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OF KANSAS GEOLOGY

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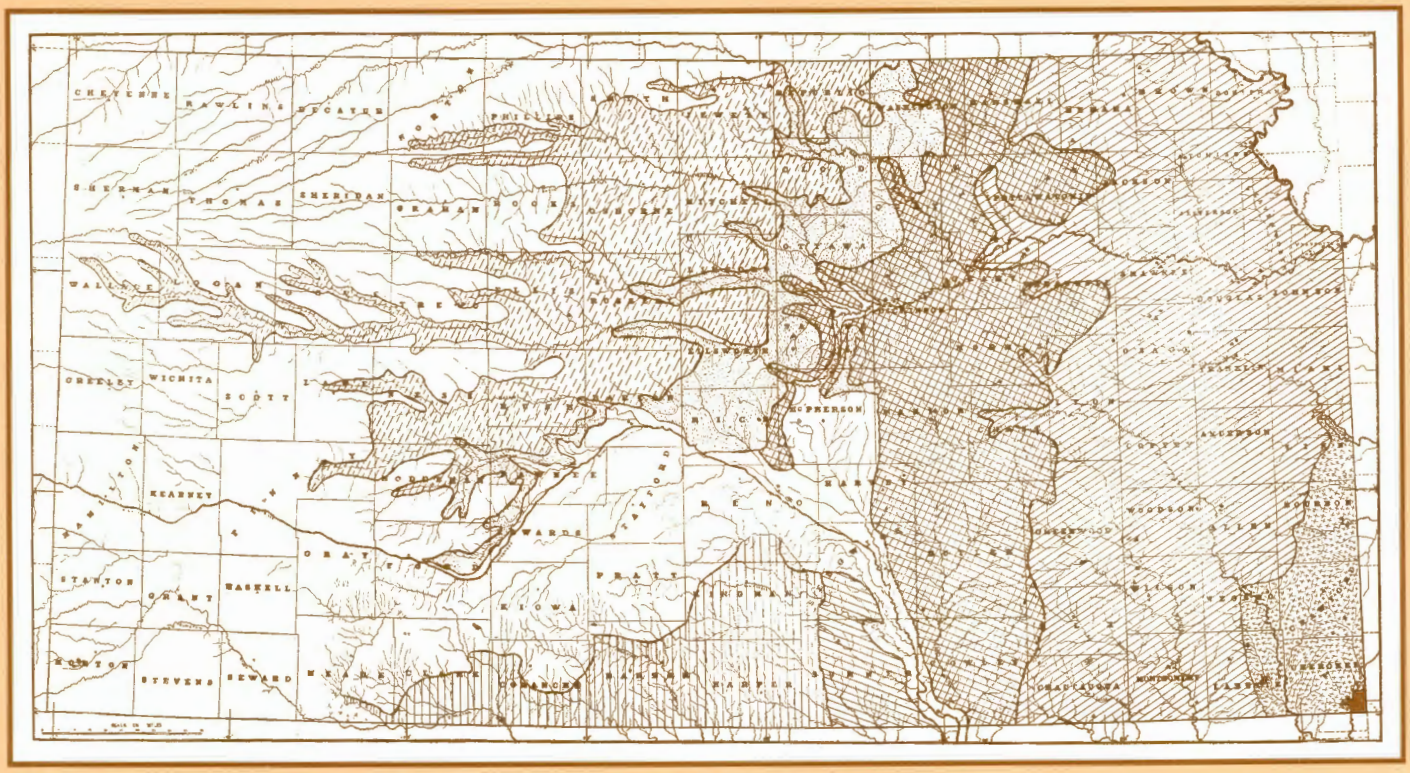

