amassed on the borders of the continental ice-sheet at times of pause or readvance interrupting its general departure from this region. The more northern of these tracts begins close east of Fertile and reaches about thirty-five miles northeast and east, with a width from one to five miles, passing close south of Erskine and onward to Gully station, near the east boundary of the county. The more southern morainic tract is part of a wider and longer hilly belt, stretching from Fosston southward into Mahnomen County and northeastward into and through Clearwater County.

Hills in each of these moraines occasionally rise 50 to 75 feet, or rarely more, above the adjoining and intervening hollows. Nearly all the surface is strewn with plentiful drift boulders, varying in size up to five feet or sometimes ten feet in length or diameter. Their abundance on the moraine belts is in remarkable contrast to their infrequent occurrence on other and smoother glacial drift areas that form much of this southeast part of Polk County and also the greater parts of Red Lake and Pennington counties, which originally were included in this county.

No rock outcrop is found in these counties, nor indeed in a very large region of western Minnesota, which is overspread with a vast sheet of the glacial and modified drift deposits to a depth commonly ranging from 100 to 200 feet or more, mantling and concealing the bed rocks.

Westward, along the low and flat valley of the Red River, fine alluvial silt, destitute of drift boulders or even pebbles, is spread over both the underlying rocks and the glacial drift, reaching in general about twenty or twenty-five miles from the river. This deposit, which has given this valley its fame as a very fertile wheat raising area, was laid down chiefly by river floods that flowed northward after the ancient lake of the valley had been drained away. If the valley silt were mainly of lacustrine deposition, it would extend farther from the Red River to the old lake beaches on each side of the valley at considerable heights above the flat river plain.

**FLOODS OF RED RIVER.**

The range between the lowest and highest stages of the Red River much surpasses that of any other river in Minnesota. At Breckenridge the range is about 15 feet, but it increases rapidly northward, becoming 32 feet at Moorhead, attaining its maximum of 50 feet in the south part of Polk County, and continuing nearly at 40 feet from Grand Forks to the international boundary and Winnipeg. Floods rising nearly or quite to the high water line thus noted have been rare, occurring in 1826, 1852, 1860, 1861, and 1882. They are caused in the spring by the melting of unusual supplies of snow and by heavy rains, and often are increased by gorges of ice, which is usually broken up along the southern upper portion of the river earlier than along its lower course. These floods attain a height only a few feet below the level of the adjoining prairie where that is highest, and along the greater part of the distance between Moorhead and Winnipeg the banks are overflowed and the flat land on each side of the river to a distance of two to four or five miles from it is covered with water one to five feet or more in depth.

**HEIGHTS ABOVE THE SEA.**

It is of much interest, for our consideration of the ancient water levels, that a brief notice be given to the altitude and general contour of Minnesota, and more especially of the basin of the Red River. The topographic features of the state may be summed up for its western three quarters as being a moderately undulating, sometimes nearly flat, but occasionally hilly area, gradually descending from the Coteau des Prairies and from the Leaf hills, respectively about 2,000 and 1,700 feet above the sea, to half that height, or from 1,000 to 800 feet, in the Red River Valley and to the same height along the valley of the Mississippi from St. Cloud to Minneapolis. The lowest land in Minnesota is the shore of Lake Superior, 602 feet above the sea; and the Mississippi flows past the southeast corner of the state at the height of 620 feet.