



STATE OF ILLINOIS

DEPARTMENT OF REGISTRATION AND EDUCATION

**STRUCTURE OF THE TOP
OF THE KARNAK LIMESTONE MEMBER
(STE. GENEVIEVE) IN ILLINOIS**

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STRUCTURE OF THE TOP OF THE KARNAK LIMESTONE MEMBER (STE. GENEVIEVE) IN ILLINOIS

HUBERT M. BRISTOL AND RICHARD H. HOWARD

ABSTRACT

A structure map of the top of the Karnak Limestone Member (Ste. Genevieve) has been drawn for most of southern Illinois (scale 1 to 500,000, contour interval 100 feet; plate 1). All available electric logs and selected studies of well cuttings were used in constructing the map.

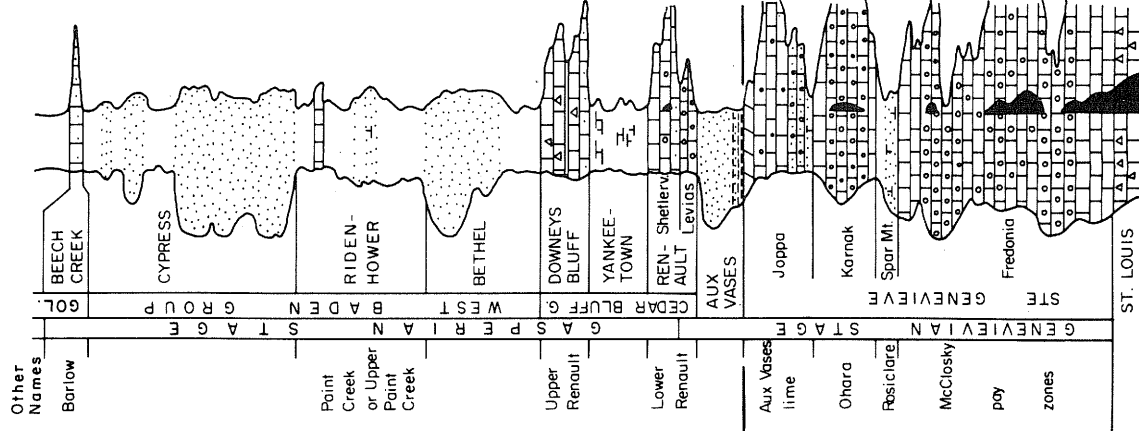
The limits of the map area are determined by: (1) the lack of recognizable Spar Mountain Sandstone separating the Karnak from hundreds of feet of underlying Mississippian limestones; (2) absence of the Karnak due to nondeposition of it, erosion of it prior to deposition of the overlying Aux Vases Sandstone, or erosion of it at the sub-Pennsylvanian unconformity; and (3) lack of sufficient subsurface data in Clark County and in the structurally complex area south of the Cottage Grove Fault System and the Shawneetown Fault.

INTRODUCTION

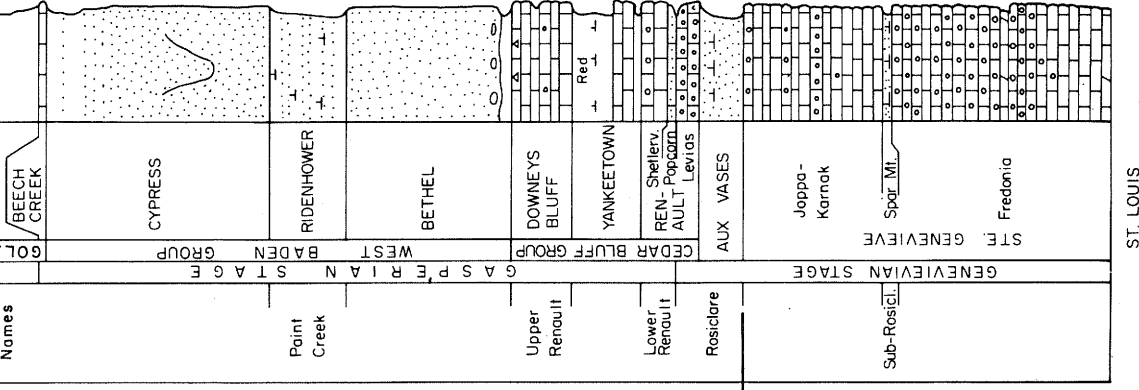
In recent years the Illinois State Geological Survey has published four statewide geologic structure maps, the main purpose of which is to facilitate petroleum exploration in Illinois. These include maps of the Devonian-Silurian Hunton Limestone Megagroup (Stevenson and Whiting, 1967), the Mississippian Beech Creek (Barlow) Limestone (Bristol, 1968), and the Ordovician Galena (Trenton) Limestone Group (Bristol and Buschbach, 1973). Plate 1 of the present report, a map of the structure of the Karnak Limestone Member, is the latest of these statewide maps.

