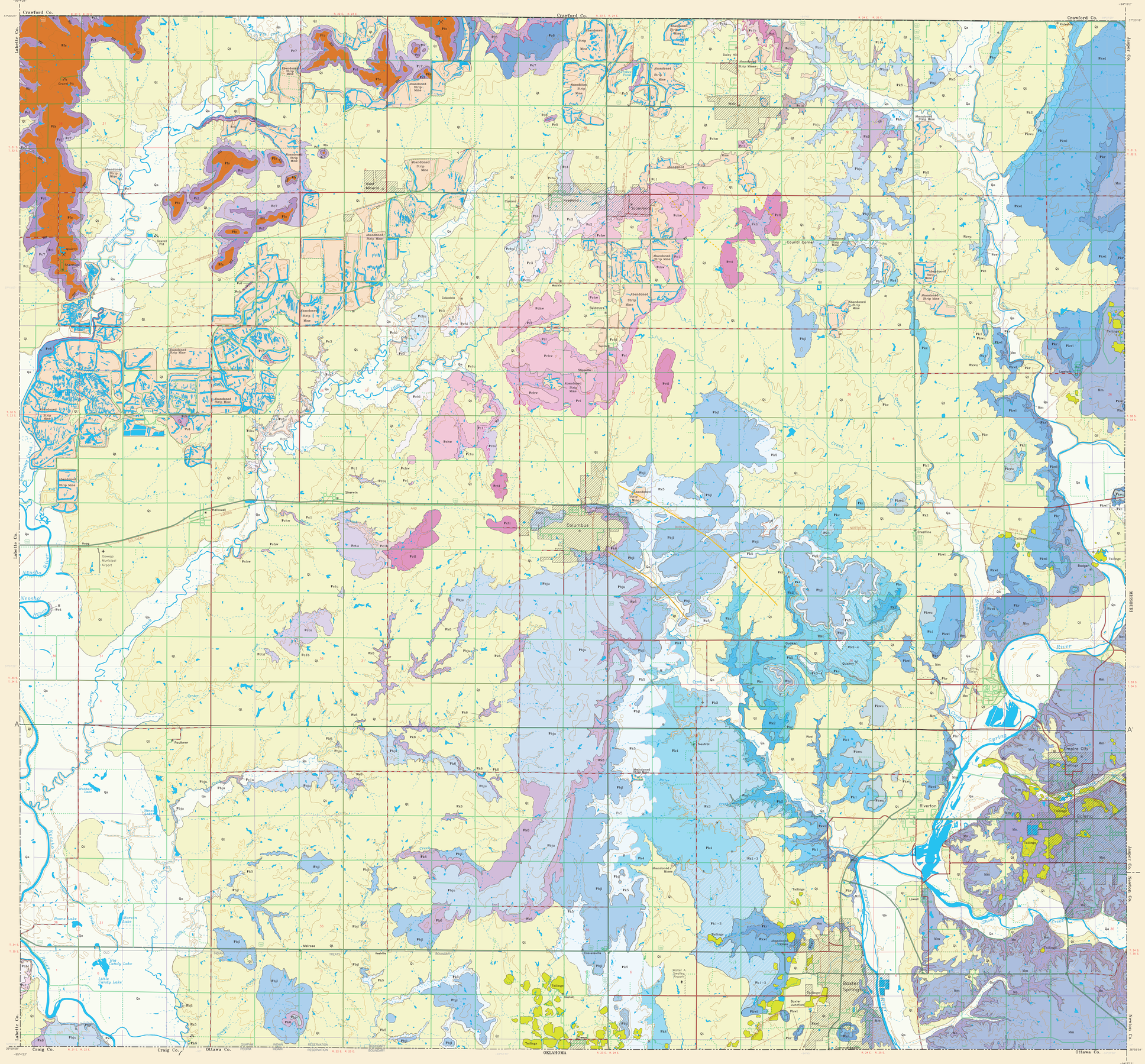
KANSAS GEOLOGICAL SURVEY
THE UNIVERSITY OF KANSAS
MAP M–104

