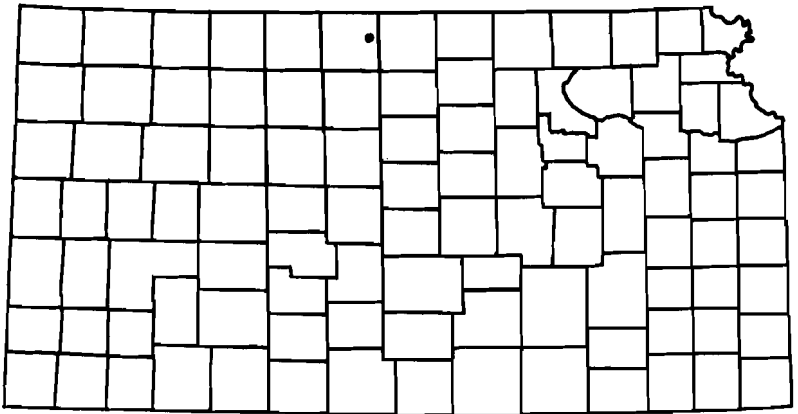


Map of the United States showing the geographical center of the United States (excluding Alaska and Hawaii).



Map of Kansas showing the location of the geographical center near Lebanon, and the general shape of the state.

The Physical Geography of Kansas

By Dixon Smith

What is included in the "geography" of Kansas?

"Geography" might be defined as the study of regional differences of the earth which result from the interrelation between human groups and their physical environment. Therefore, the geography of Kansas is the study of how and why Kansas is different from other areas, and also, it is the study of the regional differences within the state itself.

At a recent meeting of the Association of American Geographers, a geographer from another state and I were discussing course offerings at our respective colleges. I mentioned that Emporia State had just started a course in "The Geography of Kansas." He began to laugh, and asked how we managed to stretch the course for an entire semester. His point was that since Kansas was one vast, monotonous plain, anyone ought to be able to describe the geography of the state in practically one sentence.

However, any Kansan would resent this kind of reasoning. There *are* striking differences between different sections of the state.

Although the geographic study of any area usually includes both physical elements (the earth) and cultural elements (man), I will restrict my talk to the following physical elements of Kansas geography: the spatial factors, landforms, and climate.

SIZE, SHAPE, AND LOCATION

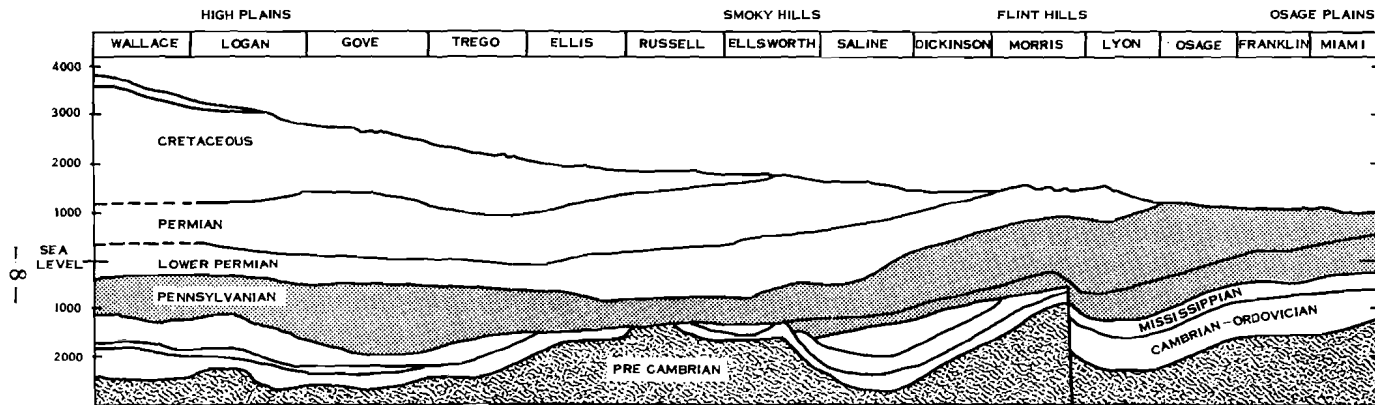
We are all so familiar with the fact that Kansas is the geographical center of the United States that I hardly need mention it. The spot is marked by a monument near the town of Lebanon which is located approximately twelve miles from the Nebraska line, and about mid-way in the state east and west.