STRATIGRAPHIC SETTING OF THE KARNAK MEMBER

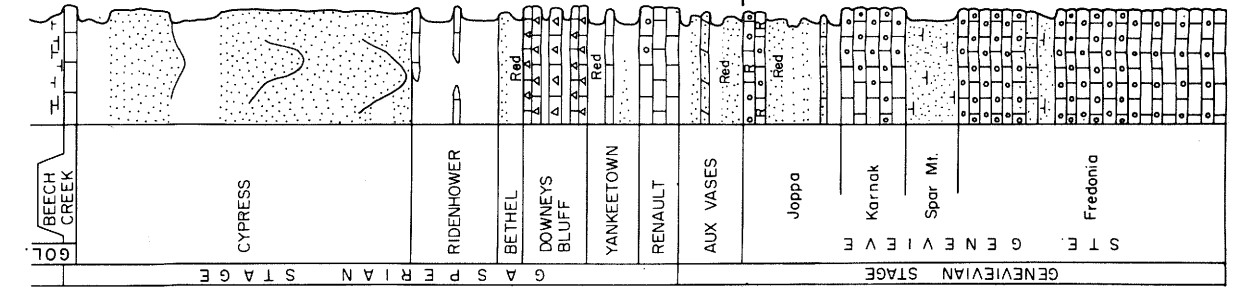
Karnak Limestone Member was proposed by Swann (1963, p. 71) as the name for "a relatively pure persistent limestone unit in the Ste. Genevieve Limestone of Genevievian age. It generally is 10 to 35 feet thick. It overlies sandstone, siltstone, shale, or impure limestone assigned to the Spar Mountain Member and underlies similar strata assigned to the Aux Vases Sandstone or the Joppa [Limestone] Member." Variations in the stratigraphic setting of the Karnak throughout southern Illinois are shown in figure 1.



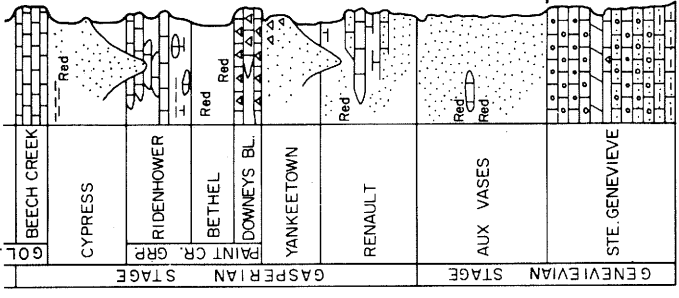
D-White County



C-Fluorspar District



B-Anno District



A-Chester District

Base of
Aux Vases
Ss.

