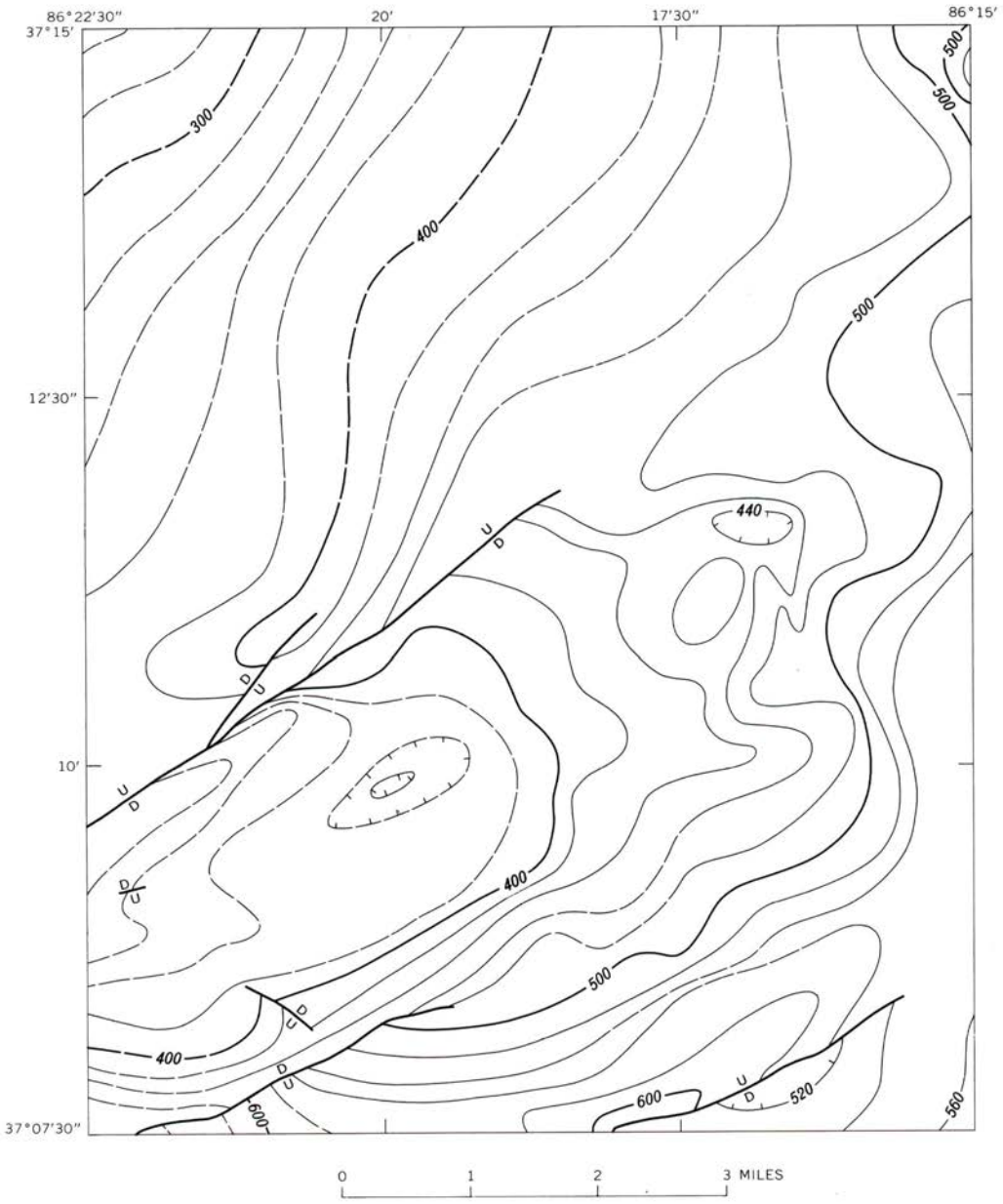
Text from source map: Brownsville Quadrangle

Stratigraphic Section

Stratigraphic Section (double-click link to open the embedded document).

Graphic from source map: Brownsville Quadrangle

Fault and Contour Map



Map showing faults and structure contours drawn on base of Hardinsburg Sandstone. Contours dashed where control less accurate. Hachures indicate closed basin. Contour interval 20 feet. U, upthrown side of fault; D, downthrown side of fault.

Graphic from source map: Brownsville Quadrangle

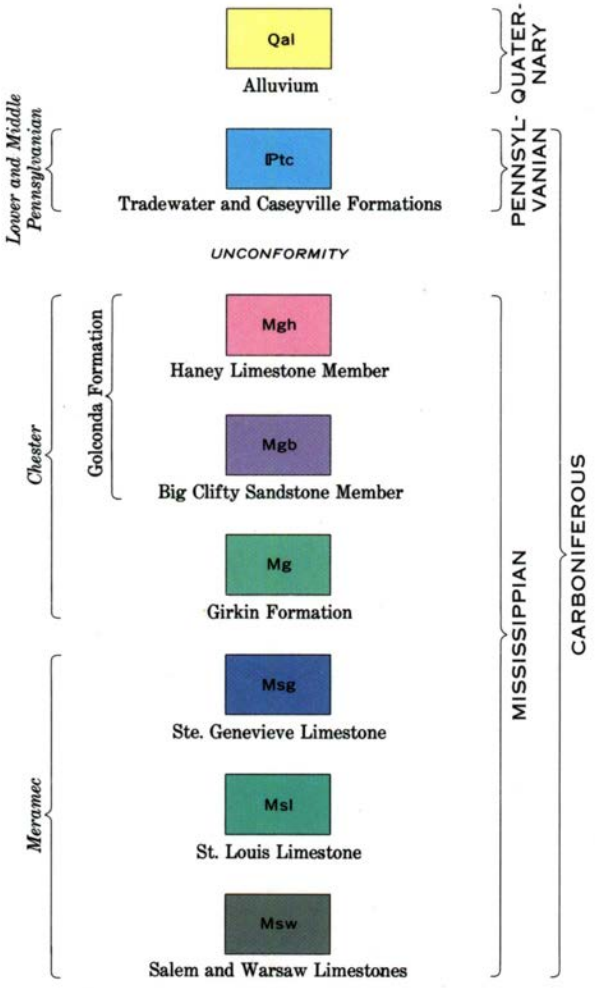
Canmer Quadrangle

The formal citation for this source.

> Miller, R.C., 1969, Geologic Map of the Canmer Quadrangle, Hart County, Kentucky: U.S. Geological Survey, Geologic Quadrangle Map GQ-816, scale 1:24,000 (*GRI Source Map ID 2754*).

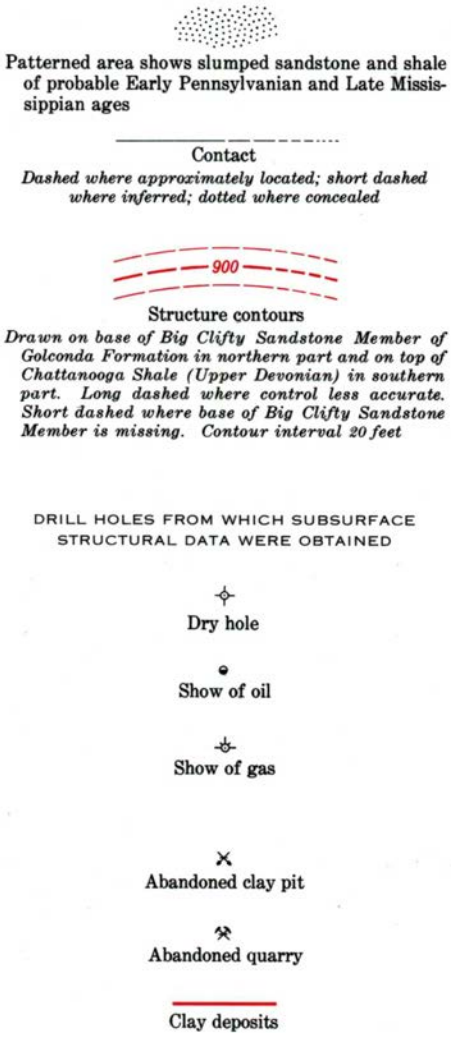
Prominent graphics and text associated with this source:

Correlation of Map Units



Graphic from source map: Canmer Quadrangle

Map Legend



Graphic from source map: Canmer Quadrangle

References

Brown, R. F., and Lambert, T. W., 1962, Availability of ground water in Allen, Barren, Edmonton, Green, Hart, Logan, Metcalfe, Monroe, Simpson, and Warren Counties, Kentucky: U.S. Geol. Survey Hydrol. mv. Atlas HA-32.

Elrod, M. N., 1899, The geologic relations of some St. Louis group caves and sink holes: Indiana Acad. Sci. Proc., p. 258-267.

Gardner, J. H., 1905, The kaolins and plastic clays on the eastern rim of the Western Coal Field: Kentucky Geol. Survey Bull. 6, p. 7-63.

Malott, C. A., 1919, The “American Bottoms” region of eastern Green County, Indiana—a type unit in southern Indiana physiography: Indiana Univ. Studies, v. 6, no. 40, 61 p.

MeFarlan, A. C., Swann, D. H., Walker, F. H., and Nosow, Edmund, 1955, Some old Chester problems —Correlations of lower and middle Chester formations of western Kentucky: Kentucky Geol. Survey Bull. 16, ser. 9, 37 p.

McGrain, Preston, 1960, A high-refractory clay in Hart County, Kentucky: Kentucky Geol. Survey Inf. Circ. 5, ser. 10, 10 p.

McGrain, Preston, and Hamlin, H. P., 1962, Occurrence of halloysite in Kentucky [abs.]: Geol. Soc. America, Spec. Paper 68, 77 p.

References from source map: Canmer Quadrangle

Economic Geology

The known mineral resources of the quadrangle are limestone and clay.

Two small, abandoned quarries in the eastern part of the quadrangle have produced limestone from the lower part of the St. Louis Limestone and from the upper part of the Ste. Genevieve Limestone. Limestone of the Girkin Formation and Ste. Genevieve Limestone is probably suitable for road metal and agricultural lime.

In the western part of the quadrangle, clay deposits at the base of the Pennsylvanian have been intermittently prospected in pits and trenches since about 1900. Most of these workings are slumped and obscured by thick undergrowth. Small amounts of clay were reportedly mined during the early part of the century and used locally for the manufacture of building brick.

In the northwestern part of the quadrangle, in the vicinity of Frenchman Knob, clay lenses occur sporadically along the unconformable contact between the Tradewater and Caseyville Formations and the Big Clifty Sandstone Member of the Golconda Formation. They range from 0 to 5 feet in thickness and consist mostly of plastic clay enclosing nodules and angular fragments of chert partially altered to clay.

The clay deposits probably are the weathered residuum of the Haney Limestone Member of the Golconda Formation reworked on an erosional surface prior to the deposition of the Caseyville Formation. Gardner (1905) studied these deposits and identified them as kaolin. According to McGrain (1960, p. 7) analyses of samples taken from a prospect pit about 7,000 feet south of Frenchman Knob showed a low plastic clay that could be used for high-heat duty refractories. Further studies by McGrain and Hamlin (1962, p. 77) of samples from the same prospect pit showed the clay to be made up of halloysite and minor amounts of gibbsite and kaolin.

Exploration for gas and oil has been carried out intermittently since about 1930, and approximately 100 test holes have been drilled in the central and southern parts of the quadrangle. Most of the tests penetrated the Chattanooga Shale of Late Devonian age and about 100 to 150 feet into the underlying limestone and dolomitic limestone of probable Silurian and Ordovician ages. In the central part of the quadrangle a few holes encountered minor amounts of gas and oil in a zone 20 to 100 feet below the Chattanooga Shale.

Ground water conditions in the quadrangle are discussed in a report by Brown and Lambert (1962).

Text from source map: Canmer Quadrangle

Stratigraphic Section

Stratigraphic Section (double-click link to open the embedded document).

Graphic from source map: Canmer Quadrangle

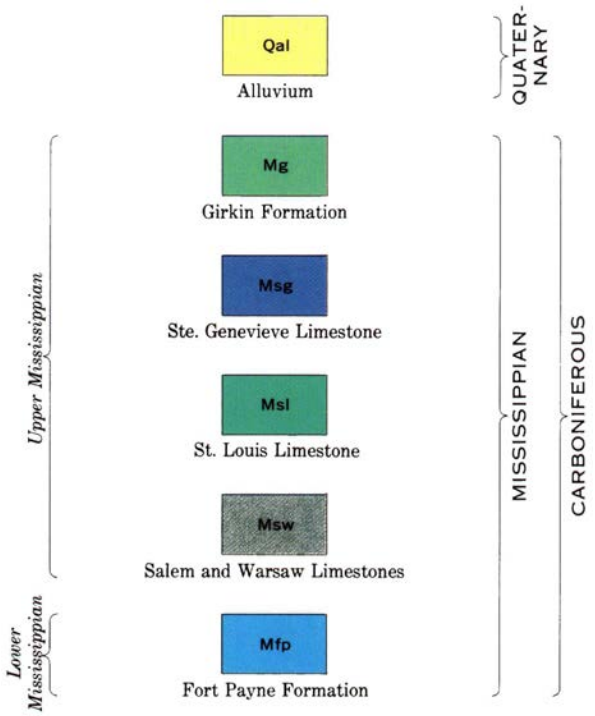
Center Quadrangle

The formal citation for this source.

> Miller, R.C., and Moore, S.L., 1967, Geologic Map of the Center Quadrangle, south-central Kentucky: U.S. Geological Survey, Geologic Quadrangle Map GQ-693, scale 1:24,000 (*GRI Source Map ID 2755*).

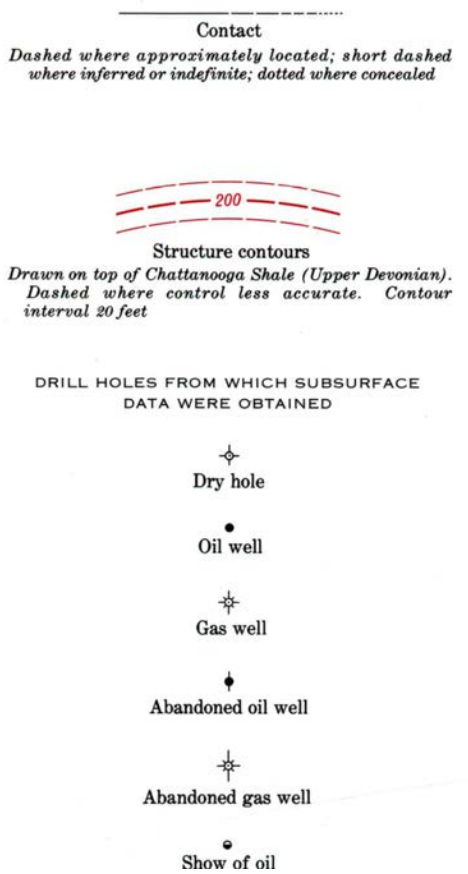
Prominent graphics and text associated with this source:

Correlation of Map Units



Graphic from source map: Center Quadrangle

Map Legend



Graphic from source map: Center Quadrangle

References

Brown, R. F., and Lambert, T. W., 1962, Availability of ground water in Allen, Barren, Edmonson, Green, Hart, Logan, Metcalfe, Monroe, Simpson, and Warren Counties, Kentucky: U.S. Geol. Survey Hydrol. Inv. Atlas HA-32

Cattermole, J. Mark, 1966, Geologic map of the Sulphur Well quadrangle, Metcalfe and Green Counties, Kentucky: U.S. Geol. Survey Geol. Quad. Map GQ-555.

McFarlan, A. C., 1943 (reprinted 1961) Geology of Kentucky: Univ. of Kentucky, Lexington 531 p.

References from source map: Center Quadrangle

Economic Geology

Gas, oil, and limestone are the principal mineral resources of the quadrangle.

A gas field was developed during the latter part of the 1920's in the vicinity of Center. The field is on a broad dome. It extends southward into the Sulphur Well quadrangle (Cattermole, 1966) and merges

westward with the LeGrande oil pool in the Park quadrangle (McFarlan, 1943, p. 337). Gas is produced from dolomitic limestone, 0 to 20 feet below the Chattanooga Shale (Upper Devonian), which is locally called the “Blue sand” and tentatively correlated with the Laurel Dolomite of Middle Silurian age. The gas was used during 1930-35 for power in developing the LeGrande oil pool, and gas from a few wells is still used to heat homes.

Oil has been produced along the western and northeastern flanks of the dome on which the Center gas field is located. Oil production on the western flank is from the southwestern extension of the LeGrande oil pool. Along the northeastern flanks oil has been produced from a group of unnamed wells extending from the vicinity of the Hazel Cemetery northwestward through Crailhope to the junction of the Green, Hart, and Metcalfe county lines. Another group of wells is located in the Horseshoe Bend of the Little Barren River. The oil producing zone in these groups of wells is in dolomitic limestone 0 to 20 feet below Chattanooga Shale, probably in the same strata as the gas producing zone in the Center field.

Pilot Knob is underlain by Ste. Genevieve Limestone that is probably suitable for road metal and agricultural lime. Ground water conditions in the quadrangle are discussed in a report by Brown and Lambert (1962).

Text from source map: Center Quadrangle

Stratigraphic Section

Stratigraphic Section (double-click link to open the embedded document).

Graphic from source map: Center Quadrangle

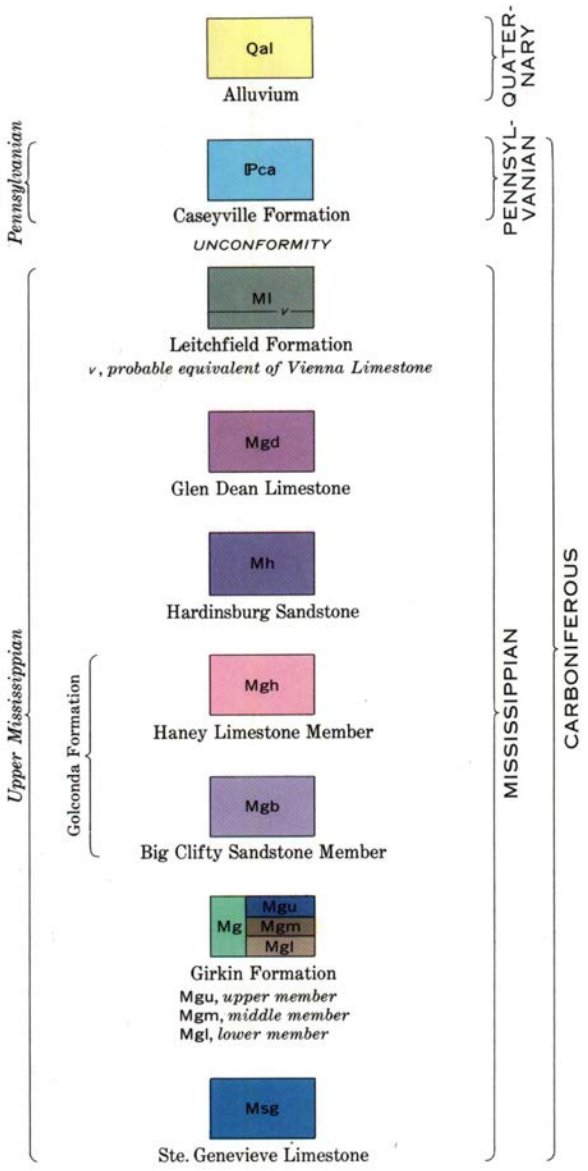
Cub Run Quadrangle

The formal citation for this source.

> Sandberg, C.A., and Bowles, C.G., 1965, Geology of the Cub Run Quadrangle, Kentucky: U.S. Geological Survey, Geologic Quadrangle Map GQ-386, scale 1:24,000 (*GRI Source Map ID 1158*).

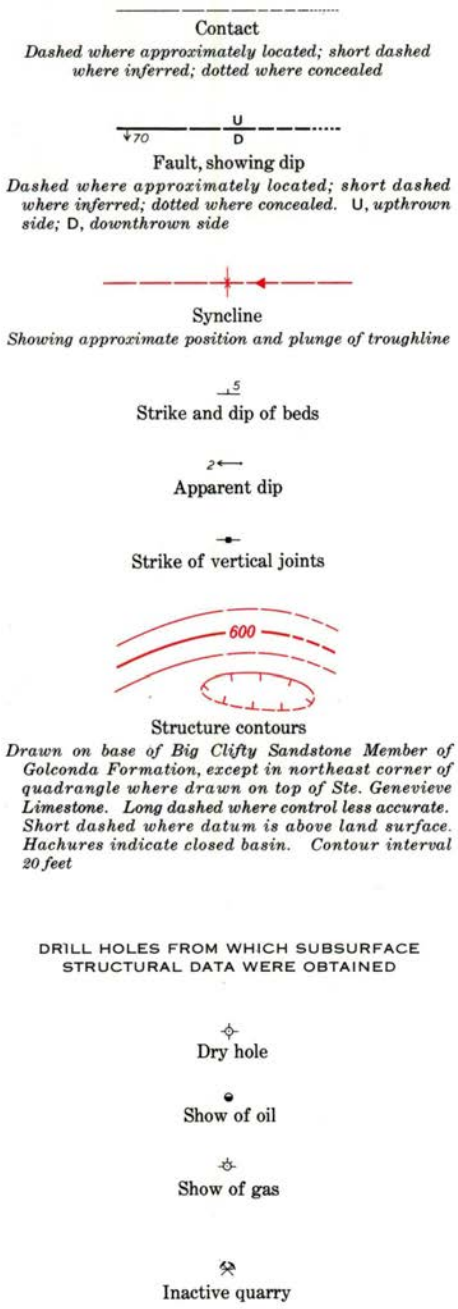
Prominent graphics and text associated with this source:

Correlation of Map Units



Graphic from source map: Cub Run Quadrangle

Map Legend



Graphic from source map: Cub Run Quadrangle

References

Hagan, W. W., 1942, Geology of the Cub Run quadrangle, Kentucky: Univ. of Illinois, Ph.D. dissertation, 252 p. (unpublished).

Malott, C. A., 1919, The “American Bottom” region of eastern Greene County, Indiana--a type unit in

southern Indiana physiography: Indiana Univ. Studies, v. 6, no.40, 61 p.

References from source map: Cub Run Quadrangle

Economic Geology

Mineral exploration within the quadrangle has concentrated chiefly on the search for oil. A structure map by Hagan (1942) showed 42 holes drilled to a maximum depth of 1,549 feet, most drilled deeper than 1,100 feet. He reported “some (holes) yielded gas, some contained shows of oil, and three were small oil wells. Most of them were drilled to the "Corniferous" oil sand (below the New Albany Shale of Late Devonian age). The drill holes were concentrated in the southeast corner of the quadrangle, generally near the north-trending fault along Cub Run and included three abandoned oil wells. Additional test holes drilled more recently have yielded a small quantity of oil. Three wells shown on the base map either are not producing or are abandoned; however, a little oil was being produced in 1963 from three wells near the mouth of Cub Run.

A coal bed at the top of the Big Clifty Sandstone Member of the Golconda Formation has been worked for local consumption, but it is too thin to be mined commercially.

Limestone for road material has been quarried from the Girkin Formation and Glen Dean Limestone. Several quarries that were inactive in early 1963 had been worked on a small scale for local road projects.