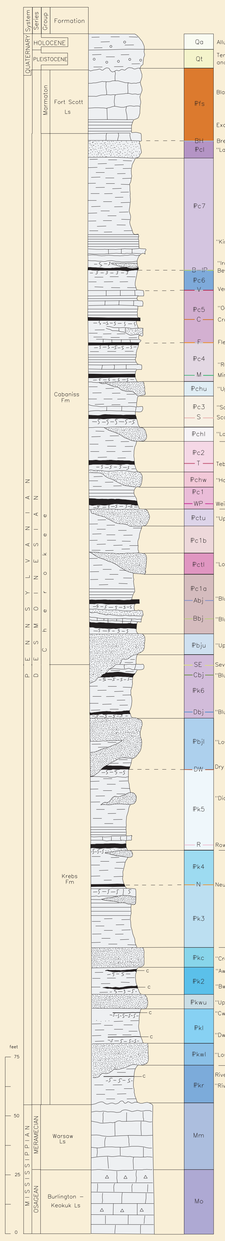
GEOLOGIC MAP OF CHEROKEE COUNTY, KANSAS

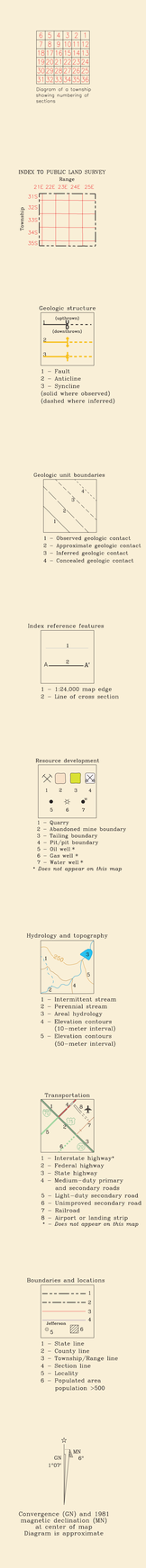
2002

Allan P. Bennison

Computer compilation
and cartography by
Jorgina A. Ross
Mieko Ono







EXPLANATION

Informal stratigraphic terms and terms used in Oklahoma but not formally recognized in Kansas are shown in " ".

Sandstone or sand
Undifferentiated sandstone or siltstone
Shale or claystone
Black shale
Soil
Coal
Limestone
Cherty limestone
Unconformity

INDEX TO 1:24,000–SCALE MAPS

1 McCune – 1973	2	3		5
2 West Mineral – 1973	8	7	9	10
3 Cherokee – 1984	11	12	13	15
4 Kirkwood – 1959(7ØPR)	16	17	18	19	20
5 Arbury – 1981				
6 Oswego – 1974				
7 Hallowell – 1974				
8 Columbus – 1958(7PR)				
9 Crestline – 1958(7ØPR)				
10 Carl Junction – 1963(7ØPR)				
11 Chetopa – 1974				
12 Melrose – 1974				
13 Neutral – 1956				
14 Baxter Springs – 1959(7ØPR)				
15 Joplin West – 1962(7ØPR)				
16 Welch North – 1971				
17 Miami NW – 1961(8ØPR)				
18 Fulcher – 1961(8ØPR)				
19 Peoria – 1960(8ØPR)				
20 Racine – 1949(7ØPR)				

PI – Photoinspected
PR – Photoreviewed

LOCATION DIAGRAM

CONVERSION TABLE

feet	metere	kilometers	miles
1	0.3048	0.0003	0.00019
3.2808	1	0.001	0.00062
3280.8	1000	1	0.6214
5280	1609.4	1.6094	1

To convert feet to meters multiply by 0.3048
To convert meters to feet multiply by 3.2808
To convert kilometers to miles multiply by 0.6214
To convert miles to kilometers multiply by 1.6094

