The Geology of Phillips County Kansas

by

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Outline.

Introduction.
- Geography of,
- Topography of, with Map.

Surface Geology.
- Supposed Former Condition.
- Chemical Action of Water.
- Mechanical " " "
- Present Condition.

Cretaceous Formations.
- Hard Limestone.
- Soft "
- How Formed.
- Distribution of,

Main Soil.
- How Formed.
- Flinty Particles in
- Nature of Its Deeper Layers,

Sand and Gravel Beds.
- How Formed.

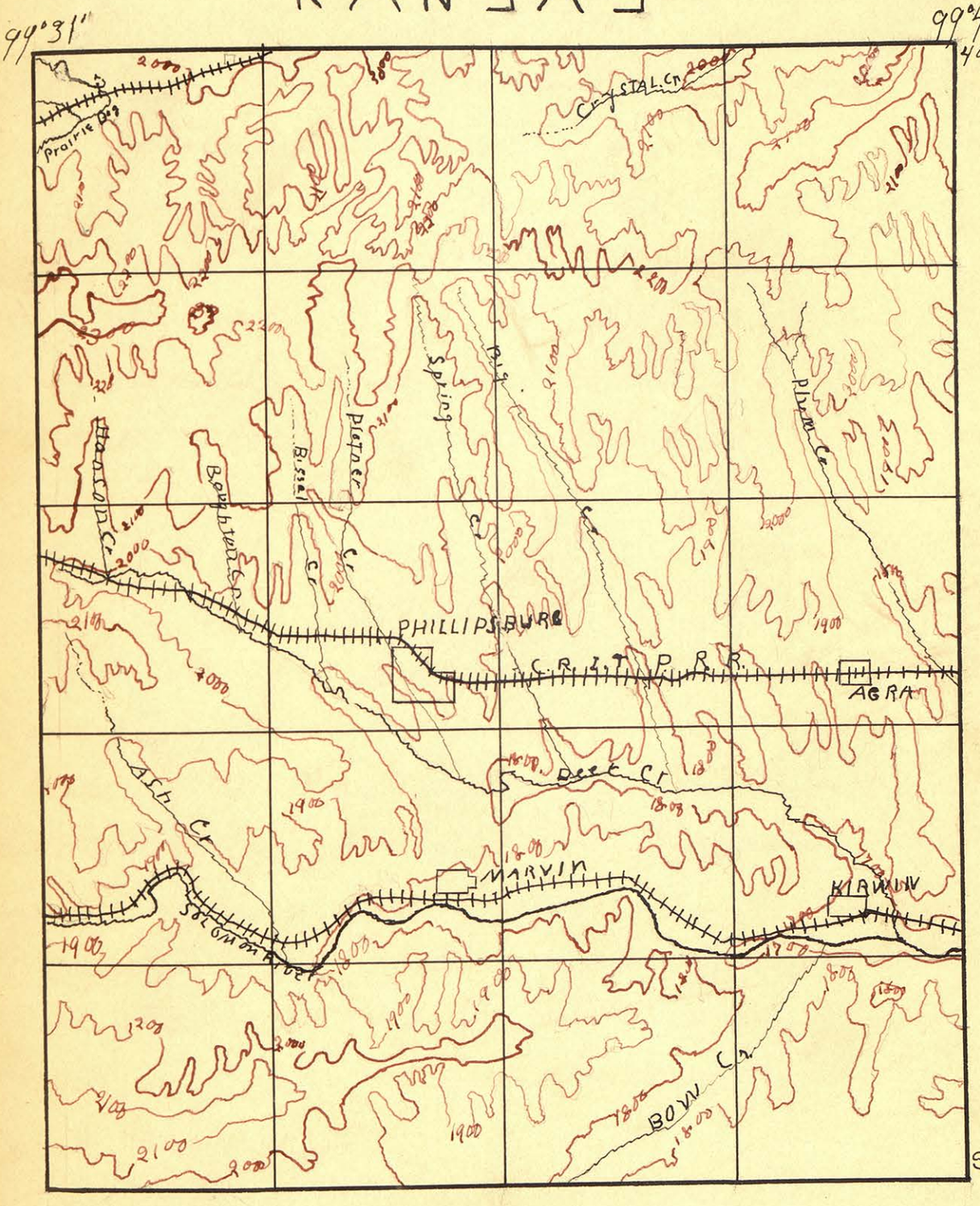
Blue Shale.
- Level of,
- Depth of,
- Thickness of,

Conclusion, Historical.

Introduction.