The recently completed Nolin Reservoir is expected to create a standing pool of water extending slightly into the west side of the quadrangle along the valley of the Nolin River. The permanent pool altitude will be 480 feet. During seasonal high precipitation, the water level will fluctuate between altitudes of 480 and 515 feet and the pool will enter the tributaries. For purposes of flood control the pool may be raised to a maximum altitude of 560 feet. All land along the Nolin River valley and tributaries up to an altitude of 565 feet has been purchased or leased for the Nolin Reservoir project.

Text from source map: Cub Run Quadrangle

Stratigraphic Section

Stratigraphic Section (double-click link to open the embedded document).

Graphic from source map: Cub Run Quadrangle

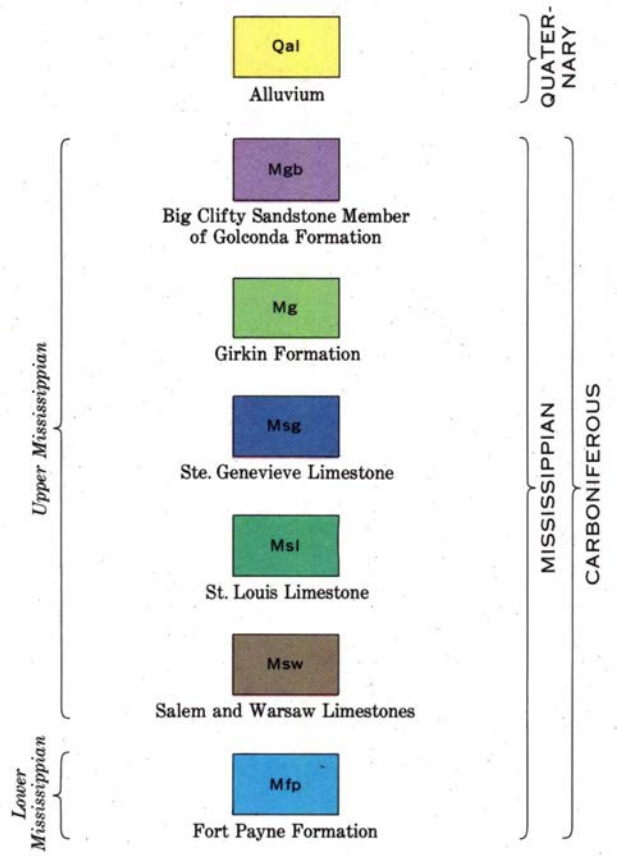
Glasgow North Quadrangle

The formal citation for this source.

> Haynes, D.D., 1964, Geology of the Glasgow North Quadrangle, Kentucky: U.S. Geological Survey, Geologic Quadrangle Map GQ-339, scale 1:24,000 (*GRI Source Map ID 1159*).

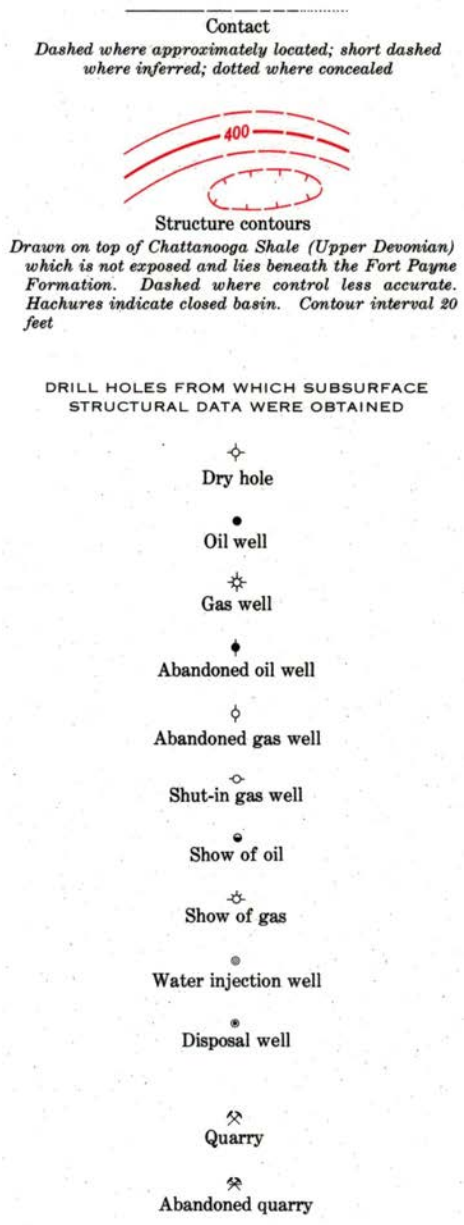
Prominent graphics and text associated with this source:

Correlation of Map Units



Graphic from source map: Glasgow North Quadrangle

Map Legend



Graphic from source map: Glasgow North Quadrangle

References

Moore, S. L., 1968, Geology of the Tracy quadrangle, Kentucky: U. S. Geol. Survey Geol. Quad. Map GQ-217.

References from source map: Glasgow North Quadrangle

Economic Geology

The principal mineral resources are limestone, oil, and gas, the gas being used for local domestic consumption only.

The only active quarry is that of the J. F. Pace Construction Company, about 1¾ miles north of Chestnut Grove School. Here the Ste. Genevieve Limestone is quarried for road metal, aggregate, and agricultural limestone. There are several localities north of the Pace quarry where the Ste. Genevieve may be suitable for commercial use.

Two small quarries were operated in the Salem and Warsaw Limestones but are now abandoned. Throughout most of the quadrangle limestone of the Salem and Warsaw is either too thin or contains too many siltstone beds to be of economic value.

Commercial quantities of oil and gas have been produced in the quadrangle since the early 1920's. A large gas field located on the structural high north of Flint Knob supplied gas in the 1930's for the surrounding towns. Gas was produced from "sands" in the lower part of the Salem and Warsaw Limestones and the middle part of the Fort Payne Formation. Until recently gas from several of the wells was still used for local domestic consumption. Gas was also produced from approximately 30 wells in the Glasgow gas pool, but almost all are now abandoned.

Oil has been produced from above and below the Chattanooga Shale of Late Devonian age, which is not exposed in the quadrangle. Several oil pools produced several hundred thousand barrels, and the old Duff lease, northeast of Glasgow, is said to have produced more than 700,000 barrels.
The "Beaver sand," which occurs in the basal part of the Fort Payne Formation, has been only a minor source of oil production. The major production came from zones below the Chattanooga Shale—the "Corniferous," the Laurel Dolomite (Blue sand), and the Brassfield (Yellow Cap), all Silurian in age.

A water flooding project was started in March 1963 on what was the old Duff lease and production in June 1963 was about 4 barrels per day for the entire lease.

Almost all major oil production in the quadrangle came from structures which occur on a wide, gently dipping structural plain that lies to the south and southeast of the 380-foot structure contour.

Within the quadrangle there are several small, relatively unexplored, structures which might reasonably be expected to produce small quantities of oil. The area probably most favorable lies on the southeast and east flank of the elongated dome immediately north of Beaver Creek on State Highway 90. There are two shut-in gas wells on this structure and oil was produced from the southwest flank for a number of years.

Over two hundred drill holes were located in the field during the mapping. Data on approximately 160 holes showing the altitude of the top and bottom of the Chattanooga Shale and (or) the Fort Payne gas "sand" are filed with the Kentucky Geological Survey, Lexington, Kentucky.

Text from source map: Glasgow North Quadrangle

Stratigraphic Section

Stratigraphic Section *(*double-click link to open the embedded document).

Graphic from source map: Glasgow North Quadrangle

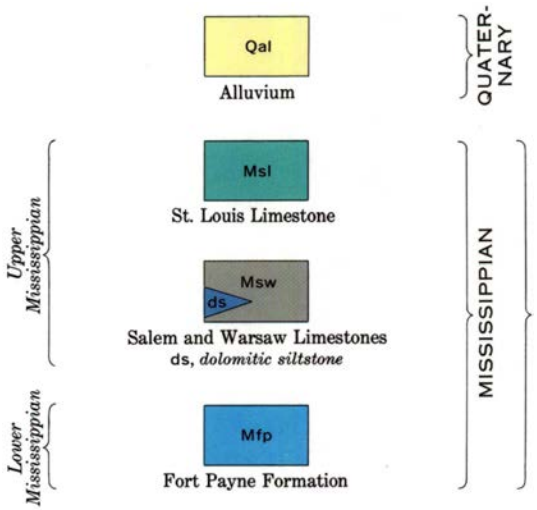
Glasgow South Quadrangle

The formal citation for this source.

> Moore, S.L., and Miller, R.C., 1965, Geology of the Glasgow South Quadrangle, Barren County, Kentucky: U.S. Geological Survey, Geologic Quadrangle Map GQ-416, scale 1:24,000 (*GRI Source Map ID 2763*).

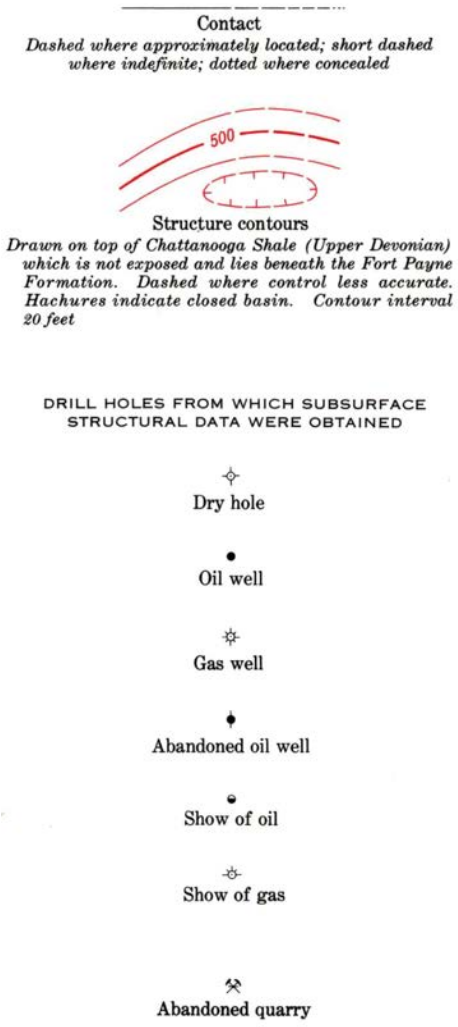
Prominent graphics and text associated with this source:

Correlation of Map Units



Graphic from source map: Glasgow South Quadrangle

Map Legend



Graphic from source map: Glasgow South Quadrangle

References

Jillson, W. R., 1929, Oil and gas map of Barren County, Kentucky: Kentucky Geol. Survey, ser. 6.

References from source map: Glasgow South Quadrangle

Economic Geology

The Glasgow area has been a center of oil and gas production for more than 40 years. Extensive exploration started about 1920 and continued to about 1935. During this period hundreds of holes were drilled for oil and gas in the quadrangle, and one gas field and several oil pools were developed. Another period of intensive drilling started during the latter part of the 1950's; it led to the discovery of one oil pool

south of the Cedar Grove School and other smaller oil pools.

Most oil and gas has been produced from below the Chattanooga Shale (Upper Devonian) in the Louisville Limestone, Laurel Dolomite, and Brassfield Dolomite, all Silurian in age. Minor amounts of oil have been produced from limestone beds in the lower part of the Fort Payne Formation. The accompanying table summarizes the stratigraphic occurrence of oil and gas in the quadrangle.

Most oil wells are on the flanks and crests of anticlines or domes. One such oil-bearing structure is an irregular anticline that trends northwestward across the central part of the quadrangle; two domes with at least 30 feet closure occur on the crest of this anticline. However, large areas of this anticline, including the dome in the vicinity of the Oak Grove School, have been penetrated by numerous test holes that did not encounter commercial quantities of oil or gas. Such factors as variation in the porosity and permeability of reservoir rocks and the unconformable relationship of the Chattanooga Shale with the underlying rocks may account for the unproductive areas within this anticline. Two relatively untested structures may be favorable for the accumulation of oil and gas; one is a northeastward-trending anticlinal nose about 5000 feet southwest of Pritchardsville and the other is a small dome in the northeastern part of the quadrangle.

Limestone in the Fort Payne Formation and Salem and Warsaw Limestones in most places is interbedded with siltstone and is generally not of commercial grade.

Two quarries, one in the vicinity of Pritchardsville and the other in the western part of the city of Glasgow, produced small tonnage of limestone from the upper part of the Salem and Warsaw Limestones, but both were abandoned when quarry operations encountered large amounts of siltstone interbedded with limestone.

Text from source map: Glasgow South Quadrangle

Stratigraphic Section

Stratigraphic Section (double-click link to open the embedded document).

Graphic from source map: Glasgow South Quadrangle

Oil and Gas Table

Name of pool and years of production	Location	Producing formation and age; driller's term for producing beds; distance producing zone is above or below Chattanooga Shale
*Glasgow gas 1920-1926	In city of Glasgow	Laurel Dolomite (Middle Silurian) Blue sand (100-130 feet below)
*Gorby oil 1924-1929	Near South Fork School (Carter Coordinates 7 and 14-F-43)	Fort Payne Formation (Early Mississippian) Beaver sand (0-40 feet above) Louisville Limestone (Middle Silurian) "Corniferous" sand (65-75 feet below) Laurel Dolomite (Middle Silurian) Blue sand (100-130 feet below)
*Oskamp oil 1920-1930	Along Boyds Creek about 4500 feet north of Cedar Grove School (Carter Coordinates 12, 13, 18, and 19-F-43)	Louisville Limestone (Middle Silurian) "Corniferous" sand (20-40 feet below)
Unnamed oil 1957-1963	Along Skaggs Creek about 3500 feet south of Cedar Grove School (Carter Coordinates 22 and 23-F-43, and 1 and 2-E-43)	Louisville Limestone (Middle Silurian) "Corniferous" sand (20-45 feet below)
Unnamed oil 1955-1963	Along Beaver Creek in northwestern part of quadrangle (Carter Coordinates 4 and 5-F-43)	Louisville Limestone (Middle Silurian) "Corniferous" sand (65-85 feet below)
Unnamed oil 1924-1963	West of city of Glasgow (Carter Coordinates 2 and 3-F-43)	Laurel Dolomite (Middle Silurian) Blue sand (100-130 feet below) Brassfield Dolomite (Early Silurian) Yellow cap sand (155-180 feet below)
Unnamed oil 1957-1963	Southwestern part of quadrangle (Carter Coordinates 5, 6, and 7-E-43)	Louisville Limestone (Middle Silurian "Corniferous" sand (40-80 feet below) Laurel Dolomite (Middle Silurian) Blue sand (140-155 feet below)

*Jillson (1929)

Table from source map: Glasgow South Quadrangle

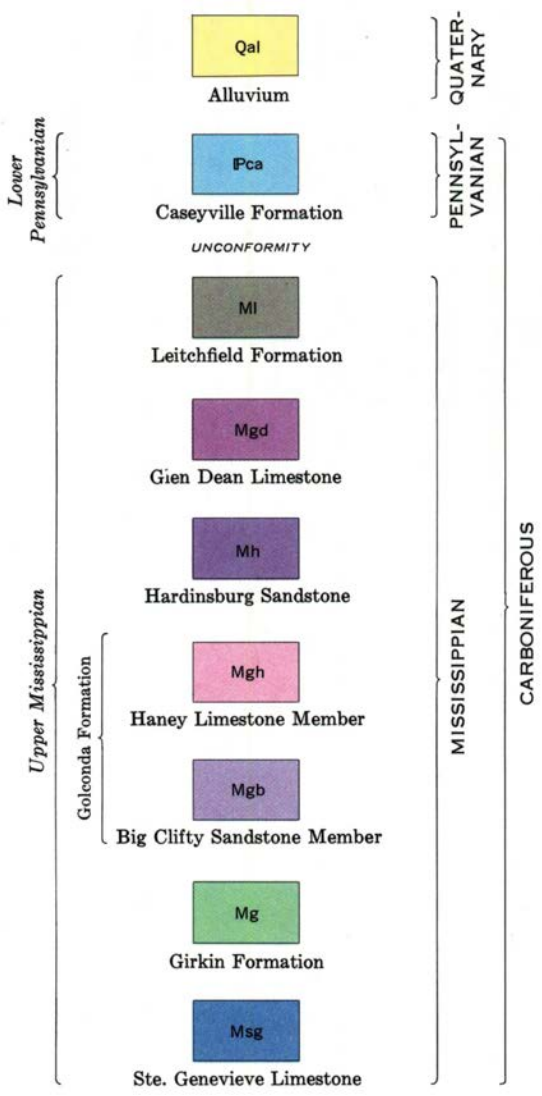
Hadley Quadrangle

The formal citation for this source.

> Rainey, H.C., 1963, Geology of the Hadley Quadrangle, Kentucky: U.S. Geological Survey, Geologic Quadrangle Map GQ-237, scale 1:24,000 (*GRI Source Map ID 2766*).

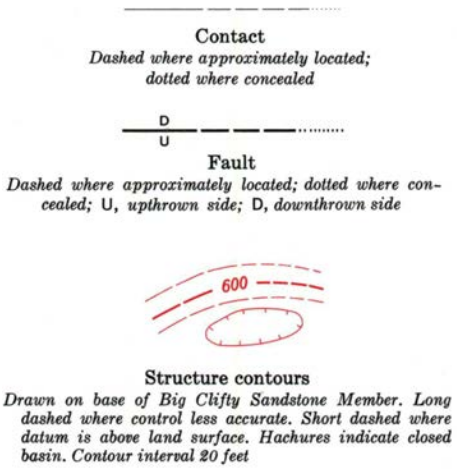
Prominent graphics and text associated with this source:

Correlation of Map Units



Graphic from source map: Hadley Quadrangle

Map Legend



Graphic from source map: Hadley Quadrangle

Economic Geology

Oil is the principal resource that has been exploited. Drilling started in the 1920's and has continued intermittently to the present. The main production comes from beds in the Salem and Warsaw Limestones of Late Mississippian age and three beds within 200 feet below the base of the Chattanooga Shale of Late Devonian age. Recent sporadic drilling has produced little oil. The structure contours drawn on the base of the Big Clifty Sandstone Member define several small anticlines or domes, some of which have more than 30 feet of closure; some have been drilled.

Limestones in the Girkin Formation have been quarried fairly extensively, but at present no quarries are in operation. Most of the quarries were small and produced dimension stone.

Text from source map: Hadley Quadrangle

Stratigraphic Section

Stratigraphic Section (double-click link to open the embedded document).

Graphic from source map: Hadley Quadrangle

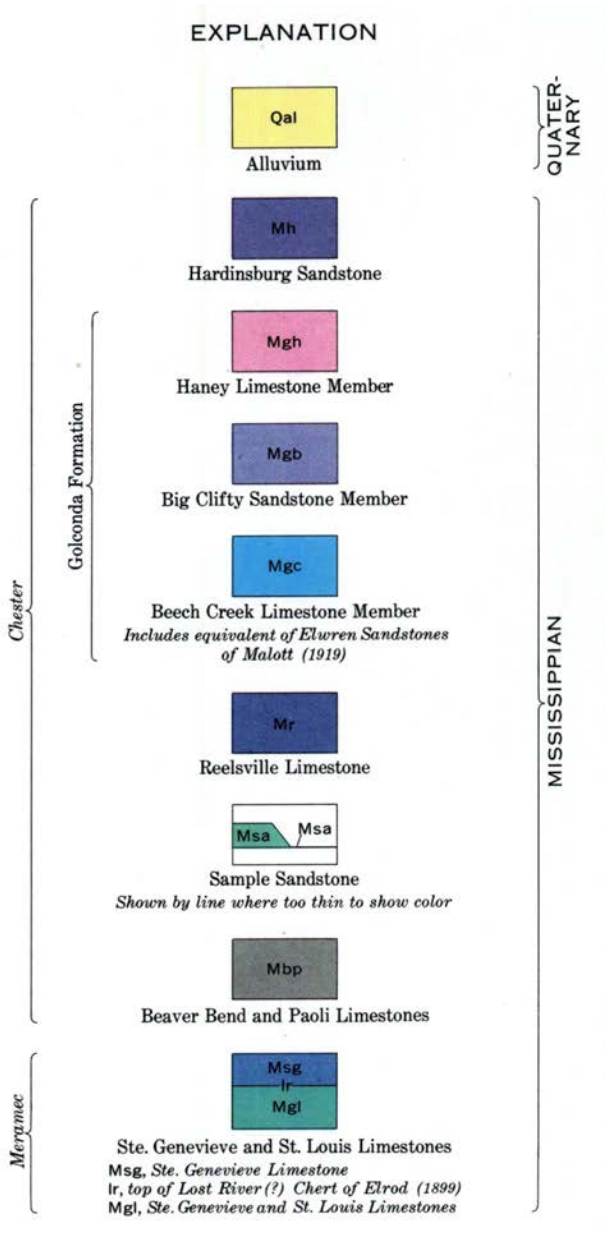
Hammonville Quadrangle

The formal citation for this source.

> Moore, F.B., 1972, Geologic Map of the Hammonville Quadrangle, Larue and Hart Counties, Kentucky: U.S. Geological Survey, Geologic Quadrangle Map GQ-1051, scale 1:24,000 (*GRI Source Map ID 2757*).

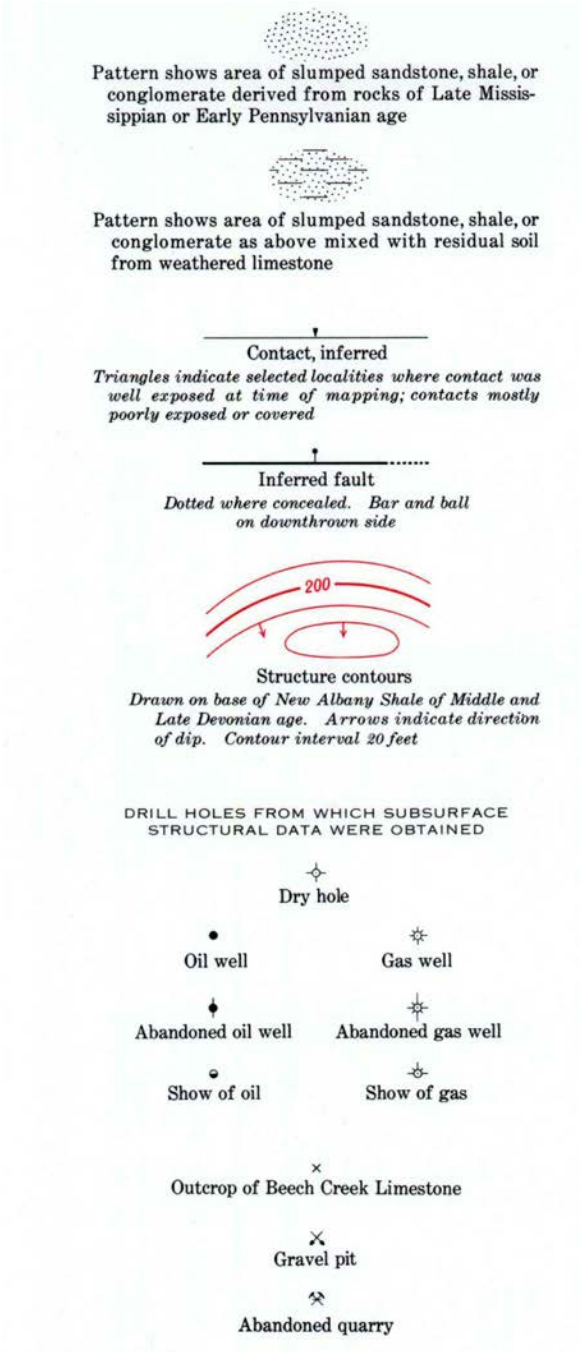
Prominent graphics and text associated with this source:

Correlation of Map Units



Graphic from source map: Hammonville Quadrangle

Map Legend



Graphic from source map: Hammonville Quadrangle

References

Brown, It. F., and Lambert, T. W., 1963, Availability of ground water in Breckinridge, Grayson, Hardin, Larue, and Meade Counties, Kentucky: U.S. Geol. Survey Hydrol. Inv. Atlas HA-33.