GENERAL GEOLOGY

Cherokee County is the informal stratotype for the Cherokee Group of Middle Pennsylvanian age and of the lower Desmoinesian Series. The group underlies much of the county except for Mississippian strata in the southeast corner and the Marmaton Group of the upper Desmoinesian Series in its northwest corner. These stratigraphic units overlie a westward–plunging spur of the Ozark uplift known as the "Chautauqua arch." Much of the Late Mississippian Chesteran and Early Pennsylvanian Morrowan and Atokan strata were either not deposited or were eroded as a result of probable Early Pennsylvanian epeirogenic uplifts. Except for local folds and faults, these Paleozoic strata are tilted homoclinally to the west–northwest at about 20 feet per mile. Quaternary deposits cover most of the Paleozoic beds in Cherokee County.

MISSISSIPPIAN STRATIGRAPHY

In the Joplin quadrangle W. J. Seevers (1975) reported 300 feet of Osagean limestones and cherts belonging to the Fern Glen and overlying Keokuk Limestones. On the Kansas portion of this quadrangle, only the upper beds of this interval are exposed, aggregating about 130 feet. These are succeeded by 120 feet of Meramecian Warsaw Limestone. All these limestones and cherts experienced lead and zinc mineralization that gave rise to the Tri–State mining district. Remnants of Chesteran limestone and shales were noted in sinkholes near Galena.

PENNSYLVANIAN STRATIGRAPHY

CHEROKEE GROUP: The Middle Pennsylvanian Cherokee Group has been economically outstanding in the midcontinent – owing to its many exploited coal beds and also its numerous oil–and–gas–producing sandstones. Because the informal stratotype for the Cherokee Group is in Cherokee County, Kansas, it is worthy of investigation.

The Cherokee Group is arbitrarily divided at the top of the Seville(?) Limestone Member into the underlying Krebs Formation and the overlying Cabaniss Formation. Top of the Cabaniss Formation is placed at the base of the Fort Scott Limestone.

KREBS FORMATION: This formation is measured at about 140 to 180 feet in thickness in Cherokee County where it consists of about eight poorly defined cyclothems (fourth–order cycles) attributed to rapid meltdown and slow buildups of Pangea ice sheets in the southern hemisphere. A complete Cherokee cyclothem consists in ascending order of: a basal fossil soil horizon (underclay), coal, a thin capping limestone, dark–gray to black clay shale, a gray clayey to silty shale, and finally siltstone to sandstone, with much variation shown on the accompanying stratigraphic column.

The basal member is the 10–to–25–feet–thick "Riverton shale" with a coal bed at or near its top. The overlying Warner Sandstone Member, as much as 30 feet thick, crops out almost continuously across eastern Cherokee County. Four thin and discontinuous coal beds (Harris, 1984) are associated with the equally discontinuous "upper Warner sandstone" 15–to–20–feet above the Warner Sandstone Member. About 60 feet above the Warner Sandstone Member is a previously undescribed moderately thick sandstone which is here designated the "Crestline sandstone bed," owing to its many exposures along Road 50 Southeast, 2 miles west of Crestline. A few feet higher is the Neutral coal, which was mined at scattered localities throughout Cherokee County. A good outcrop of this coal is present in a roadside ditch one–half mile north of the village of Neutral where it is about 14 inches thick. Below its underclay is a highly oxidized pebbly sandstone. The Neutral coal is a likely correlative of the Spaniard coal in northeastern Oklahoma where it forms the basal bed of the Savanna Shale. About 20 feet higher is the Rowe coal, which also has been mined at several scattered localities in Cherokee County. The Rowe coal crops out along Fly Creek just north of the Oklahoma border, where it is overlain by the thin Doneley Limestone (Oklahoma term). Another good outcrop is at a bend of Cow Creek, 1 mile east of the Bird School and 1.2 miles south of Crawford County. Here it consists of two coals exceeding 1 foot in thickness and separated by 3 to 4 feet of gray shale.