Our state is almost a perfect rectangle, being nearly twice as long as it is wide. It extends some 207 miles north and south, and 411 miles east and west (when measured along the southern border), with a nibble taken out of its northeast corner by the Missouri River. Even if this nibble were not taken out, Kansas's north border would be some seventeen miles shorter than its south border due to the convergence of the meridians as they approach the poles. As it is, the north border is only 357 miles in length.

The state has an area of 82,276 square miles, 163 of which is inland water. It is the thirteenth largest state of the old forty-eight states.

LANDFORMS AND CLIMATE

The next two physical elements are the ones which most impress outsiders. To an eastern tourist bound for the cool and exciting mountains of



**Generalized cross-section of rock layers in Kansas, and their westward slope in contrast to the overall eastward slope of the surface.
 (Based on diagram from "Kansas Rocks and Minerals" by Laura Lu Tolsted and Ada Swineford, State Geological Survey, 1957.)**

Colorado, Kansas might well seem like an interminable plain dominated by a blazing sun and constant hot dry winds. But these are only the impressions of a traveler irritated by the length of his trip.

The topography, or landforms, of Kansas are determined by the facts of its geologic history. About half a billion years ago Kansas was an area composed of hard granitic rocks similar to those now exposed over a large area in Canada from the Great Lakes to Labrador. However, since that time the two areas have had a separate geologic history. The area in Canada has remained as a land area practically all of that time, whereas Kansas, and the interior of the United States in general, has been inundated by the oceans on at least fifty different occasions.

Each inundation left more layers of sediment to cover the previous layers. At the present these layers are nearly two miles thick in parts of western Kansas, while the "original" granite platform lies only 500 feet beneath the surface in parts of eastern Kansas. Of course, even the layers which are 10,000 feet thick do not represent the total deposits, since the periods between inundations were periods when some of the sediments were eroded away.

It should be noted that not all of the sediments were deposited by oceans. The upper layers in western Kansas are the result of streams depositing sediments eroded from the Rocky Mountains over a period of millions of years. These stream deposits extended at least as far east as the Flint Hills at one time but have been eroded westward to their present position.

In northeastern Kansas, the surface materials were deposited by still another agent—a great continental glacier. Other parts of the state, and especially in the north, are covered with a deep layer of loess, the deposits of tremendous dust storms of the distant past.

The layers which were put down in the oceans were all relatively flat. Since there have been no major movements of the earth's crust in Kansas (in contrast to the Rocky Mountain area), the result, of course, is that in present gross features, this state is still rather flat. However, it is an important fact that these layers are not *perfectly* flat. In the eastern half of the state, these layers in most places dip slightly (never more than thirty-five feet per mile) to the west and northwest. This dip of the rock layers and the erosion of the layers of differing resistance have together created the cuesta topography of the eastern third of the state, which will be described later.

Even though the rock layers slope or dip westward, the overall surface of Kansas slopes eastward. This eastward sloping is a result of two factors: (1) The later stream deposits were laid down to a greater depth in western Kansas, and (2) the uplift of the Rockies probably brought some uplift to Kansas as well, greatest again in the western part of the state.

