Proceedings of the Iowa Academy of Science

Volume 66 | Annual Issue Article 43

1959

# The Varied Character of the Des Moines River Valley in Central Iowa

Gene R. DeKoster
*Iowa State University*

Keith M. Hussey
*Iowa State University*

Robert D. Munson
*Iowa State University*

# The Varied Character of the Des Moines River Valley in Central Iowa

By Gene R. DeKoster, Keith M. Hussey, and Robert D. Munson[1]

*Abstract.* The drainage system on the Des Moines River is quite varied between Humboldt and Des Moines. The variation in drainage characters is highlighted on a map prepared from aerial photographs and topographic sheets. The northern part of this area is associated with the Mankato drift sheet and is characterized by poorly developed, non-integrated drainage. The central part of the drainage system in Boone County flows across the Cary ground moraine. In this area the tributaries are short, intermittent, and deep, and appear as gullies and washes. Just south of Des Moines, the drainage makes another sharp change, and in this area is associated with the Kansan drift. It is well integrated and featured by a relatively small number of far-reaching primary tributaries. It seems to be more than coincidental that the change in character of the drainage is so closely associated with the relative ages of the drift sheets comprising the drift plain.

The unusual characteristics of the middle portion of the Des Moines River valley are quite apparent on the aerial photos as well as on the topographic sheets of the area. It is certainly more than coincidental that the sites of change in character of the valley almost exactly coincide with major relief features produced by the late Pleistocene glaciation in that part of Iowa.

The Des Moines River flows across a drift plain created by three different intervals of glaciation (Figure 1). North of Boone County,

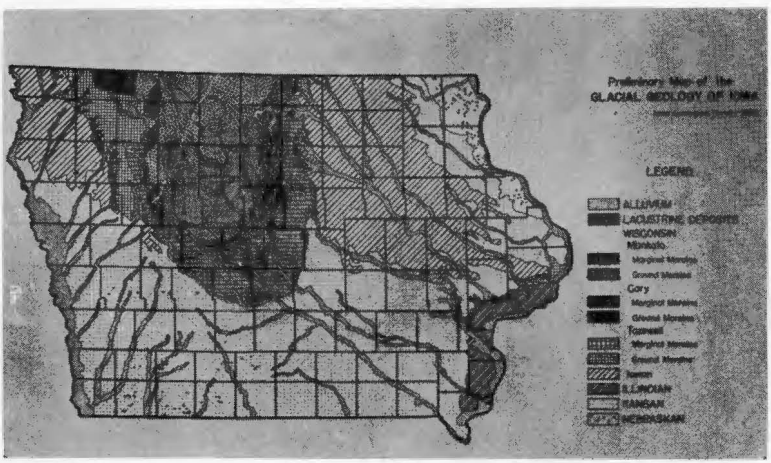


Figure 1

[1]Present address, Phillips Petroleum Co., Box 98, Craig, Colorado.

in central Iowa, the river is flowing upon the Mankato drift sheet. In northern Boone County, the Des Moines cuts through the Gary moraine of the Mankato and flows southward across the Cary ground moraine. Northwest of the city of Des Moines, the river flows off the Cary drift sheet onto that of Kansan age. The southern half of the valley is cut into the Kansan drift and the underlying bedrock.

There is an apparent association in age between the different parts of the drift plain and the tributaries of the Des Moines River. One can easily see the lack of any sizable tributaries entering the master valley north of the Boone River from the area of the relatively undissected Mankato surface (Figure 2). That portion of the main

Figure 2. The drainage pattern on the Mankato Drift. Scale: Approximately 1 inch to the mile.

valley in Boone County (Figure 3) has numerous tributaries. However, they are all very short and intermittent, and appear as deep gullies and washes. South of Boone County (just to the northwest of the city of Des Moines) the tributaries developed on the Kansan surface (Figure 4) are long and far-reaching. An attempt at an explanation may be found by tracing the history of the river.

James H. Lees (1914) believed the beginning of the Des Moines valley could have preceded the beginning of the Pleistocene. The closest we can estimate its origin would be at the close of the Nebraskan glaciation. This first glacial advance must have changed drainage conditions throughout the area over which it advanced, and Iowa would be no exception. New drainage systems were formed as the ice wasted away, and it was during this time that the Des Moines

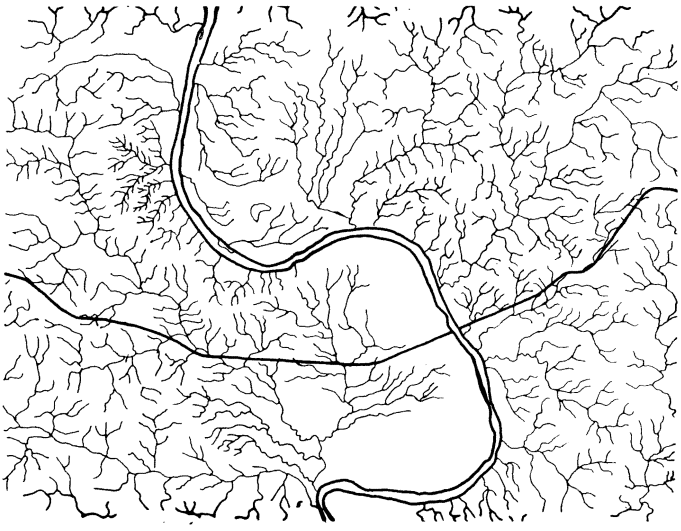

Figure 3. The drainage developed on the Cary drift sheet. Scale: Approximately 1 inch to the mile.