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Cover Map

The "Map of Kansas, Showing the Geological Position of Springs and Wells" was prepared by W. R. Crane, a mining engineer, and appeared in "The University Geological Survey of Kansas, Vol. VII, Special Report on Mineral Waters" by Edgar H. S. Bailey and assistants, published in 1902. Bailey was a chemist and is the namesake of Bailey Hall at the University of Kansas. Originally built for the chemistry department, Bailey Hall today is home to the School of Education. This geologic map contains triangles and dots that represent mineral springs and mineral wells, respectively, that are discussed in the report. The map differs somewhat from modern maps of the state, especially in eastern Kansas. One notable difference is the stratigraphic nomenclature which was in vogue at the time. In the extreme southeastern corner of the state is a black area labeled Sub-Carboniferous. This represents the cherty limestones that crop out there and cover much of the Ozark Plateau extending into adjacent parts of Missouri, Arkansas, and Oklahoma. Today, the Sub-Carboniferous is known in North America as the Mississippian Period named for outcrops in the Mississippi Valley of the Midwest. Beyond the Sub-Carboniferous to the north and west are areas mapped as Lower-Carboniferous and Upper-Carboniferous. Carboniferous means coal-bearing and is recognized as a single geologic period everywhere except in North America. Here the Carboniferous is divided into two separate geologic periods, the Mississippian and the Pennsylvanian. This division is based on changing environments in much of what was North America at that time. This resulted in drastically different rock types as is apparent in southeast Kansas. There, the predominantly marine limestones of the Mississippian Period are overlain by shales, siltstones, and sandstones of the Pennsylvanian Period that are terrestrial in origin as well as by coal beds. These coal beds are the same age as those in the coal fields of Pennsylvania for which the period was named. The Lower-Carboniferous is today considered Middle Pennsylvanian and the Upper-Carboniferous is known as Upper Pennsylvanian. The division between the Pennsylvanian rocks and those of the next geologic period, the Permian, is a little farther west on the 1902 map than it is on modern maps. It is placed slightly higher stratigraphically and the prevailing westward dip of the rocks at the surface results in a westward shift. This boundary also extends much farther up the valleys of the Blue, Kansas, Neosho, and Cottonwood rivers than is today recognized. An area in Sedgwick and Sumner counties has a cross-hatching pattern that does not appear in the legend accompanying the map. This area should be mapped as Permian, the same as the area to the east across the Arkansas River. A draftsman's error apparently omitted the other set of cross-hatching. The Red-Beds in south-central Kansas are not assigned an age in the legend. The age of these nearly fossil-free formations had been debated for a number of years; however, the text of the report correctly assigns them to the Permian. The area mapped as Dakota also includes rocks that are today mapped as Kiowa Shale and Cheyenne Sandstone which underlie the Dakota Formation. Although the Dakota is not assigned an age in the legend, it is correctly identified as Cretaceous in the text. The Upper-Cretaceous on the 1902 map corresponds quite well with the Upper Cretaceous as mapped today, except outcrops are more extensive in Smith and Phillips counties and extend up the valley of the South Fork of the Solomon River in Rooks and Graham counties. Much of western and south-central Kansas is mapped as Tertiary. The Ogallala Formation of Tertiary age underlies much of western Kansas. But in southwestern Kansas, the Great Bend of the Arkansas River, the Equus Beds north of Wichita, and in the Arkansas River below Wichita, Quaternary rocks are at the surface. Likewise glacial deposits of Quaternary age bury parts of the glaciated region in northeast Kansas and appear on modern maps.

In Bailey's report he defines mineral waters as "those natural waters which contain an excess of some ordinary ingredients or a small quantity of some rare ingredients, and which on this account are used as remedial agents." Bailey devotes 28 pages of his report to the therapeutics of mineral waters covering both internal as well as external uses. In all, 108 different mineral waters from wells and springs were analyzed for their dissolved constituents and then classified and arranged according to general chemical groups and compared to similar waters from famous springs and spas throughout the world. Nearly all the waters discussed occur in eastern Kansas. The westernmost water mentioned is the Victoria Spring in eastern Ellis County. The vast underground water resources contained in the High Plains aquifer go unmentioned. The fresh nature of these waters most likely excludes them from Bailey's definition of mineral waters. Likewise some springs of historical note in Kansas such as Big Springs and Alcove Spring on the Oregon Trail, and Diamond, Wagon Bed, and Middle Springs on the Santa Fe Trail are left out. Again, the fresh nature of these waters plus the abandonment of the trails some 30 years earlier probably account for their omission.

The highly mineralized nature of the ground water in central and eastern Kansas is due to the marine origin of much of the bedrock. When these ancient sediments were buried, the sea water they contained was often buried with them. This plus the presence of buried evaporites such as rock salt and gypsum account for the high mineral content of the region's nonalluvial ground water. Some of the mineral wells mentioned by Bailey are artesian. Named for a region of France, Artois, where they were common, these are wells that tap zones where water is under enough pressure to rise up and flow to the surface. Despite the advertising claims of various bottlers and brewers, water being artesion is no guarantee of purity. For instance, the Abilene artesian well produced water with a salinity five times that

Introduction

The Kansas Geological Survey has long recognized the importance of collecting bibliographic information on geologic research in Kansas. In 1989, with Bulletin 221, the Survey published an updated comprehensive bibliography on Kansas geology that included 9,500 references covering the period from 1823 to 1984. This volume, Bulletin 234, lists over 2,400 references, most of them published from 1984 to 1989, and stands as the next installment supporting published bibliographies on earth-science research in Kansas. A concentrated effort was made to locate and add references previously omitted (pre-1985) from Bulletin 221.

At present, bibliographic data files are stored on the Survey's main-frame computer allowing for two primary functions of the bibliographic data base—production of published bibliographies and indexes, and custom on-line literature searches. Nearly 12,000 references from all areas of the geological sciences have been collected, including references on water and mineral resources, geochemistry, soil science, and environmental geology. In addition to references appearing in published sources, the titles of many unpublished manuscripts, such as open-file reports, theses, and dissertations, have been included in the data base.

In 1993, the Survey released its first CD-ROM, "Database Sampler CD-ROM," which contains nine data bases. The searchable on-line version of the bibliography, supported by commercial software, is included on the sampler. The retrieval software allows for the choice of specific field searches (i.e. author, county) or global field searches and the ability to combine searches using boolean logic. Information on the CD-ROM is available from the Survey's Publication Sales Office.