This coal grades up locally into the lenticular "Dickson sandstone" above which is the Dry Wood coal bed about 11 to 13 inches thick.

The overlying "lower" Bluejacket Sandstone Member (the subsurface lower Bartlesville sand) is about 30 feet thick along U.S. Highway 166 north of Treece but gradually thins northward toward the Weir area where it is mainly interbedded shales and siltstones with thin laminae of sandstones. The overlying shale wherever exposed consists of two thin coals named "Bluejacket D" and "C" in upward order. "Bluejacket C" is overlain by a thin but persistent limestone correlated by Harris (1984), with the Seville (?) Limestone Member. This limestone could possibly correspond to the Inola Limestone of northeastern Oklahoma.

CABANISS FORMATION: The Cabaniss Formation is about 300 feet thick measured from the top of the Seville(?) Limestone Member to the base of the Fort Scott Limestone and consists of about 11 cyclothems. This upper half of the Cherokee Group contains more commercial coal beds than any other similar interval in Kansas. An overlying sandstone is indicated as the "upper Bluejacket sandstone" on the accompanying map although it may correlate with the "lower" Taft Sandstone of adjacent Oklahoma. The "upper Bluejacket sandstone" forms a cuesta south of Columbus where it is as much as 25 feet thick. North of Columbus it is largely covered by terrace deposits and thick soils. Above this sandstone is a rarely exposed predominantly shale interval that also contains two local beds described by Harris (1984) as "Bluejacket B" and "Bluejacket A" coal beds. Coal "Bluejacket B," which is nearly a foot thick, overlies the "upper Bluejacket sandstone" and is directly overlain by a thin limestone and thin unnamed sandstone on the north bank of Fly Creek near the Fly Creek Cemetery. Above this sandstone and below a black shale bed is the thin "Bluejacket A" coal. Above this approximately 30–foot shale interval is the probable correlative of the "upper Taft sandstone" of Oklahoma. Locally the Weir–Pittsburg coal is up to 4 feet in thickness in northern Cherokee County but thins southward, being about 11 inches thick on the west side of NW 30th Street, 2.8 miles north of Kansas Highway 96. Approximately 20 feet higher is a sandstone about 15 feet thick that is here designated the "Hallowell sandstone bed" due to its excellent outcrops along Cherry Creek both north and south of the Dove Cemetery southeast of Hallowell.

The overlying Tebo coal was not observed in outcrop. Still higher is the 10–to–20–feet–thick Chelsea Sandstone Member which is capped by the Scammon coal and a nameless limestone that crops out. In its few outcrops, this coal is thin to missing. However, it was mined along the Missouri Pacific Railroad north of NW Bellview Road. A thin lenticular sandstone mapped about 20 feet above the Scammon coal is tentatively called the "upper Chelsea sandstone," and may correspond to the upper part of the Chelsea Sandstone of Oklahoma.

Above this sandstone are four closely spaced coals which in upward order are the Mineral, "Robinson Branch," Fleming, and Crowsburg coals. Two or more of these coals were commonly extracted in the same strip mine. The Mineral coal, about 17 inches in thickness, is capped by the thin gray "Russell Creek limestone." The Fleming coal is locally overlain by a thin lenticular sandstone which is known as the Goldenrod Sandstone in adjacent Craig County, Oklahoma. The Crowsburg coal, averaging about 14 inches in thickness, is overlain in turn by a gray shale succeeded by a black phosphatic shale and the Verdigris Limestone Member.

Along Lightning Creek in northwest Cherokee County, the Verdigris Limestone Member is overlain by a thin weathered limestone and the underclay of the 14–inches–thick Bevier coal. The Bevier coal is similarly overlain by the black phosphatic shale of the "Kinnison shale." Above this black shale are about 70 feet of gray shales and siltstones that grade up into the thin "Lagonda sandstone." The 4–to–5–feet sandy Breezy Hill Limestone Member overlies this sandstone and is locally capped by the very thin Mulky coal and its underclay.