Elrod, M. N., 1899, The geologic relations of some St. Louis group caves and sinkholes: Indiana Acad. Sci. Proc., p. 258-267.

Malott, C. A., 1919, The "American Bottoms" region of eastern Greene County, Indiana—a type unit in southern Indiana physiography: Indiana Univ. Studies, v. 6, no. 40, 61 p.

McFarlan, A. C., 1943, Geology of Kentucky: Lexington, Ky., Univ. Kentucky, 531 p.

Miller, R. C., 1969, Geologic map of the Canmer quadrangle, Hart County, Kentucky: U.S. Geol. Survey Geol. Quad. Map GQ-816.

Moore, F. B., 1965, Geology of the Millerstown quadrangle, Kentucky: U.S. Geol. Survey Geol. Quad. Map GQ-417.

Moore, F. B., 1966, Geologic map of the Tonieville quadrangle, Larue and Hardin Counties, Kentucky: U. S. Geol. Survey Geol. Quad. Map GQ-560.

Moore, F. B., 1972, Geologic map of the Upton quadrangle, central Kentucky: U.S. Geol. Survey Geol. Quad. Map GQ-1000.

Ray, L. L., Butler, A. P., Jr., and Denny, C. S., 1946, Geology sheet in Fort Knox and vicinity: U.S. Army Corps of Engineers, Terrain Studies in the U.S., Folio 1.

Sandberg, C. A., and Bowles, C. G., 1965, Geology of the Cub Run quadrangle, Kentucky: U.S. Geol. Survey Geol. Quad. Map GQ-386.

References from source map: Hammonville Quadrangle

Economic Geology

Commercial quantities of oil and some gas have been found in wells mostly drilled in the 1950's, near the west edge of the quadrangle along and north of Bacon Creek. In 1967 oil was being pumped intermittently from two wells, but total production from the area is small. Gas from some of the wells was used locally. The producing zone the "Blue sand" about 50 to 60 feet below the New Albany Shale is probably the Laurel Dolomite of Middle Silurian age. Gas and shows of oil have been reported from the area east and northeast of Hammonville. This area, at the west end of the Magnolia gas field which is now used for storage, is outside the limits of former commercial gas production.

Limestone was produced from one small quarry, now abandoned, in the lower part of the Ste. Genevieve Limestone. Limestone beds enclosing the Ste. Genevieve-Paoli contact, similar to those being quarried near Upton in the adjoining quadrangle, are exposed on several knobs near the west border.

Sand and gravel are produced from a small pit near Pike View in the southeastern part of the quadrangle. The material is derived from weathering of slumped sandstone and conglomerate, mostly of Pennsylvanian age.

Adequate supplies of water are generally encountered in wells drilled into the Ste. Genevieve and St.

Louis Limestones but not in many wells drilled into the Chester rocks below the Big Clifty Sandstone Member of the Golconda Formation (Brown and Lainbert, 1963). Adequate supplies may be difficult to obtain in certain places, such as the Jonesville area, that are covered by thick deposits of slumped sandstone and shale derived from rocks of Pennsylvanian age. Unpredictable amounts of water are encountered in wells drilled into slumped sandstone and shale derived from rocks of Mississippian age. To prevent silting these wells are generally drilled to bedrock. However, depth to bedrock varies greatly; as much as 200 feet to bedrock has been recorded in a well two miles west of the northwest corner of the quadrangle.

Text from source map: Hammonville Quadrangle

Stratigraphic Section

Stratigraphic Section (double-click link to open the embedded document).

Graphic from source map: Hammonville Quadrangle

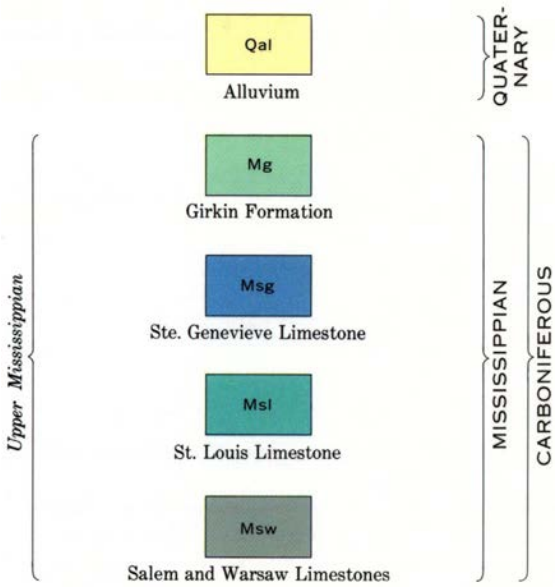
Hiseville Quadrangle

The formal citation for this source.

> Haynes, D.D., 1965, Geology of the Hiseville Quadrangle, Kentucky: U.S. Geological Survey, Geologic Quadrangle Map GQ-401, scale 1:24,000 (*GRI Source Map ID 2750*).

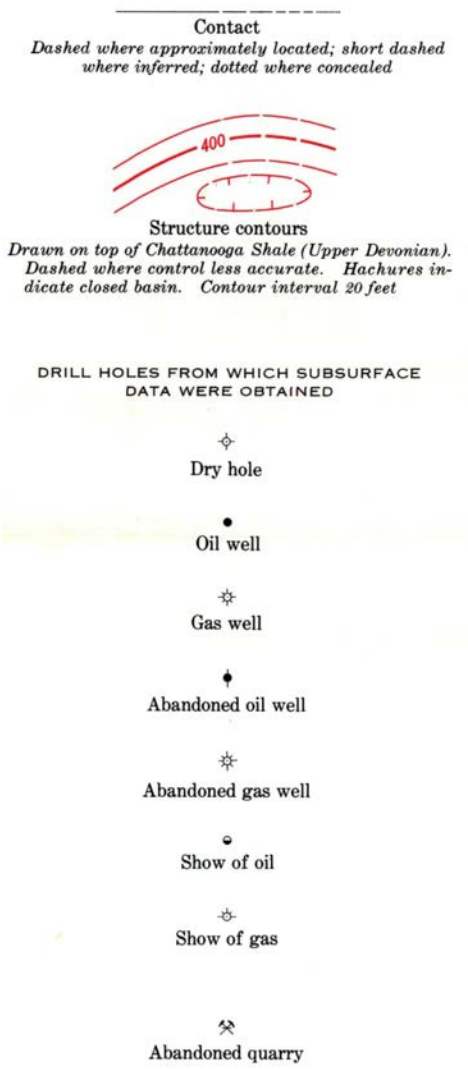
Prominent graphics and text associated with this source:

Correlation of Map Units



Graphic from source map: Hiseville Quadrangle

Map Legend



Graphic from source map: Hiseville Quadrangle

Economic Geology

The principal mineral resources are oil and gas, the gas now being used only for local domestic consumption. Commercial quantities of oil have been produced from below the Chattanooga Shale, of Late Devonian age, which is not exposed in the quadrangle. Major oil production in the Lecta and Hiseville areas has come from the Louisville Limestone, which is the "Corniferous" of drillers, and the Laurel Dolomite (Blue sand) of Silurian age. In September 1963 less than 10 wells were being pumped, and no well was producing more than 1 barrel per day. In the late 1920's and early 1930's commercial quantities of gas were produced north and northeast of Hiseville.

Over 200 drill holes were located in the field during the mapping. Data on most of these, showing location and altitude of the top and bottom of the Chattanooga Shale, are filed with the Kentucky Geological Survey, Lexington, Kentucky.

One small quarry was operated in the Salem and Warsaw Limestones but is now abandoned. Throughout most of the quadrangle beds of limestone in the Salem and Warsaw Limestones are too thin or contain too much siltstone to be of economic value. Limestone in the St. Louis Limestone and the Girkin Formation contains too much chert for commercial use; locally the Ste. Genevieve Limestone may be suitable for commercial production.

Text from source map: Hiseville Quadrangle

Stratigraphic Section

Stratigraphic Section (double-click link to open the embedded document).

Graphic from source map: Hiseville Quadrangle

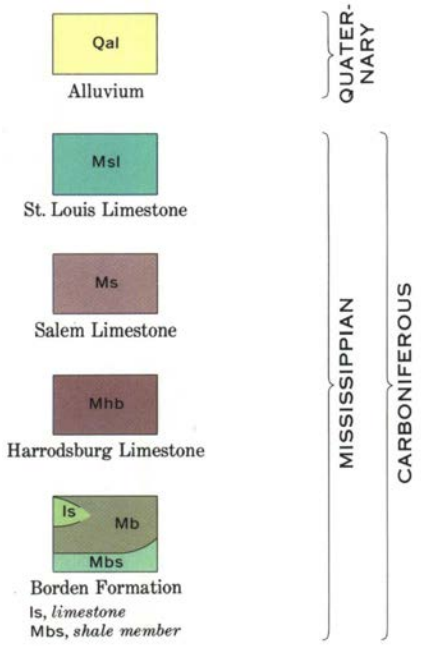
Hodgenville Quadrangle

The formal citation for this source.

> Moore, F.B., 1968, Geologic Map of the Hodgenville Quadrangle, Larue and Nelson Counties, Kentucky: U.S. Geological Survey, Geologic Quadrangle Map GQ-749, scale 1:24,000 (*GRI Source Map ID 2200*).

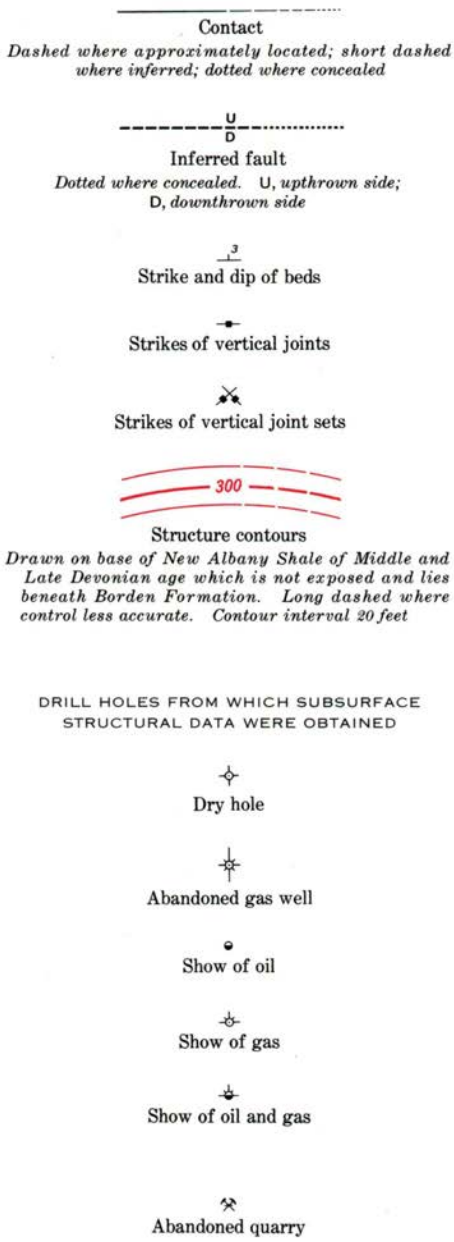
Prominent graphics and text associated with this source:

Correlation of Map Units



Graphic from source map: Hodgenville Quadrangle

Map Legend



Graphic from source map: Hodgenville Quadrangle

References

Brown, R. F., and Lambert, T. W., 1963, Availability of ground water in Breckinridge, Grayson, Hardin, Larue, and Meade Counties, Kentucky: U.S. Geol. Survey Hydrol. Inv. Atlas HA-33.

Butts, Charles, 1922, The Mississippian series of eastern Kentucky: Kentucky Geol. Survey, ser. 6, v. 7, 188 p.

McFarlan, A. C., 1943, Geology of Kentucky: Lexington, Univ. Kentucky, 531 p.

Stockdale, P. B., 1939, Lower Mississippian rocks of the east-central interior: Geol. Soc. America Spec. Paper 22, 248 p.

Weir, G. W., Gualtieri, J. L., and Schianger, S. 0., 1966, Borden Formation [Mississippian) in south- and southeast-central Kentucky: U.S. Geol. Survey Bull. 1224-.F, 38 p.

References from source map: Hodgenville Quadrangle

Economic Geology

Gas in quantities sufficient for household use was found in five test holes drilled for oil two to four miles east of Hodgenville. One of these wells supplied gas for 14 years and another, reportedly, for about 17 years. The gas was trapped beneath the New Albany Shale in truncated “Corniferous” limestone beds of Middle Devonian age. In the east-central part of the quadrangle, where the “Corniferous” is missing through truncation, shows of gas in the New Albany Shale of Middle and Late Devonian age and shows of oil in the Laurel Dolomite of Middle Silurian age have been reported for several wells.

Limestone has been quarried from the St. Louis Limestone at three localities and from a limestone lens near the top of the Borden Formation at one locality. The quarries are now abandoned.

A calcareous shale (marl) near the base of the Salem Limestone has been used to a limited extent as a soil conditioner.

Groundwater is available in wells drilled into the St. Louis Limestone generally at depths of less than 100 feet. Numerous fractures and solution cavities make this limestone a good aquifer. Springs are common at or near the base. Difficulty in obtaining water may be encountered near the rim of the escarpment in the eastern part of the quadrangle in an area where the St. Louis Limestone is thin or absent. The Salem Limestone and Borden Formation are generally poor aquifers. The Harrodsburg Limestone carries water, especially at the base, but rarely in large amounts.

Groundwater conditions are discussed by Brown and Lambert (1963).

Text from source map: Hodgenville Quadrangle

Stratigraphic Section

Stratigraphic Section (double-click link to open the embedded document).

Graphic from source map: Hodgenville Quadrangle

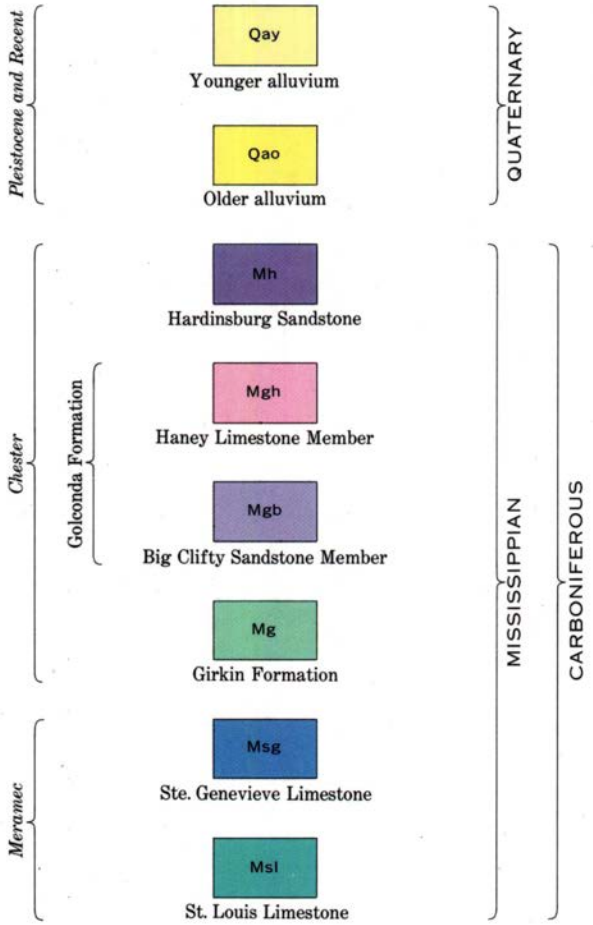
Horse Cave Quadrangle

The formal citation for this source.

> Haynes, D.D., 1966, Geologic Map of the Horse Cave Quadrangle, Barren and Hart Counties, Kentucky: U.S. Geological Survey, Geologic Quadrangle Map GQ-558, scale 1:24,000 (*GRI Source Map ID 1160*).

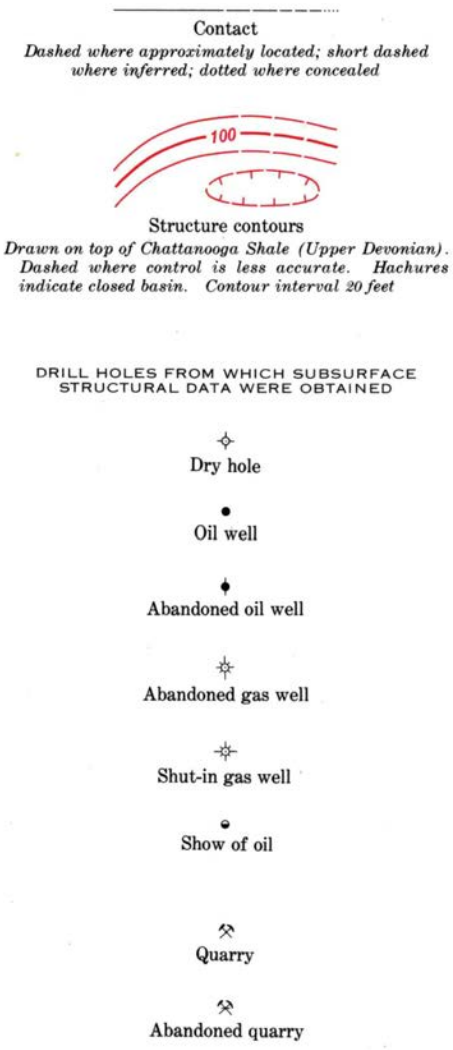
Prominent graphics and text associated with this source:

Correlation of Map Units



Graphic from source map: Horse Cave Quadrangle

Map Legend



Graphic from source map: Horse Cave Quadrangle

Economic Geology

The principal mineral resources are limestone, oil, and gas.

The Hart Stone Company quarry about 11/2 miles east of Horse Cave is the only active quarry in the quadrangle. Here the Ste. Genevieve Limestone is quarried for road metal, aggregate, and agricultural limestone. The lower part of the Girkin Formation and the upper part of the Ste. Genevieve were quarried at two localities on Huckleberry Knob and on the extreme north end of Wootens Knob but all have now been abandoned. There are a number of additional localities within the quadrangle where the Ste. Genevieve appears to be suitable for commercial use.

Oil has been produced in significant quantities in the quadrangle but in early .1964 only one well was pumping, producing less than half a barrel per day. In the northern part of the quadrangle oil occurs in the "First Corniferous sand" immediately below the Chattanooga Shale of Late Devonian age, but in the

central part of the quadrangle, near Gossett Knob and Vial Knob, the oil occurs in the "Second Corniferous sand" about 80 to 90 feet below the Chattanooga Shale. In some holes drilled in the mid and late 1950's north of Vial and Gossett Knobs initial production was several hundreds of barrels per day for several days but rapidly declined to less than ten barrels per day.

Gas from wells northwest of Horse Cave, northwest of Cave City, and along the Green River west of Summer Seat Knob was sold commercially at one time but by early 1964 most wells had been shut-in or abandoned. Gas from those still in production is used only for local domestic consumption. Along the Green River major gas production was from the "First Corniferous sand" but a small amount was also produced from above the Chattanooga Shale, probably from the "Beaver sand".

In the area northwest of Cave City and northwest of Horse Cave gas was produced principally from below the Chattanooga Shale but some production did occur from or near the stratigraphic position of the "Beaver sand". At this time very little is known about the oil and gas potential of the deeper pay horizons such as the "Knox" and the "Blue sand" (Laurel Dolomite of Silurian age). The "Blue sand" was tested in several holes near Horse Cave but was found to be unproductive.

Text from source map: Horse Cave Quadrangle

Stratigraphic Section

Stratigraphic Section (double-click link to open the embedded document).

Graphic from source map: Horse Cave Quadrangle

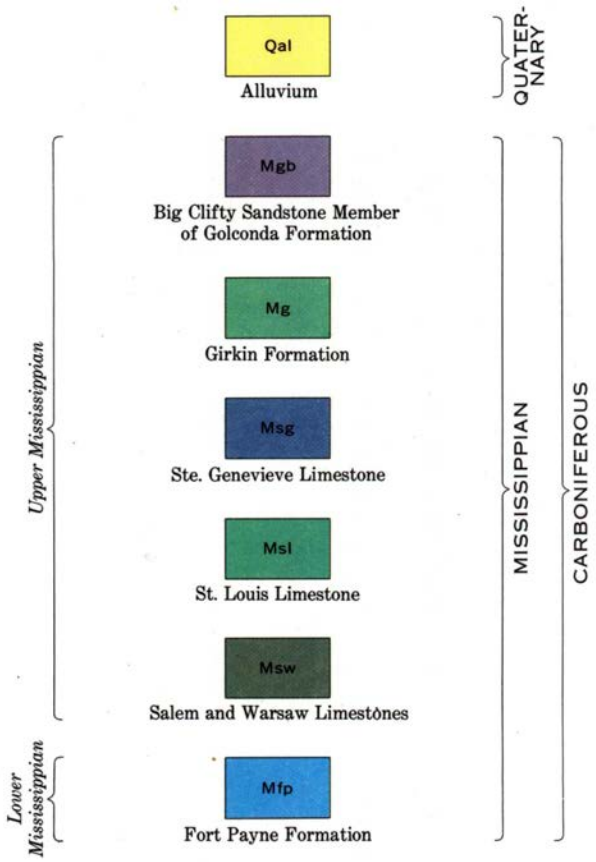
Hudgins Quadrangle

The formal citation for this source.

> Miller, R.C., and Moore, S.L., 1969, Geologic Map of the Hudgins Quadrangle, Green and Hart Counties, Kentucky: U.S. Geological Survey, Geologic Quadrangle Map GQ-834, scale 1:24,000 (*GRI Source Map ID 7341*).

