PRE-GLACIAL RIVER TICONA*

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The topography of north-central Illinois reflects the glacial history of the area and consists of a youthful surface with the characteristic forms of glacial deposition locally modified by stream erosion. Study of the topography of the bedrock surface in outcrops and in records of borings shows that the glacial deposits conceal a drainage system strikingly different from the present drainage system. The bedrock surface consists of a broad gently-sloping surface, above which rise elevations 40-50 feet high and in which are eroded many deep branching valleys. The general picture is that of a dissected peneplain in late youth or early maturity.

The area studied centers about the upper Illinois Valley (fig. 1) and includes most of LaSalle, Kendall, Will, Grundy, Livingston, and Putnam counties. The bedrock surface in this area was drained westward, as at present, by a river named River Ticona for the railroad station of Ticona, which is located along the buried valley a mile northeast of Tonica.

Along the Ticona drainage divide the pre-glacial upland surface generally has an elevation of 600-625 feet, with some hills as high as 650 feet, and locally near Lisbon and Fairbury as high as 675 feet. The upland surface has an elevation of about 625 feet along the axis of the LaSalle anticline near the west side of the drainage area, and an upland level of 600 feet is common as far east as Marseilles. Farther east the surface lowers and is generally 525-550 feet in the eastern part of the drainage area, although it rises to the higher areas along the drainage divide. The general slope of the surface, therefore, is east, although the main drainage is westward.

River Ticona occupied a valley both broader and deeper than that of the present Illinois River in the same area. In the lower part of its course River Ticona was entrenched in a steep-walled valley at least 300 feet deep and about 1¾ miles wide at the top. The valley-walls are exposed southeast of Lowell where Vermilion Valley crosses Ticona Valley almost at right angles. The bedrock surface lowers from near the top to the bottom of the Vermilion valley-walls, about 80 feet, in less than 100 yards.

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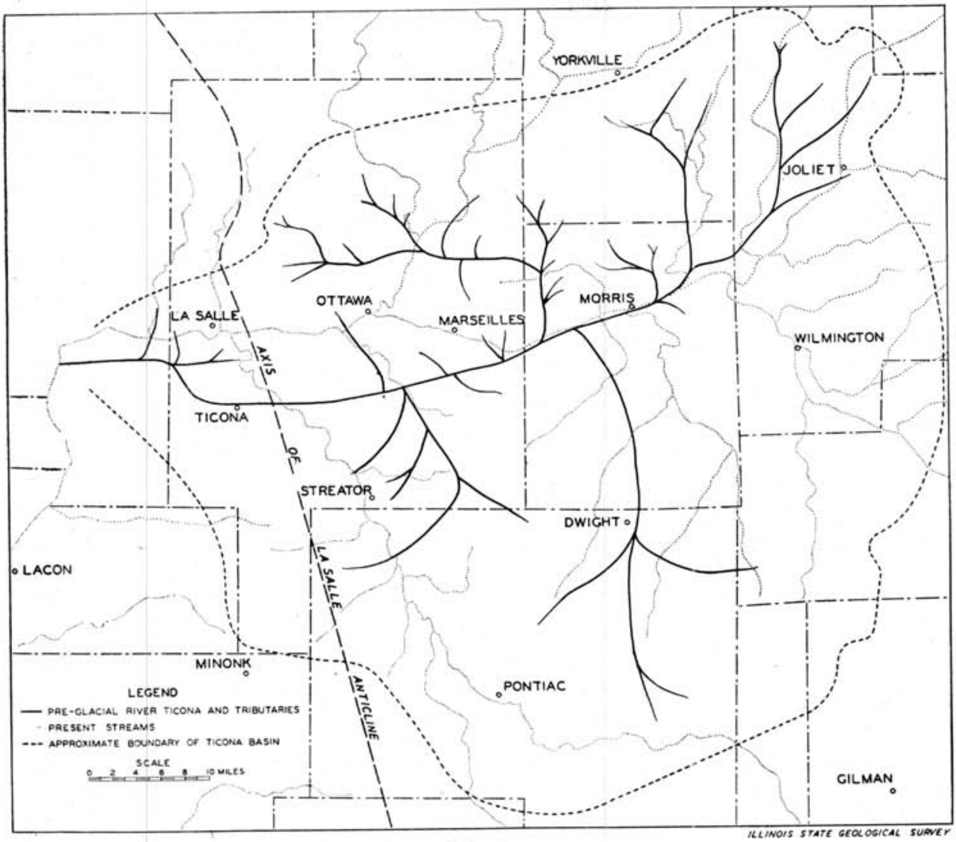

Fig. 1

Only the upper walls of Ticona Valley are exposed, as its bottom is far below the level of Vermilion River. At its mouth the elevation of River Ticona was as low as 300 feet, which is 150 feet below the level of Illinois River. Although Ticona Valley was eroded about 300 feet deep in bedrock, the present Illinois valley, locally 200 feet deep, has a maximum depth in bedrock of only 175 feet.

Although the course of the main valley of River Ticona is westward or directly contrary to the general slope of the bedrock surface, the tributary valleys mostly conform to the regional slopes. North of Ottawa and at Streator the tributary rivers flowed eastward away from the high area along the axis of the LaSalle anticline. The tributary river north of Ottawa flowed eastward nearly 25 miles before it joined Ticona River. In the eastern half of the drainage area the directions of the streams were more normal, leading directly away from the drainage divides.

