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[Paper F.]

THE TOPOGRAPHY AND ALTITUDE OF MINNESOTA. — *Warren Upham.*

[ABSTRACT.]

The topographic features of Minnesota may be briefly summed up for its western three-quarters, being a moderately undulating, sometimes nearly flat, but occasionally hilly expanse, gradually descending from the Coteau des Prairies and 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 long flat basin of the Red river valley, and to the same height along the valley of the Mississippi from St. Cloud to Minneapolis.

The only exceptions to this moderately undulating or rolling and rarely hilly contour, are the southeast part of the state where the Mississippi river and its tributaries are enclosed by bluffs from 200 to 600 feet high; and the northwest shore of Lake Superior, and the part of the state lying north of this lake and east of Vermillion lake. A very bold rocky highland rises 400 to 800 feet above lake Superior, within from one to five miles back from its shore-line, all along the distance of 150 miles from Duluth to Pigeon point, the most eastern extremity of Minnesota; while farther north are many hill-ranges, 200 to 500 feet higher, mostly trending from northeast to southwest or from east to west. The most jagged of these lines of rugged peaks and ridges of rock, near the shore of lake Superior from Temperance river to Grand Marais, is called the Sawteeth mountains; and a second range of hills, rising from the more elevated region half-way between the lake and the north boundary, is called the Mesabi range. The height of lake Superior is 602 feet above the sea; and of the higher of the Sawteeth mountains 1,300 to 1,600, Carlton's peak being 1,520 feet above the sea, or 927 above lake Superior, about one and a half miles distant. The Mesabi range, south of Vermillion lake and eastward, is found by Prof. Winchell to be from 1,800 to 2,200 feet above the sea, being the highest land in Minnesota.

A few more altitudes in various parts of the state are as follows: Low water of the Mississippi river at the southeast corner of Minnesota, 620 feet above the sea-level; same of Lake Pepin, 662; same at St. Paul, 683; top of the falls of St. Anthony, 800; Mississippi river at St. Cloud railroad bridge, 906; at Brainerd, 1,152; head of Pokegama falls, 1,266; lake Winnibigoshish, 1,290; Leech lake, 1,292; Cass lake, 1,300; Itasca lake, about 1,500; high-

est points of the Leaf hills, 1,600 to about 1,750; of the Coteau des Prairies, 1,800 to about 1,900; lake Traverse, 970. and Big Stone lake 962; lake Benton, 1,754; lake Shtetek about 1,475; Heron lake, 1,403; Mille Lacs, 1,251. and lake Minnetonka, 928.

The average elevation of the whole state cannot be less than 1,200 feet, which is 370 feet above the plain of modified drift on which Minneapolis is built; and it may be found, when carefully estimated throughout, even as high as a quarter of a mile, 1,320 feet above the sea. This is about half the average altitude of the whole United States, which is approximately 2,600 feet above the sea; but probably no state east of the Mississippi river has a greater mean altitude than Minnesota. Humboldt estimated the mean height of all North America to be 1,500 feet, and of Europe, 1,340 feet.

[*Paper G.*]

NOTES ON THE LOCAL GEOLOGY OF MANKATO. A PRE-GLACIAL RIVER CHANNEL. *A. F. Bechdolt.*

What is locally known as Van Brunt's Slough lies in the western part of the city of Mankato, opens on the flood plain of the Minnesota river, and has a devious course in a direction slightly west of south.

The sides of the Slough resemble the banks of a river rather than those of a lake. In all their windings the opposite shores remain parallel.

This feature holds true for the entire length of the Slough except at one point where the concave side is not concentric with the opposite bank but makes a noticeable bay. This want of uniformity will be explained a little farther on. South of the point referred to lies Indian lake, an oblong pond, gradually filling up with silt. The depression of the Slough, above the head of the lake, turns to the west, along a small affluent of the lake, which is usually dry in mid-summer, to its source in a swamp. From this swamp another small stream flows west along the depression emptying into the Le Sueur river, not over one-fourth mile above the railroad bridge. Chalk run, as this stream is called, at its source, the highest place in the Slough depression, is probably not over twenty feet above low water in the Le Sueur. The outlet of Indian lake runs north along the slough, loses itself in the swamp,