MARMATON GROUP: The Marmaton Group barely enters Cherokee County in its northwest corner where it forms the uppermost limestone beds on several mesas north to northeast of Sherman and north of West Mineral. This limestone formation is correlated with the Fort Scott Limestone. Its basal member is the 5–to 8–feet–thick Excello Shale Member, which is overlain in turn by the Blackjack Creek Limestone Member, the Little Osage Shale Member, and the Higginsville Limestone Member (Note: the base of the Fort Scott Limestone is commonly placed at the base of the Blackjack Creek Limestone Member; and this contact is presently questioned in new stratigraphic studies). The Fort Scott Limestone has a total thickness of about 25 feet where quarried just north of the village of Sherman.

QUATERNARY DEPOSITS

Quaternary deposits and soils mask much of the Paleozoic bedrock sequence in Cherokee County. These include deep soils and fluvial clays, sands, and gravels. Many cutbanks in soil profile show a few inches of dark humic soil over 3 to 10 feet of mottled–gray to yellow–brown subsoil with ferruginous and calcareous nodules and tree roots. The widespread Pleistocene (or possibly Pliocene) terrace deposits consist of streamworn gravel in a clayey to sandy matrix. Considerable thickness of Late Pleistocene to Holocene typical fluvial deposits can be observed throughout the floodplains of the Neosho River and Spring River and their tributaries.

STRUCTURE

Average dip throughout much of Cherokee County is about 20 feet per mile toward the west–northwest except for a few structural anomalies indicated by both a structural map by Ebanks and others (1977) on top of the Mississippian sequence and by my surface mapping. Anticlines and noses are mainly oriented northwest–southeast. One is centered in sec. 34, T. 32 S., R. 21 E. about 2 miles northwest of Sherwin and may explain the northwest deflection of both the Chelsea Sandstone Member and nearby Cherry Creek. Another is centered in sec. 20, T. 34 S., R. 23 E. about 3 miles northeast of Melrose. Also much of T. 32 S., R. 24 E. east of Scammon consists of an anticline which has placed the Weir–Pittsburg coal in a high structural position and caused a northwest deflection of coal beds.

Columbus is situated on an anticline and much of adjacent T. 33 S., R. 24 E. contains several low–amplitude synclines and anticlines. Several other small structures were mapped by Ebanks and others (1977) for which the surface evidence is marginal.

Cross section A–A' reveals west–dipping monoclinal flexures involving the Bluejacket Sandstone Member on the cuesta south of Columbus.

REFERENCES AND SUGGESTED READINGS

Baker, D. R., 1962, Organic geochemistry of the Cherokee Group, southeastern Kansas and northeastern Oklahoma: American Association of Petroleum Geologists, Bulletin 46, p. 1,621–1,642.

Brady, L. L., Nuelle, L. M., Haug, D., Smith, D. C., Bostic, J. L., and Jacques, J. C., 1994, Coal resources of the Joplin 1X2 degree quadrangle, Kansas and Missouri: U.S. Geological Survey, Miscellaneous Investigations Series I–2426–B.

Branson, C. C., Huffman, G. G., and Strong, D. M., 1965, Geology and oil and gas resources of Craig County, Oklahoma: Oklahoma Geological Survey, Bulletin 99, 109 p.

Brenner, R. L., 1989, Stratigraphy, petrology, and paleogeography of the upper portion of the Cherokee Group (Middle Pennsylvanian), eastern Kansas and northeastern Oklahoma: Kansas Geological Survey, Geology Series 3, 70 p.

Ebanks, Jr., W. J., James, G. W., and Livingston, N. D., 1977, Evaluation of heavy oil and tar sands in Bourbon, Crawford, and Cherokee counties, Kansas: U. S. Department of Energy, BERC/RI–77/20, 110 p.