Organization and Use

The bibliography is arranged alphabetically by the author's last name and initials, and then chronologically by publication year. The bibliography is followed by three indexes: subject, county, and rock-unit. To aid in using these last two indexes, a map of Kansas counties and a geologic map are shown in fig. 1. The subject index is based on broad-to-narrow search logic modeled after and modified by the GeoRef system of the American Geological Institute. Synonymous terms as well as many second- and third-level terms have been cross referenced to direct users to the appropriate index entry. Most users with interest in a particular geographic area or stratigraphic interval should start their search with the county or rock-unit indexes. In an effort to aid users, references listed under a given entry in theses indexes have been further categorized by primary subject content as well. The rock-unit index contains rock-stratigraphic geologic names as they have been used in references. Therefore, formal and informal terms, provincial names, and outdated terms have been listed as they appear in references. Whenever possible, informal terms and outdated terms have been cross referenced to probably formal equivalents.

Availability

Most published references listed are available from libraries or the publishers. However, the Survey's on-line bibliographic data files do include location sources for most articles and reports. If a report or article is difficult to locate, contact the Survey's library for assistance. Reports published by the Federal government are often available for purchase from the National Technical Information Service (NTIS), 5285 Port Royal Road, Springfield, VA 22161. Available NTIS report numbers have been included with the bibliographic citation. Reports and maps published by the U.S. Geological Survey are only available from Branch of Distribution, U.S. Geological Survey, P.O. Box 25286, Denver, CO 80225. Open-file materials released by the U.S. Geological Survey are sold through Open File Reports–ESIC, U.S. Geological Survey, P.O. Box 25425, Denver, CO 80225. Theses and dissertations are available for inspection at the institution granting the degree or through the interlibrary-loan services of participating libraries. In addition, the Survey's library maintains a set of about 125 theses and dissertations as part of the Survey's open-file collection. Unbound photocopies of such reports may be purchased from the Library, Kansas Geological Survey, Lawrence, KS 66047. Microform and paper copies of most dissertations completed after 1955 also are available for purchase from University Microfilms International, 300 North Zeeb Road, Ann Arbor, MI 48106–1346.

Corrections

Whenever possible, articles and papers listed in the bibliography were examined to verify citation information and to assist with indexing. To maintain the quality of the data, titles have been recorded as they appear in the original source. In spite of considerable attempts at accuracy and completeness, this listing undoubtedly contains errors and omissions. Please submit any corrections or additions to the Survey's library.

Acknowledgments

I wish to acknowledge and thank those individuals who have made the publication of this bibliography possible: James Deputy, system analyst for the Survey, for his creative programming talents and sincere interest in the bibliography; Marla Adkins–Heljeson, Survey editor, and Wayne Davis, assistant to the editor, for their efforts in the editing and layout; Jennifer Sims, graphic designer for the Survey's Publications and Public Affairs Section, for the cover design; James McCauley, Survey geologist, for writing the detailed description of W. R. Crane's geologic map of Kansas that shows springs and wells and the discussion of Dr. Bailey's volume on mineral waters in Kansas; and Rex C. Buchanan, assistant director of the Publications and Public Affairs Section, for encouragement and support.

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1994

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sedimentary rocks: French, J.A., 1988a; McNeice, B.T., 1987; Silfer, J.A., 1985, 1986, 1986a
sedimentation: Merriam, D.F., 1986a
sediments: Aber, J.S., 1985a, 1988a; Law, M.S., 1986
soils: Throckmorton, R.I., 1942
stratigraphy: Harris, J.W., 1989; Pabian, R.K., 1989a; Skelton, L.H., 1986; Sutton, M.J., 1985a
vertebrate paleontology: Foreman, B.C., 1988b
water resources: Kansas State Planning Board, 1936b

Comanche County

biostratigraphy: Kues, B.S., 1987
geomorphology: Martin, C.W., 1985, 1986, 1987
geophysical surveys: Austin, M.N., 1988, 1989, 1989a, 1989b
ground water: Frye, J.C., 1942g
petroleum: Hotchkiss, H.G., 1939a; Ross, J.A., 1989j; Slamal, Bob, 1985; Wilson, M.E., 1988
sedimentation: Watney, W.L., 1985c, 1986
soils: Hoffman, B.R., 1989
structural analysis: Gardner, J.R., 1985
well-logging: Doveton, J.H., 1989a