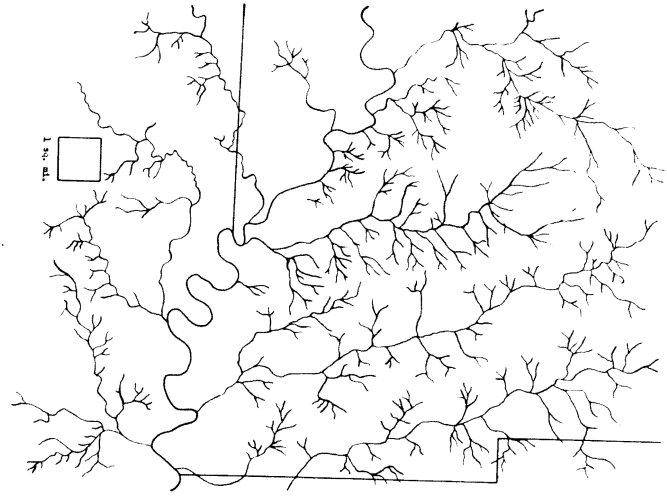

Figure 4. The drainage pattern developed on the Kansan drift plain. Box in the diagram is 1 square mile.

River system began to develop. Lees also believed that the Raccoon River originated at this time as a major tributary to the Des Moines.

The Aftonian inter-glacial interval was long enough to allow complete integration of a drainage system in the area covered by Nebraskan ice. According to Lees, the soft strata and coal measures north and south of the city of Des Moines were a major factor in

the development of a well established drainage system in the central part of Iowa.

The advance of the Kansan filled in valleys and destroyed the drainage systems which had developed during the Aftonian. This forced the meltwaters from the Kansan ice to seek new courses and develop new drainage systems.

At the beginning of the Yarmouth inter-glacial stage, the area was again characterized by disordered drainage with lakes and ponds abundant. However, as time elapsed an integrated drainage system was established. This would be represented today by that part of the Des Moines River system which lies south and east of the so-called Des Moines lobe; that is, that part which lies in the area of the drift plain of Kansan age.

The ice of the Illinoian stage probably had little effect in Iowa on the drainage network developed during Yarmouth time, as it did not cover the area. Small, indirect effects might have occurred, but it is unlikely that the main valley was disturbed as it had been by the previous glaciation. With this in mind, it may be assumed that during the Illinoian advance the drainage system was being expanded over the Kansan drift plain. This expansion continued through the Sangamon inter-glacial stage and was not interrupted until the Wisconsin glaciation.

By the time of the Wisconsin ice advance, the drainage to the south and east across Iowa must have been well established with many far-reaching tributaries. Major valleys with broad floodplains were now present, and in the southern part of Iowa these valleys would not be overrun with Wisconsin ice.

The Wisconsin stage is divided into four sub-stages, the first two of which had little effect on the Des Moines River system. In most instances, the Iowan and Tazewell drifts are associated with northern Iowa and are quite thin. The drift from these two sub-stages probably buried parts of the system in its upper reaches, but this would have had little effect on the position of the river farther south. The last two sub-stages (Cary and Mankato) of the Wisconsin played a major role in the development of the present Des Moines valley. The drift from these two sub-stages was formed by the Des Moines lobe of the Wisconsin stage.

The Cary ice, the third sub-stage of the Wisconsin, advanced as far south as the present city of Des Moines and disrupted drainage north of there. However, the main drainage valley south of Des Moines was probably affected only by a slight increase in gradient and an increase in the volume of water being carried. As the Cary ice wasted away, the run-off waters began to form new drainage

patterns. These waters, in seeking out the lines which were least resistant to flow, progressed from a disordered to some distinct pattern of drainage. The position of the present North Raccoon River seems to have been determined by the distal end of the Cary drift. After the Cary ice had melted, the waters had time to develop valleys with short-reaching tributaries. However, the re-establishment of a drainage system in the area of the Cary drift was once again disrupted, this time by the advancing Mankato ice.

The Mankato sub-stage of the Wisconsin advanced as far south as northern Boone County, in the central part of Iowa. Its southern extension is outlined by the Gary moraine in this area. Once again that part of the Des Moines drainage area north of Boone Conty was mantled with drift deposited from the massive ice sheet. The drainage developed on the Cary drift was destroyed north of Boone County; but south of the Gary moraine, it was disturbed only by an increase in volume of water and a possible localized increase in gradient. The northern part of the system was destroyed, and the runoff water of the Mankato ice and that of post-Mankato time took up the task of developing a drainage system upon the Mankato drift. That this task is far from complete, is evidenced by the disordered, non-integrated state of drainage in that area today.

The present Des Moines valley reflects the effects of glaciation in its history. South of the capital city, the valley has not been disturbed (to any great extent) since the Kansan ice wasted away. The river has had time to develop a broad, rather deep valley with far-reaching tributaries.

North of Des Moines and south of the Gary moraine, the valley has been disturbed only indirectly since the melting of the Cary ice sheet. The river has developed a fairly deep, narrow valley with a few short tributaries and many intermittent washes and gullies. The valley in this area is quite rugged and unique. It represents an important stage in the complicated history of the drainage in central Iowa.

The valley north of Boone County seems to be in a very early stage of development. The river seems to be flowing in broad sags upon the Mankato drift. The lack of major tributaries is evident, and the presence of many sloughs and lakes reveals the disordered condition of the drainage.

### Literature Cited

Lees, James H. 1914. Physical features and geologic history of Des Moines Valley. Iowa Geological Survey Annual Report, v. 25, pp. 423-615.

Department of Geology
Iowa State University
Ames, Iowa