Before entering upon a discussion of the geologic features of the county, it will first be necessary to give something of the location and general drainage system of the place. Phillips County is situated in the northwestern part of the State of Kansas. It is the fifth county from the western state line, and borders Nebraska on the north. It lies between the meridians of about 99° 38' and 99° 4'; and between the parallels of latitude 39° 34' and 40°. The principal streams are Prairie Dog Creek which flows through the northwest corner; the Solomon River flowing through the south central; Bow Creek in the southwest; and Deer Creek which flows through near Phillipsburg emptying into the Solomon near Kirwin. The general direction of all is from west to east. There are many other small streams, which may be seen on the map, but these will be sufficient to indicate, in a general way, the drainage system

PHILLIPS COUNTY
KANSAS



Contour Interval 100 feet

west line of Townships Omitted

of the county.

The elevation above sea level is from 1700 feet in the southeastern to 2300 in the northwestern part. This gives the main part of the county considerable slope in a southeasterly direction. North of the parallel of about 39° 55' the land slopes northward. This includes a strip of land about seven miles wide from north to south, and extending the entire length of the county from east to west

Surface Geology.

The surface of the land was probably comparatively smooth at one time, but through the process of weathering it has been transformed to its present condition which may well be called rough. The greater part of this change has been brought about by the action of water which has been both chemical and mechanical.

The chemical work of water is small as compared with the mechanical, but it has played its part in soil formation and rock disintegration. All

soil has been formed and is still being formed by the weathering of rocks, due to the agencies of the atmosphere, the active ingredients of which are oxygen, carbon dioxide, and water. Ordinary rain water contains both oxygen and carbon dioxide in solution which makes it a very important factor in rotting down rocks and breaking them into smaller particles which may be carried away by the streams.

The mechanical action of water has brought about the principal surface changes. The rain falling as it does in too large quantities to be absorbed by the soil will naturally run off if there is any slope to the land on which it falls. In this county the slope being comparatively great, there is ample opportunity for this mechanical action. The water in running off first formed tiny rills which joined to form small streams, and these in turn united to form rivers. These have kept deepening their channels, year by year, and carrying

the soil down to be deposited wherever the current is in any way checked. In this way the surface has been furrowed out by gullies, ravines, and river beds. The land nearest the streams would naturally be worn away faster than that at some distance from them, owing to the fact that it would not only be worn away by the water falling immediately upon it, but also by that running down from the higher land. On account of this the creeks are usually separated by "divides" many miles in extent. These "divides" almost invariably extend in a northwesterly and southeasterly direction. This is due to the general slope of the land, which it will be remembered is from northwest to southeast. The land between the "divides" is made up of a succession of ridges and gulches. It is only a question of time until these gulches will cut their way back through the great "divides", and make, of them, a series of mounds instead of one continuous ridge.

This whole process of erosion has required thousands of years for its completion. Indeed it is so slow that at first thought one may be led to suppose the surface was always just as it is today. But if any one will notice the way a ditch is cut back and made longer by each rain he can easily see just how the great ravines have been formed. Or if one will notice any stream in time of a freshet – see how the soil is taken from one place and deposited in another he cannot fail to see something of the erosive and transporting power of water, even though the process does seem to be a very slow one. It has been estimated that the territory drained by the Mississippi River is lowered at the rate of only about one foot in five thousand years. Of course the process of erosion is not uniform in all localities. Some places may be worn away at the rate of several feet annually, while others are scarcely affected, or may even be built up by the washing down of soil from

some higher point

In some parts of the county, as for instance, along the Prairie Dog and Solomon, there are bluffs which rise to a considerable height. However these are the exception rather than the rule. Along the bluffs of Prairie Dog Creek is found, a very hard kind of stone which is sometimes called granite. The probabilities are, however, that this is only a very compact form of ~~stat~~ ified rock. The fact that it occurs in layers indicates that it is not granite.

Cretaceous Formations.

Deposits of limestone of various degrees of hardness are found in all parts of the county. The northern part contains very little or none of that which is ordinarily known as soft limestone. However, a harder limestone is found in abundance. It is deposited in strata from four or five inches to as many feet in thickness. Many boulders of this stone are strewn promiscuously

over the surface. They range in size from mere pebbles up to blocks several feet in diameter. They are very rich in lime which material has been obtained from them for building purposes.

In the southern part of the county near the little town of Marvin, we find much larger boulders which are of a more chalky consistency. In this same region there are mounds of the hard limestone which resemble in form what is known as "volcanic necks". There is little probability, however, that these are of any other than sedimentary origin.