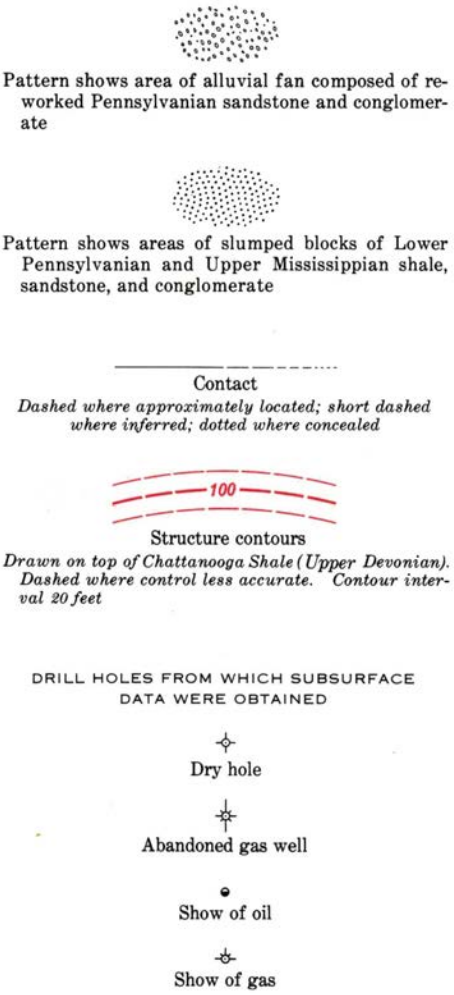
Prominent graphics and text associated with this source:

Correlation of Map Units



Graphic from source map: Hudgins Quadrangle

Map Legend



Graphic from source map: Hudgins Quadrangle

References

Brown, R. F., and Lambert, T. W., 1962, Availability of ground water in Allen, Barren, Edmonson, Green, Hart, Logan, Metcalfe, Monroe, Simpson, and Warren Counties, Kentucky: U.S. Geol Survey Hydrol. Inv. Atlas HA-32.

Elrod, M. N., 1899, The geologic relations of some St. Louis group caves and sink holes: Indiana Acad. Sci. Proc., p. 258- 267.

McFarlan, A. C., Swann, D. H., Walker, F. H., and Nosow, Edmund, 1955, Some old Chester problems—correlation of lower and middle Chester formations of western Kentucky: Kentucky Geol. Survey, ser. 9, Bull. 16, 37 p.

References from source map: Hudgins Quadrangle

Economic Geology

The known mineral resources of the quadrangle are limestone, gravel, oil, and gas.

Limestone of the Girkin Formation and the Ste. Genevieve Limestone exposed along the slopes of Maxey, Akin, and Puckett Knobs is probably suitable for road metal and agricultural lime.

Conglomerate shown in the northeast part of the quadrangle is part of a large alluvial fan presently being mined by open- pit methods in the adjacent Magnolia and Hibernia quadrangles.

Exploration for oil and gas has been carried out intermittently since about 1930. Approximately 40 test holes have been drilled in the quadrangle. Most of the tests penetrated the Chattanooga Shale of Late Devonian age and were extended into the underlying limestone and dolomitic limestone of probable Silurian and Ordovician ages. A few of these holes encountered minor amounts of oil and gas in the central and northern parts of the quadrangle in a zone 20 to 100 feet below the Chattanooga Shale.

Groundwater conditions in the quadrangle are discussed by Brown and Lambert (1962).

Text from source map: Hudgins Quadrangle

Stratigraphic Section

Stratigraphic Section (double-click link to open the embedded document).

Graphic from source map: Hudgins Quadrangle

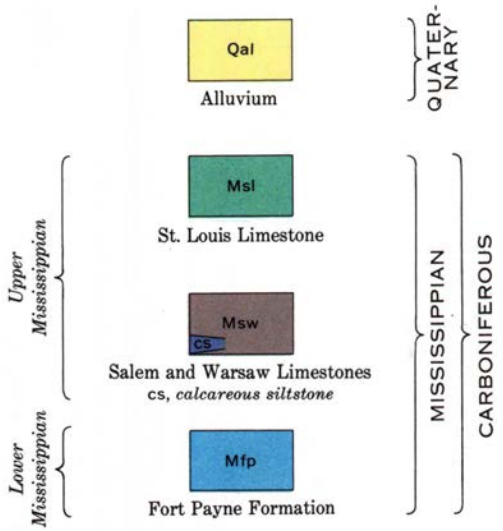
Lucas Quadrangle

The formal citation for this source.

> Haynes, D.D., 1963, Geology of the Lucas Quadrangle, Kentucky: U.S. Geological Survey, Geologic Quadrangle Map GQ-251, scale 1:24,000 (*GRI Source Map ID 2752*).

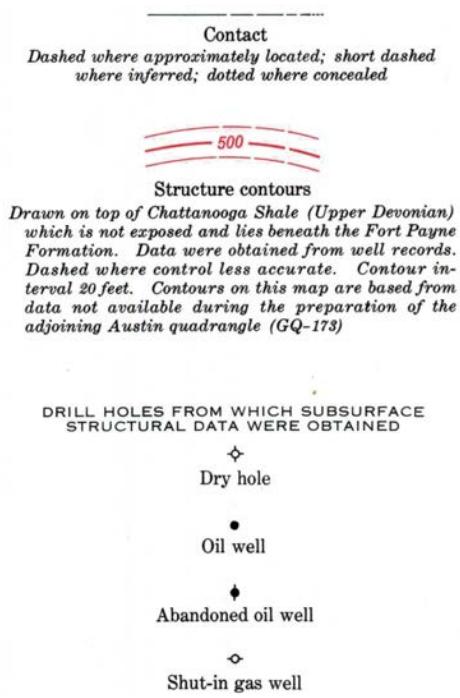
Prominent graphics and text associated with this source:

Correlation of Map Units



Graphic from source map: Lucas Quadrangle

Map Legend



Graphic from source map: Lucas Quadrangle

Economic Geology

The only mineral resource exploited in the quadrangle is oil. There are about 55 producing oil wells and several shut-in gas wells. All major production is from zones below the Devonian Chattanooga Shale, the "Corniferous", and the "Blue sand" or Laurel Dolomite, both Silurian in age. The Chattanooga Shale is not exposed in the quadrangle. Older wells produce 1 to 15 barrels per day but initial production for the better wells may be as much as 40 barrels. Rocks of the area have a regional northwestward dip that is locally modified by northward- or northwestward-trending folds. Oil is produced from crests and flanks of domes and anticlines. All production is from the area southeast of the 340-foot structure contour; this area appears also to have the most potential for future discoveries.

Some of the thicker beds of detrital limestone in the Salem and Warsaw may be usable as aggregate.

Text from source map: Lucas Quadrangle

Stratigraphic Section

Stratigraphic Section (double-click link to open the embedded document).

Graphic from source map: Lucas Quadrangle

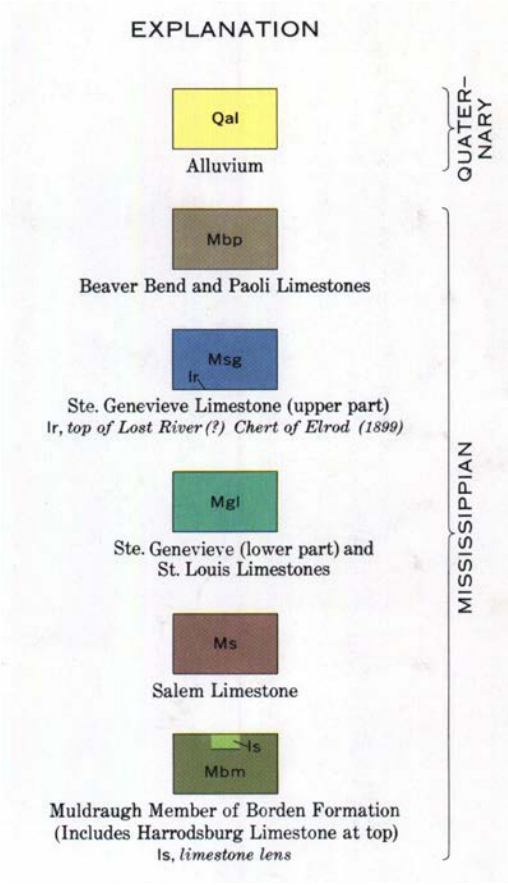
Magnolia Quadrangle

The formal citation for this source.

> Moore, F.B., 1975, Geologic Map of the Magnolia Quadrangle, central Kentucky: U.S. Geological Survey, Geologic Quadrangle Map GQ-1280, scale 1:24,000 (*GRI Source Map ID 2756*).

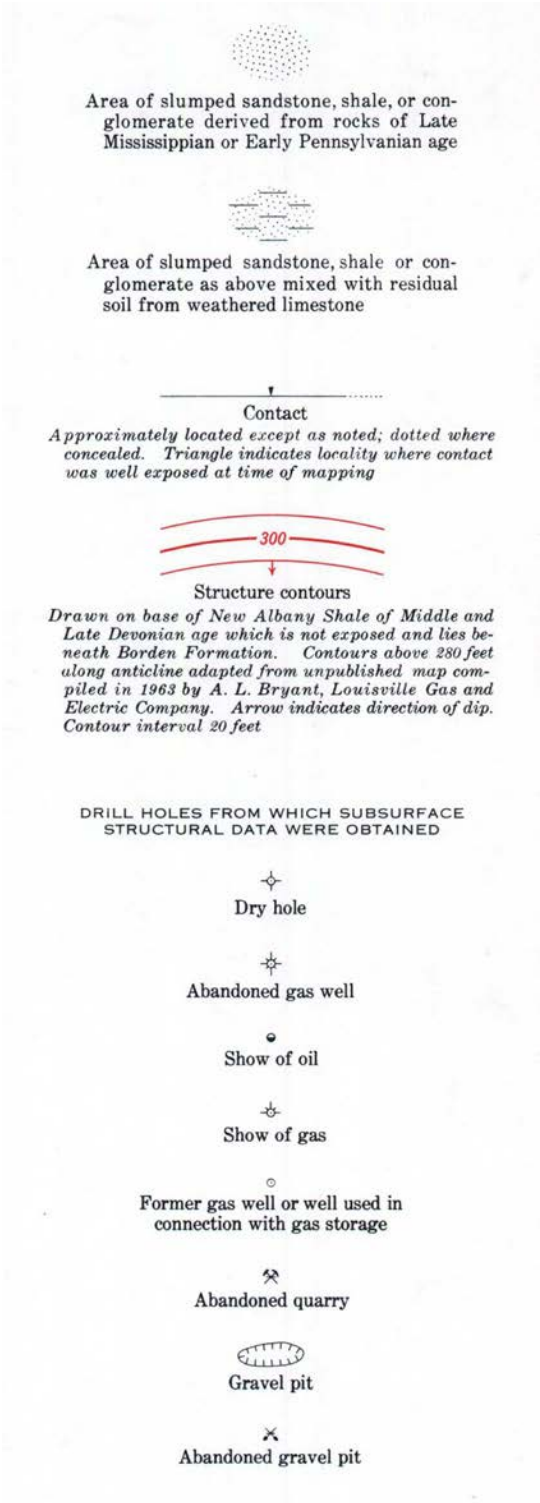
Prominent graphics and text associated with this source:

Correlation of Map Units



Graphic from source map: Magnolia Quadrangle

Map Legend



Graphic from source map: Magnolia Quadrangle

References

Brown, R. F., and Lambert, T. W., 1962, Availability of ground water in Allen, Barren, Edmonson, Green, Hart, Logan, Metcalfe, Monroe, Simpson, and Warren Counties, Kentucky: U.S. Geol. Survey Hydrol. Inv. Atlas HA-32.

Brown, R. F., and Lambert, T. W., 1963, Availability of ground water in Breckinridge, Grayson, Hardin, Larue, and Meade Counties, Kentucky: U.S. Geol. Survey Hydrol. Inv. Atlas HA-33.

Elrod, M. N., 1899, The geologic relations of some St. Louis group caves and sinkholes: Indiana Acad. Sci. Proc. 1898, p. 258-267.

McFarlan, A. C., 1943 [reprinted 1961], Geology of Kentucky: Lexington, Ky., Univ. Kentucky, 531 p.

Miller, R. C., and Moore, S. L., 1969, Geologic map of the Hudgins quadrangle, Green and Hart Counties, Kentucky: U.S. Geol. Survey Geol. Quad. Map GQ-834.

Moore, F. B., 1965, Geology of the Millerstown quadrangle, Kentucky: U.S. Geol. Survey Geol. Quad. Map GQ-417.

Moore, F. B., 1966, Geologic map of the Tonieville quadrangle, Larue and Hardin Counties, Kentucky: U. S. Geol. Survey Geol. Quad. Map GQ-560.

Moore, F. B., 1968, Geologic map of the Hodgenville quadrangle, Larue and Nelson Counties, Kentucky: U.S. Geol. Survey Geol. Quad. Map GQ-749.

Moore, F. B., 1972, Geologic map of the Hammonville quadrangle, Larue and Hart Counties, Kentucky: U.S. Geol. Survey Geol. Quad. Map GQ-1051.

Ray, L. L., Butler, A. P., Jr., and Denny, C. S., 1946, Geology sheet in Fort Knox and vicinity: U.S. Army Corps of Engineers, Terrain Studies in the U.S., Folio 1.

Russell, W. L., and McClurkin, J. H., 1934, Oil and gas pools of Hart County, Kentucky: Univ. Kentucky, Lexington, Bur. of Mining and Topog. Survey, ser. 7, Bull. 5,14 p.

Sandberg, C. A., and Bowles, C. G., 1965, Geology of the Cub Run quadrangle, Kentucky: U.S. Geol. Survey Geol. Quad. Map GQ-386.

References from source map: Magnolia Quadrangle

Economic Geology

The Magnolia gas field was developed in the 1930's and early 1940's. According to Russell and McClurkin (1934) gas was found in the "Corniferous", "1 to 35 feet beneath the base of the Chattanooga shale [New Albany Shale of Middle and Late Devonian age] and the Blue sand [Laurel Dolomite of Middle Silurian age] about 80 feet beneath the base of the Chattanooga shale." McFarlan (1943) states that in 1941 there were 11 wells shut in waiting for pipe line. Gas from the field was used locally but no production records are available. The field has been used for gas storage by the Louisville Gas and Electric Company since 1958.

Slumped conglomerate of Pennsylvanian age was being screened and washed in 1969 at a pit in the south-central part of the quadrangle. The product shipped consisted of the middle-sized portion of the

deposit, leaving a byproduct of rounded quartz pebbles generally less than 1 inch in diameter which may have decorative or metallurgical use.

One small quarry, now abandoned, has been operated in the lower part of the St. Louis Limestone.

Adequate supplies of groundwater generally are available to wells drilled into the Ste. Genevieve and St. Louis Limestones, but adequate supplies may be difficult to obtain from wells drilled into the Salem Limestone, the Borden Formation, or into thick deposits of slumped sandstone, shale, and conglomerate. Availability of ground water is also discussed by Brown and Lambert (1962, 1963).

Text from source map: Magnolia Quadrangle

Stratigraphic Section

Stratigraphic Section (double-click link to open the embedded document).

Graphic from source map: Magnolia Quadrangle

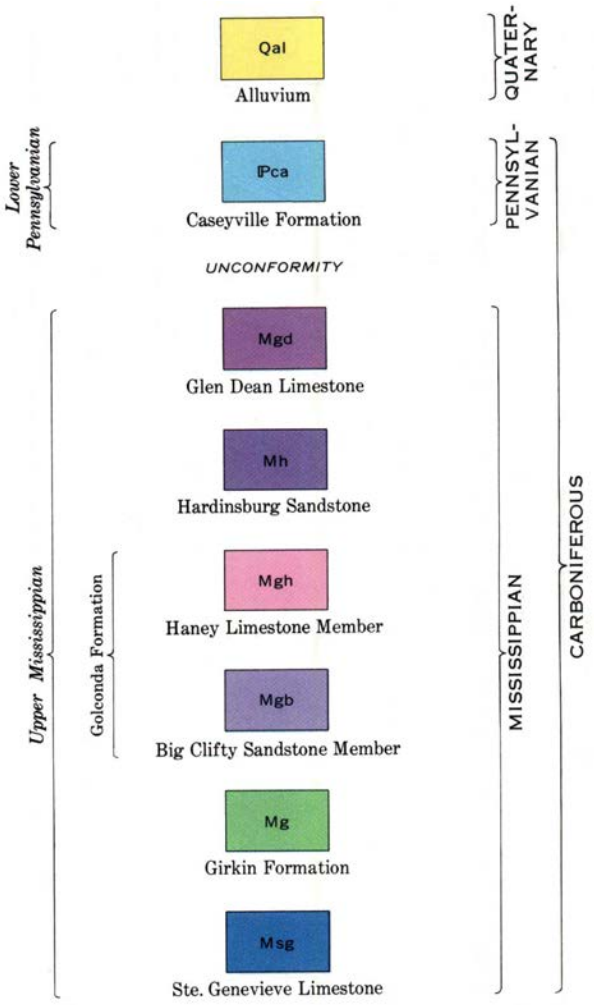
Mammoth Cave Quadrangle

The formal citation for this source.

> Haynes, D.D., 1964, Geology of the Mammoth Cave Quadrangle, Kentucky: U.S. Geological Survey, Geologic Quadrangle Map GQ-351, scale 1:24,000 (*GRI Source Map ID 1546*).

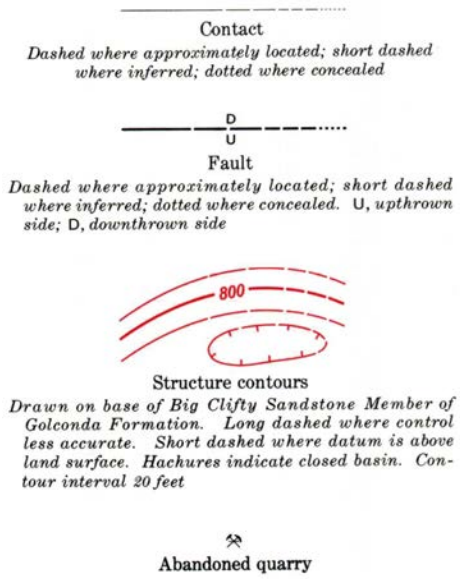
Prominent graphics and text associated with this source:

Correlation of Map Units



Graphic from source map: Mammoth Cave Quadrangle

Map Legend



Graphic from source map: Mammoth Cave Quadrangle

Economic Geology

Most of the quadrangle lies within the boundaries of Mammoth Cave National Park, and very little exploration for petroleum has taken place in the last few years. A few holes have been drilled, and oil and gas were produced from below the Chattanooga Shale of Devonian age in the extreme northeast corner of the quadrangle, but at present there are no producing wells.

Limestone has been quarried from the Girkin Formation and Ste. Genevieve Limestone, but all operations are now inactive. At one time sandstone from the Hardinsburg was mined on Flint Ridge.

Within Mammoth Cave National Park there are several tens of miles of explored cave passages and probably an equal amount of unexplored passages. Most of the caves occur in the lower part of the Girkin Formation and throughout that part of the Ste. Genevieve Limestone which occurs at or above water level of the Green River. There are several underground streams, one of which is accessible from Mammoth Cave. In addition to Mammoth Cave, which occurs on Mammoth Cave Ridge, there are explored caves on Flint Ridge, on the south side of Woolsey Valley, northwest of Three Sisters Island on the north side of the Green River, and at Highland Springs.

Text from source map: Mammoth Cave Quadrangle

Stratigraphic Section

Stratigraphic Section (double-click link to open the embedded document).

Graphic from source map: Mammoth Cave Quadrangle

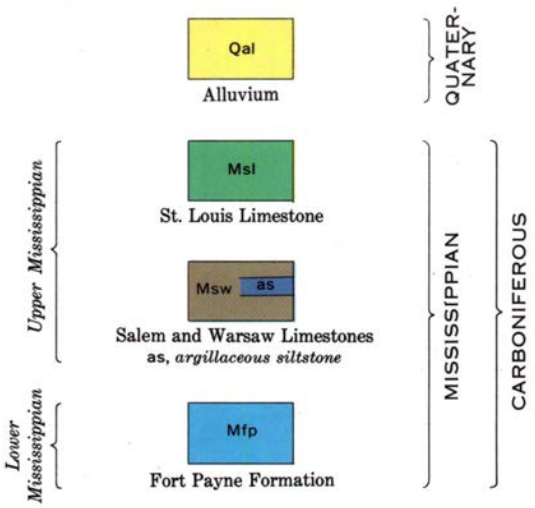
Meador Quadrangle

The formal citation for this source.

> Nelson, W.H., 1963, Geology of the Meador Quadrangle, Kentucky: U.S. Geological Survey, Geologic Quadrangle Map GQ-288, scale 1:24,000 (*GRI Source Map ID 2765*).

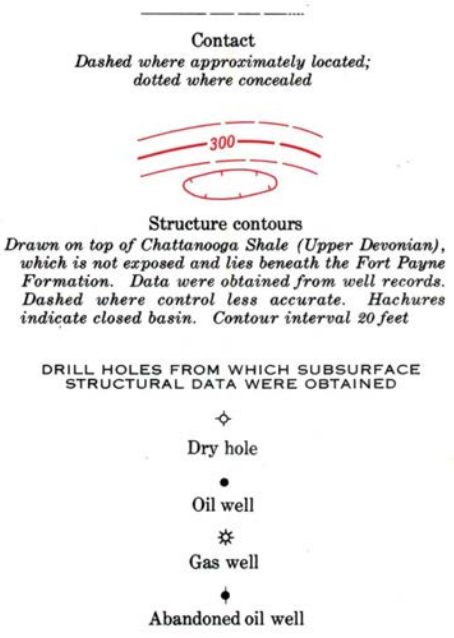
Prominent graphics and text associated with this source:

Correlation of Map Units



Graphic from source map: Meador Quadrangle

Map Legend



Graphic from source map: Meador Quadrangle

Economic Geology

Moderate amounts of oil are, or have been, produced at several localities in this quadrangle from rocks of Middle and Early Silurian age, and possibly from rocks of Late Ordovician and Middle Devonian age, which lie within a few tens of feet below an unconformity at the base of the Chattanooga Shale of Late Devonian age. The oil produced about 3/4 mile south of Buck Creek, near the eastern edge of the quadrangle, seems to have accumulated on the flank of a small structural dome, and oil was produced about one mile northwest of Meador on a structural ridge. The oil wells shown just south of Meador, those near Mt. Union Church, those 0.6 mile south of Berry Store, wells that are not shown on the map 2.5 miles due south of Berry Store, and abandoned wells 1.5 miles south-southwest of Mt. Union Church may penetrate stratigraphic or structural traps that are not shown by the structure contours either because there are insufficient data locally to delineate the structure of the top of the Chattanooga Shale, or because the structure developed prior to the deposition of the Chattanooga Shale.

In the southern part of the quadrangle the structure contours are projected to the top of the Chattanooga Shale from surface contacts on the basis of thicknesses derived from drill holes. In the northern part of the quadrangle the contours are based entirely on data from wells. For the most part, the contours are believed to reflect the structure of the Chattanooga, but in some places they undoubtedly reflect variations in the thickness of formations overlying the Chattanooga.

Limestone thick enough to be quarried economically occurs in the St. Louis, Salem and Warsaw Limestones; however, most of these limestones are not of desirable color for building stone, and the chert in the St. Louis Limestone and, locally, in the Salem and Warsaw Limestones may make these rocks undesirable as sources of crushed limestone.

Text from source map: Meador Quadrangle

Stratigraphic Section

Stratigraphic Section (double-click link to open the embedded document).