Cowley County

hydrology: Hinderlider, M.C., 1905; Pope, L.M., 1985; U.S. Geological Survey, 1925a, 1925b, 1928a, 1929, 1930, 1930d, 1931a, 1931b, 1931c, 1932a, 1932b, 1932d, 1932e, 1932g, 1932h, 1933, 1933a, 1933b, 1935a, 1936, 1936b, 1937, 1940a, 1941a
invertebrate paleontology: Gautier, T.G., 1968; Warner, D.J., 1972
paleoecology: Bifano, F.V., 1974a
petroleum: Bloesch, Edward, 1918; Freund, M.J., 1986; Kesler, L.W., 1928a; Mason, K.L., 1986; Officer, H.G., 1926; Ross, J.A., 1989i; Snow, D.R., 1925a; Wierick, G., 1932
sedimentary rocks: Hatch, J.R., 1989; Matzen, T.A., 1985; Toomey, D.F., 1989
sedimentary structures: Toomey, D.F., 1988
stratigraphy: Denesen, S.L., 1985, 1985a; Sporleder, J.C., 1987; Staton, M.D., 1987; Sutton, M.J., 1985a; Toomey, D.F., 1986
structural analysis: Wagner, K.[L.], 1985
uranium ores: Erickson, R.L., 1954
vertebrate paleontology: Foreman, B.C., 1988b; Schultze, H.-P., 1986
water resources: Bingham, R.H., 1980

Crawford County

areal geology: Blair, K.P., 1989; Brady, L.L., 1989c; Kisvarsanyi, E.B., 1989; McCauley, J.R., 1989; Pratt, W.P., 1989
coal deposits: Brady, L.L., 1989d
diagenesis: McKibben, M.E., 1986
environmental geology: Berendsen, Pieter, 1988b; Naughton, G.G., 1981; Powell, W.E., 1985, 1988, 1989; Wiseman, K.M., 1986
geochemical surveys: Erickson, R.L., 1985, 1989
geochemistry: Bullock, J.H., Jr., 1989b, 1989i, 1989q, 1989r, 1989s; Imes, J.L., 1988
geophysical surveys: Branham, K.L., 1986; McCafferty, A.E., 1989; Steeples, D.W., 1986, 1988b, 1988c
ground water: Macfarlane, P.A., 1987
hydrology: Bevans, H.E., 1983; U.S. Geological Survey, 1941a
lead ores: Nuelle, L.M., 1989
metal ores: McFarland, M.C., 1989
mineral deposits: Palmer, J.R., 1989
mineral resources: Ohle, E.L., 1989; Pratt, W.P., 1989b, 1989c
mining geology: Brady, L.L., 1989b
natural gas: Stoeckinger, W.T., 1989a
paleobotany: Taylor, E.L., 1988
petroleum: Chesser, K.C., 1987a; Netzler, B.W., 1989; Ross, J.A., 1989h
sedimentary rocks: Bouquet, D.J., 1984; Brenner, R.L., 1989; Hatch, J.R., 1989; Mosier, E.L., 1989
soils: Welch, J.E., 1988
stratigraphy: Denesen, S.L., 1985; Ece, O.I., 1986, 1987; Harris, J.W., 1985, 1985a, 1985b; Knight, K.L., 1985, 1985a; Suchy, D.R., 1987; Sutton, M.J., 1985a
structural analysis: Imes, J.L., 1989

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Decatur County

areal geology: Eversoll, D.A., 1988
geochemistry: Stell, M.J.A., 1988
ground water: Nellis, M.D., 1987; Shaukat, Nadeem, 1987a
hydrology: U.S. Geological Survey, 1932, 1932c, 1932f
mineral resources: Heidenreich, W.L., 1952
petroleum: Hotchkiss, H.G., 1938c; Robinson, C.S., 1985; Ross, J.A., 1989; Taylor, F.B., 1937
sedimentary rocks: Anderson, J.E., 1989
sedimentation: Watney, W.L., 1985c, 1986
soils: Hamilton, V.L., 1989a

Dickinson County

engineering geology: Hart, R.J., 1988
geophysical surveys: Wojcik, K.M., 1985
ground water: Gillespie, J.B., 1986
hydrology: Hinderlider, M.C., 1905; Jarvis, C.S., 1936; Jian, Xiaodong, 1988; McElwee, C.D., 1985; Pope, L.M., 1985, 1988; U.S. Geological Survey, 1921b, 1923, 1925, 1928, 1931, 1932, 1932c, 1932f, 1933c, 1935, 1935b, 1940, 1941, 1942
invertebrate paleontology: Gautier, T.G., 1968; Ho, Tong-Yun, 1961
paleobotany: Gillespie, W.H., 1986a; Leisman, G.A., 1989
paleogeography: McCoy, A.W., 1921
petroleum: Newell, K.D., 1988; Ross, J.A., 1989b, 1989f
stratigraphy: Newell, K.D., 1987, 1987a
structural analysis: Berendsen, Pieter, 1986a; Johnsgard, S.K., 1988
vertebrate paleontology: Foreman, B.C., 1988b
water resources: Kansas State Planning Board, 1936h

Doniphan County

environmental geology: U.S. Department of Agriculture, 1987, 1988b, 1988c
geomorphology: Aber, J.S., 1988c; Wells, P.V., 1987a
ground water: Miller, Rachel E., 1987a
invertebrate paleontology: Spaulding, S.A., 1985, 1985a; Taylor, D.W., 1965, 1966
paleobotany: Wells, P.V., 1987
paleoecology: Ostlie, W.R., 1986
petroleum: Ross, J.A., 1989c
sedimentary rocks: Schultz, R.B., 1988
seismology: Burchett, R.R., 1982, 1983f
stratigraphy: Dort, Wakefield, Jr., 1986a; Hedstrom, B.L., 1986, 1986a; Schultz, R.B., 1988a
vertebrate paleontology: Martin, L.D., 1985
water resources: Kansas State Planning Board, 1936e

