

Forests and Flooding in Canterbury

[Abstract of discussion at the first ordinary meeting of the Christchurch Section of the Institute, held at Canterbury College on 25th July, 1930.]

The meeting was opened by the Chairman, Mr. Foweraker, who stated the object of the discussion—namely, that while it was generally accepted that forests were of value in the prevention of flooding and erosion, it was desired to obtain a clearer view of the direct economic value that might be expected, with particular reference to Canterbury's problems. He then called upon the various speakers in order. Sir Francis Boys, a member of the Waimakariri River Trust, was present, and spoke by invitation.

Mr. Wickett dealt with the ways in which the forest functioned to control erosion and run-off. The effect of forests on the actual amount of rainfall recorded was slight, but the factors of absorption, penetration of the soil, delayed run-off, lowered velocity and decreased transporting power were stated to be important and appreciable, while the root mat was a valuable prevention of erosion.

Mr. Hocking undertook to show that these effects were of considerable economic value, and that forests were indispensable aids to watershed stability.

He dealt with the Mediterranean countries, China, U.S.A., Australia, and India, showing that the deforestation of hilly country in lands both of light and heavy rainfall was invariably followed by disastrous erosion, flooding, silting up, and deposition of shingle. He then cited France as an example in which reckless deforestation and overgrazing had wrought havoc in the mountain regions after the French Revolution. The grazing had been rigidly controlled, and afforestation vigorously prosecuted, together with fixation works in the beds of torrents. The results had been entirely successful and erosion and flooding had been practically cured in the areas dealt with.

Mr. Skipworth stated that the benefits obtained from the forest were in the first case exaggerated, and in the second case, could be provided as effectively by other types of vegetation than forest, as grassland.

In support of his contention he stated that the disasters cited by Mr. Hocking may not have resulted through the removal of the forest, but because no other growth had been allowed to take its place. He dealt with the absorptive power of the duff, which was small in relation to heavy rains, with the building up of a retentive soil of organic matter which might be done as fast by tussock as by the forest, and stated results secured in U.S.A. where forest actually decreased summer flow through greater transpiration, over a non-forested area.

He concluded by stating that as the grassland had a higher economic value than the forest, and functioned probably quite as efficiently to control run-off, it was to be preferred. Protected from fire and overgrazing, grassland associations could be expected to give good results. Had the mountain beech areas of Canterbury been scientifically grassed with grasses suited to the soil and climate, upon the burning of the bush, they might have a higher value, and erosion might not have taken place.

Mr. Sando, criticising the opposing sides, stated that it was clear from the evidence given that the importance of maintaining an adequate vegetative cover could not be exaggerated. Between the two types of forest and grassland there might be little to choose provided that the cover could be effectively maintained in either type under the given site conditions. Where either type might be expected to succeed it might be that choice would be decided by the direct returns from either grazing or timber. In timber cover the snowfall might be better conserved, and surface evaporation less. On the other hand, the forest was more susceptible to snowbreak and windfall. The grassland type could be established more quickly than the forest but was more susceptible to damage by fire and overgrazing. The general weight of evidence would tend to the belief that the forest on the whole was a better type than the grassland for the purpose, but as the direct return

was usually low, due to inaccessibility, while the grazing could usually be made to yield a fair return, the grassland type might prove more economical.

Mr. Whitehead dealt with the forest areas at time of settlement in Canterbury, showing the destruction by fire of much of the beech forest on the frontal ranges about 1880-90. He then quoted from reports by early surveyors on the Canterbury rivers to show that flooding in some of the rivers was a recent development and was increasing in point of damage done.

Mr. Hutchinson dealt with the important protection areas of Canterbury, the Lake Coleridge drainage and the Waimakariri, with brief mention of the front range rivers, the Ashley, Eyre, Hinds, and Orari. He said that of an area of 300,000 acres affected in the Waimakariri and Lake Coleridge basins, 60,000 acres was Crown lease, the remainder forest reserve and unoccupied Crown land. This 60,000 acres was the poorest of the grazing country, and £1 per acre was a high valuation.

This area was now 30 per cent. tussock, 20 per cent. forest, and 50 per cent. above timber line (herb field and barren). The tussock area was the eastern block forming the divide between the Waimakariri and Rakaia Rivers. It had been badly burnt and overgrazed, and erosion was here serious. If stock and deer were excluded it would probably come back to a good sole of grass in the eastern portions, with an extension of the forest in the western area. Belts of native and exotic trees might be established by direct seeding, and left to seed up adjacent areas in time. Much forest cover could probably be established in this way fairly cheaply, thus

controlling the portion of the watershed exposed to sou'-west rains and snows. The 50 per cent. of barren could not be afforested by the native species. Hardy exotics might be introduced to push the timber line upward. The ravages of the deer in the alpine herb-fields should certainly be checked. Utilisation from the forests would not be great, probably, though the Midland railway might make some utilisation practicable.

On the drainage areas of the Hinds, Orari, and Eyre it should be possible to establish commercially profitable forests.

Sir Francis Boys spoke of the work being done by the Trust. The bed was building up at 3in. per year, directly menacing either Christchurch or Kaiapoi. They were cutting a straight channel to the sea to steepen the gradient, and make the river carry its load to the sea. The confining of the banks would then be advanced. The Trust had a revenue of £5,000 from rents of reserves and £15,000 from rates. The present scheme was to cost £176,000, of which £100,000 was from loan, the balance being met by rates. The scheme was to take 10 years to complete. Maintenance would probably be £9,000 to £10,000. The speaker understood that the powers of the Trust ceased at the Gorge. If only 60,000 acres of occupied land were concerned it might be worth while doing something in the upper reaches. If by forest or other means the peak of the flood could be reduced and delayed it would be a valuable aid. It was estimated that the river now carried $1\frac{1}{2}$ million cubic yards per year, of which one-third was solid and two-thirds in solution. Probably over half this was picked up by lateral erosion below the gorge.