Graphic from source map: Meador Quadrangle

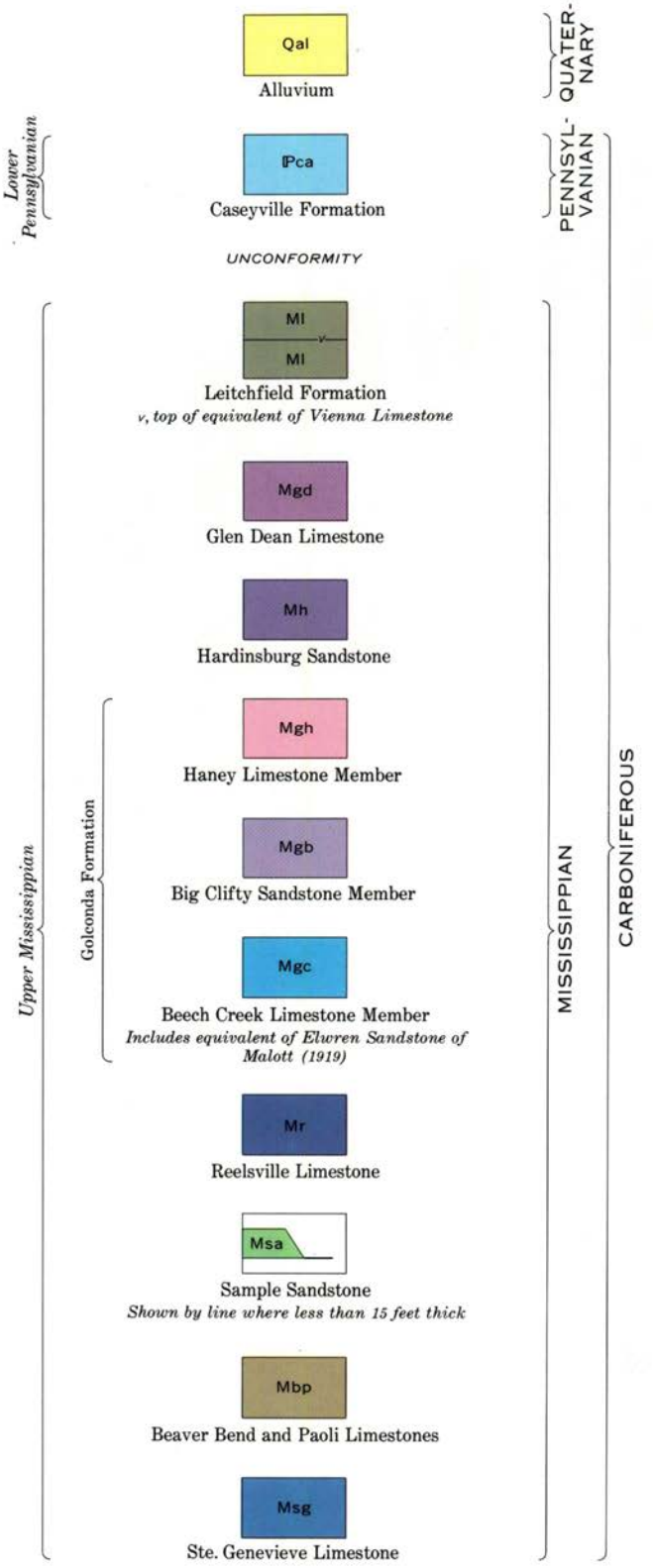
Millerstown Quadrangle

The formal citation for this source.

> Moore, F.B., 1965, Geology of the Millerstown Quadrangle, Kentucky: U.S. Geological Survey, Geologic Quadrangle Map GQ-417, scale 1:24,000 (*GRI Source Map ID 2759*).

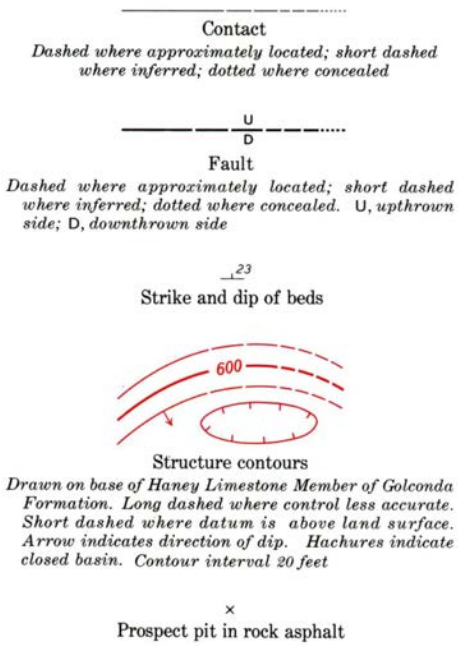
Prominent graphics and text associated with this source:

Correlation of Map Units



Graphic from source map: Millerstown Quadrangle

Map Legend



Graphic from source map: Millerstown Quadrangle

References

Hagan, W. W4, 1942, Geology of the Cub Run quadrangle, Kentucky: Illinois Univ. Ph.D. dissertation, 252 p.

Malott, C. A., 1919, The “American Bottoms” region of eastern Greene County, Indiana—a type unit in southern Indiana physiography: Indiana Univ. Studies, v.6, no. 40, 61 p.

References from source map: Millerstown Quadrangle

Economic Geology

Gas and shows of oil have been reported by local residents in several holes drilled within the past 10 years east of Broad Ford and south of the westward-striking fault. Hagan (1942) records a show of gas from one older hole in this area, and a hole near Millerstown reportedly encountered gas. Shows of oil are recorded from two holes in Akers Valley. All of these holes probably tested the “Corniferous” of Devonian age. No commercial production has been achieved within the quadrangle.

Rock asphalt occurs in the Caseyville Formation on and southwest of Buzzard Ridge. The three locations (shown by prospect pits) suggest a southwesterly trend for the asphalt deposit. A fourth

reported location, west of the middle one, was not observed during the mapping. At the northernmost locality, two small prospects 200 feet apart and about 20 feet above the base of the Caseyville Formation have yielded numerous blocks of medium- to coarse-grained sandstone well impregnated with asphalt. Slumping obscures the exposure, but a bed at least several feet thick is indicated by the amount of asphaltic rock produced. The middle prospect, an estimated 40 feet above the base of the Caseyville, exposes about 12 feet of medium- to fine-grained crossbedded blocky sandstone. All of the exposed sandstone is moderately well impregnated with asphalt, giving the rock a dark-brown color. At least two 4- to 6-inch black beds appear to be well impregnated. Weathering gives the rock a light-gray color which obscures the presence of the asphalt. Impregnated sandstone occurs as float about 6 feet above the top of the pit and for 250 feet laterally in both directions. At the southern locality asphalt impregnates conglomerate and coarse-grained sandstone at the base of the Caseyville Formation. Two pits, which are about 120 feet apart, exposed asphalt-bearing rock 2 to 6 feet thick. The owner reported that 17 feet of asphalt rock was encountered in a drill hole a few hundred feet northeast of the pits. The asphalt occurs in sandstone and conglomerate above layers of shale and of finer grained sandstone of relatively low permeability. Approximately the lower one third of the sandstone in both exposures is well impregnated; the overall grade decreases upward to barren rock. There is no apparent lithologic control for the top of the asphaltic rock. At one of these pits a steam boiler was used to extract the asphalt from which “paint” reportedly was made, but the process seemingly proved to be uneconomical.

Abundant limestone similar to that quarried from the Ste. Genevieve and Paoli Limestones in nearby quadrangles for agricultural use and road metal is present, but it has not been exploited.

Text from source map: Millerstown Quadrangle

Stratigraphic Section

Stratigraphic Section (double-click link to open the embedded document).

Graphic from source map: Millerstown Quadrangle

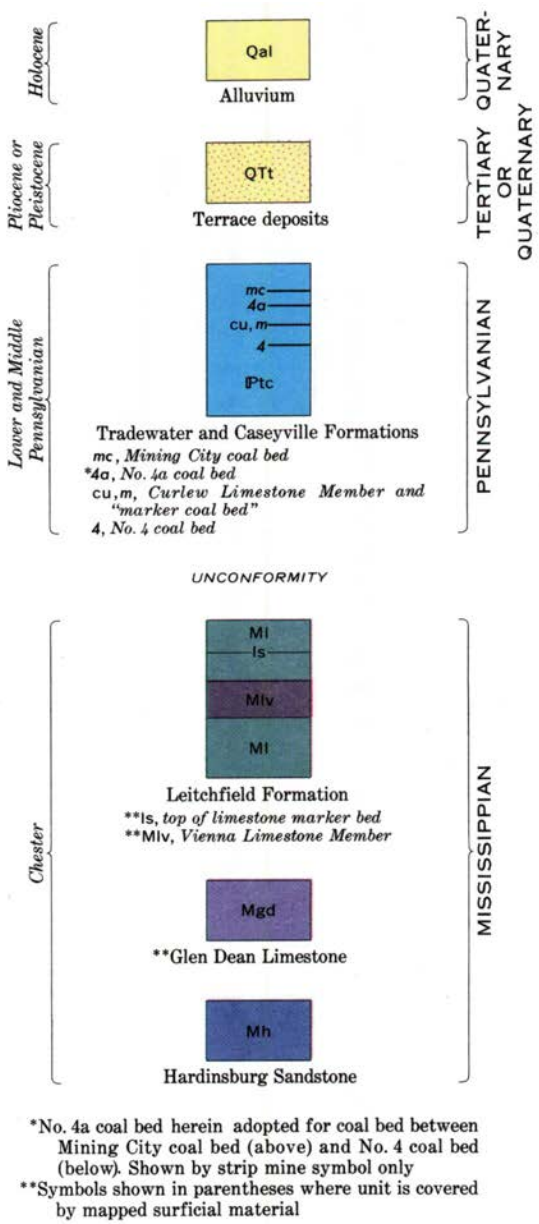
Morgantown Quadrangle

The formal citation for this source.

> Gildersleeve, Benjamin, 1972, Geologic Map of the Morgantown Quadrangle, Butler and Warren Counties, Kentucky: U.S. Geological Survey, Geologic Quadrangle Map GQ-1040, scale 1:24,000 (*GRI Source Map ID 15793*).

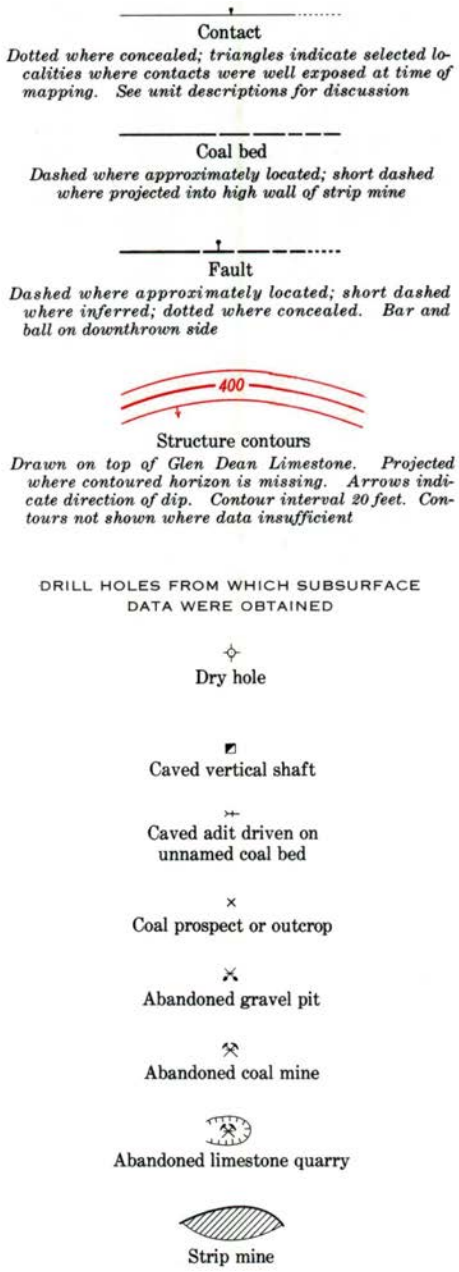
Prominent graphics and text associated with this source:

Correlation of Map Units



Graphic from source map: Morgantown Quadrangle

Map Legend



Graphic from source map: Morgantown Quadrangle

References

Crider, A. F., 1915, The coals of the Little Muddy quadrangle [Kentucky]: Kentucky Geol. Survey, ser. 4, v. 3, pt. 1, p. 155-182.

Kehn, T. M., Palmer, J. E., and Franklin, G. J., 1967, Revised correlation of the No. 4 (Dawson Springs No. 6) coal bed, Western Kentucky coal field: U.S. Geol. Survey Prof. Paper 575-C, p. 160-164.

Maxwell, B. W., and Devaul, R. W., 1962, Availability of ground water in Butler and Ohio Counties, Kentucky: U.S. Geol. Survey Hydrol. Atlas HA-26.

References from source map: Morgantown Quadrangle

Economic Geology

Coal is the principal mineral resource in the area. The Mining City and the No. 4 coal beds have yielded the most production; only small amounts have been obtained from other coal beds. In October 1969, coal was being strip mined at three locations: about 1% miles north of Davenport, 2 1/2 miles northwest of Morgantown, and north of Green River approximately 3/4 mile east of Aberdeen. The reserves of mineable coal in the Mining City coal bed and No. 4 coal bed have been estimated at 53,755,000 tons (Mullins and others, 1963, p. 20). Statistics are not available for tonnages mined since publication of the estimate.

Limestone for crushed stone has been quarried from the Glen Dean Limestone half a mile north of the southern boundary of the quadrangle, a quarter of a mile east of U.S. Highway 231.

Gravel from the terrace deposits has been used to surface local roads and driveways. The pits have been abandoned for several years.

More than 40 wells have been drilled for gas and oil in the quadrangle. All holes for which records are available have been reported dry and abandoned.

Maxwell and Devaul (1962) have studied the groundwater conditions of this area and have found that wells in the flood plain of the Green River can produce as much as 100 gallons of hard water per minute. Dug wells in the terrace deposits have yielded as much as 500 gallons per day of soft water. Sandstone in the lower part of the Caseyville Formation will yield as much as 60 gallons per minute but the water becomes salty at depth and may have a high sodium bicarbonate content. Water from Mississippian rocks is fresh near the surface but becomes salty at depth.

Text from source map: Morgantown Quadrangle

Stratigraphic Section

Stratigraphic Section (double-click link to open the embedded document).

Graphic from source map: Morgantown Quadrangle

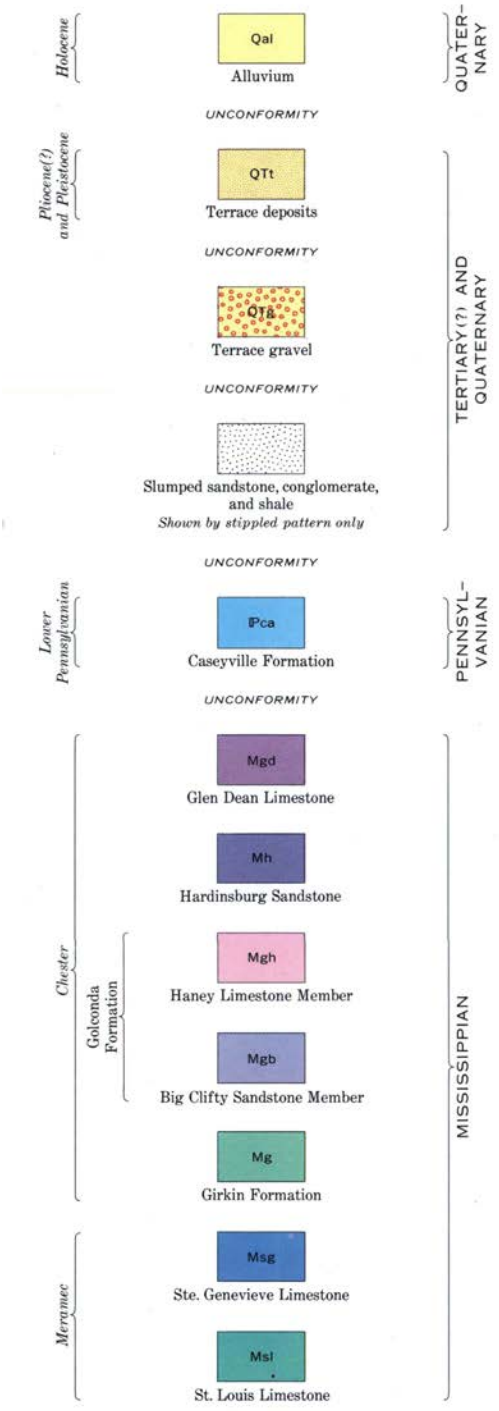
Munfordville Quadrangle

The formal citation for this source.

Moore, S.L., 1973, Geologic Map of the Munfordville Quadrangle, Hart County, Kentucky: U.S. Geological Survey, Geologic Quadrangle Map GQ-1055, scale 1:24,000 (*GRI Source Map ID 1161*).

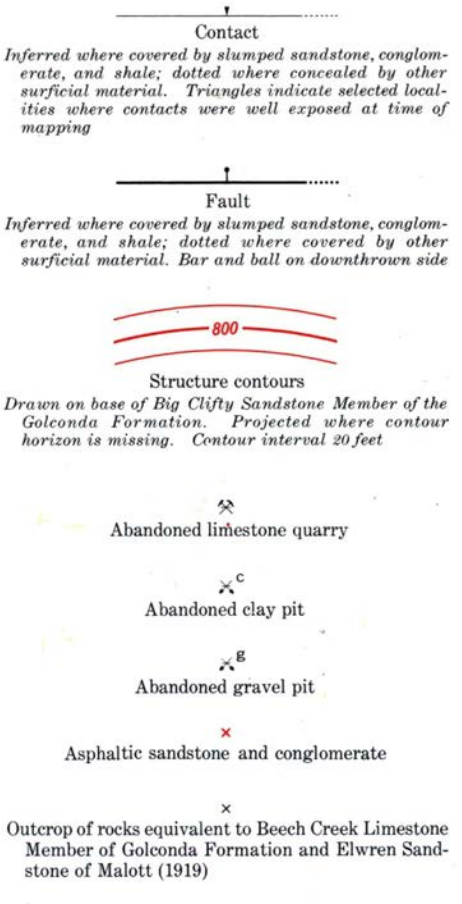
Prominent graphics and text associated with this source:

Correlation of Map Units



Graphic from source map: Munfordville Quadrangle

Map Legend



Graphic from source map: Munfordville Quadrangle

References

Brown, R. F., and Lambert, T. W., 1962, Availability of ground water in Allen, Barren, Edmonson, Green, Hart, Logan, Metcalf, Monroe, Simpson, and Warren Counties, Kentucky: U.S. Geol. Survey Hydrol. Inv. Atlas HA-32.

1963, Availability of ground water in Breckinridge, Grayson, Hardin, Larue, and Meade Counties, Kentucky: U.S. Geol. Survey Hydrol. Inv. Atlas HA-33.

References from source map: Munfordville Quadrangle

Economic Geology

Gas is the principal fuel resource. More than 15 tests have been drilled since 1930 in efforts to extend limits of the Shrewsbury field. The main gas-producing horizons in this field are the Chattanooga (New Albany) Shale of Devonian and Mississippian age and the Salem and Warsaw Limestones and Fort

Payne Formation of Mississippian age. On initial tests the wells have yielded flows ranging from 146 thousand c.f. to as much as 9 million c.f. per day (Avery E. Smith, Kentucky Geological Survey, written communication, 1974). The one well which tested 9 million c.f. per day produced from the Salem and Warsaw Limestones; it is, according to Smith, the most productive gas well completed in Grayson County. There has been no oil production.

Field studies indicate that there is little commercially mineable coal in the quadrangle. No coal is exposed at most of the small abandoned pits and adits. According to local residents, the thickest coal mined for house use averaged about 26 inches.

Most water wells in alluvium and in upland areas yield less than 100 gallons per day, and are inadequate for power pumps (Brown and Lambert, 1962, 1963).

Text from source map: Munfordville Quadrangle

Stratigraphic Section

Stratigraphic Section (double-click link to open the embedded document).

Graphic from source map: Munfordville Quadrangle

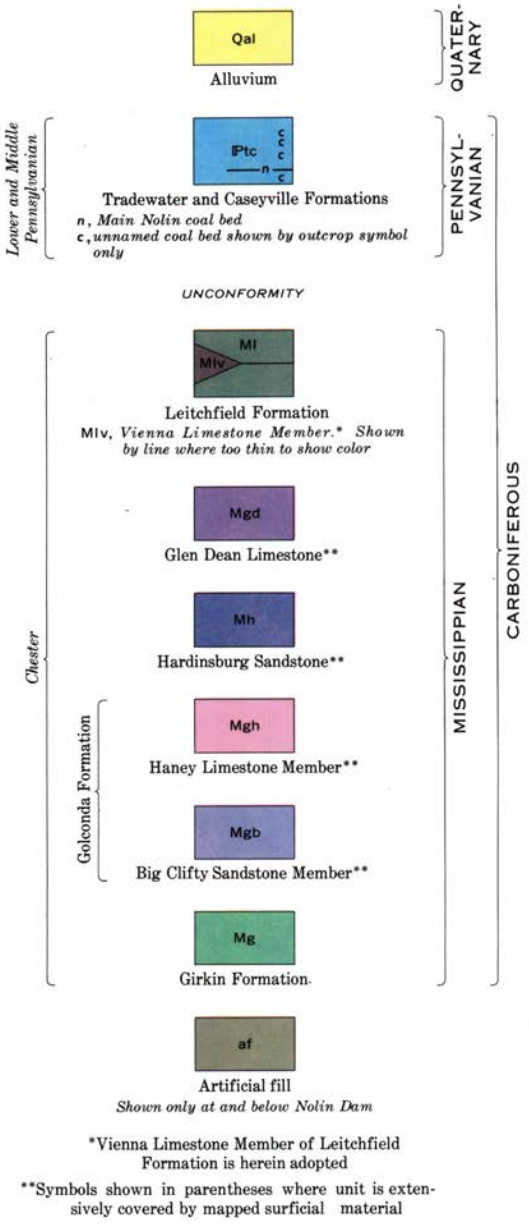
Nolin Reservoir Quadrangle

The formal citation for this source.

> Gildersleeve, Benjamin, 1971, Geologic Map of the Nolin Reservoir Quadrangle, western Kentucky: U.S. Geological Survey, Geologic Quadrangle Map GQ-895, scale 1:24,000 (*GRI Source Map ID 1162*).

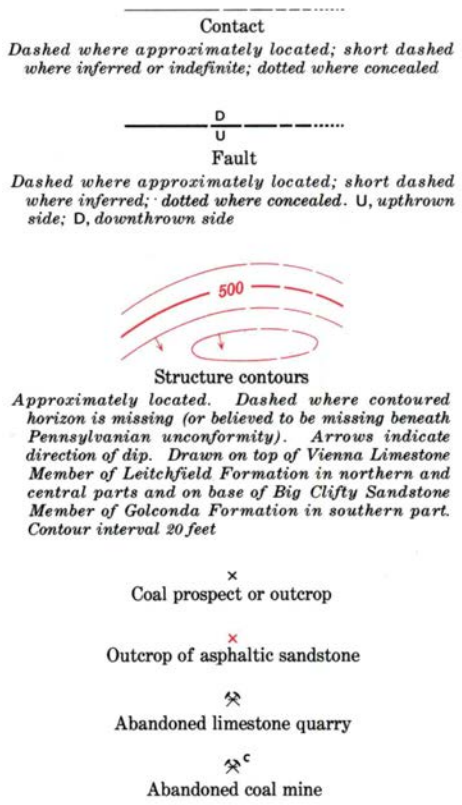
Prominent graphics and text associated with this source:

Correlation of Map Units



Graphic from source map: Nolin Reservoir Quadrangle

Map Legend



Graphic from source map: Nolin Reservoir Quadrangle

References

Brown, R. F., and Lambert, T. W., 1962, Availability of ground water in Allen, Barren, Edmonson, Green, Hart, Logan, Metcalfe, Monroe, Simpson, and Warren Counties, Kentucky: U.S. Geol. Survey Hydrol. Inv. Atlas HA-32.