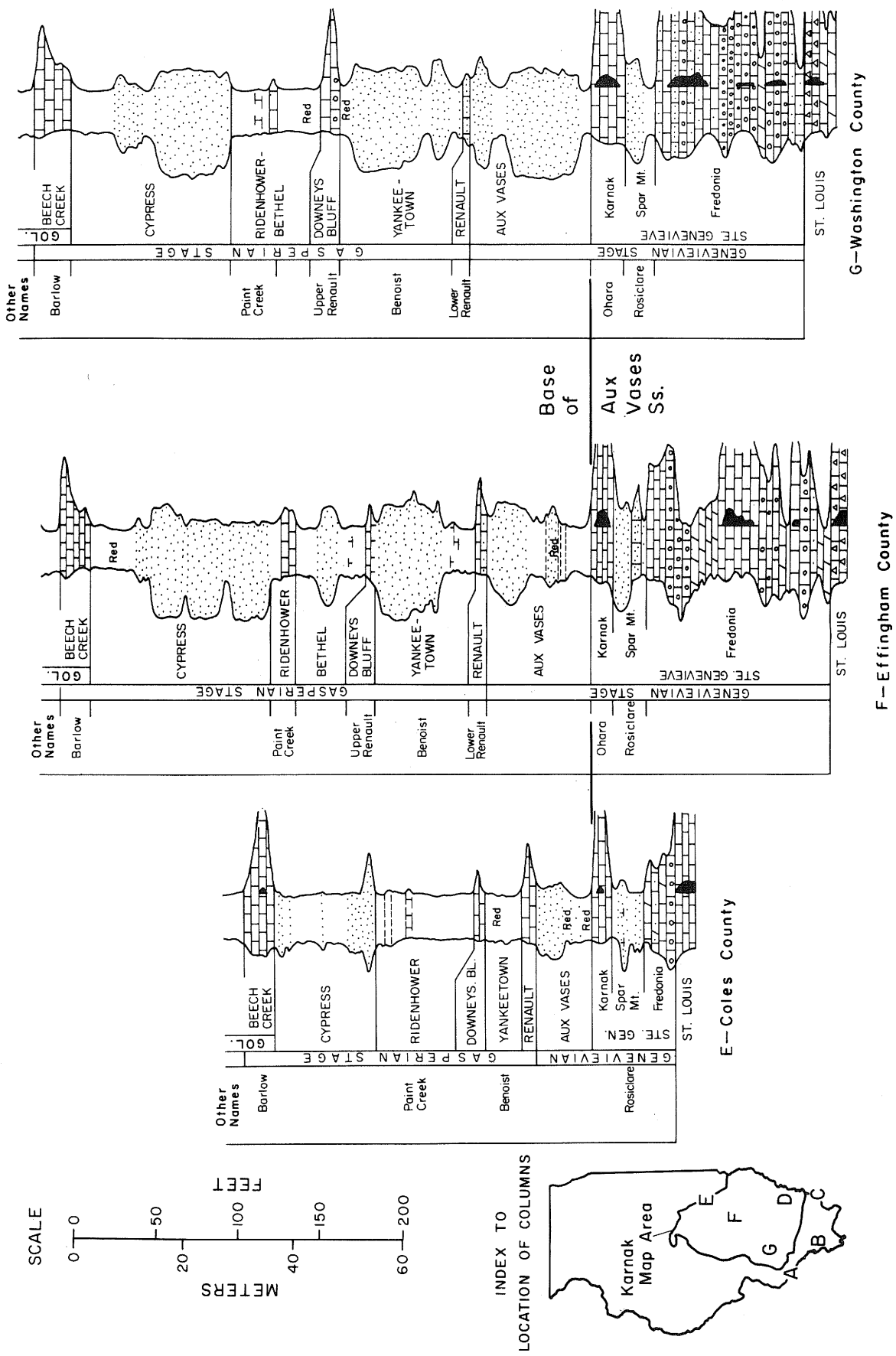


Fig. 1 - Rock columns of Genevievian and lower part of the Chesterian in southern Illinois (modified from plate 1, D. H. Swann and Elwood Atherton, in Swann, 1963). Rock columns are lined up on the base of the Aux Vases Sandstone.

Problems of Recognition

In some places the Karnak Member is not easily recognized. The unit most heavily relied upon in identifying the Karnak, both on geophysical logs and in well cuttings, is the Spar Mountain Sandstone Member, which underlies it. Over most of central southern Illinois, the Spar Mountain Member contains the first significant body of sandstone above hundreds of feet of limestones (the Fredonia Member and older Mississippian limestones). If sandstone is well developed within the Spar Mountain (fig. 1, rock columns B, E, F, G), the bottom of the Karnak is easily recognized. In easternmost and westernmost southern Illinois, absence, or poor development, of sandstone within the Spar Mountain makes recognition of the Karnak difficult (fig. 1, rock columns A, C, D). In easternmost southern Illinois, recognition of the Karnak is further obscured by the development of limestone within the Joppa Member above it (fig. 1, rock columns C, D).

LIMITS OF MAP AREA

Several factors limit the area in which the structure of the top of the Karnak can be successfully mapped. In addition to the problem of recognizing the Spar Mountain Sandstone, they are: (1) the absence of the Karnak due to nondeposition of it, erosion of it prior to deposition of the overlying Aux Vases Sandstone, or erosion of it at the sub-Pennsylvanian unconformity; and (2) lack of sufficient subsurface data in Clark County and in the structurally complex area south of the Cottage Grove Fault System and the Shawneetown Fault.