Douglas County

absolute age: Marvin, R.F., 1988
areal geology: Brady, L.L., 1989c; Buchanan, R.C., 1988a; Maples, C.G., 1988
data processing: Jorgensen, D.G., 1988
engineering geology: Hart, R.J., 1988
environmental geology: Abdollahzadeh, Sassan, 1986
geochemistry: Vogl, E.G., 1981, 1985
geophysical surveys: Kalik, A.J., 1988
ground water: Carr, J.E., 1986; Hathaway, L.R., 1976; Miller, Rachel E., 1987a
guidebooks: Heckel, P.H., 1985a
hydrology: Bevans, H.E., 1983; Butler, J.J., Jr., 1989a, 1989b; Follansbee, Robert, 1907; Hinderlider, M.C., 1905; Russell, W.G., 1902; U.S. Geological Survey, 1902, 1932, 1932c, 1932f, 1935, 1935b, 1936a, 1938, 1940, 1941, 1942
invertebrate paleontology: Gautier, T.G., 1968; Spaulding, S.A., 1985, 1985a
paleobotany: Mapes, G.K., 1989
paleoecology: Hakes, W.G., 1985
paleomagnetism: Kodama, K.P., 1989
petroleum: Ross, J.A., 1989c, 1989g; Stander, T.W., 1989
sedimentary rocks: Bergstrom, R.E., 1953a; McNeice, B.T., 1987; Nelson, M.R., 1985
soils: Cihlar, Josef, 1975, 1975a; Welch, J.E., 1986
stratigraphy: Ball, D.S., 1985, 1985a; Dubiskas, R.A., 1985; Watney, W.L., 1988b
water resources: Kansas State Planning Board, 1936h
well-logging: Doveton, J.H., 1986

E

Edwards County

environmental geology: Sophocleous, M.A., 1988
ground water: Coble, G.R., 1989, 1989a; Gillespie, J.B., 1988; Hathaway, L.R., 1980c; Kume, Jack, 1985;

H

hydrology: Sophocleous, M.A., 1986b, 1987a
petroleum: Hotchkiss, H.G., 1939a; James, Alfred, III, 1985; Morrison, Ernie, 1985; Ross, J.A., 1989j; Wilson, M.E., 1988
soils: Hoffman, B.R., 1986
statistical analysis: Sutterlin, P.G., 1986
stratigraphy: Charpentier, R.R., 1988, 1989
water resources: Sophocleous, M.A., 1989
well-logging: Doveton, J.H., 1989a

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Labette County
areal geology: Blair, K.P., 1989; Kisvarsanyi, E.B., 1989; McCauley, J.R., 1989; Moore, R.C., 1942b; Pratt, W.P., 1989
biostratigraphy: Cocke, J.M., 1989a
coal deposits: Brady, L.L., 1989d
geochemical surveys: Erickson, R.L., 1985, 1989
geochemistry: Bullock, J.H., Jr., 1989, 1989e, 1989t; Imes, J.L., 1988
geophysical surveys: Branham, K.L., 1986; McCafferty, A.E., 1989
ground water: Carr, J.E., 1986; Macfarlane, P.A., 1987
hydrology: Pope, L.M., 1985, 1988; Steps, W.E., 1942; U.S. Geological Survey, 1925a, 1925b, 1928a, 1929, 1930, 1930d, 1931a, 1931b, 1931c, 1932a, 1932b, 1932d, 1932e, 1932g, 1932h, 1933, 1933a, 1933b, 1935a, 1936, 1936b, 1937
invertebrate paleontology: Pavlicek, J.A., 1986
lead ores: Nuelle, L.M., 1989
metal ores: McFarland, M.C., 1989
mineral deposits: Palmer, J.R., 1989
mineral resources: Ohle, E.L., 1989; Pratt, W.P., 1989b, 1989c
petroleum: Chesser, K.C., 1987a; Netzler, B.W., 1989; Ross, J.A., 1989h; Sloan, W.L., 1925; Trent, T.H., 1989
sedimentary rocks: Bouquet, D.J., 1984; Brenner, R.L., 1989; Johnson, C.T.L., 1973; Mosier, E.L., 1989
sedimentation: Heckel, P.H., 1988
soils: Throckmorton, R.I., 1942
stratigraphy: Denesen, S.L., 1985, 1985a; Ece, O.I., 1986, 1987; Knight, K.L., 1985, 1985a; Staton, M.D., 1987; Sutton, M.J., 1985a; Watney, W.L., 1989, 1989d
structural analysis: Imes, J.L., 1989
water resources: Kansas State Planning Board, 1936b