Soft limestone occurs all over the county except, as before stated, in the northern part. It makes a very fair building stone, and is largely used in that part of the country because it can be so easily fashioned into the desired form. It is so soft that it can be sawed almost as readily as a block of wood. Yet it stands the

weather fairly well. It occurs in layers from six inches to three or four feet in thickness. It may be found in large quantities cropping out on the hillsides. The fact of its being in layers shows that it has been deposited under water. It is of organic origin

At the present time we can still see just how such limestone or chalk is being formed from the shells of minute calcareous organisms which inhabit the sea. Each generation takes lime from the sea water and leaves it as shells on the bottom. These may accumulate until deposits of enormous thickness and extent are formed. The deposit thus formed may be very pure, consisting of shells only; or the shells may be mixed with mud, or embedded in mud. In most of the chalk of Phillips County the process of decomposition has been so thorough that the presence of shell can hardly be detected. However, in some places they can be seen quite plainly. From

this it may be seen that it is not a difficult matter to determine the origin of the stone. Why it should be found in some places and not in others is not an easy question to answer.

We know that at one time the whole of this country was under water. This limestone was probably deposited very evenly over this part of the sea bottom at that time. But the land may have been raised very unevenly. This would cause the formation of numerous islands and lakes. These islands being exposed to the action of the atmosphere would gradually be washed down into the lakes and deposited in layers on the limestone already accumulated there.

Again the deposit may have been of uniform thickness all over the sea bottom and when the land was raised out of the water the whole surface was covered with one continuous mass of limestone. Certain parts of the land may have been again submerged

and received a deposit which protected the limestone from weathering when the land was again raised. In this way the protected portions have been preserved, while the exposed parts have been carried away. Ordinary rain water washing over it would wear this soft stone away at a comparatively rapid rate. The streams would very soon wear their way through it and by cutting back under it, cause large blocks to break off by their own weight. The fragments being thus thrown into the current would be rolled along on the bottom and ground off by particles of sand held in suspension, until it would disappear entirely.

Soil and Sand.

Some of the main soil is being formed at the present time by the rotting down of the various rocks, but probably the greater part of it has been carried from some other part of the earth. As a rule most of the soil of

North America has been shifted from its original position. Immediately upon the surface the soil is a rich black loam, but several feet down it begins to grow lighter in color and more compact, until a material of a light grayish or yellowish color is reached. This latter is very soft and rather soapy. Through this material are found pieces of flint ranging in size from very small particles up to pieces ten or twelve inches in diameter. It seems very apparent that these are only small portions which were once embedded in a solid mass of rock. The greater mass has been decomposed and carried away by the subsurface water, while these have been left undisturbed. These flinty particles are very angular with sharp edges, showing that they have not been subjected to the action of running water.

Immediately under this yellowish material is a bed of coarse quartz sand and gravel which rests upon

what is commonly called "blue shale." It is very probable that this gravel is only the insoluble material which was once a part of the blue shale, but on account of its resistance to the action of water has been left just where it was formed. This gravel bed varies in thickness from one to ten or fifteen feet. It constitutes the water bearing stratum although water may be found before this is reached.

Blue Shale.

This layer of blue shale lies almost on a dead level all over the county. The soil covering it varies in thickness from fifteen or twenty feet on the bottom land in the eastern part of the county to several hundred feet on the divides in the western. This is of considerable interest to the inhabitants for in some places in boring a well the shale is reached before water is found. On this case it is, as a rule, only a waste of time to go any deeper. No one has yet been able to bore through it although borings

over four hundred feet have been made in the solid mass. In a very few instances a vein of water has been found at a considerable depth in the rock, but the chances of striking one are so rare that very few people attempt it. The rock is still in the process of decomposition. The first few inches of it can be dug up with an ordinary spade but on going deeper it becomes so solid that even a pick affects it but little. This decomposition process has not worn the rock down uniformly but has hollowed out basins several feet deep. If we grant this to be the case we can easily account for the fact that some wells which once contained eight or ten feet of water are now dry. At the time the well was sunk the walls of the basin were continuous all the way around, but by decomposition some place in it has been worn away, thus draining the basin almost completely.

Conclusion, Historical.

If this top and comparatively recent mass of soft loose material with its in-

tercalated strata of limestone and chalk was transported from another place, the question comes to mind, whence was it brought. However interesting the question may be the only answer is a conjecture. In ages past different parts of the earths crust varied in their altitude with the ever present phenomena of the erosion of the higher and the filling and building up of the lower.

There may at one time have been land much higher and much nearer than the present high land of Colorado This would account for more rapid and more extensive deposits; and larger and more rapid rivers may have been the agents of transportation. Whether the high land was to the north or whether it was, as at present, to the west is uncertain, but the indications seem to point to the latter.

In conclusion it may be added that it is well to keep in mind that possibly many millions of years have elapsed while the various changes in the

crust of our globe have been taking place and that it is not strange if we do not always read the records of these changes correctly. Yet it is gratifying to know that the progress in the science of geology is rapidly enabling us to do so.