The earliest streams of the present landscape were consequent; that is, their course was determined by the eastward slope of the land. At first

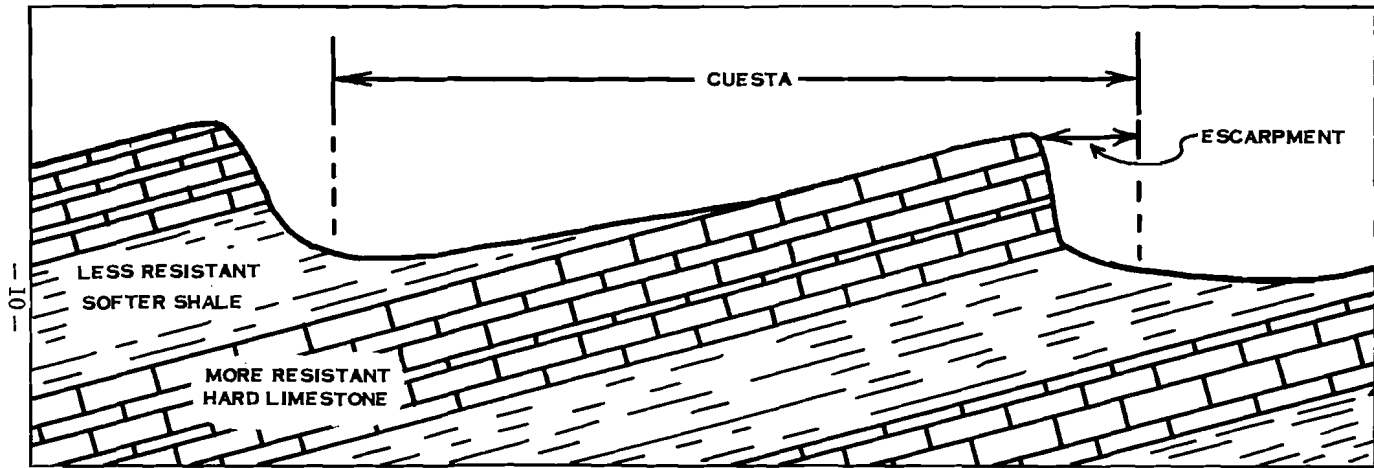


Diagram showing a generalized cross-section of a cuesta.
(Based on diagram from "The Geography of Kansas" by Walter H. Schoewe,
Transactions of the Kansas Academy of Science, September, 1949.)

these streams carried a great deal of material which had been eroded in their headwaters in the Rocky Mountains. Kansas, as far east as the Flint Hills, was buried by these sediments. Later the streams began their process of erosion. As the whole surface of Kansas was subjected to erosion, the layers of rock which were most resistant were not worn down as easily as the layers of softer rocks. Thus the geologic structure and the nature of the rock material, plus the erosive action of the streams, account for the variations in relief and topography of the state.

Going from west to east, the landforms of Kansas are as follows:

I. *The High Plains*, covering approximately the western third of the state. This area, which is made up of old stream deposits, is part of one of the greatest plains in the world. The High Plains area at present has few streams to dissect it.

The eastern edge of the High Plains is marked in most places by an escarpment, the "breaks of the plains." This is a very uneven line lying further west along stream *heads* and extending eastward on the *inter-stream* areas. This eastern border of the Plains is the result of the erosive action of streams to the east which extend themselves and their tributaries like reaching tentacles into the Plains. Where dissection has been extensive, the topography becomes rougher. This rougher, highly dissected border is indicated by its names: the Smoky Hills, the Kearney Hills, the Blue Hills, and the Red Hills.