Lane County
areal geology: McClain, T.J., 1987
geochemistry: Stell, M.J.A., 1988
ground water: Clark, A.B., 1988; Dague, B.J., 1985a, 1986a, 1987a; Gillespie, J.B., 1988; Kume, Jack, 1985
mineral resources: Heidenreich, W.L., 1952
petroleum: Albright, M.C., 1985; Hotchkiss, H.G., 1939a; Ross, J.A., 1989d
water resources: Kansas State Planning Board, 1936c

Leavenworth County
ground water: Lohman, S.W., 1940f; Miller, Rachel E., 1987a
hydrology: U.S. Geological Survey, 1932, 1932c, 1932f, 1935, 1935b, 1936a, 1938, 1940, 1941, 1942
natural gas: Goebel, E.D., 1987
paleoecology: Hakes, W.G., 1985
petroleum: DuBois, M.K., 1985; Ross, J.A., 1989c, 1989g
sedimentary rocks: Bergstrom, R.E., 1953a; Brenner, R.L., 1989; McNeice, B.T., 1987; Nelson, M.R., 1985
sedimentation: Strickland, M.O., 1987
soils: Welch, J.E., 1986
stratigraphy: Ball, D.S., 1985, 1985a; Harris, J.W., 1989; Pabian, R.K., 1989a
structural analysis: Callen, J.M., 1985
water resources: Kansas State Planning Board, 1936e, 1936h

Lincoln County
geophysical surveys: Wojcik, K.M., 1985
hydrology: U.S. Geological Survey, 1927, 1930a, 1930b, 1930c
invertebrate paleontology: Herrington, H.B., 1958; Taylor, D.W., 1965
mineral resources: Heidenreich, W.L., 1952
oil and gas fields: Hedberg, H.D., 1926
paleobotany: Kovach, W.L., 1987, 1988, 1988a
petroleum: Newell, K.D., 1988; Ross, J.A., 1989a, 1989b, 1989e, 1989f
sedimentary structures: Batt, R.J., 1987, 1987a
soils: Barker, W.L., 1985
stratigraphy: Newell, K.D., 1987, 1987a; Twiss, P.C., 1988a
structural analysis: Johnsgard, S.K., 1988
vertebrate paleontology: Guilday, J.E., 1972; Nelson, M.E., 1989

Linn County
areal geology: Brady, L.L., 1989c
coal deposits: Whelan, J.F., 1988
diagenesis: McKibben, M.E., 1986
fluid inclusions: Goebel, E.D., 1989
geochemistry: Imes, J.L., 1988
geophysical surveys: Steeples, D.W., 1988b
guidebooks: Heckel, P.H., 1985a
hydrology: Bevans, H.E., 1983; Kansas Water Resources Board, 1958e; Pope, L.M., 1985, 1988; U.S. Geological Survey, 1925, 1926, 1927
lead ores: Blasch, S.R., 1985, 1986, 1987, 1988
petroleum: Ross, J.A., 1989g
sedimentary rocks: Emerson, J.W., 1987
sediments: Law, M.S., 1986
stratigraphy: Ece, O.I., 1986, 1987; French, J.A., 1989a; Harris, J.W., 1989; Pabian, R.K., 1989a; Sutton, M.J., 1985a; Watney, W.L., 1989
structural analysis: Imes, J.L., 1989
water resources: Kansas State Planning Board, 1936f
zinc ores: Ragan, V.M., 1987, 1988

Logan County
biostratigraphy: Martin, L.G., 1989
geochemistry: Stell, M.J.A., 1988
geomorphology: Wells, P.V., 1987a
ground water: Kume, Jack, 1985; Nellis, M.D., 1987; Shaukat, Nadeem, 1987a
invertebrate paleontology: Hasenmueller, W.A., 1985, 1985a
mineral resources: Heidenreich, W.L., 1952
paleobotany: Wells, P.V., 1987
paleoecology: Stewart, J.D., 1985
petroleum: Frankamp, Steve, 1985; Hotchkiss, H.G., 1938d; Langrehr, J.A., 1985; Ross, J.A., 1989, 1989d
sedimentary rocks: Caldwell, C.D., 1985
vertebrate paleontology: Buchanan, R.C., 1987
water resources: Kansas State Planning Board, 1936a

Lyon County
absolute age: Marvin, R.F., 1988
areal geology: Bridge, T.E., 1988b; Maples, C.G., 1988; Moore, R.C., 1942b
data processing: Nordeng, S.C., 1986
geochemistry: Schroeder, D.C., 1989
hydrology: Bevans, H.E., 1983; Carswell, W.J., Jr., 1985; Hinderlider, M.C., 1905; Jordan, P.R., 1985a; Kansas Water Resources Board, 1958e; Michel, D.C., 1986; Rodriguez Castro, J.A., 1985; Schroeder, D.C., 1987; Steps, W.E., 1942
invertebrate paleontology: Warner, D.J., 1972
paleoecology: Bifano, F.V., 1974a
petroleum: Ross, J.A., 1989f, 1989g
sedimentary rocks: Bisby, C.G., 1985a, 1986; French, J.A., 1988a; Silfer, J.A., 1985, 1986, 1986a
sedimentation: Merriam, D.F., 1986a; Shields, D.C., 1987a
sediments: Aber, J.S., 1985a, 1988a; Law, M.S., 1986
soils: Throckmorton, R.I., 1942
stratigraphy: Barrett, F.J., 1989; Cunningham, C.R., 1989; Skelton, L.H., 1986; Sporleder, J.C., 1987; Sutton, M.J., 1985a
structural analysis: Berendsen, Pieter, 1986a; Johnsgard, S.K., 1988
uranium ores: Willoughby, K.L., 1981
vertebrate paleontology: Foreman, B.C., 1988b
water resources: Kansas State Planning Board, 1936b, 1936f
well-logging: Collins, D.R., 1986

