

Some Observations of the Glacial Drifts North of the Driftless Area in Wisconsin

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North Central Wisconsin is a gently rolling plain which slopes south and is somewhat dissected in the vicinities of the Wisconsin and Black Rivers. Outcrops are of pre-Cambrian crystallines in the northern portion, and of Cambrian sandstones, siltstones and clays in the southern portion. Except for an east-west strip about ten miles wide on the south, these rocks are covered with a mantle of glacial drift which averages about ten feet in thickness. The northern part of the area is crossed by a strip, five miles wide, of rugged hills which consist of glacial deposits, and which constitutes the "Terminal Moraine" of the Cary substage of the Wisconsin drift.

Glacial geologists have found it difficult to determine the age of the "border drift" which lies south of the terminal moraine and north of the Driftless Area. Previous work in this and adjacent regions has been done by Samuel Weidman (1), Frank Leverett (2), F. T. Thwaites (3), John Mathiesen (4), and Lewis Nelson (5.) Weidman distinguished, largely on the basis of topography, three border drifts, the southernmost of which he considered the oldest, and all of which he thought to be older than the terminal moraine and the drift north of it. They were, in order: "First Drift," almost wholly on sandstone, and extremely dissected; "Second Drift," thicker but devoid of kettles, although bordered by a moraine between Marshfield and Neillsville; "Third Drift," which was like the Second Drift, but showing a few kettles and knolls, mainly gravel. Leverett concluded that the extra-morainic drift is chiefly Illinoian, although he recognized some extensions of Wisconsin drift south of the terminal moraine. His field maps are on file in the office of the Wisconsin Geological Survey at Madison. In a letter to F. T. Thwaites, he suggested that there may be only one border drift, and that soil profiles are probably the most reliable criterion. Thwaites and Mathiesen suggested that there are two border drifts in adjacent North-western Wisconsin, the younger of which, lying farthest north, is probably Iowan, judging from the pitted outwash which characterizes it. Nelson is the only one of the investigators named above who has depended on other criteria besides the criterion of topography. He concluded that the Marathon silt loam in North Central Wisconsin developed from the Colby silt loam which occurs on all the border drifts distinguished by Weidman, and which also occurs north of the terminal moraine.

The writer made observations, summarized below, of soil profiles in this area in July and August, 1940. Alteration of drift, sources of drift, and stratigraphy of drift are the objects of the present study.

Observations

1. Calcareous drift was found in this border drift and in the terminal moraine, which were hitherto believed to be noncalcareous. A strip of drift which is calcareous at from three to fourteen feet lies on both the First and Second Drifts of Weidman in the vicinities of Auburndale and Marshfield. The conclusion suggested is that the calcareous drift cannot be older than Iowan.

2. The reddish brown color of the drift near Marshfield has been considered proof of the great age of the drift. Reddish brown and bluish grey clays and silts were observed interbedded with crossbedded sandstone, and several cuts in drift showed reddish brown and bluish grey tills irregularly interpenetrating. North of Marshfield, reddish brown till was found near valleys, while dull brown till lay on the uplands. The conclusions suggested are as follows: the red color of some of this drift is inherited from materials, while in other places it has been brought about under conditions of good drainage. Drift of the terminal moraine is probably red because Lake Superior basin clays and silts were red. The excessive stoniness of that till may indicate a separate readvance of the ice which moved about due south.

3. Of the four soil series significant in this study, the Colby and the Marathon which developed from it are the most important. The A and B₁ horizons of the Colby soil have been observed on calcareous drift, on noncalcareous drift, on columnar reddish brown clay loam of the B₂ horizon, on non-columnar sandy loam, on residual granite "gravel", and on reddish brown drift north of the terminal moraine. The conclusion suggested is that the drift north and south of the terminal moraine is apparently all young.

4. At the State Agricultural Experiment Station at Marshfield, there is a black soil buried about fifteen feet beneath calcareous drift. The conclusion suggested is that a series of older till, sand, gravel, and clay underlies the calcareous drift.

5. One observation indicates that the disintegration of the granite in the vicinity of the Wisconsin River valley has taken place since the till was deposited although considerable alteration had doubtless occurred before.

Mechanical and chemical analyses in the laboratory, and further field investigation are necessary to throw light on many problems. Is the erosional topography due primarily to bed rock control? Has a glacial readvance brought northern drift to overlie calcareous drift from another direction? Can columnar structure develop in the B₂ horizon of a soil as young as the above suggested conclusions make the Colby silt loam? Is the light brown soil on the quartzite Rib Mountain (relief, 800 feet) loess or weathered till?

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