1963, Availability of ground water in Breckinridge, Grayson, Hardin, Larue, and Meade Counties, Kentucky: U.S. Geol. Survey Hydrol. Inv. Atlas H A-33.

Gildersleeve, Benjamin, 1966, Geologic map of the Homer quadrangle, Logan County, Kentucky 1968a, Geologic map of the Quality quadrangle, Butler and Logan Counties, Kentucky: U.S. Geol. Survey Geol. Quad. Map GQ-673.

1968b, Geologic map of the Bee Spring quadrangle, Edmonson and Grayson Counties, Kentucky: U.S. Geol. Survey Geol. Quad. Map GQ-757.

Glick, E. E., 1963, Geology of the Clarkson quadrangle, Kentucky: U.S. Geol. Survey Geol. Quad. Map GQ-278.

Johnson, W. D., J r., and Smith, A. E., 1968, Geologic map of the Olaton quadrangle, western

Kentucky: U.S. Geol. Survey Geol. Quad. Map GQ-687.

Moore, P. N., 1877, On the geology of the Nolin River district, embracing portions of Grayson. Edmonson, Hart, and Butler Counties: Kentucky Geol. Survey, new ser. v. 2, pt. 2, 56 p.

Mullins, A. T., Hodgson, D. L., Avery, G. G., and Wilson, E. N., 1963, Coal reserves in portions of Butler, Edmonson, Grayson, Muhlenberg, Ohio, and Warren Counties, Kentucky: Kentucky Geol. Survey, ser. 9, Inf. Circ. 11, 29 p.

Sandberg, C. A., and Bowles, C. G., 1965, Geology of the Cub Run quadrangle, Kentucky: U.S. Geol. Survey Geol. Quad. Map GQ-386.

Shawe, F. R., 1966, Geologic map of the Reedyville quadrangle, western Kentucky: U.S. Geol. Survey Geol. Quad. Map GQ-520.

1968, Geologic map of the Riverside quadrangle, Butler and Warren Counties, Kentucky: U.S. Geol. Survey Geol. Quad. Map GQ-736.

Weller, J. M., 1927, The geology of Edmonson County: Kentucky Geol. Survey, ser. 6, v. 28, 246 p.

References from source map: Nolin Reservoir Quadrangle

Economic Geology

Nolin Reservoir (at altitudes of 480 feet permanent pool, 515 feet seasonal pool, and 560 feet controlled inundation) is, perhaps, the most important resource of the quadrangle. It is hoped that the geologic map, showing the distribution of different rock types, will be useful to engineers and land-use planners. Large areas adjacent to the reservoir are underlain by shale and siltstone of the Leitchfield Formation which are easily excavated but are poor foundation materials. This fact should be considered in erecting structures and building roads. Where cuts are over-steepened during excavation, structural failures (caused by flowage of water-saturated shale) as well as landslides and slumps are to be expected.

Limestone has been quarried from the Glen Dean Limestone near Iberia. The quarry is in an area subject to controlled inundation of Nolin Reservoir. Small quantities of limestone were obtained from the Haney Limestone Member of the Golconda Formation at Dogcreek. The site is below seasonal pool of Nolin Reservoir. During the geologic mapping no limestone was being quarried in the quadrangle; there are few localities where conditions are suitable for commercial production. Crushed stone for road metal and aggregate is produced at a large quarry in the Glen Dean Limestone half a mile northwest of Nolin Dam (Bee Spring quadrangle).

Coal outcrops, prospects, and abandoned mines shown on the map indicate the wide areal distribution of coal beds in the Tradewater and Caseyville Formations. There are at least five coal beds for which accurate correlations throughout the quadrangle could not be determined. Very likely most of these coals are thin and of only local occurrence. Inconclusive field evidence suggests that some of the coal beds occur in small channels. Only the Main Nolin coal bed has been mined and it is the most important coal. It varies from 12 inches to 36 inches in thickness where exposed. Reported thicknesses of 48 inches at abandoned mines could not be verified. According to Mullins and others (1963, p. 15), estimated reserves of the Main Nolin coal in the quadrangle total 18,269 short tons. No coal mines were in operation during the geologic mapping.

The "iron ores" of the quadrangle are not economically important but are of interest historically. They occur in the Leitchfield, Tradewater, and Caseyville Formations. Limonite, siderite, and ferruginous

sandstones were used to make cold blast iron in the Nolin charcoal furnace (known locally as the Baker Furnace) near the mouth of Davis Creek. According to local residents, most of the "ore" was obtained from deposits in the Bee Spring quadrangle. The furnace, built about 1846, was not operated after 1850 (written communication, C. E. Whittle, 1962). The furnace is below seasonal pool level of Nolin Reservoir, and is partly exposed during periods of drawdown. Incomplete records indicate that more than 12 test holes drilled in the quadrangle yielded shows of gas and oil. Of the three shown on the map about 1 mile northeast of Straw, one has been abandoned and two yield small quantities of oil. It is believed that the production is from limestone beds 75 to 85 feet below the Chattanooga Shale (Upper Devonian).

Natural rock asphalt occurs mainly in the lower part of the Caseyville Formation as thick-bedded sandstone impregnated with bitumen. Two zones, each 25 feet thick, were penetrated in an oil well near Ollie. Outcrops and slumped beds of asphaltic sandstone are rare. The deposits have not been mined. Ground-water resources are described in reports by Brown and Lambert (1962,1963).

Text from source map: Nolin Reservoir Quadrangle

Stratigraphic Section

Stratigraphic Section (double-click link to open the embedded document).

Graphic from source map: Nolin Reservoir Quadrangle

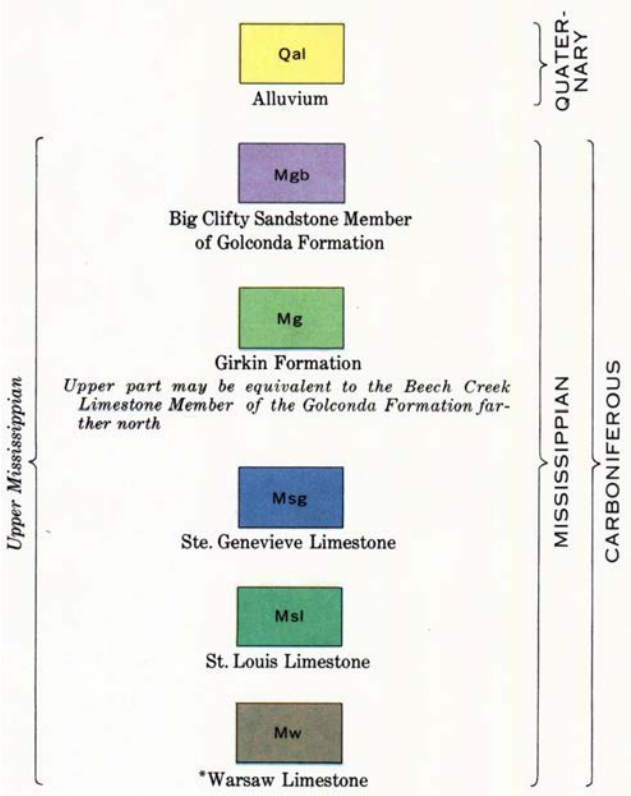
Park City Quadrangle

The formal citation for this source.

Haynes, D.D., 1962, Geology of the Park City Quadrangle, Kentucky: U.S. Geological Survey, Geologic Quadrangle Map GQ-183, scale 1:24,000 (*GRI Source Map ID 1163*).

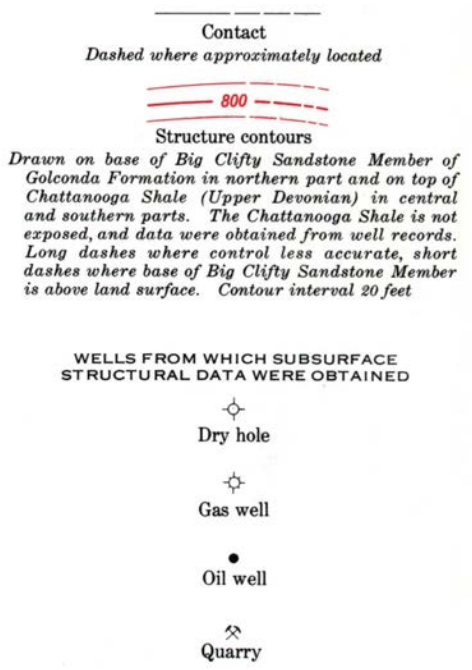
Prominent graphics and text associated with this source:

Correlation of Map Units



Graphic from source map: Park City Quadrangle

Map Legend



Graphic from source map: Park City Quadrangle

Economic Geology

The principal mineral resources of the Park City quadrangle are limestone, oil, and gas. The only active stone quarry is that of the McLellan Stone Co. west of Park City on U.S. Highway 31-W, where the Ste. Genevieve Limestone is quarried for road metal, aggregate, and agricultural lime. A small amount of oil is produced just west of Fairview Church on Gardner Creek and north of Mt. Vernon Church on State Highway 467. A small amount of gas is produced and consumed locally.

Text from source map: Park City Quadrangle

Stratigraphic Section

Stratigraphic Section (double-click link to open the embedded document).

Graphic from source map: Park City Quadrangle

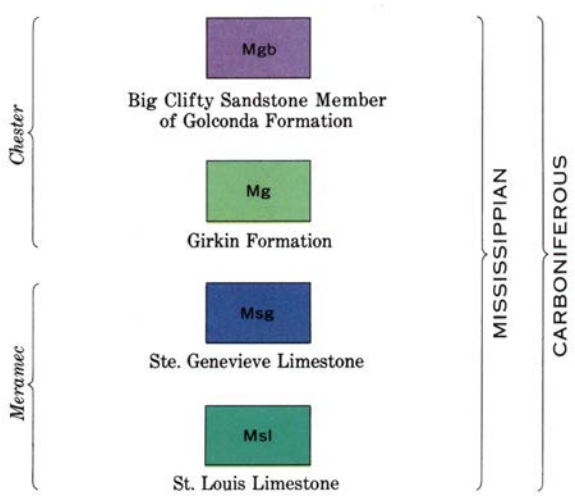
Park Quadrangle

The formal citation for this source.

> Moore, S.L., and Haynes, D.D., 1967, Geologic Map of the Park Quadrangle, south-central Kentucky: U.S. Geological Survey, Geologic Quadrangle Map GQ-634, scale 1:24,000 (*GRI Source Map ID 2762*).

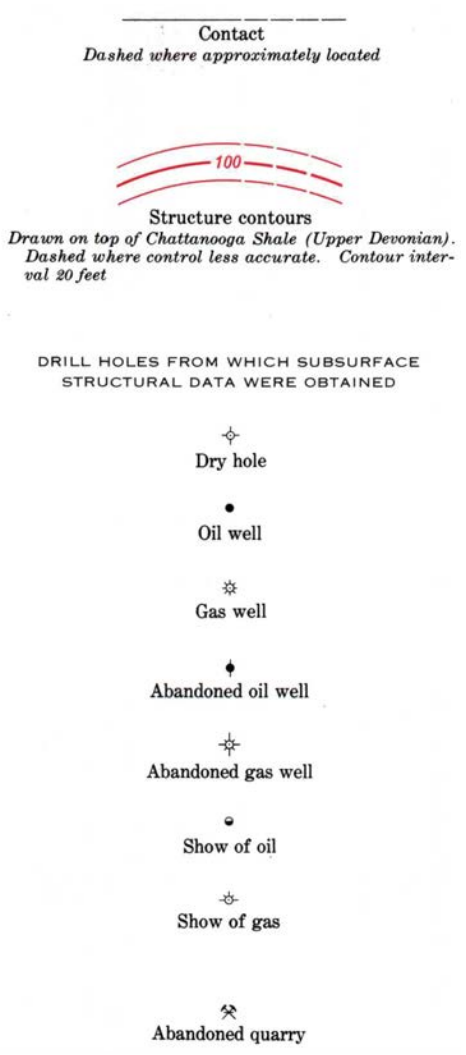
Prominent graphics and text associated with this source:

Correlation of Map Units



Graphic from source map: Park Quadrangle

Map Legend



Graphic from source map: Park Quadrangle

References

McFarlan, A. C., 1943 (reprinted 1961), Geology of Kentucky: Univ. of Kentucky, Lexington, 531 p.

References from source map: Park Quadrangle

Economic Geology

Limestone and oil are the principal resources of the quadrangle.

Dawson and Wootens Knobs are underlain by Ste. Genevieve Limestone and limestone of the Girkin Formation which are probably suitable for road metal, dimension stone, and agricultural lime. A small quarry in Ste. Genevieve Limestone on the northwest slope of Allison Knob was abandoned because of

interbeds of chert.

Oil has been produced in the quadrangle since 1930 from the LeGrande oil pool (McFarlan, 1943, p. 337) which covers about 3000 acres and extends from the vicinity of Seymour northward to Allison Knob. According to McFarlan (1943, p. 337-339), oil production in the LeGrande oil pool is from two zones of porous dolomitic limestone below the Chattanooga Shale of Late Devonian age. The upper producing zone, identified as the "Corniferous", is 0 to 40 feet below the Chattanooga Shale; most production from this zone came from the upper 15 feet of dolomitic limestone. The lower producing zone, 70 to 100 feet below the Chattanooga Shale, is called the "Blue sand." It is tentatively correlated with the Laurel Dolomite of Middle Silurian age. McFarlan (1943, p. 337) correlated the dolomitic limestones of the lower producing zone with the lower part of the Louisville Limestone and the upper part of the Laurel Dolomite, both Middle Silurian in age.

The LeGrande oil pool is on the western limb of the Cincinnati arch within a series of structural ridges and troughs; all plunging gently northwestward. The oil within the "Corniferous sands" occurs on the ridges and troughs and is apparently associated with a stratigraphic pinchout of porous dolomitic limestone beds along the unconformable contact at the base of the Chattanooga Shale (McFarlan, 1943, p. 338).

The LeGrande oil pool produced approximately 3,500,000 barrels of oil from hundreds of wells during the period 1930-35 (McFarlan, 1943, p. 340); most wells were abandoned by 1965. Production of oil from wells in the "Blue sand" was initially 40 to 50 barrels of oil per day but declined rapidly to about 4 to 5 barrels per day. Production of oil from the "Corniferous" ranged initially from 50 to several hundred barrels per day; one well was reported to have flowed 2400 barrels per day. Since 1958 at least 50 test holes have been drilled for oil in the vicinity of LeGrande and about 20 of these holes encountered commercial quantities of oil from 0 to 55 feet below the Chattanooga Shale.

A small unnamed oil pool, developed in the late 1950's near the northern boundary of the quadrangle, produced oil from dolomitic limestone 70 to 100 feet below the Chattanooga Shale. These dolomitic limestone beds are tentatively correlated with the Laurel Dolomite of Middle Silurian age. The producing beds are in what appears from the structure contours on the Chattanooga Shale to be a northwestward plunging anticlinal nose. The shale, however, ranges in thickness from 70 feet along the flanks to as little as 3 feet along the crest of the structure, and the geologic structure of the underlying strata is unknown. The occurrence of oil along the anticlinal nose suggests, however, that the producing beds were folded with the Chattanooga Shale.

Text from source map: Park Quadrangle

Stratigraphic Section

Stratigraphic Section (double-click link to open the embedded document).

Graphic from source map: Park Quadrangle

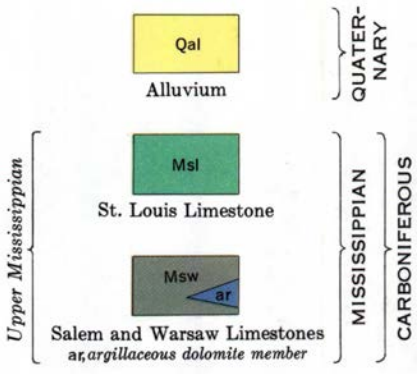
Polkville Quadrangle

The formal citation for this source.

> Gildersleeve, Benjamin, 1962, Geology of the Polkville Quadrangle, Kentucky: U.S. Geological Survey, Geologic Quadrangle Map GQ-194, scale 1:24,000 (*GRI Source Map ID 2747*).

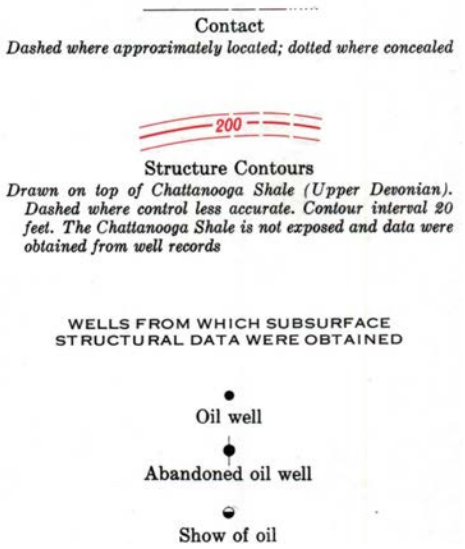
Prominent graphics and text associated with this source:

Correlation of Map Units



Graphic from source map: Polkville Quadrangle

Map Legend



Graphic from source map: Polkville Quadrangle

Economic Geology

Many oil wells have been drilled in the quadrangle. A few wells are pumped intermittently, and the small production is from the Salem and Warsaw Limestones (Upper Mississippian) and "Corniferous sands" (Devonian). Gas has been produced from undetermined formations, but there is no current production.

Most of the quadrangle is underlain by limestone which, in most areas, is covered by cherty, clayey residuum. The value of the residual clay for purposes other than agricultural use has not been determined. The St. Louis Limestone has been quarried for road metal.

Text from source map: Polkville Quadrangle

Stratigraphic Section

Stratigraphic Section *(*double-click link to open the embedded document).

Graphic from source map: Polkville Quadrangle

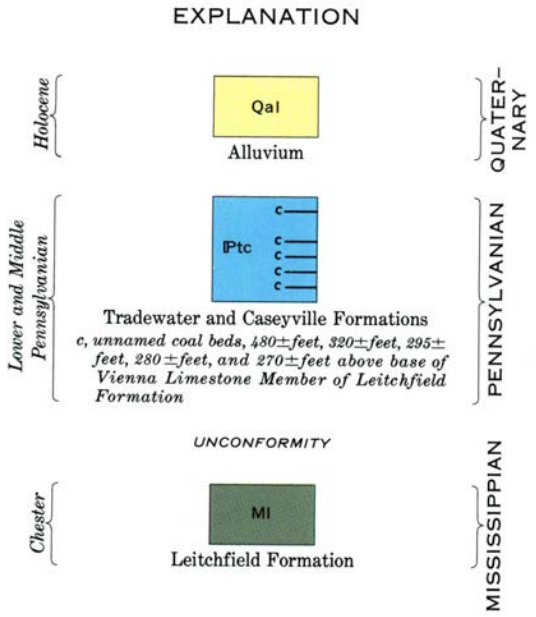
Ready Quadrangle

The formal citation for this source.

> Gildersleeve, Benjamin, 1975, Geologic Map of the Ready Quadrangle, western Kentucky: U.S. Geological Survey, Geologic Quadrangle Map GQ-1263, scale 1:24,000 (*GRI Source Map ID 2745*).

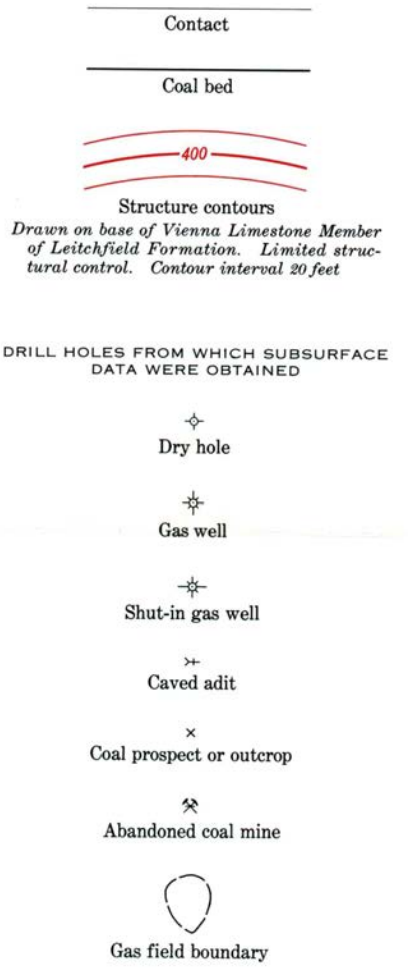
Prominent graphics and text associated with this source:

Correlation of Map Units



Graphic from source map: Ready Quadrangle

Map Legend



Graphic from source map: Ready Quadrangle

References

Brown, R. F., and Lambert, T. W., 1962, Availability of ground water in Allen, Barren, Edmonson, Green, Hart, Logan, Metcalf, Monroe, Simpson, and Warren Counties, Kentucky: U.S. Geol. Survey Hydrol. Inv. Atlas HA-32.

1963, Availability of ground water in Breckinridge, Grayson, Hardin, Larue, and Meade Counties, Kentucky: U.S. Geol. Survey Hydrol. Inv. Atlas HA-33.

References from source map: Ready Quadrangle

Economic Geology

Gas is the principal fuel resource. More than 15 tests have been drilled since 1930 in efforts to extend limits of the Shrewsbury field. The main gas-producing horizons in this field are the Chattanooga (New Albany) Shale of Devonian and Mississippian age and the Salem and Warsaw Limestones and Fort Payne Formation of Mississippian age. On initial tests the wells have yielded flows ranging from 146 thousand c.f. to as much as 9 million c.f. per day (Avery E. Smith, Kentucky Geological Survey, written communication, 1974). The one well which tested 9 million c.f. per day produced from the Salem and Warsaw Limestones; it is, according to Smith, the most productive gas well completed in Grayson County. There has been no oil production.

Field studies indicate that there is little commercially mineable coal in the quadrangle. No coal is exposed at most of the small abandoned pits and adits. According to local residents, the thickest coal mined for house use averaged about 26 inches.

Most water wells in alluvium and in upland areas yield less than 100 gallons per day, and are inadequate for power pumps (Brown and Lambert, 1962, 1963).

