THE INFLUENCE OF UNDERDRAINAGE ON SPRING FLOODS.*

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During recent years my attention has been drawn to the opinion held by some that underdrainage increases floods. After much thought and some investigation, I have come to hold the opposite view.

In the first place, facts, so far as I have been able to observe and otherwise learn, show that underdrainage lessens the amount of water at times of freshet. Let me illustrate: On a certain farm of which I could give the lot, concession and township, there was a swamp of 15 acres, the water from which flowed along a lane ditch, a part of the fall being quite rapid. The swamp was all cleared at one time, but the upper 5 acres had been allowed to grow up into a slash. The remaining 10 acres was cropped, but with indifferent results, as it was too wet, a few open ditches and water furrows providing the only drainage. Every spring freshet brought down large volumes of water, the evidence of which might be seen in the washing of the banks and the cutting of the rock in the rapid portion of the ditch, and also in the large deposits of mud lower down where the grade was not so steep. Some years ago the 10 acres was tile drained, and personally observing the ditch from time to time since then, I have wondered at the comparative freedom from washing, cutting and sediment. The 5 acres was afterwards cleared and tiled and the erosion and deposit of sediment still further reduced. Only a week or so ago the owner corroborated my own observations and stated very emphatically that in his case tile drainage, and that alone, had decreased the floods.

There is the fact, as revealed by observation and testimony, in one case at least. Let us examine whether it is what should be expected as a result of underdrainage. Speaking for Ontario generally, there is more precipitation in June, July and August than in any other months, as may be learned from the records kept at the observatory in Toronto, nevertheless the ground is drier in August and early September than at any other time. In late September, October and November, however, the ground becomes wetter and wetter, not because of increasing rainfall, for it is really less then than in the summer, but because evaporation is less, and any rain that does fall remains to moisten the ground instead of being returned to the air in vapor. The soil, however, is porous like a sponge, and in its dry state it is capable of absorbing a great deal of water before becoming really wet, and before any is lost either by run off or drainage. Often the rainfall for November is very large, for instance, in 1908, at Guelph, it was 5.07 ins. for one month, and in 1909, 6.41 ins., which is more than for April and May combined, except once in the 23 years' record at the college, yet the November rains do not cause floods, nor even the phenomenal rain of November, 1909. Why? Because the soil is far from saturation, and consequently is able to absorb most of the rain that comes. Moreover, the November rains are usually of the moderate, steady nature, giving plenty of time for absorption of the water by the soil. By the middle of December when in most parts of Ontario it is permanently frozen up for the winter, the ground is usually pretty thoroughly saturated, and from the highlands considerable drainage, either natural or artificial, has occurred, with the result that much undrained, low land, such as slashes, swamps and marshes, is under water. On December 4, 1909, I attempted to cross a swamp that I had crossed a month before without difficulty, but found the water so deep that I could not have done so had it not been frozen over. Practically all the undrained, slashes, swamps and marshes have their soil saturated, indeed, covered with water, by the middle of December, and in that condition they remain until spring, when in March or April the snow melts and several inches of water all over the country is liberated within a few days, sometimes, indeed, within a few hours. The soil on the upland being still frozen, or practically saturated with water, if the frost is out, the melted snow, unable to find entrance to the soil, takes the steepest slope for the low land, the slashes, swamps and marshes, where it finds a soil long since saturated and covered with water. These reservoirs, already nearly full, soon overflow and a flood results. These are conditions familiar to all who have given any thought or observation to the subject. What should we find if the slashes, swamps and marshes were tile drained? During the latter part of December last the drains in the one-time swamp previously mentioned were pouring a nice stream of water down the lane ditch, as they do every winter, and when the spring time comes around that 15 acres is thoroughly drained. Therefore when the snow-water from the high land reaches the swamp (?) instead of finding a saturated soil covered with water, it finds a soil comparatively dry and capable of absorbing great quantities of water. When this absorption has taken place, and when the soil has become covered with water to the same depth as it used to be during the winter before the drains were put in, there is not nearly so much surplus left to cause floods as if the snow-water had found the swamp already nearly full as it used to. Consequently, underdrainage should be expected to lessen floods, not increase them. That experience bears out the logic is strong evidence of its correctness.

To be sure, the drains begin working in the spring as soon as the water has saturated the soil, but underdrainage is slow compared with run-off, and the amount of water the drains deliver in a given time is small compared with the overflow that must occur in the same time if the water running into the swamps found them already full almost to overflowing.

* Abstract of report to Minister of Agriculture.

THE WORLD'S LARGEST CRANE.

According to Consul J. N. McCunn, of Glasgow, there has been erected at Govan, on the River Clyde, for the Fairfield shipyards, the largest crane in existence. The official trials of this mammoth appliance have been satisfactory and it stands in bold relief on the River Clyde, where a number of the most powerful cranes in the world had previously been erected.

The jibhead of the crane is of the hammer-head type, built on the cantilever principle, and stands 160 feet above high-water level, or to rail level 169 feet. The jib, with a total length of 270 feet, extends 169½ feet outward from the center and can be utilized within every point of a circle 336 feet in diameter. The motors for operating the gear vary from 60 to 90 horsepower, and are situated in the machinery house at the rear end of the crane, the test load of which is 250 tons.

The crane, on slow gear, can elevate 200 tons extended 75 feet along the jib, and on quick gear it can manipulate a load of 100 tons at 133 feet. The maximum load of 200 tons can be lifted from 30 feet below wharf level to 140 feet above, a total of 170 feet. The three controlling brakes are worked by magnetic, mechanical and hydraulic action. The stability of the structure of the crane depends on four huge steel cylinders, one under each corner of the tower. These great tubes, 15 feet in diameter at their base, are filled with concrete and sunk 74 feet below ground.