

But there are tracts that never produced wood. Wherever alkali is found in the soil the trees do not grow. This alkali is not potash, derived from the ashes of fires, but is derived from gypsiferous rock.

The saline lands are not suited for timber. When I was travelling in autumn the Half-Breeds would go to a pond and try the water by tasting it. But I would send them directly to one which I knew contained fresh water. How did I know? I found that in the spring of the year, when the ponds were filled, nearly all, except the salt lakes, were fresh. The pond has an impervious bottom and in the fall of the year it begins to be salt. In the latter part of August and September the sedges, which remain fresh in the fresh water ponds, lose vigor and change color where the water is saline. Men who have thought much will make trivial things mean much for them.

How do we get humidity? What is the benefit of a forest? What is the difference between a country covered with grass and a country covered with forest?

A tree turns out thousands of leaves and has great roots far down in the ground, and the sun is pumping water out of the tree all day long. It is pumping water out of the depths of the soil, and that water for hundreds of square miles is passing into the atmosphere. The cutting off of the forests means that the rainfall will be carried off the soil too quickly. The atmospheric currents are not interfered with, but are only prevented from taking the humidity out of the air. Thus you have the climate suited to the growing of cereals. The humidity in the air compensates for the want of it in the climate.

In the sub-arctic forest the trees are spruce, white and black; one pine, the Banksian; one balsam, *Abies balsamea*; two poplars, *trunculoides* and the balsam poplar; and tamarack. The north country produces these and no others. Of the elm tree, which does not grow on the prairie, there is a magnificent specimen occurring fourteen miles north of Regina in the valley of Qu'Appelle. The elm is a river bottom tree. The oak extends from the Maritime Provinces up on the prairie to Fort Ellice. The red ash occurs to half way across Assiniboia at the Dirt Hills, four hundred miles west of Winnipeg.

In 1879 the country up to Moosejaw had a sufficient rainfall for the growth of cereals. In all that country there should be no difficulty in re-covering the whole with forest, with poplar and white spruce. I eliminate the cold and the chinooks altogether.

Let us consider, now, the main prairie, including the country four hundred miles from Moosejaw to Calgary. Mr. Pearce has solved the problem of tree growing at Calgary and will tell you what he has done. I saw Mr. Pearce's place before he planted trees and can tell how successful he has been.

My report of 1880 showed that this district was not a desert. Where there is a sward there is no desert. How are the trees to be got on? Precisely in the way that they were taken off. I say that cold has nothing to do with the want of success in growing trees, it is the want of water and water only. Two years ago, when I was in the west, a gentleman now deceased, but then Mayor of Calgary, said to me, "The chinooks prevent the growth of trees." I called his attention to a large tree in the valley of Bow River. I asked why one was killed while another was left. The reason was that one had water and the other had not. When the trees are planted on the prairie and given plenty of water, as has been demonstrated by the success of the efforts of the Canadian Pacific Railway Company at Moosomin and Medicine Hat, they will grow and thrive. If it can be done in one place it can be done in another.

When at Indian Head in 1891 I saw a dam built over a creek, and, when asked to speak at a gathering in the evening, I told the people that I would like to see them raise a statue to the man who built that dam. There is a dam also at the Experimental Farm and the trees growing there are proof of the success of a water supply.

In the prairie region west of Moosejaw there should be dams put across the creeks and some spruce and some poplar put in the beds and valleys, and you can then extend indefinitely. These are the conditions that exist wherever there are trees. The trees grow in all the hollows. There must be a snow-catcher and the trees will grow. The trees must be grown from seed. You take up a tree and cut the tap root and set it down in another place and the drought gets below to the root. The almost inevitable result is that the tree withers and dies.

In 1880 we reached Stinking Lake, and north towards

the Saskatchewan in some sand hills we discovered twenty-three big poplar trees, none less than one foot in diameter, and not a shrub around them. The conclusion I reached in regard to them was that the sand hills received the water from the air and the trees stayed where the water was, and the fire could not get at them. That satisfied me that neither chinooks or cold had to do with the matter.

An important point where a dam might be built is at Cypress Lake, in order to make use of the water out of the Cypress Hills.

A paper on "Tree Planting in the West" was read by Mr. William Pearce, Superintendent of Mines for the Department of the Interior at Calgary. He stated that no great skill or effort is required to reforest the great treeless plains of the west. It could not be done economically, however, he claimed, if water had to be artificially supplied. Irrigation is a necessity for forestation, he said.

Mr. Archibald Mitchell, formerly forester for Lord Dunraven and the Earl of Roseberry in England, submitted the following contribution relating to forestry in the North-West:

FORESTRY IN THE NORTH-WEST.

By ARCHIBALD MITCHELL.

I do not think it will be at all necessary for me at this time to touch upon the principles upon which the future forest system of Canada ought to be based. In the face of such a committee, formed for such a purpose, I feel that anything I could say in that connection would be unnecessary and altogether uncalled for.

Upon the existing forests of Canada then, I will say little beyond expressing the hope that a thoroughly sound system of forest economy will very shortly be established. It seems to me that the people of Canada are suffering from a lack of information on this subject. If it only could be placed before them, laying due emphasis upon the necessity for such a system, together with the general principles upon which it will be based, I believe we should very soon have it in full working order. Canadians are a business people, and a system founded upon a solid business basis could not but appeal to them and win their approbation.

This Association, I have no doubt, will speedily accomplish the object for which it has been constituted, and Canada will in a very little while be in possession of a forest system which will be a splendid monument to posterity of Canadian intelligence and business enterprise.