Text from source map: Ready Quadrangle

Stratigraphic Section

Stratigraphic Section *(double-click link to open the embedded document).*

Graphic from source map: Ready Quadrangle

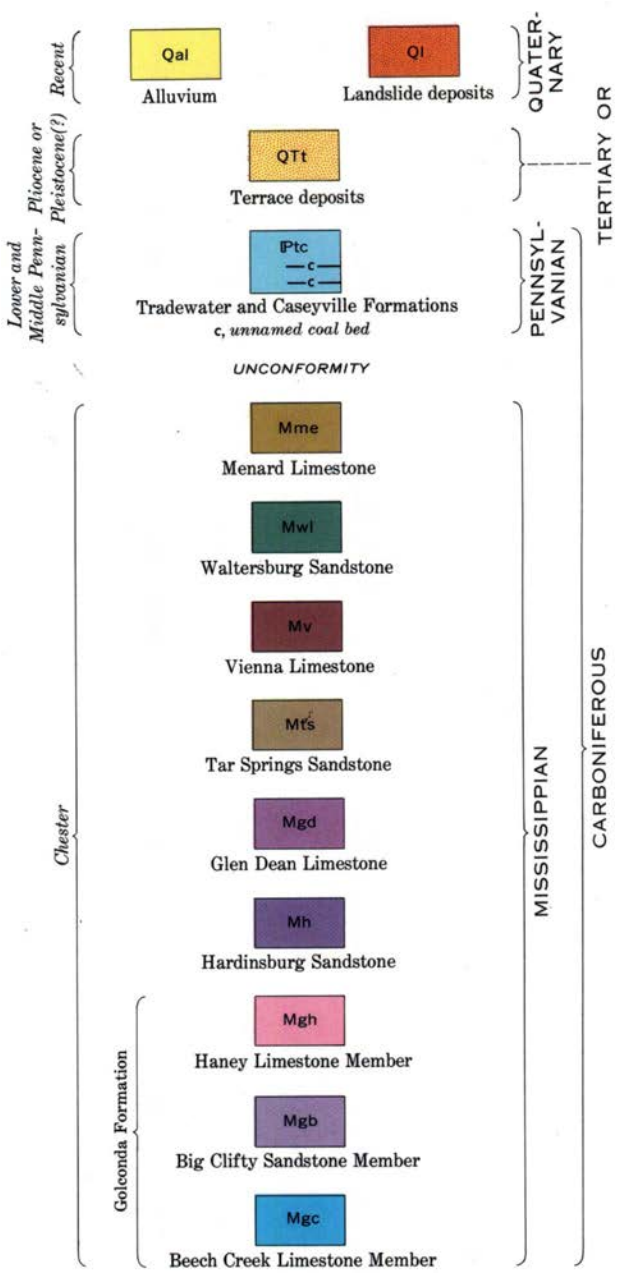
Reedyville Quadrangle

The formal citation for this source.

> Shawe, F.R., 1966, Geologic Map of the Reedyville Quadrangle, western Kentucky: U.S. Geological Survey, Geologic Quadrangle Map GQ-520, scale 1:24,000 (*GRI Source Map ID 2769*).

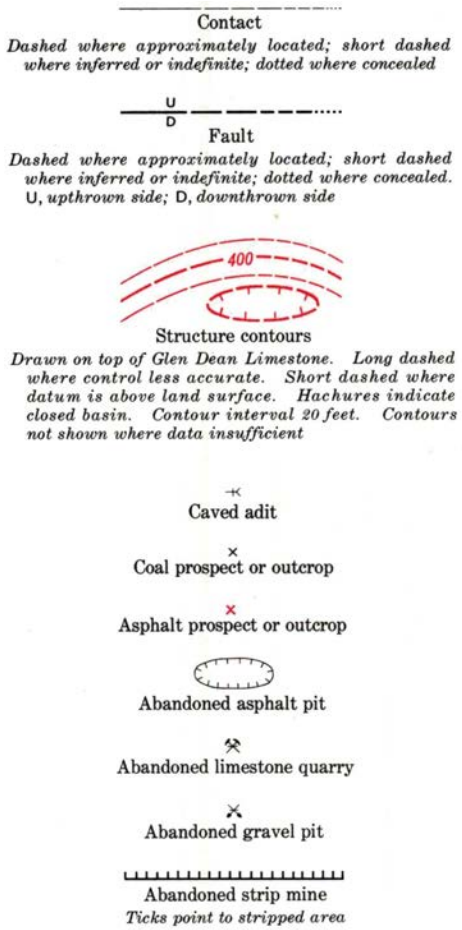
Prominent graphics and text associated with this source:

Correlation of Map Units



Graphic from source map: Reedyville Quadrangle

Map Legend



Graphic from source map: Reedyville Quadrangle

References

Gildersleeve, Benjamin, 1965, Geology of the Brownsville quadrangle, Kentucky: U.S. Geol. Survey Geol. Quad. Map GQ-411.

Malott, C. A., 1919, The "American Bottoms" region of eastern Greene County, Indiana-a type unit in southern Indiana physiography; Indiana Univ. Studies, v, 6, no. 40, 61 p.

McFarlan, A. C., 1943 (reprinted 1961) Geology of Kentucky: Univ. of Kentucky, Lexington, 531 p.

McFarlan, A. C., Swann, D. H., Walker, F. H., and Nosow, Edmund, 195.5, Some old Chester problems correlations of lower and middle Chester formations of western Kentucky: Kentucky Geol. Survey, ser. 9, Bull. 16, 37 p.

Moore, P. N., 1884, Report on the geology of the Nolin River district, embracing portions of Grayson,

Edmonson, Hart, and Butler Counties: Kentucky Geol. Survey, Rept. Prog. 2, new ser. Western Coal Field D, p. 8-38.

Mullins, A. T., Hodgson, D. L., Avery, G. G., and Wilson, E. N., 1963, Coal reserves in portions of Butler, Edmonson, Grayson, Muhlenberg, Ohio, and Warren Counties, Kentucky: Kentucky Geol. Survey, ser. 10, Info. Circular 11, 29 p.

Shawe, F. R., 1963, Geology of the Bowling Green North quadrangle, Kentucky: U.S. Geol. Survey Geol. Quad. Map GQ-234.

References from source map: Reedyville Quadrangle

Economic Geology

Rock asphalt has been mined for paving material from the lower sandstone units of the Tradewater and Caseyville Formations 1/4 mile north of Segal and 1/2 mile southeast of Cherrys Chapel. Other exposures of rock asphalt in this same interval were noted in these two areas and rock asphalt float was seen in the vicinity of Fallover Bend. Other surface occurrences are in the Hardinsburg Sandstone southwest of Cherrys Chapel. Logs of drill holes southwest of Roundhill, east of Threlkel, and southwest of Reedyville show rock asphalt variously in the Glen Dean Limestone, Hardinsburg Sandstone, Haney Limestone and Rig Clifty Sandstone Members of the Golconda Formation, and in limestone at depths as much as 180 feet below the base of the Big Clifty Sandstone Member. The exposed rock asphalt deposits are irregular, crudely lenticular masses of medium- to very coarse grained sandstone saturated with asphalt. McFarlan (1943, p. 384) says of these deposits: "The occurrence of rock asphalt is erratic and lenticular and the mapping of the particular sandstone in which a deposit is known to occur is not a mapping of the asphalt deposit" Grade ranges from an estimated 2 percent to an estimated 15 percent asphalt by volume. Localization of the deposit near Segal seems to be associated with a deep part of a channel cut into the underlying Mississippian rocks much like the deposits in the adjacent Brownsville quadrangle (Gildersleeve, 1965). However, the deposits near Cherrys Chapel seem to be associated with a fault that has cut a small domelike structure in the Mississippian rocks. Nothing is known of the nature and size of the occurrences in limestone reported in drillhole logs. The rock asphalt may be of future importance as a paving material for secondary roads and a source of petroleum.

Coal has been mined extensively from the Tradewater and Caseyville Formations; most mining was in beds in the lower shaly unit (Mullins and others, 1963, p. 10). No mines were in operation during the geologic mapping. The highest coal bed is probably the Foster coal and the lowest coal bed is probably the Main Nolin coal. There is probably little, if any, commercially minable coal left in the quadrangle (Mullins and others, 1963, p. 7). The lower coal beds were mined near the head of Lick Branch, along Cub Creek and Bear Creek, in three small hollows near the mouth of Bear Creek, and near Shanty Hollow Lake. Apparently two coal beds were worked; the lower bed was the more extensively mined and is probably the Main Nolin coal. Many small mines reportedly have been operated in the upper coal beds; only two of these mines are shown on the map. Elsewhere, even where evidence of mining is present, no reasonably accurate position of the coal beds could be determined.

Brown and gray clay has been reported by local sources in the interbedded sandstone and shale of the upper part of the Tradewater and Caseyville Formations in the northwestern part of the quadrangle. These clay deposits could not be located in the field; however, drill-hole logs show a few clay beds up to 2 feet thick in this same interval. Underclay beneath coal beds is probably too thin and erratically distributed to be of commercial interest.

Limestone was once quarried from the Glen Dean Limestone about 114 miles south of Cherrys Chapel. Total production was quite small. Much of the Glen Dean Limestone and the thicker parts of the Haney

Limestone Member of the Golconda Formation are suitable for use as agricultural limestone and aggregate.

Several exploratory oil wells have been drilled in the quadrangle, but no commercial quantities of oil have been found.

Small amounts of gravel are available from the bed of the Green River and from gravel lenses in the terrace deposits. Some of this material from both sources has been used to surface farm roads locally.

Text from source map: Reedyville Quadrangle

Stratigraphic Section

Stratigraphic Section (double-click link to open the embedded document).

Graphic from source map: Reedyville Quadrangle

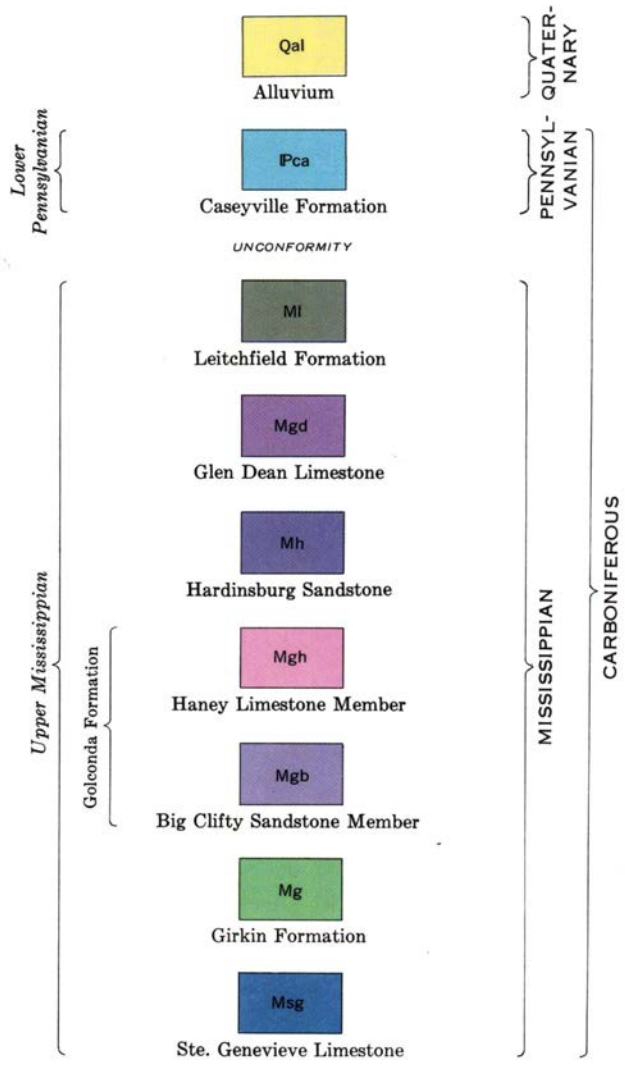
Rhoda Quadrangle

The formal citation for this source.

> Klemic, Harry, 1963, Geology of the Rhoda Quadrangle, Kentucky: U.S. Geological Survey, Geologic Quadrangle Map GQ-219, scale 1:24,000 (*GRI Source Map ID 1164*).

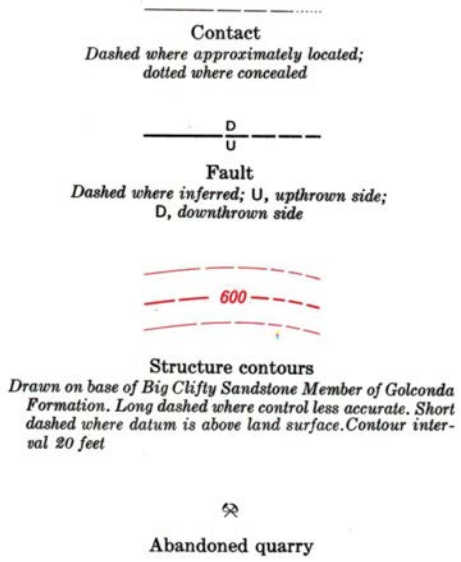
Prominent graphics and text associated with this source:

Correlation of Map Units



Graphic from source map: Rhoda Quadrangle

Map Legend



Graphic from source map: Rhoda Quadrangle

Economic Geology

Oil has been produced in small amounts from a few wells in the southern part of the quadrangle, but there is no current production. The oil was obtained from beds of probable Devonian or Silurian age below the Chattanooga Shale of Late Devonian age in areas where that formation lies about 1100 feet below the surf ace.

Asphaltic sandstone in the Big Clifty Sandstone Member in the northern and western part of the quadrangle is similar to "asphalt rock" in the Caseyville that has been mined from open pits in adjoining areas. The pore spaces in this rock contain a petroleum residue and the rock has a petroliferous odor. Limestone has been quarried from the Glen Dean Limestone near Rhoda and from the Girkin Formation at Mill Creek north of Good Spring Church in the Mammoth Cave National Park. No limestone is being quarried now, and no quarries are equipped for operation.

The interesting and beautiful physiographic features of the part of the quadrangle that is within the National Park including prominent ridges, cliffs, sinks, caves, and deep river valleys are of potential value as tourist attractions.

Text from source map: Rhoda Quadrangle

Stratigraphic Section

Stratigraphic Section (double-click link to open the embedded document).

Graphic from source map: Rhoda Quadrangle

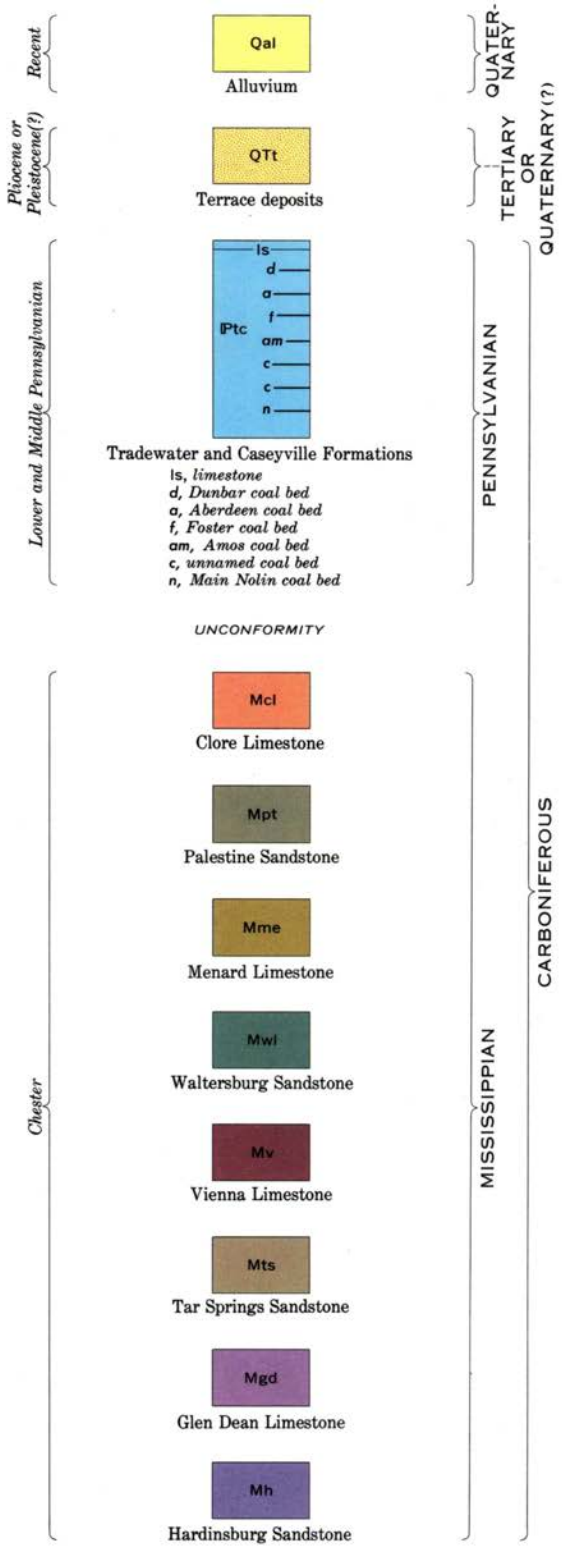
Riverside Quadrangle

The formal citation for this source.

> Shawe, F.R., 1968, Geologic Map of the Riverside Quadrangle, Butler and Warren Counties, Kentucky: U.S. Geological Survey, Geologic Quadrangle Map GQ-736, scale 1:24,000 (*GRI Source Map ID 2768*).

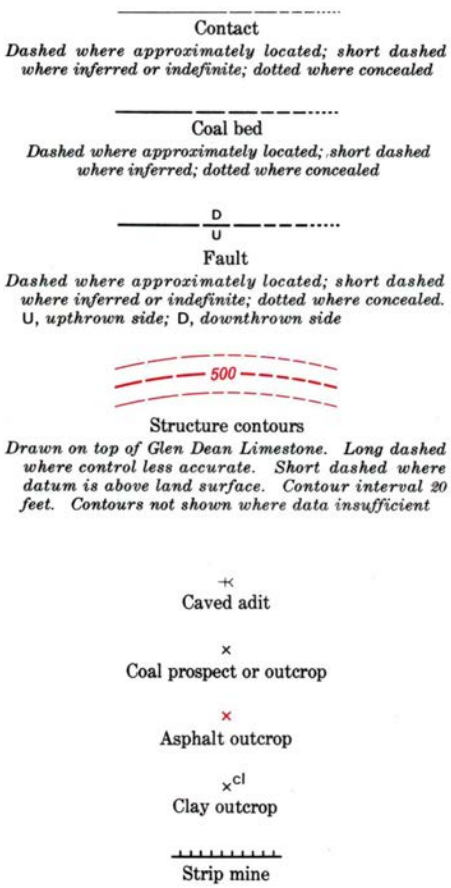
Prominent graphics and text associated with this source:

Correlation of Map Units



Graphic from source map: Riverside Quadrangle

Map Legend



Graphic from source map: Riverside Quadrangle

References

Brown, R. F., and Lambert, T. W., 1962, Availability of ground water in Allen, Barren, Edmonson, Green, Hart, Logan, Metcalfe, Monroe, Simpson and Warren Counties, Kentucky: U.S. Geol. Survey Hydro]. Inv. Atlas HA-32.

Maxwell, B. W., and Devaul, R. W., 1962, Availability of ground water in Butler and Ohio Counties, Kentucky: U.S. Geol. Survey Hydrol. Inv. Atlas HA-26,

Moore, P. N., 1884, Report on the geology of the Nolin River district, embracing portions of Grayson, Edmonson, Hart, and Butler Counties: Kentucky Geol. Survey, Rept. Prog. 2, new ser., Western Coal Field D, p. 8-38.

Mullins, A. T., Hodgson, D. L., Avery, G. G., and Wilson, E. N., 1963, Coal reserve s in portions of Butler, Edmonson, Grayson, Muhlenberg, Ohio, and Warren Counties, Kentucky: Kentucky Geol. Survey, ser. 10, Info. Circ. 11, 29 p.

Rainey, H. C., III, 1963, Geology of the Hadley quadrangle, Kentucky: U.S. Geol. Survey Geol. Quad.

Map GQ-237.

Shawe, F. R., 1966, Geologic map of the Reedyville quadrangle, western Kentucky: U.S. Geol. Survey Geol. Quad. Map GQ-520.

References from source map: Riverside Quadrangle

Economic Geology

Coal is the principal mineral resource in the quadrangle and has been mined from all of the seven coal beds mapped. The Foster coal bed has produced most of the coal with lesser amounts coming from the Dunbar coal bed; only very small amounts have been obtained from the other coal beds. All mines were inactive during 1965-66. Mullins and others (1963, p. 23) estimate reserves (in the Dunbar, Foster, and Amos coal beds only) to be 36,412,000 short tons of mineable coal.

Gray underclay was noted at two places beneath the Main Nolin coal bed. These two exposures are along the road about 1 1/2 miles southwest of Riverside. Clay in the northern exposure appears to be about 4 feet thick, but because of surface slumping no measurement could be made. Clay in the southern exposure is about 10 inches thick. Local sources indicate that elsewhere underclays are either absent or too thin to be of economic interest.

Asphalt-bearing sandstone of Pennsylvanian age crops out in a hollow near the eastern edge of the quadrangle along the same fault near which asphalt has been mined in the adjacent Reedyville quadrangle (Shawe, 1966).

Several exploratory holes have been drilled for oil, but no production has been reported.

Limestone suitable for aggregate and agricultural purposes is available in the Glen Dean Limestone within the quadrangle. Gravel in small quantities is available from the beds of the Barren and Green Rivers and from the terrace deposits. Small amounts of this material have been used to improve local farm roads. The groundwater conditions in the quadrangle are discussed in reports by Brown and Lambert (1962) and Maxwell and Devaul (1962).

Text from source map: Riverside Quadrangle

Stratigraphic Section

Stratigraphic Section (double-click link to open the embedded document).

Graphic from source map: Riverside Quadrangle

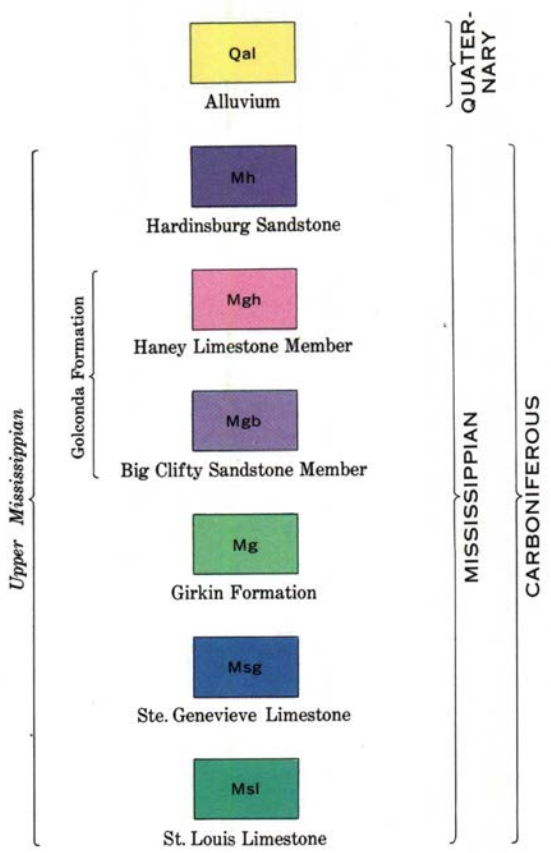
Smiths Grove Quadrangle

The formal citation for this source.

> Richards, Paul W., 1964, Geology of the Smiths Grove Quadrangle, Kentucky: U.S. Geological Survey, Geologic Quadrangle Map GQ-357, scale 1:24,000 (*GRI Source Map ID 1165*).