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Marion County
geophysical surveys: El-Hussain, I.W., 1986
ground water: Chaffee, P.K., 1986, 1988; O'Connor, H.G., 1986, 1987; Spinazola, J.M., 1985
hydrology: Jordan, P.R., 1985a; Michel, D.C., 1986; Rodriguez Castro, J.A., 1985
oil and gas fields: Hedberg, H.D., 1926
paleobotany: Johnson, W.C., 1985
petroleum: Kesler, L.W., 1928a; Newell, K.D., 1988; Ross, J.A., 1989f

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Nemaha County
absolute age: Marvin, R.F., 1988
environmental geology: U.S. Department of Agriculture, 1988a
geochemistry: Denne, J.E., 1986, 1987
geomorphology: Abdelsaheb, I.Z., 1988; Aber, J.S., 1988c; Denne, J.E., 1987a
ground water: Melia, A.S., 1987; Miller, Rachel E., 1987a
hydrology: Abdulmumin, S., 1987
invertebrate paleontology: Warner, D.J., 1972
paleoecology: Bifano, F.V., 1974a
petroleum: Longman, M.W., 1987; Newell, K.D., 1988; Ross, J.A., 1989b, 1989c
sedimentary rocks: Caldwell, C.D., 1985a; Hatch, J.R., 1987
structural analysis: Johnsgard, S.K., 1988; Stander, T.W., 1989a
well-logging: Collins, D.R., 1986

Neosho County
areal geology: Blair, K.P., 1989; Kisvarsanyi, E.B., 1989; McCauley, J.R., 1989; Moore, R.C., 1942b; Pratt, W.P., 1989
coal deposits: Brady, L.L., 1989d
diagenesis: McKibben, M.E., 1986
geochemical surveys: Erickson, R.L., 1985, 1989
geochemistry: Bullock, J.H., Jr., 1989e, 1989g, 1989l, 1989q, 1989r, 1989t; Imes, J.L., 1988
geophysical surveys: McCafferty, A.E., 1989
ground water: Clark, A.B., 1988; Macfarlane, P.A., 1987
hydrology: Steps, W.E., 1942
lead ores: Nuelle, L.M., 1989
metal ores: McFarland, M.C., 1989
mineral deposits: Palmer, J.R., 1989
mineral resources: Ohle, E.L., 1989; Pratt, W.P., 1989b, 1989c
paleobotany: Rogers, R.A., 1985
petroleum: Chesser, K.C., 1987a; Joers, J.C., 1950d; Netzler, B.W., 1989; Ross, J.A., 1989h
sedimentary rocks: Bouquet, D.J., 1984; Dawson, W.C., 1985; Mosier, E.L., 1989
sedimentary structures: Dawson, W.C., 1986
soils: Perkins, A.T., 1948; Throckmorton, R.I., 1942
stratigraphy: Denesen, S.L., 1985, 1985a; Dubiskas, R.A., 1985; Harris, J.W., 1989; Pabian, R.K., 1989a; Staton, M.D., 1987; Sutton, M.J., 1985a; Watney, W.L., 1989, 1989c
structural analysis: Imes, J.L., 1989
water resources: Kansas State Planning Board, 1936b

Ness County
geochemistry: Stell, M.J.A., 1988
geophysical surveys: Foote, R.S., 1987; Hall, D.J., 1985
ground water: Gillespie, J.B., 1988; Kume, Jack, 1985; Waite, H.A., 1942b
mineral resources: Heidenreich, W.L., 1952
petroleum: Bieber, D.W., 1985; Hotchkiss, H.G., 1939a; Kornfeld, J.A., 1941b; Ross, J.A., 1989d, 1989e
sedimentary rocks: Nodine-Zeller, D.E., 1985
water resources: Kansas State Planning Board, 1936c

Norton County
absolute age: Marvin, R.F., 1988
areal geology: Eversoll, D.A., 1988
environmental geology: U.S. Bureau of Reclamation, 1971b
geochemistry: Stell, M.J.A., 1988
ground water: Spruill, T.B., 1985
mineral resources: Heidenreich, W.L., 1952
petroleum: Hotchkiss, H.G., 1938c; Ross, J.A., 1989, 1989a
stratigraphy: Bennett, D.K., 1985