With regard to the needs of the West, however, perhaps I may be allowed to say a few words, more particularly with regard to the grazing regions of Southern Alberta and Assiniboia. These regions, it is superfluous to mention, form a magnificent stock-feeding area, and the prairies in summer are covered with thousands of cattle and horses. I say summer advisedly, because in winter or at least whenever rough or cold weather is experienced the stock seek the shelter of the river-bottoms. They get among the willows there and congregate in great numbers. Food, naturally, soon gets very scarce, and the animals become quite poor in condition, and in prolonged cold weather many of the weakly ones die. There is abundance of food out on the prairie, but the rigor of the climate prevents its being used. When a chinook wind occurs and the snow is swept off the grass, the cattle will very often refuse to leave the brush because of the cold north wind, or, when they do leave it, they do not get far into the good grass before another storm compels them once more to return to shelter.

Now, if there were groups of trees, say about 30 to 40 acres in extent, planted all over the prairie a few miles apart, all this would be avoided. The cattle would have shelter close beside their feeding grounds, they would never lose in condition, and much pecuniary loss to their owners would be avoided.

Every rancher in this country well knows how much such plantations would add to the value of his stock, but the scheme is one which is too large for private enterprise to undertake. Very few ranchers, indeed, have succeeded in raising even a shelter belt around their houses. As a rule they do not know how to set about raising a plantation, and they have little time to experiment. Their business is stock raising, and they attend to that. It is a scheme for the government to undertake, and as

a branch of creative forestry, is well worthy the attention of this Association. Perhaps the already existing machinery of the experimental farms would be better equipped with it, and at any rate their experience of the greatest value in furnishing data upon select plants, etc.

And now a few words with regard to the practical question. The trees planted would be conifers (chiefly black Austrian), spruces and the woods suitable for the North-west. They would be planted in groups of each sort, say an acre of more than 100 yards diameter to each group, or the whole of a plantation could consist of one kind. The plants would be from two to three feet certainly not more than three feet. Conifers would be planted when they were three years old, two years seed-bed and one year transplanted. Hardwoods would be planted as seedlings, but would be better as seedling and one year transplanted. The seedling plants the greater proportion of roots and they are handled. There is less risk of them being injured in the lifting. They are less easily blown over the ground, as their tops are close to the ground besides are much more flexible, and there is at least on the flat, a stratum of air about one foot from the ground which is calmer in a storm than the surface. The seedling plants would be raised in a situation convenient for such a purpose and central to at least 12 of the proposed plantations.

All areas to be planted would be ploughed and with oats or other grain. These crops would ameliorate and loosen the surface soil for the late sowing, and besides provide somewhat to help the expenses. After the lifting of the crop and the fall the plantation grounds would require to be ploughed about 18 inches deep and left rough over winter. This would loosen the soil for the spring help to catch and retain moisture for the growing year. This is a most important consideration in South for the frequent chinooks melt the snow, which runs off the surface and by and by finds its way to the rivers and lakes because the frozen ground will not it to penetrate into the soil. The rough, broken left by the plough would help to collect this water and hold it till spring, when it could soak into the ground.

In the meantime the plants for each area have been transplanted into lines in the areas were to ultimately occupy. Another crop would be taken off the trenched land and the stubble in on the stubble in the spring following plants being already on the ground much less drought during the planting would be avoided, ground being comparatively level and held by the trees there would be less risk of the plants being burnt by a condition of affairs which must be reckoned on in this country. There would be little danger of the damaging the plants, as in summer they would be covered them and in winter when the grass was covered snow, the trees, at first at any rate, would be covered snow also. By and by, when they got above the snow they would be of size enough to recover any little that might be incurred.

Once established, growth would be most rapid. 15 years the plantations would be as many as the drifting snow would be caught by the trees and remain there to gradually melt with the heat of the sun. The ground being then soft a plentiful supply of water would sink into the soil for the use of the trees falling needles, too, and forest mosses would serve to retain large quantities of water. The surplus run off to the outside of the wood and help to grow grass on the prairie all round the plantation. It would just be on a great scale what is to be seen in the coulees and scrubby patch in the country, the same being retained till the ground was soft enough to be ploughed. This, indeed, seems to be the trouble with the semi-arid regions of S. Alberta and Assiniboia of moisture falls in the form of snow but the cold it while the ground is frozen. It cannot enter and so finds its way at last into the rivers or low pools on the surface to be dried up by the days of real warm weather.

And another effect the afforestation would also bring about. Forests, as is well known, collect from the air, and many additional springs probably be formed around the woods, a matter of considerable importance when perhaps for miles there is no available for the cattle except, may be, a small impregnated lake.

And yet another benign influence might be the retention and subsequent gradual evaporation of quantities of water in the district would cause an increase of moisture in the atmosphere and possibly increased rainfall as a result of that; and what would be the value of such a blessing to the sun-baked west. Even this alone would warrant the adoption of this or some such measure as I have here suggested. The experiment, if conducted on a sufficiently extensive scale, would be a magnificent one, and the result would be well worthy of the intelligence and enterprise of the people of Canada.

It is not, of course, intended that this paper indicate in any arbitrary fashion the course to be followed in this matter. It is simply intended to draw attention to what is felt to be a real need in the country, and to point out briefly the general lines in which it may be met. Such a scheme will be of infinite benefit, and in the for the department of Canada the partial afforestation of this section of the North-West in something in the manner indicated will deserve a most worthy place.