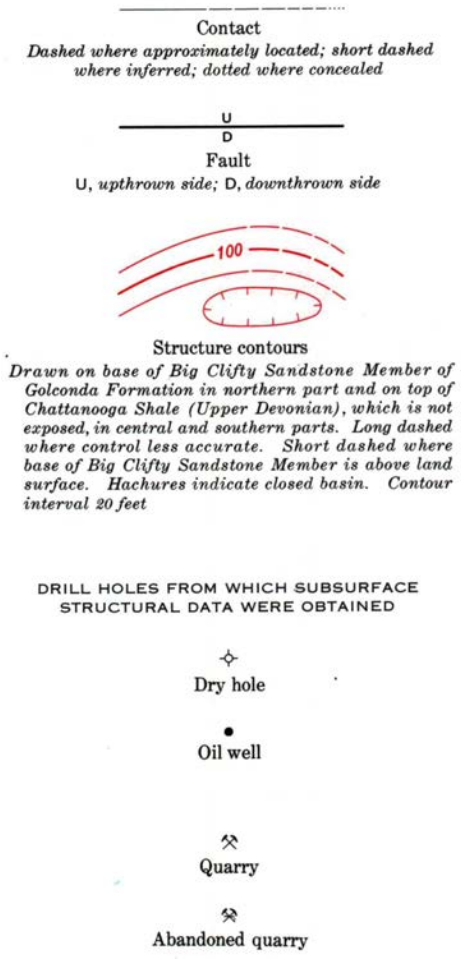
Prominent graphics and text associated with this source:

Correlation of Map Units



Graphic from source map: Smiths Grove Quadrangle

Map Legend



Graphic from source map: Smiths Grove Quadrangle

References

McFarlan, A. C., 1943, (reprinted 1961), Geology of Kentucky: Lexington, University of Kentucky, 531 p.

References from source map: Smiths Grove Quadrangle

Economic Geology

More than 40 wells, most of which are in the east-central part of the quadrangle are producing, or have recently produced, oil. All or most of the oil comes from "Corniferous" beds of probable Silurian age. Scanty records indicate the oil comes from a zone 30 feet or less thick underlying the Chattanooga Shale (Upper Devonian). Drilling was active during and just preceding the 1920's and has been sporadic since that time. The light crude initially flows under gas pressure from many wells, but most production is by pump. Shows of oil and gas have been reported from the Beaver sand, which seems to be porous

limestone a few feet above the Chattanooga Shale in the basal part of the Fort Payne Formation of Early Mississippian age.

The Ste. Genevieve Limestone is quarried near Pilot Knob southeast of Smiths Grove, and it has been quarried northeast of Ice Sink School in the north-central part of the quadrangle. The limestone is crushed and used chiefly for road metal and agricultural lime. The Ste. Genevieve is relatively free of chert and argillaceous material. It is accessible and can be quarried where only soil and weathered rock must be removed. These advantages have made the Ste. Genevieve Limestone more valuable for quarrying than either the Girkin Formation above it or the St. Louis Limestone below.

Text from source map: Smiths Grove Quadrangle

Stratigraphic Section

Stratigraphic Section (double-click link to open the embedded document).

Graphic from source map: Smiths Grove Quadrangle

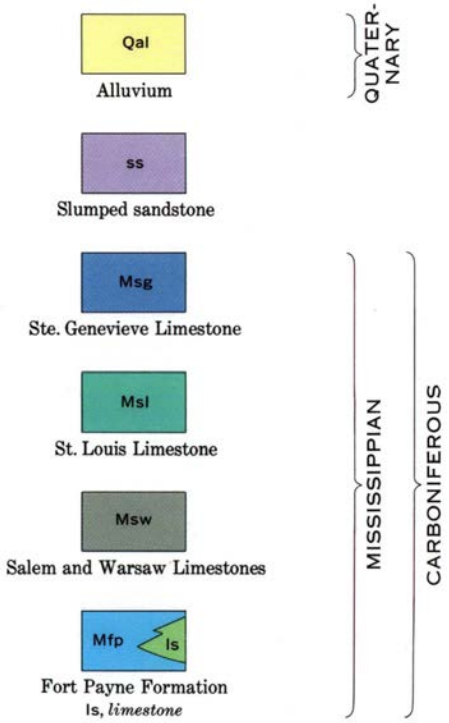
Sulphur Well Quadrangle

The formal citation for this source.

> Cattermole, J.M., 1966, Geologic Map of the Sulphur Well Quadrangle, Metcalfe and Green Counties, Kentucky: U.S. Geological Survey, Geologic Quadrangle Map GQ-555, scale 1:24,000 (*GRI Source Map ID 2742*).

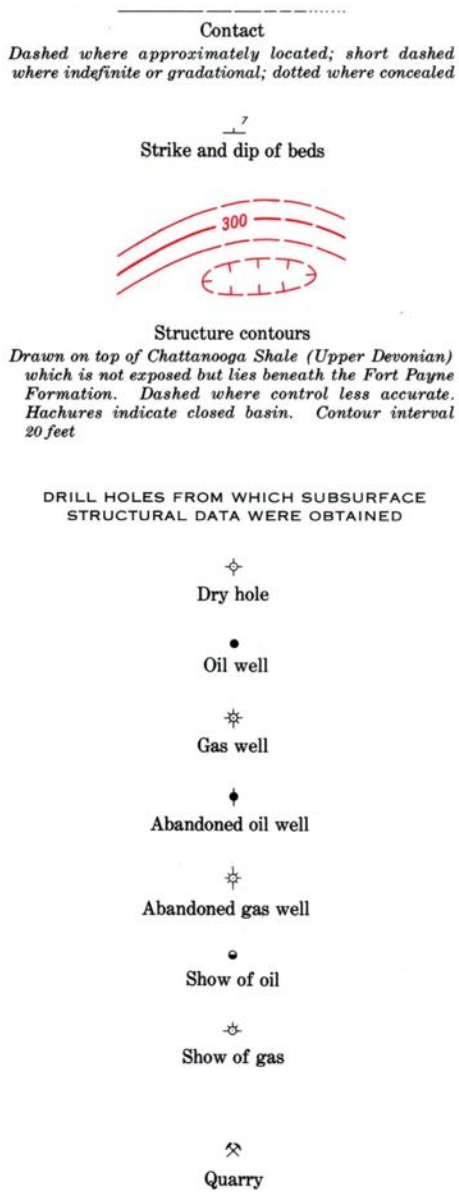
Prominent graphics and text associated with this source:

Correlation of Map Units



Graphic from source map: Sulphur Well Quadrangle

Map Legend



Graphic from source map: Sulphur Well Quadrangle

References

Brown, R. F., and Lambert, T. W., 1962, Availability of ground water in Allen, Barren, Edmonson, Green, Hart, Logan, Metcalfe, Monroe, Simpson, and Warren Counties, Kentucky: U.S. Geol. Survey Hydrol. Inv. Atlas HA-32.

References from source map: Sulphur Well Quadrangle

Economic Geology

Gas, oil, and crushed limestone are the main mineral resources that have been produced in the quadrangle.

In the northwestern part of the quadrangle, a number of abandoned gas wells are the southwestern most extension of the Center gas field. This field was developed in the latter part of the 1920's as a commercial gas field. Adequate production records and well logs are not available; however, reports and well depths indicate that most of these wells produced from Silurian, or Devonian strata immediately below the Chattanooga Shale of Late Devonian age and a few wells listed as producers bottomed in the Fort Payne Formation. Gas from a few wells is still used for heating nearby homes.

From 1959 through 1963 more than 350,000 barrels of oil were produced within the quadrangle. This production is from three areas: Knob Lick field, Ebenezer School field, and a westward extension of the Edmonton North field. In the Knob Lick field, in the north-central part of the quadrangle, the majority of the wells produce from Silurian or Devonian strata immediately below the Chattanooga Shale, but a few wells in the vicinity of Franklin and Mitchell Cemetery produce from the "reef" limestone in the lower part of the Fort Payne Formation. This field is abnormal from the generally accepted concept that the most favorable location for commercial accumulation of oil is a structural high for, in the Knob Lick field, the production is along the axial line, or trough, of a syncline. Subsurface information supports the hypothesis that the oil reservoir in this syncline is a permeability trap developed along a pre-Chattanooga unconformity. Many of the wells producing from Silurian or Devonian strata have been improved by "shooting". In the Ebenezer School field, in the central part of the quadrangle, production is from the "reef" limestone in the lower part of the Fort Payne Formation. A few wells produced without treatment, but some were developed by acidization. In the western extension of the Edmonton North field, along the southeastern border of the quadrangle, production is from the "reef" limestone in the lower part of the Fort Payne Formation. Most of these wells have been improved by acidization.

The limestone quarry one mile north of Knob Lick is in the upper part of the Ste. Genevieve Limestone. The rock is quarried, crushed, and screened into grades for road construction, concrete aggregate, and agricultural limestone.

Text from source map: Sulphur Well Quadrangle

Stratigraphic Section

Stratigraphic Section (double-click link to open the embedded document).

Graphic from source map: Sulphur Well Quadrangle

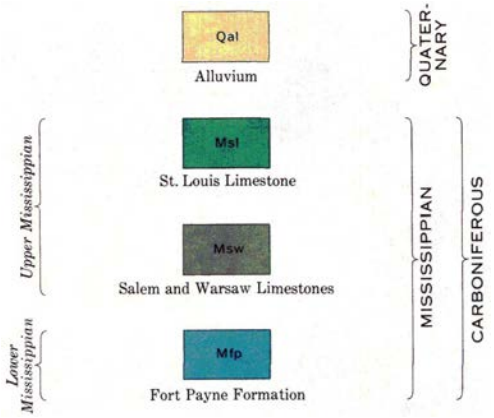
Summer Shade Quadrangle

The formal citation for this source.

> Hail, W.J., 1964, Geology of the Summer Shade Quadrangle, Kentucky: U.S. Geological Survey, Geologic Quadrangle Map GQ-308, scale 1:24,000 (*GRI Source Map ID 2749*).

Prominent graphics and text associated with this source:

Correlation of Map Units



Graphic from source map: Summer Shade Quadrangle

Map Legend



Graphic from source map: Summer Shade Quadrangle

Economic Geology

Oil and gas have not yet been discovered in commercial amounts within the quadrangle, although several test holes reportedly have encountered shows of both oil and gas. Gas from a few wells has been used for heating by individual farmers. This gas has been produced mostly from limestone beds in the lower part of the Fort Payne Formation. Nearby areas produce some oil from lenticular limestone beds in the Fort Payne Formation. Such production may be more closely related to permeability traps rather than to closed anticlinal structures.

Agricultural limestone and road metal have been produced from a quarry 1/2 mile northeast of Summer Shade. The entire thickness (about 50 feet) of the Salem and Warsaw Limestones at this quarry is unusually free of siltstone, clay, or other impurities.

Much road metal, particularly on private farm roads, consists of chert rubble derived from the Fort Payne Formation. Such rubble is plentiful in most of the stream valleys cutting the Fort Payne.

A bed of rock gypsum of unknown thickness was reported in the drilling of a water well near Taylor Branch in the west-central part of the quadrangle. Presumably the gypsum occurs in the lower part of the St. Louis Limestone.

Text from source map: Summer Shade Quadrangle

Stratigraphic Section

Stratigraphic Section (double-click link to open the embedded document).

Graphic from source map: Summer Shade Quadrangle

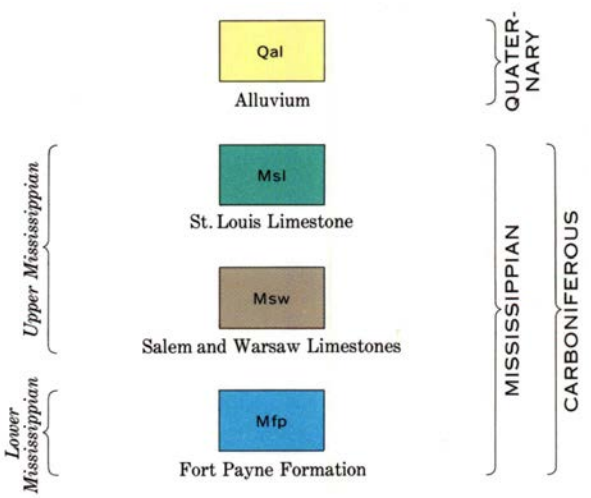
Temple Hill Quadrangle

The formal citation for this source.

> Moore, S.L., and Miller, R.C., 1965, Geology of the Temple Hill Quadrangle, Barren County, Kentucky: U.S. Geological Survey, Geologic Quadrangle Map GQ-402, scale 1:24,000 (*GRI Source Map ID 2764*).

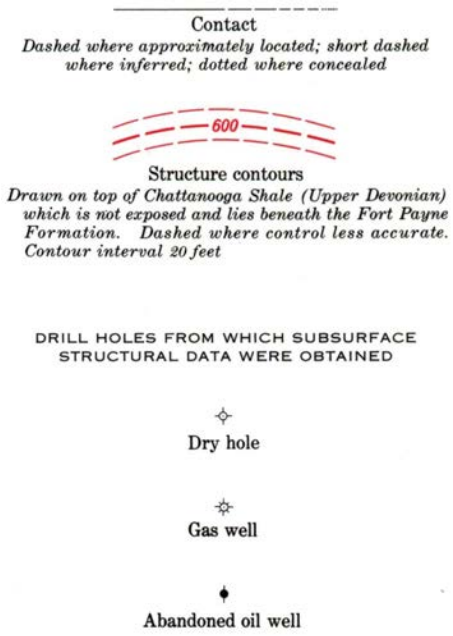
Prominent graphics and text associated with this source:

Correlation of Map Units



Graphic from source map: Temple Hill Quadrangle

Map Legend



Graphic from source map: Temple Hill Quadrangle

Economic Geology

At least 140 holes have been drilled for oil and gas in the quadrangle but only minor amounts have been produced. A gas well in the east-central part of the quadrangle, approximately 1 mile southwest of Kino, produced enough gas to supply one family in 1963. In the same vicinity, 1 1/2 miles southwest of Kino, one well (abandoned) produced a minor amount of oil. The only other known production of oil was in a well (now abandoned) in the northwestern part of the quadrangle, approximately 1 mile northeast of New Salem Church. The oil and gas were obtained from limestone beds beneath the Chattanooga Shale of Late Devonian age.

Limestones in the quadrangle are unsuitable for commercial use due to a high content of shale, silt, and chert.

Text from source map: Temple Hill Quadrangle

Stratigraphic Section

Stratigraphic Section (double-click link to open the embedded document).

Graphic from source map: Temple Hill Quadrangle

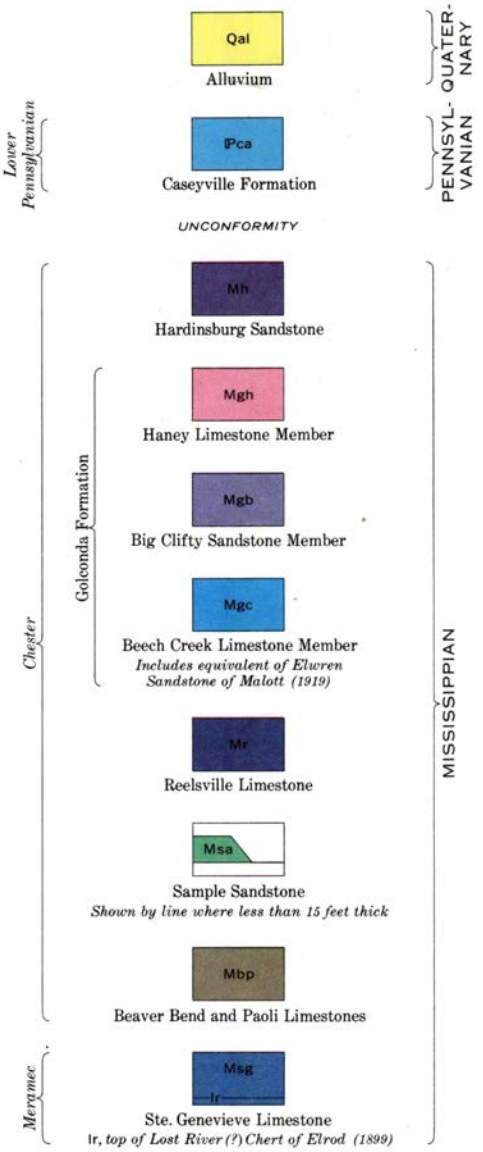
Upton Quadrangle

The formal citation for this source.

> Moore, F.B., 1972, Geologic Map of the Upton Quadrangle, central Kentucky: U.S. Geological Survey, Geologic Quadrangle Map GQ-1000, scale 1:24,000 (*GRI Source Map ID 2758*).

Prominent graphics and text associated with this source:

Correlation of Map Units



Graphic from source map: Upton Quadrangle

Map Legend



Pattern shows area of slumped sandstone, shale, or conglomerate derived from rocks of Late Mississippian or Early Pennsylvanian age

Contact

Dashed where inferred; dotted where concealed. Triangles indicate selected localities where contact was well exposed at time of mapping

Fault

Approximately located; dashed where inferred; dotted where concealed. Bar and ball on downthrown side



Structure contours

Drawn on base of Sample Sandstone which is rarely exposed southeast of line A-A'. Projected where contoured horizon is missing. Contour interval 20 feet

DRILL HOLES FROM WHICH SUBSURFACE STRUCTURAL DATA WERE OBTAINED

Dry hole

Abandoned oil well

Abandoned gas well

Shut-in oil well

Show of oil

Show of gas

Quarry

Abandoned quarry

Graphic from source map: Upton Quadrangle

References

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References from source map: Upton Quadrangle

Economic Geology

Large quantities of limestone for use as agricultural limestone and road metal are produced near Upton from a quarry in the upper Ste. Genevieve Limestone and in the Paoli and Beaver Bend Limestones. Three other quarries, two in the Ste. Genevieve Limestone and one in the Ste. Genevieve-Paoli-Beaver Bend Limestones, are abandoned.

More than 20 test holes for oil have been drilled near Priceville at the north end of the Priceville field which extends southeasterly into the adjoining Munfordville quadrangle. Although reportedly most of these holes encountered oil, total production from the area was small. The producing horizon was the "Blue sand," probably the Laurel Dolomite of Middle Silurian age, at a depth of about 1,000 feet. About one mile east of this group several test holes encountered oil in the "Corniferous" [Louisville (?) Limestone] of probable Devonian age. Whether wells in this group achieved more than very limited production is doubtful.

Gas and some oil were found in a number of test holes drilled near Burnt Knob at the eastern border. The pay horizon was the "Blue sand" at about 950 feet.

Availability of groundwater is discussed by Brown and Lambert (1962, 1963).

Text from source map: Upton Quadrangle

Stratigraphic Section

Stratigraphic Section (double-click link to open the embedded document).

Graphic from source map: Upton Quadrangle

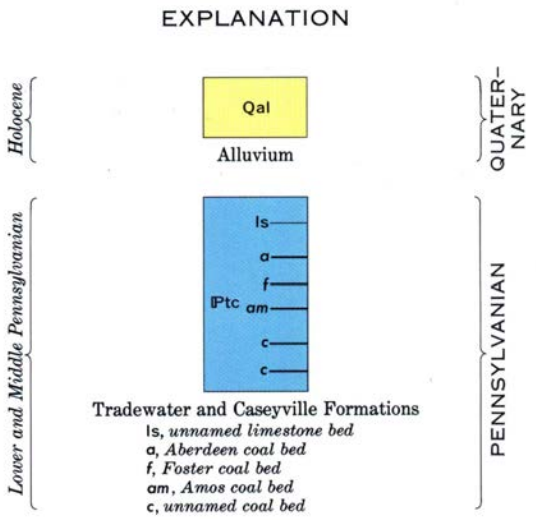
Welchs Creek Quadrangle

The formal citation for this source.

> Gildersleeve, Benjamin, 1976, Geologic Map of the Welchs Creek Quadrangle, Butler and Grayson Counties, Kentucky: U.S. Geological Survey, Geologic Quadrangle Map GQ-1339, scale 1:24,000 (*GRI Source Map ID 2744*).

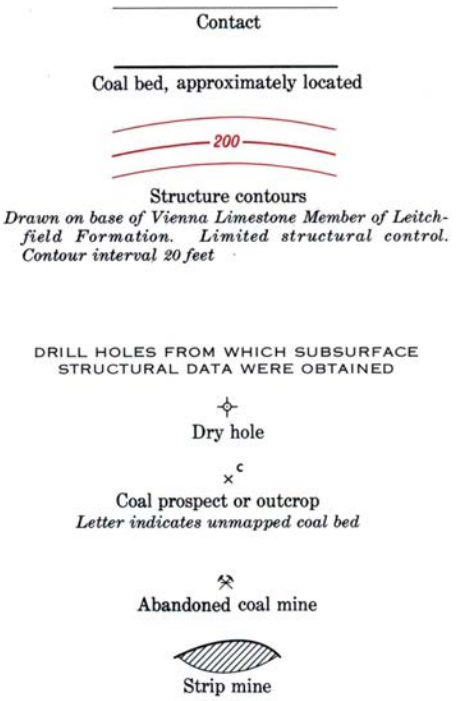
Prominent graphics and text associated with this source:

Correlation of Map Units



Graphic from source map: Welchs Creek Quadrangle

Map Legend



Graphic from source map: Welchs Creek Quadrangle

References

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References from source map: Welchs Creek Quadrangle

Economic Geology

Small amounts of coal have been mined mainly for home use from the Aberdeen, Foster and Amos coal beds. No coal is exposed at most of the abandoned workings. All mines were inactive in 1974.

More than 14 holes have been drilled in the quadrangle for oil and gas. All holes for which records are available have been reported dry and abandoned. Shows of dead oil have been reported from the

Tradewater and Caseyville Formations at depths of 106 to 107 feet and 296 to 304 feet; from the Ste. Genevieve Limestone of Meramec age at a depth of 1,260 to 1,270 feet; and from the Big Clifty Sandstone Member of the Golconda Formation of Chester age at a depth of 788 to 792 feet. Shows of gas have been reported from the Tradewater and Caseyville Formations at a depth of 300 to 315 feet, and from the Tar Springs Sandstone of Chester age at a depth of 283 to 285 feet.

According to Maxwell and Devaul (1962), most of the water wells in this quadrangle yield more than 500 gallons per day from depths of less than 300 feet. Thick sandstone beds are the best aquifers, whereas wells penetrating only shale, sandy shale, or thin sandstone beds yield only small quantities of water. The water is fresh near outcrops, but may become increasingly mineralized with depth.

Text from source map: Welchs Creek Quadrangle

Stratigraphic Section

Stratigraphic Section (double-click link to open the embedded document).

Graphic from source map: Welchs Creek Quadrangle

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This document was developed and completed by Shea Slonkosky, Lucas Chappell and Jim Chappell (Colorado State University) for the NPS Geologic Resources Division (GRD) Geologic Resources Inventory (GRI) Program. Quality control of this document by Stephanie O'Meara and Jim Chappell (Colorado State University).

The information in this document was compiled from GRI source maps, and is intended to accompany the digital geologic-GIS maps and other digital data for Mammoth Cave National Park, Kentucky (MACA) and Abraham Lincoln Birthplace National Historical Park (ABLI) developed by Jim Chappell, Shea Slonkoski, Lucas Chappell, James Winter, Stephanie O'Meara and Ron Karpilo (Colorado State University) (see the GRI Digital Maps and Source Map Citations section of this document for all sources used by the GRI in the completion of this document and related GRI digital geologic-GIS maps).

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