until the departure of the ice-sheets gave them again opportunity to spread over the northern lands.

High preglacial elevation of the drift-bearing regions is known by the depths of fjords and submerged continuations of river valleys, which on the Atlantic, Arctic and Pacific coasts of the north part of North America show the land to have been elevated at least 2,000 to 3,000 feet higher than now. In Norway the bottom of the Sogne Fjord, the longest and deepest of the many fjords of that coast, is 4,000 feet below the sea level. Previous to the Glacial period or Ice age, and doubtless causing its abundant snowfall, so high uplift of these countries had taken place that streams flowed along the bottoms of the fjords, channeling them as very deep gorges on the borders of the land areas.

Under the vast weight of the ice-sheets, however, the lands sank to their present level, or mostly somewhat lower, whereby the temperate climate, with hot summers, properly belonging to the southern portions of the ice-clad regions, was restored. The ice-sheets were then rapidly melted away, though with numerous pauses or sometimes slight readvances of the mainly receding glacial boundary.

On certain belts the drift was left in hills and ridges accumulated during this closing stage of the Glacial period along the margin of the ice wherever it halted in its general retreat or temporarily readvanced. Upon the greater part of Minnesota and North Dakota the only hills are formed of this morainic drift, ranging in height commonly from 25 to 75 or 100 feet, but occasionally attaining much greater altitude, as in the Leaf Hills of Ottertail County, Minnesota, which rise from 100 to 350 feet above the moderately undulating country on each side.

GLACIAL LAKE AGASSIZ.

When the departing ice-sheet, in its melting off the land from south to north, receded beyond the watershed dividing the basin of the Minnesota River from that of the Red River, a lake, fed by the glacial melting, stood at the foot of the ice fields, and extended northward as they withdrew along the valley of the Red River to Lake Winnipeg, filling this broad valley to the height of the lowest point over which an outlet could be found. Until the ice barrier was melted on the area now crossed by the Nelson River, thereby draining this glacial lake, its outlet was along the present course of the Minnesota River. At first its overflow was on the nearly level undulating surface of the drift, 1,100 to 1,125 feet above the sea, at the west side of Traverse and Big Stone counties; but in the process of time this cut a channel there, called Brown’s Valley, 100 to 150 feet deep and about a mile wide, the highest point of which, on the present water divide between the Mississippi and Nelson basins, is 975 feet above the sea level. From this outlet the valley plain of the Red River extends 315 miles north to Lake Winnipeg, which is 710 feet above the sea. Along this entire distance there is a very uniform continuous descent of a little less than one foot per mile.

The farmers and other residents of this fertile plain are well aware that they live on the area once occupied by a great lake, for its beaches, having the form of smoothly rounded ridges of gravel and sand, a few feet high, with a width of several rods, are observable extending horizontally long distances upon each of the slopes which rise east and west of the valley plain. Hundreds of farmers have located their buildings on these beach ridges as the most dry and sightly spots on their land, affording perfectly drained cellars even in the most wet spring seasons, and also yielding to wells, dug through this sand and gravel, better water than is usually obtainable in wells on the adjacent clay areas. While each of these farmers, and in fact everyone living in the Red River Valley, recognize that it is an old lake bed, few probably know that it has become for this reason a district of special interest to geologists, who have traced and mapped its upper shore along a distance of about 800 miles.

Numerous explorers of this region, from Long and Keating in 1823, to General G. K. Warren in 1868 and Professor N. H. Winchell in 1872, recognized the