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Variations in the Level of the Lakes.

The recent extraordinary rise in the waters of the Great Lakes has assumed an importance in relation to navigation, boundaries of property, and the preservation of property situated upon their shores, which throws into the shade all considerations of the phenomenon as a purely scientific question. It will be interesting to enquire whether the present remarkable rise is due to causes which do not at present appear, or whether it is the result of extraordinary rainfall, followed by an unusually small degree of evaporation. Other phenomena of a less general description, yet also influencing the level of the Lakes in different localities, demand attention. We think that the fluctuations in the water level of our inland seas may be conveniently divided into three groups:—

1. Variations in the general level of the waters of the Lakes.
2. Sudden local variations.
3. Influx and efflux of the mouths of rivers and harbours.

We propose to enumerate some of the changes which have been observed in the levels of Lakes Erie and Ontario before proceeding to enquire into the causes which have occasioned them. It is well known that these changes have produced very remarkable effects upon the coast wherever the drift clays or the softer shales form the lake boundaries, and even where the coast is in the form of a sloping beach.

We glean the following notices from Hall's Geology of the 4th District of New York:—

"Twenty-five and thirty years ago the beach of Lake Erie was a travelled highway beyond Buffalo, but at this time it would be quite impossible to travel along the same."

"From the united testimony of persons residing along the margins of all the Lakes, and from other demonstrative proofs, it appears that for many years previous to 1838, all the Lakes had been rising; that about this period they attained their maximum, and have since been subsiding."

"Mr. Hiram Burton, who resided at the mouth of Slippery-Rock Creek for twenty-three years, informed me (Mr. Hall,) in 1840 that the water of Lake Erie was then four feet higher than when he came to that place; that in 1838 it was still higher, but he had made no accurate measurements."

"Mr. Higgins, Topographer to the Geological Survey of Michigan, has given the rise of the Lakes as five feet three inches from 1819 to 1838; he regards it as probable that the minimum period continues for a considerable length of time, while the maximum continues only for a single year."

Several of the Lake shore or beach roads on the North side of

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Lake Ontario have disappeared in numerous localities, within the memory of living residents. The old Lake Shore Road, from Toronto to Hamilton, is in parts quite washed away, and we were informed by a resident, a mile or so to the west of the Humber, that a road existed about seven years ago below the present old road. The shore is flat at the place just alluded to, and the destruction of the first and second roads may be attributed to the effects of South-Easterly winds upon a high level of the waters of the Lake. A storm from the South East would place the new Plank Road in considerable jeopardy. A very favourable illustration of some of the results to be anticipated by high lake levels in conjunction with prolonged storms, exists now at the Peninsula opposite the Toronto City Hall, where a wide gap was formed during the Spring of the present year by the waves of the Lake washing away sand, shingle and pebbles to the depth of several feet. The Canal thus formed is at present about 160 feet wide and 4 feet deep. Its width and depth, and even its position are constantly varying with each high wind from the East, South or South West. Similar occurrences have been frequently observed to take place in the narrow stripe between Ashbridge's Bay and the Lake on the same Peninsula; and at the present moment, and about the same place, a sand and gravel ridge not less than three feet above the present high level of the Lake, is to be found occupying the spot where open communications existed between the Bay and the Lake during a part of last winter and the winter of 1849. We may learn from these occurrences the probable fate of the Canal opposite the City Hall. The effects of high lake levels upon the precipitous clay cliffs which form a very large portion of the coast lines of Lakes Erie and Ontario, are interesting both in their relation to property and to the future probable condition of the Lakes, as well as to their past history. An average of a yard a year would be a very moderate allowance for the encroachments of the waters upon the land, occasioned by the washing away of the cliffs which form the coast. We have lately witnessed the entire removal of many acres of land, on which large trees were growing, by the encroachment of the waters of Lake Simcoe on its eastern shores. Instances might be multiplied to shew that the annual march of the waters inland is a very curious item in the physical history of the Great Lakes, and one to which we are inclined to ascribe far greater importance in many relations than appears at the first view of this phenomenon.

We now proceed to give such results as we have been able to collect from the different observers who have interested themselves in the rise and fall of the waters of the Great Lakes. The following table shows the mean depth, the least depth, the greatest depth, the monthly fluctuation, and the greatest fluctuation during twenty-four hours, which we have reduced from the measurements made at Port Colborne, Welland Canal, Lake Erie, during the years 1850, 1851 and 1852. The influence of winds, and probably of local variations in the atmospheric pressure, will become apparent upon examination of the column which gives the greatest fluctuations during twenty-four hours.