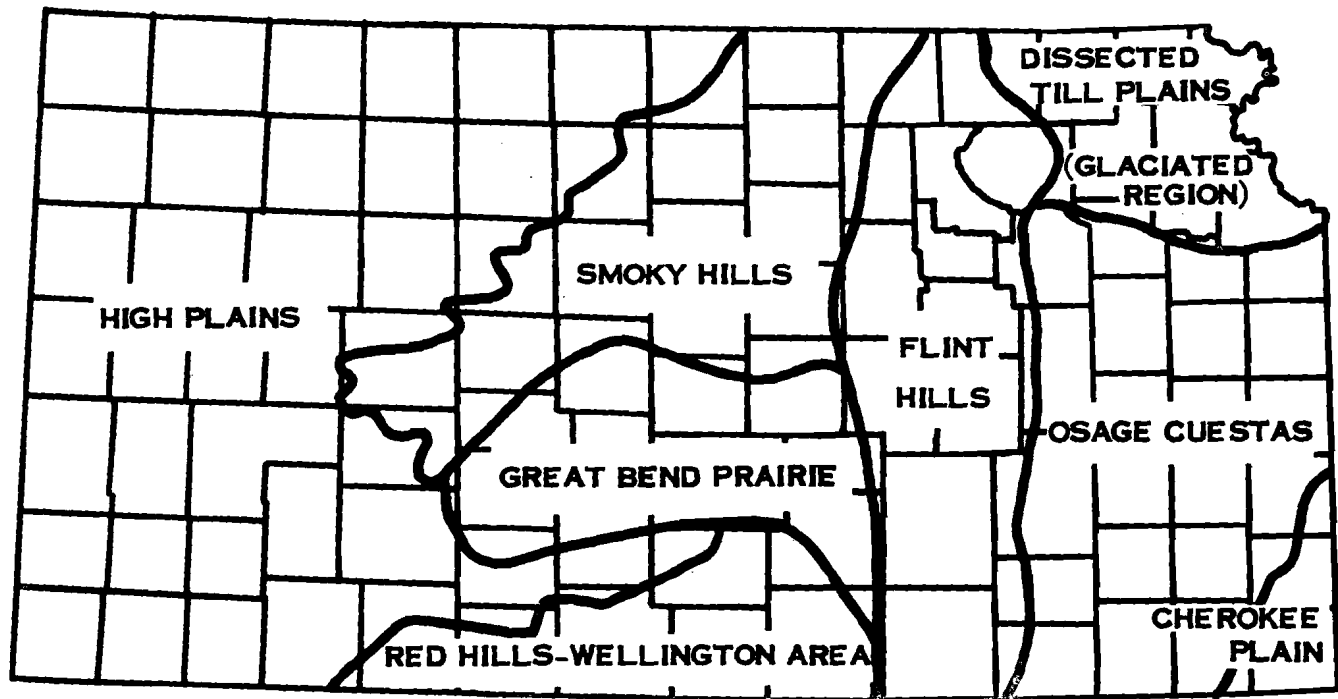
One place where there are no such sharp demarcations is the region known as the *Great Bend Prairie*. This region, in reality, is an eastward extension of the High Plains, and the rolling prairie extends, like a peninsula, eastward to the Flint Hills. This extension is probably due to the fact that the Arkansas River has failed to cut its bed as deeply as the other rivers; consequently, its tributaries have not cut into the surrounding land areas.

II. *The Osage Plains*, occupying the eastern third of the state and stretching as far west as the Flint Hills. The most characteristic features of the region are the series of *cuestas*.

The *cuestas*, "ridges" with one steep slope or escarpment and a more gentle slope on the opposite side, trend in a north-to-south direction in this section of the state, and the steep slope is east-facing. They are due to differential erosion acting on the alternating hard and soft sedimentary layers which dip westward as we have previously described. There are about eighteen of these *cuestas* or ranges of hills which run north and south across the state. Between the escarpments, flat or gently rolling plains are formed by the softer rocks.

Subdivisions of this region are the Flint Hills, the Osage *Cuestas*, the Chautauqua Hills, and the Cherokee Lowlands. The Flint Hills, as part of the Osage Plains, have had a similar geologic history to the Plains. However, the escarpment in this case may be as high as 400 feet, whereas the other escarpments to the east are much lower.

