

point the continuity of the plain is broken by many ridges of igneous rocks isolated from the main escarpment, such as the ridge north of the town of Renfrew.

The principal tributary streams to the Ottawa on the Ontario side are the Rideau, Mississippi, Madawaska, Bonnechere and Petewawa and on the Quebec side are the Gatineau, Coulange and Black rivers. All these rivers except the Rideau have their source in the Laurentian upland and descend over generally steep gradients with mostly insignificant valleys in the general upland with the exception of the Bonnechere valley which is almost as large as the Ottawa valley above Renfrew.

The prevailing rocks of the region are granite gneisses with which are associated some minor areas of crystalline limestones, schists, gabbro, etc. These rocks are of Archean origin and they form the escarpments and the vast upland behind them to the exclusion of all others. It is probable that the entire valley bottom was at one time floored with layers of later rocks, such as sandstones, shales, limestones and dolomites. These rocks have been so much worn down by various agencies of erosion, that only patches of them remain, and the old floor of Archean rocks on which they were laid down now forms the bed rock over large areas of the valley.

The bed rock is concealed over the greater portion of the valley plain by a sheet of unconsolidated material consisting of varying thickness of sand, gravel, and clay. These materials are either directly glacial deposits or are the results of the glaciation of the region.

In glacial times the region appears to have been covered with an ice sheet of considerable thickness such as covers Greenland and the Antarctic continent at present. The weight of this ice appears to have depressed the land surface to such an extent that the sea was able to flow into the Ottawa valley when the ice finally melted. Conditions were then similar to what they are now in the St. Lawrence below Quebec. In other words the marine estuary reached up to about the military camp at Petawawa at the close of glacial times. As the land rose when relieved of its immense burden of ice the sea margin gradually withdrew to succeeding lower land levels until it came to its present position in the St. Lawrence valley. The sediments which were accumulated in this narrow sea are now the most valuable asset which the Ottawa valley possesses as they are the bases of the agricultural wealth of the region. Furthermore there is probably no other region in the world where a recently drained sea bottom is available for human inspection and use on such a scale as the one now in view in the St. Lawrence and Ottawa valleys. It is a source of never failing profit to the farmer if he uses it aright and a source of

never failing interest to the field naturalist. This belt of stoneless marine clay has had much to do with the growth of towns and villages located on it.

The great mounds, ridges, or sheets of sand, gravel or stony clay were also contributed by the ice sheet either during its advance or retreat.

Some of this material is covered by the marine clay but a great deal of it is exposed. Many of these sand and gravel heaps are moraines, being the results of drainage from the margins of the melting ice. These morainal ridges or mounds are generally striking topographic features in the valley plain. They have their economic uses, as the sand and gravel for building purposes and road making are drawn from this source. A striking instance is the Rideau moraine which extends from Ottawa to Prescott, and if the Ottawa-Prescott road is ever built, doubtless most of the materials for its construction will be furnished by the boulders, sand and gravels of this moraine.

AGRICULTURE AND FORESTS.

The agricultural possibilities of the region are rather rigorously defined by the geology. The greater part of the rugged uplands beyond the escarpments that border the Ottawa valley are underlain by granite gneiss and covered with only a thin layer of stony drift or not at all. These areas are absolute forest land and should never have been cleared for cultivation. The lesser areas underlain by crystalline limestone are generally depressions on account of the relative softness of these rocks to the granite gneisses which form the ridges surrounding the depressions. These limestone areas are covered with sandy loam which is capable of cultivation. So closely does agriculture follow the limestone bands in the Laurentian upland that it would be almost possible for a geologist to map these bands by mapping the cultivated areas, as the farmer follows them up just as a miner follows ore shoots. At certain points in the upland there are glacial morainic ridges generally composed of sand and gravel with smooth outlines which are almost sure to be cleared and cultivated. This light sandy soil becomes unproductive after four or five years of cultivation, unless well manured, and even then does not produce good crops unless during unusually wet seasons, so that it is doubtful if it is economy to try and cultivate these sand ridges instead of leaving them in forest.

Farms are constantly being abandoned or several abandoned farms are fenced into one pasturing ground or ranch for raising cattle.

Conditions such as these tend to sparseness of population and inhibit the growth of any large towns within the Laurentian plateau.

The valley of the Ottawa below the 500 foot level is for the most part covered with a heavy