In the erosion of an anticlinal area such as the LaSalle anticline, a relatively high area would normally remain along the axis of the structure and thus form a divide between divergent drainage systems. Such a high area occurs along the LaSalle anticline, but peculiarly enough the main drainage line of the area directly crosses it. It is of interest, therefore, to consider some of the events in the history of the area which may have resulted in the establishment of River Ticona across the anticline.

Ticona valley contains glacial deposits which have been correlated with the Kansan stage of glaciation, and it was therefore eroded before Kansan time. As the youngest bedrock cut by the valley is Pennsylvanian in age, the drainage system is younger than the Pennsylvanian deposits. On the basis of these data alone, it might be logically assumed that the position of Ticona valley across the LaSalle anticline indicates the valley is antecedent and was present before the folding of the anticline in Late Paleozoic time. Because of the great length of time since the Paleozoic era, and the varied history of the area as indicated by evidence in other areas, it seems unlikely that the drainage system of Late Paleozoic time persisted to the Pleistocene period.

Following the folding of the LaSalle anticline at the end of the Paleozoic era the area was eroded to a relatively flat plain. Probably it was reelevated and eroded again several times during the Mesozoic and Cenozoic eras, and at least 600 feet of Paleozoic strata were eroded from the area. It is possible that many later strata, of which no remnants are now present, may have been deposited and also eroded. The area was probably eroded to a peneplain during the early Mesozoic time as the Cretaceous deposits of the Gulf coast embayment overlie the peneplaned surface of the older strata. During Tertiary time the area was again peneplaned, and the present upland surfaces of the bedrock are remnants of this peneplain. The peneplain truncates the LaSalle anticline and all the formations from the Shakopee dolomite to the youngest Pennsylvanian beds in less than two miles, and in spite of their striking differences in resistance to erosion, retains a comparatively flat surface. Erosional surfaces in the unglaciated area in northwestern Illinois and southwestern Wisconsin have been variously described as the result simply of differential erosion, or of one or two periods of peneplanation subsequently modified by rejuvenated erosion. A recent study[1] of the problem has indicated that the highest upland surfaces are broad remnants of a late Tertiary peneplain, named the Dodgeville peneplain, and the slope and elevation of the peneplain indicates its identity with the one recognized in this area.

Although the divide along the axis of the anticline might be expected to persist throughout the interval of peneplanation, drainage might have been established across the natural divides of the surface during the uplift of the peneplain especially if accompanied by slight warping of the surface.

It is also possible that sometime during the Mesozoic era or Tertiary periods flat-lying deposits were laid down across the structure. If this happened a new drainage would be established dependent on the slope of the surface of these beds and regardless of the underlying structure. With erosion through these beds the drainage would be superimposed on the structure. The course of the major river might persist across the anticline but the courses of the tributaries might be altered to follow the regional slopes of the old buried surface, and new streams developing would likely follow the same slopes. Although this interpretation adequately accounts for the drainage pattern, it requires the deposition of beds which have since been completely eroded and it therefore cannot be confirmed.

In late Tertiary time the area was eroded to the level of the Dodgeville peneplain, and the fact that the surface of the peneplain is slightly higher along the axis of the anticline suggests that drainage was not established across the anticline during the erosion of the peneplain. If River Ticona did not extend across the anticline during erosion to the level of the peneplain, it at least took this position on the peneplain before uplift caused entrenchment of the river in the peneplain. Because Nebraskan glacial deposits occur on the peneplain and not in the valleys, it has been suggested[2] that dissection of the peneplain did not occur until after Nebraskan glaciation but before Kansan glaciation. Therefore the course of River Ticona may have been established during the Nebraskan glaciation.

There is no direct evidence that the Nebraskan ice invaded the Ticona drainage area. The nearest deposits correlated with the Nebraskan glacier which advanced from the Keewatin center occur in the northeastern corner of Iowa and in west-central Illinois. However, the ice may have extended farther east and, if so, it might well have established new drainage lines across the pre-existing divides. It is also possible that a Nebraskan advance from the Labradorean center blocked drainage eastward from the anticline and forced an outlet westward over the divide along the anticline. Any Nebraskan deposits not eroded during the dissection of the peneplain before the

Kansan glaciation would be in the most favorable place for erosion by the succeeding glaciers. In the Ticona basin the Kansan, Illinoian, and earliest Wisconsin deposits are found in Ticona valley and its tributaries, and the later Wisconsin deposits usually rest directly on the bedrock on remnants of the peneplain. There may be, therefore, in the discordant drainage pattern of the bedrock surface some evidence of Nebraskan glaciation not found in the glacial deposits of the area.

In summary, the position of River Ticona across the LaSalle anticline was attained in the interval between the Pennsylvanian period and the Kansan age of the Pleistocene period. It might be antecedent on the structure and Late Paleozoic in age; it could have been attained during the uplift of the peneplains eroded during Mesozoic and Tertiary time; it might have been superimposed on the structure during the same interval; and it might be the result of Nebraskan glaciation. Of these the latter seems most likely.

Ticona Valley was gradually filled with deposits during the succeeding glaciations but it controlled the main drainage of the area through Kansan, Illinoian, and early Wisconsin time. The valley may have been obliterated by the Bloomington drift, and it certainly was by the Cropsey drift, as the Inner Cropsey moraine shows no depression where it crosses the valley, and by that time drainage was established along the present course of Illinois Valley.

[1] Bates, R. E., Geomorphic history of the Kickapoo region, Wis., Geol. Soc. Am. Bull. vol. 50, 1939, pp. 819-880.

[2] Trowbridge, A. C., The erosional history of the Driftless Area, Univ. of Iowa Studies in Nat. Hist., vol. 9, No. 3, 1921.