III. *The Dissected Till Plains*, lying for the most part north of the Kansas River and east of the Big Blue River. This area is structurally part



General landform areas of Kansas.
(Based on map from "The Kansas Scene" by Grace Muilenberg,
State Geological Survey, 1953.)

of the Osage Plains. Here, however, the cuesta-type topography of the Osage Plains is concealed or mantled by a covering of drift, the result of two major ice invasions. The topography ranges from gently undulating to extremely hilly, rough, and highly dissected areas looking over the Missouri River. Where erosion has been minor, remnants of the original ground moraine topography are present. Eroded areas near the Missouri may have a local relief up to 300 feet.

The elevation varies in Kansas from 4,135 feet west of Sharon Springs to 700 feet where the Verdigris River leaves Kansas just south of Coffeyville. Elevation in itself is not too important in the state, having little or no effect on climate. Its primary effect is in causing all the rivers to flow, generally, from west to east. This is not particularly advantageous either. In fact, it has been suggested that Kansas would benefit greatly if we could figure out a way to jack up the east side of the state and have the rivers flow the other way, thus allowing the heavier rains of eastern Kansas to benefit the western area.

This brings us to the matter of climate. On the whole, it is safe to say that the difference in landforms between eastern and western Kansas is less important than the difference in climate between these areas.

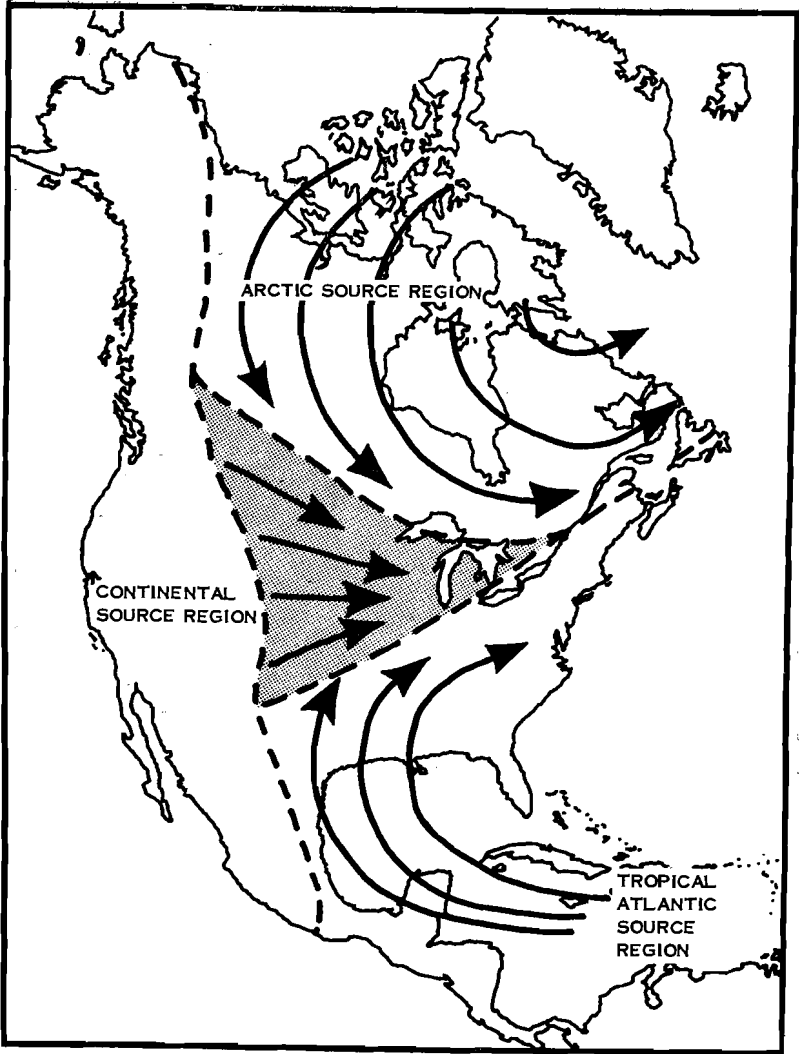
Our Kansas climate is noted for its extremes. This is, of course, due to our location in the heart of the continent, far from the moderating influence of large bodies of water and in the latitude of cyclonic storms. In this respect it could be said that Kansas is dependent on free trade: The wheat which we export to other parts of the world is almost entirely dependent on the climate which we import. One authority estimates that about 70 per cent of the rainfall in Kansas is derived from the oceans, and primarily the Gulf of Mexico. The climatic conditions of the state are not determined by the physical setting within the state, but are set by much greater forces outside the state. Kansas is the meeting point of great air masses.