Harris, J. W., 1984, Stratigraphy and depositional environments of the Krebs Formation (lower Cherokee Group, Middle Pennsylvanian) in southeastern Kansas: Kansas Geological Survey, Open–file Report 84–9, 147 p.

Haworth, E., and Kirk, M. Z., 1894, A geologic section along the Neosho River from the Mississippian formation of the Indian Territory to White City, Kansas, and along the Cottonwood River from Wyckoff to Peabody: Kansas University Quarterly, v. 2, p. 104–115.

Howe, W. B., 1951, Bluejacket Sandstone of Kansas and Oklahoma: American Association of Petroleum Geologists, Bulletin 35, p. 2,087–2,093.

Howe, W. B., 1956, Stratigraphy of pre–Marmaton Desmoinesian (Cherokee) rocks in southeastern Kansas: Kansas Geological Survey, Bulletin 123, 132 p.

McCauley, J. R., and Smith, D. C., 1998, Bedrock geologic map of the Joplin 1X2 degree quadrangle, Kansas and Missouri: U. S. Geological Survey, Miscellaneous Investigations Series I–2426–B.

Moore, R. C., Frye, J. C., Jewett, J. M., Lee, W., and O'Connor,H. G., 1951, The Kansas rock column: Kansas Geological Survey, Bulletin 89, 132 p.

Pierce, W. G., and Courtier, W. H., 1938, Geology and coal resources of the southeastern Kansas coal field: University of Kansas, Bulletin 24, 122 p.

Seevers, W. J., 1975, Description of the surficial rocks in Cherokee County, southeastern Kansas: Kansas Geological Survey, Geology Series 1, 7 p.

Walton, A. W., Bouquet, D. J., Evenson, R. A., Rofheart, D. H., and Woody, M. D., 1985, Characterization of sandstone reservoirs in the Cherokee Group (Pennsylvanian, Desmoinesian), Reservoir Characterization, L. W. Lake and H. B. Carroll, eds.: Orlando, Florida, Academic Press, p. 39–62.

Woody, M. D., 1983, Sedimentology, diagenesis, and petrophysics of selected Cherokee Group (Desmoinesian) sandstones in southeastern Kansas: Shale Shaker, v. 33, no. 9–10, p. 91–104, 107–121.

Zeller, D. E., ed., 1968, The stratigraphic succession in Kansas: Kansas Geological Survey, Bulletin 189, 81 p.

Suggested reference to this map:

Bennison, Allan P., 2002, Geologic Map of Cherokee County, Kansas: Kansas Geological Survey, Map M–104, scale 1:50,000.

Elevation contours are presented for general reference. They are taken from USGS Digital Line Graph (DLG) files compiled from base maps at a scale of 1:100,000. In some places the contours from the DLG's may be more generalized than the base maps used for compilation of geologic outcrop patterns. Outcrop patterns on the map will typically reflect topographic variation more accurately than the associated contour lines. Repeated fluctuations of an outcrop line across a contour line should be interpreted as an indication that the mapped rock unit is maintaining a relatively constant elevation along a generalized contour.

The geology was mapped in the field using USGS 7.5–min. 1:24,000–scale topographic maps.

This map was produced by computer–aided cartography using the GIMMAP (Geodata Interactive Management Map Analysis and Production) system developed at the Kansas Geological Survey.

Roads and highways are shown on the base map as represented by data in the Kansas Cartographic Database. These data are derived primarily from USGS 1:24,000–scale topographic maps. As accurate data are acquired, the base map will be revised to reflect new highway construction (not yet represented on the USGS maps).

The Kansas Geological Survey does not guarantee this map to be free from errors or inaccuracies and disclaims any responsibility or liability for interpretations made from the map or decisions based thereon.

ISBN # 1–58806–944–3