Following is a discussion of the map boundaries (plate 1), beginning at the northeast and proceeding clockwise. The northeastern boundary of the map, extending from Piatt County to Clark County, is drawn where Karnak strata in the steeply dipping western flank of the La Salle Anticlinal Belt are truncated by the sub-Pennsylvanian unconformity. Owing to the scarcity of suitable subsurface data, Clark County was not mapped.

Southward from the Cottage Grove Fault System and the Shawneetown Fault, the amount of subsurface information diminishes and the structural geology becomes complex. These factors, together with progressive southeastward decrease of sandstone within the Spar

Mountain Member, prompted the choice of the Cottage Grove Fault System and the Shawneetown Fault as the southern limit of the map.

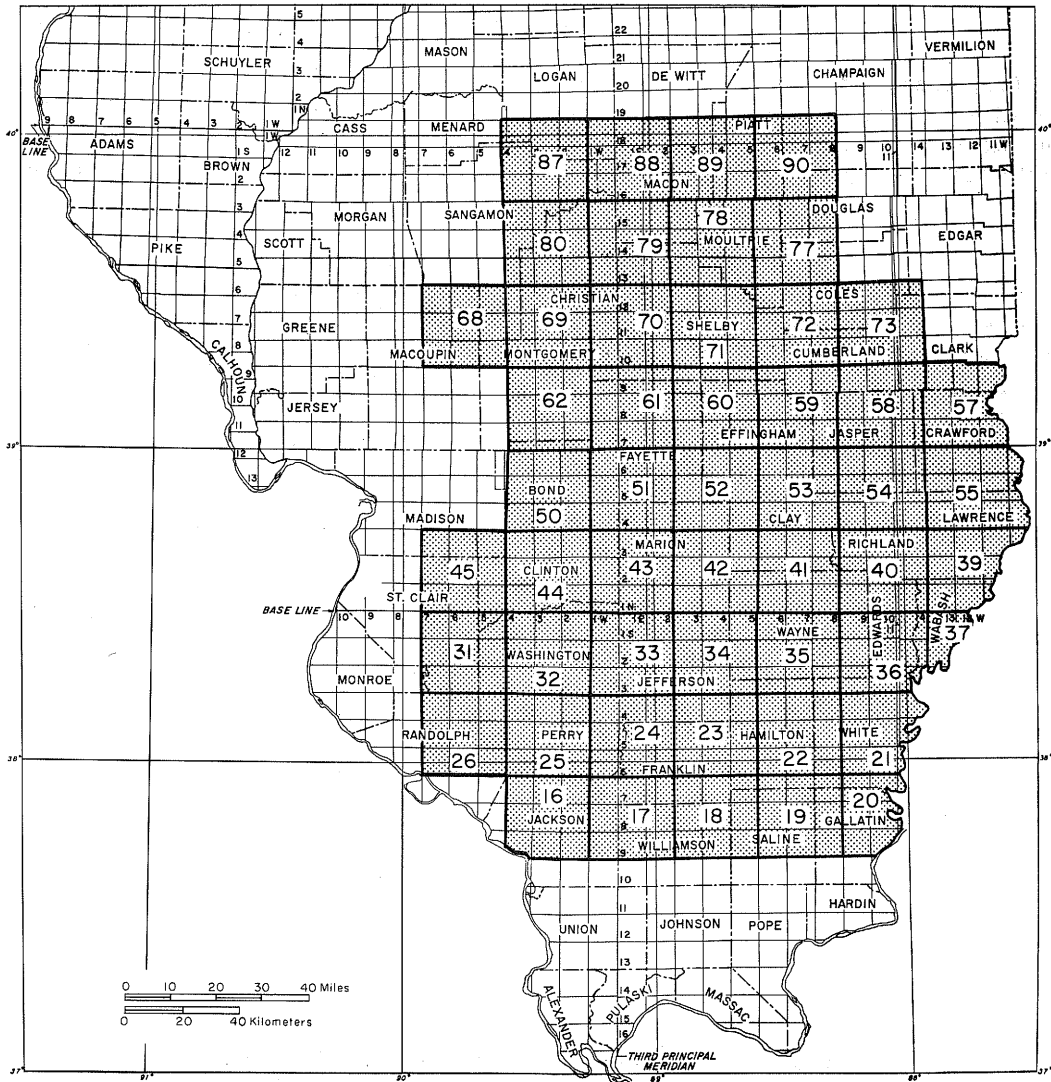
In placing the western boundary of the map in southwestern Illinois, the areal distribution of the Spar Mountain Sandstone is an important factor, because recognition of the Karnak is difficult in the absence of the Spar Mountain Sandstone. The western limit of principal Spar Mountain Sandstone development is an irregular north-south line through Bond, Clinton, Washington, and Perry Counties. However, after a 12 to 18 mile gap, recognizable Spar Mountain Sandstone reappears in western Washington and Perry Counties.

