RIVER REGULATION, WITH SPECIAL REFERENCE TO THE ONTARIO PENINSULA AND TO THE GRAND RIVER.*

The flow of streams is due to a variety of causes, primarily, precipitation, rainfall and snowfall; extent and declivity of the drainage area; nature of the ground, rock or soil, and condition of the soil; condition of the surface, the chief element being whether it is forested or clear; the presence of lakes or large collecting basins in the stream. A steep rocky drainage area will give the greatest run-off in the shortest time. There is great difference in the nature of soils and in their permeability; as for instance between clay and loam, or gravel.

Whether forestation has much influence on precipitation is not entirely clear. There are generally other governing conditions. As to the Ontario Peninsula there are the vast adjacent bodies of water-the Great Lakes. As far as records go it appears that precipitation has not decreased in Ontario with deforestation. The influence of forestation is in retarding and diverting. The forest floor is more or less obstructed with litter, and is soft and permeable. Water finds its way slowly into creeks and rivers, much disappears into the ground to come up lower on the slope in the form of springs. A large part evaporates, and vegetation, tree growth, by transpiration, absorbs a large amount of water. Owing to evaporation and transpiration together the total run-off from a forested area is, in fact, somewhat less than from a non-forested one. Conservation and continuation of the flow, with ground water, and slow melting of the snow, are, however, very much better with the forested watershed. The forest acts as an equalizer, being a check both on extremely high and on extremely low water. Where the ground is bare and compact the water rushes quickly over the surface, forming torrents, washouts, and floods.

Large basins or lakes in the course of a river exercise an important function in its regulation. Water, though in great quantity, will increase the depth of a basin of large area very little; the head of water at its outlet will also be but little increased, and the flow will be long-sustained. With artificial ^{control} of the outlet the natural automatic regulating value of a large storage basin in a stream can be much enhanced.

*Paper read at Engineers' Club, Toronto, March 5th, 1908, by W. H. Breithaupt. M. Inst. C.E., 43 Victoria St., Toronto.