III. SOME REASONS FOR THE PARALLEL COURSES OF STREAMS IN OKLAHOMA

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It is a matter of common remark among the geologists and geographers of Oklahoma that the courses of the larger streams crossing the state from west to east are more nearly parallel than is usual in an area of this size. A glance at a physical map of North America will also give the impression that the western tributaries of the Mississippi and Missouri rivers have a parallelism that is lacking in the river systems of the other parts of the continent. The streams of this series of tributaries are larger than those of any other region of the United States, the drainage is mature, and the streams flow across a relatively flat area from a dry to a progressively more humid region. However, a closer examination of the map will show that marked parallelism is not uncommon among smaller streams, as for example the streams flowing into the Atlantic Ocean south of the Potomac River and some of the areas draining into Hudon Bay. But nowhere else on the continent is there a series of streams of the size and length of those of the Interior Plains that hold parallel courses throughout their length.

As a result of a careful study of this region the following causes are suggested as giving at least a partial explanation of this unusual condition.

1. The climate of the region. The streams of the area rise in or near the Rocky Mountains from which some of them get a rather constant supply of water. They then flow through a dry area for a considerable distance but as they continue on their courses they come into regions of greater and greater rainfall, until in their lower courses they are flowing under distinctively humid conditions. The gradient of the streams is rather steep although the country as a whole is quite level and is covered in most places to some depth with relatively fine and easily eroded material. An examination of the drier regions of the world will show that desert streams that are strong enough to maintain themselves are generally streams of great length and few tributaries. This dry condition prevails from the Rocky Mountains east to about the 100th meridian and is the area that is chiefly responsible for the increased length and apparent parallelism of the streams.

2. Aggrading streams. The larger streams of the Great Plains are in general aggraded streams. Their upper courses

flow through regions where the surface is easily eroded and they obtain a large load in proportion to the amount of water they receive. There are at least two reasons why a series of aggraded streams are likely to run parallel.

a. An aggraded stream is not inclined to commit piracy because its tributaries usually will not have sufficient gradient t cut back far from the parent stream.

b. It tends to make its tributaries run parallel with itself. It fills in their mouths and thus decreases their gradient and so forces them to go farther and farther down the parent stream in order to maintain their gradients. This well illustrated in the case of Little River which rises near Norman within one and a half miles of the South Canadian River and flows sixty miles east before joining it.

3. The streams have broad, flat sandy beds and run perpendicular to the direction of the prevailing winds. The general course of the streams of the region is somewhat south of east. The prevailing winds are south eight or nine months of the year and north the rest of the time. These winds pick up the sand and silt from the river beds and pile it up in banks and dunes along the shores. This occur to some extent on both sides of the streams but is more evident on the north sides. An examination of the map will show that the tributaries on the north sides of the streams usually are longer and run more nearly parallel to the main streams than those on the south sides. This piling up of the sand along the banks also helps the streams to resist piracy to some extent as shown near Oklahoma City where some of the streams head within a quarter of a mile of the North Canadian and flow north to the Cimarron.

4. The streams may be running parallel with the folds of the rocks. Streams have a tendency to follow the folds in sedimentary rocks. In a steeply folded region they will sometimes be in valleys worn into the anticlines but where the structure is only warped the drainage may follow it by flowing in the synclines and it may be that this has been a factor in causing the streams of this region to flow in parallel lines.

5. The streams of the region sometimes work headward by sapping. As stated by Fenneman in Bulletin 730-D; U. S. Geological Survey, sapping is an important process in the erosive work of the Interior Plains. In subsurface sapping the water sinks in and then moves outward along the bedding planes to the stream. A little consideration will show that this will probably be most effective where the bedding planes are relatively level,

that is along the direction of the folds at the top of an anticline or the bottom of a syncline. This cause may hove worked with number 4 to hold the streams parallel with the folds as their courses were lengthened.

Summary

The streams of the Great Plains Region flow parallel for a greater distance than is usual in a drainage area of this size because:

1. They flow for part of their course through a semi-arid region.
2. They are aggrading streams.
3. Prevailing winds pile the sand from the river beds along the sides of the stream.
4. In some places they may be following the synclines of a mildly folded surface.
5. Sub-surface sapping may have helped to hold them parallel to the direction of the folds as they were working headward.