Three major air masses vie for the position of dominant air mass over the state of Kansas. These different masses come from three different centers of mean divergence: the sub-tropical Atlantic anti-cyclone, the Arctic region, and the eastern base of the Rockies.

The first air mass, moving eastward from the base of the Rocky Mountains, has crossed a series of major orographic (mountain) barriers, has subsided over the Great Basin and Interior Plateaus, and has descended to the Great Plains. This air mass is a dry, continental stream of air; it is carried far to the east by the westerly winds; in winter, when the westerlies are especially strong, it is carried as far as the Great Lakes. This wedge of continental air lies between two belts of maximum cyclonic frequency: the "Alberta Storm Track" and the "Texas Storm Track."

The second air mass is a cold dry air mass stemming from the Arctic center. It moves south and east from the Arctic regions, and dominates the area north of the Alberta Track.

The third air mass, the Tropical Atlantic, is a warm, moist mass



Map of North America showing air masses and the directions of their movements.

(Based on information in "The Climate of the Central North American Grassland" by John R. Borchert, *Annals of the Association of American Geographers*, March, 1950.)

which moves clockwise around the sub-tropical high pressure area. It moves westward and northward across the Gulf of Mexico into the gulf coastal areas; from there, it moves into the Texas storm path and north-eastward toward the Great Lakes.

The climate of Kansas depends on which of these air masses are dominant over the various parts of the state. The winter months are characteristically dominated by the continental air which has moved away from the Rockies, creating the cool dry sunny weather of winter. The occasional extremely cold spells of winter occur when the Arctic air mass expands farther south than normal, pinching off the flow from the Rockies and taking over the area. The summers in the western third of the state continue to be dominated by the dry continental air mass from the Rockies. However, as we go eastward, the sub-tropical warm, moist air from the Gulf of Mexico dominates more and more. In the southeastern part of the state it dominates throughout most of the summer, bringing high summer precipitation to that area.

The resulting pattern of climatic and weather elements shows these averages: average January temperature, 27° to 33°; average July temperature, 77° to 81°; average number of days without killing frost, 155 to 195; average annual precipitation, 16 to 42 inches.

As I mentioned in the beginning, in order to do a complete study of the geography of the state, we would have to consider many other factors besides these three physical elements—the spatial features, landforms, and climate. We would have to study the earth resources: water, plants, animals, soil, and minerals, all of which are part of the physical make-up of the area. In addition, we would have to study the anthropological elements of the region, since “geography” was defined as the study of regional differences of the earth which result from the interrelation between human groups and their physical environment.

The anthropological elements should include cultural philosophies and factors such as religion, custom, tradition, values, ethics; education and technology; language, nationality, race, and ethnic groups. Economic philosophies and factors, and political philosophies and factors are also indispensable items for examination when studying geography in its fullest sense.

The interrelationships and combinations of the above mentioned physical and human elements create “geographic expressions”—such things as (1) the type and extent of agriculture, (2) the type and extent of manufacturing, (3) the type and extent of trade and transportation, (4) population density and distribution, (5) settlement types, (6) standards of living, and (7) political units. The interrelationships and combinations of all the geographical elements and expressions of a given area compose the regional differences which make that geographical area unique. These are the things which make the study of geography interesting and almost unlimited in scope.

—And these things are what make Kansas like no other region in the world. Kansas is uniquely . . . Kansas.



Blizzard of 1886—East of Dodge City. (Courtesy of the Kansas State Historical Society.)