Despite the gap in recognizable Spar Mountain Sandstone, correlations of electric logs indicate that the top of the Karnak Member can be traced with reasonable certainty an appreciable distance west of the main body of the Spar Mountain Sandstone. Therefore structure mapping was extended through the above-mentioned sandstone-free area (see plate 1) into areas to the west underlain by recognizable Spar Mountain Sandstone. The western and southern limits of the largest of these areas and the boundaries of the two smaller ones are determined either by erosion of, or nondeposition of, the Karnak. Northward from western Washington County to southwestern Montgomery County, the map area extends 10 to 20 miles west of the western limit of recognizable Spar Mountain Sandstone.

Northeastward from northwestern Montgomery County to Piatt County, the map area is limited by erosion of the Karnak Member at the sub-Pennsylvanian unconformity.

CONSTRUCTION OF KARNAK STRUCTURE MAP

In the construction of the structure map of the Karnak Member (plate 1), all available electric logs and selected studies of well cuttings were used. Elevations of the top of the Karnak were recorded beside the appropriate well symbols on 51 Illinois State Geological Survey Oil and Gas Development Maps (scale 2 inches equal 1 mile, see fig. 2). These data were then contoured with a 20-foot interval. (The resulting structure maps are on open file in the offices of the Illinois State Geological Survey.) The 100-foot contours were used to construct plate 1 at a scale of 1 to 500,000.



- | | | |
|-------------------|----------------|------------------|
| 16. Murphysboro | 37. Mt. Carmel | 60. Beecher City |
| 17. Carbondale | 39. Allendale | 61. Ramsey |
| 18. Thompsonville | 40. Noble | 62. Hillsboro |
| 19. Eldorado | 41. Clay City | 68. Carlinville |
| 20. Shawneetown | 42. Xenia | 69. Raymond |
| 21. Carmi | 43. Centralia | 70. Pana |
| 22. McLeansboro | 44. Carlyle | 71. Shelbyville |
| 23. Benton | 45. Lebanon | 72. Mattoon |
| 24. Du Quoin | 50. Greenville | 73. Charleston |
| 25. Pinckneyville | 51. Patoka | 77. Arcola |
| 26. Sparta | 52. Kinmundy | 78. Sullivan |
| 31. Marissa | 53. Louisville | 79. Moweaqua |
| 32. Nashville | 54. Olney | 80. Taylorville |
| 33. Roaches | 55. Flat Rock | 87. Mt. Pulaski |
| 34. Mt. Vernon | 57. Robinson | 88. Decatur |
| 35. Fairfield | 58. Greenup | 89. Cerro Gordo |
| 36. Albion | 59. Effingham | 90. Sadorus |

Fig. 2 - Oil and Gas Development Maps (scale 2 inches equal 1 mile) containing Karnak structure contours (interval 20 feet). These maps are on open file at the Illinois State Geological Survey.

REFERENCES

Bristol, H. M., 1968, Structure of the base of the Mississippian Beech Creek (Barlow) Limestone in Illinois: Illinois State Geological Survey Illinois Petroleum 88, 12 p.

Bristol, H. M., and T. C. Buschbach, 1973, Ordovician Galena Group (Trenton) of Illinois—structure and oil fields: Illinois State Geological Survey Illinois Petroleum 99, 38 p.

Stevenson, D. L., and L. L. Whiting, 1967, Geologic structure of the Devonian-Silurian Hunton Megagroup in Illinois: Illinois State Geological Survey Illinois Petroleum 87, 5 p.

Swann, D. H., 1963, Classification of Genevievian and Chesterian (Late Mississippian) rocks of Illinois: Illinois State Geological Survey Report of Investigations 216, 91 p.