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Osage County
areal geology: Maples, C.G., 1988; Wilson, F.W., 1988a
engineering geology: Szpakiewicz, M.J., 1987; Wilson, F.W., 1987a
geophysical surveys: Kalik, A.J., 1988; Miller, R.D., 1987, 1988
hydrology: Bevans, H.E., 1983; Kansas Water Resources Board, 1958e; Pope, L.M., 1985, 1988; U.S. Geological Survey, 1926, 1927, 1928, 1930a, 1930b, 1930c, 1931, 1935, 1935b, 1936a, 1938, 1940, 1941
petroleum: Ross, J.A., 1989g
sedimentary rocks: French, J.A., 1988a; McNeice, B.T., 1987; Silfer, J.A., 1985, 1986, 1986a
sedimentation: Spencer, R.S., 1989
sediments: Aber, J.S., 1985a, 1988a; Law, M.S., 1986
soils: Dickey, H.P., 1985
stratigraphy: Harris, J.W., 1989; Pabian, R.K., 1989a; Sutton, M.J., 1985a
vertebrate paleontology: Foreman, B.C., 1988b
water resources: Kansas State Planning Board, 1936f

Osborne County
geophysical surveys: Wojcik, K.M., 1985
ground water: Kume, Jack, 1985a; Macfarlane, P.A., 1988d
hydrology: U.S. Bureau of Reclamation, 1960b, 1970a; U.S. Geological Survey, 1923, 1925, 1926, 1927, 1928, 1930b, 1931, 1932, 1932c, 1932f
mineral resources: Heidenreich, W.L., 1952
petroleum: Douglass, H.M., 1985, 1985a; James, John, 1985; Newell, K.D., 1988; Ross, J.A., 1989a
stratigraphy: Newell, K.D., 1987, 1987a
water resources: Burnett, R.D., 1985, 1986

Ottawa County
geophysical surveys: Wojcik, K.M., 1985
ground water: Gillespie, J.B., 1986
hydrology: Flaxman, E.M., 1937; Jarvis, C.S., 1936; Russell, W.G., 1902; U.S. Geological Survey, 1902, 1921b, 1923, 1925, 1926, 1927, 1928, 1930a, 1930b, 1930c, 1931, 1932, 1932c, 1932f, 1933c, 1935, 1935b, 1936a, 1938, 1940, 1941, 1942
mineral resources: Heidenreich, W.L., 1952
paleobotany: Kovach, W.L., 1987, 1988, 1988a
petroleum: Newell, K.D., 1988; Ross, J.A., 1989b, 1989f
stratigraphy: Newell, K.D., 1987, 1987a
structural analysis: Johnsgard, S.K., 1988
vertebrate paleontology: Nelson, M.E., 1989

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Pawnee County
environmental geology: Sophocleous, M.A., 1988
ground water: Coble, G.R., 1989, 1989a; Gillespie, J.B., 1988; Hathaway, L.R., 1980c; Kume, Jack, 1985; Sophocleous, M.A., 1987, 1989a; Stullken, L.E., 1987; Waite, H.A., 1942c; Whittemore, D.O., 1989a, 1989b
hydrology: Arruda, J.A., 1989; Sophocleous, M.A., 1986; U.S. Geological Survey, 1925a, 1925b, 1928a, 1929, 1930, 1930d, 1931a, 1931b, 1931c, 1932a, 1932b, 1932d, 1932e, 1932g, 1932h, 1933, 1933a, 1933b, 1935a, 1936, 1936b, 1937, 1940a, 1941a
petroleum: Beauchamp, D.W., 1985; Callewaert, D.L., 1987; Ross, J.A., 1989e; Taylor, F.B., 1937
water resources: Kansas State Planning Board, 1936c; Sophocleous, M.A., 1989

Phillips County
geochemistry: Stell, M.J.A., 1988
ground water: Spruill, T.B., 1985
hydrology: U.S. Bureau of Reclamation, 1950b; U.S. Geological Survey, 1923, 1925, 1926, 1927, 1928, 1930b, 1931, 1932, 1932c, 1932f
invertebrate paleontology: Taylor, D.W., 1965
mineral resources: Heidenreich, W.L., 1952
paleoecology: Ostlie, W.R., 1986; Stewart, J.D., 1985
petroleum: Hotchkiss, H.G., 1938c; Kornfeld, J.A., 1941b; Newell, K.D., 1988; Ross, J.A., 1989a
sedimentation: Watney, W.L., 1985c, 1986
soils: Palmer, C.D., 1987
stratigraphy: Bennett, D.K., 1985

Pottawatomie County
absolute age: Marvin, R.F., 1988
biogeography: Davis, L.C., 1987
geomorphology: Bowman, M.W., 1986; Dort, Wakefield, Jr., 1987a; Richter, J.G., 1988
ground water: McGregor, K.M., 1988; Miller, Rachel E., 1987a
hydrology: Gray, M.W., 1964; Hinderlider, M.C., 1905; Jian, Xiaodong, 1988; Medina, K.D., 1987a; U.S. Geological Survey, 1923, 1925, 1926, 1927,

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