

tion, but a closer inspection will reveal the presence of a large stock of young conifers growing in the shade of the poplars. The young pines shoot up straight and slim, reaching for the source of the light that filters through the leaves of the poplar. In the course of time the pines, which develop slowly at first, overtake and outgrow their competitors. The growth of the pine during the first two or three years is slow, but after that time the rate of growth increases in a very marked degree. In such a forest of about 20 or 25 years' standing the pines will be observed here and there protruding their crowns above the leaf canopy. The poplars, being gradually crowded out by the sturdier evergreens, die and decay, adding to the soil nutriment for the now dominant pines. The dense shade furnished by the poplars has in the meantime killed the lower branches of the pines, which consequently rise straight and free of limbs to the height of the crowns of the desiduous trees. The next and final stage reveals the forest as it originally stood, displaying a mixed growth, with the tops of the giant pines visible from a distance, reaching above the general level of the leafy canopy of the forest.

The township of Burleigh, in the county of Peterborough, comprising an area of 124 square miles, may be considered a typical sub-division of what was at one time an extensive lumbering district. The cutting of square timber and saw logs in the township began about fifty years ago. The original forest was principally pine of excellent quality mixed with hardwoods. A colonization road opened the way for settlement about 33 years ago, but owing to the outcrop of rock, settlers are confined to small districts. Lumbering operations continued active for forty years, and even yet there is a small quantity of merchantable pine standing. The usual result followed, where mixed operations of settlement and lumbering were carried on together; nearly the whole country was ravaged from time to time by forest fires.

As showing what the actual conditions may be in a cut-over and burned-over area, a portion of the township around Burleigh post office, on the west side of Eels Creek, where the creek runs alongside of the colonization road, was selected for investigation. There are but few settlers in this part of the township; the soil is rocky and unfit for settlement, except in patches, and is not far from the contact between the granite and the limestone. On the west side of the creek the country is a veritable wilderness; it has been burned over repeatedly, the last fire occurring in 1896, and, judging from the size of the charred remains of the young growth, another fire had swept over it three years before that time. The frequent fires have burned a large part of the soil and killed any pines that may have been left by the lumbermen, so that any natural reforestation would here be a very slow process.

The east side of the creek presents altogether a different aspect. Viewed from the Burleigh road, it has the appearance of a thrifty young poplar forest, with a few young pine trees appearing on a level with the poplar. On closer examination it was found that the young forest was largely composed of white and red pine, poplar, white birch, balsam and spruce, with cedar, black ash and spruce in the lowlands, as well as an odd pine tree standing here and there that had been left by the lumbermen—relics of the original forest that had survived the fires. From information, given by the postmaster, who was formerly a lumber foreman and is an old resident of the district, your Commissioners were able to fix the exact date of the last fire that swept over this territory. It occurred twenty-three years ago.

The trees were of various ages and showed different degrees of growth according to situation. A fair average of the older poplars would be $3\frac{3}{4}$ inches in diameter at two feet from the ground, with 20 annual rings of growth at this point, making the tree, say, twenty-two years old. As a rule, the poplar was taller and with smaller diameter than the pine. The white and red pine stood thick on the ground, of various ages, vigorous and healthy, and will, in a short time, if protected from fire, overtop the poplars and assert the supremacy of the species as some few of the trees have already done.

The older white pine average 6 inches in diameter, two feet from the ground, with 19 annual rings of growth, showing them to be about the same age as the poplars. Red pine was the same age, but the average diameter of the trees examined was half an inch less than the white pine. The average height of the pines was about 26 feet, and showed by the branches a varying height growth of one to two feet yearly. Black ash in the swamps average 5 inches in diameter in twenty-two years, cedar $3\frac{3}{4}$ inches in twenty-six years, and spruce in these swamps which had not been burned at the last fire, standing amidst a very thick growth, averaged only four inches.

PROSPECTIVE VALUE.

The conclusion arrived at was, that within thirty-five years lumbering operations in this locality could be profitably resumed, the larger pine trees taken out, producing timber of merchantable quality and giving the younger trees a better chance to grow. Reasonably good forest conditions could, under proper regulations for cutting, be induced, and a continuous supply kept up. The one great requisite for preserving this valuable asset to the province is the absolute prevention of fire. The foregoing statement as to the condition in the Township of Burleigh may be taken as fairly typical of the course of natural forest regeneration in nearly all the fire-swept lands which came under examination—the only exception being where forest fires have been too frequent to allow the young vegetation to make headway. Throughout many of these tracts, popularly supposed to be of no value,

the second growth is springing up in profusion, and though the trees may be of little present value, their prospective value is very great, though difficult to estimate, as the time when these forests will be available depends very much on the question of adequate fire protection. Any estimate of their existing value must necessarily be on the basis of what they will be worth at such time as the timber becomes marketable to good advantage. On this point, Dr. Rothrock, Commissioner of Forestry for Pennsylvania, says in a report on Forest Fires in 1896:

"For example it is fairly within bounds to assert, that if all the unproductive lands now vacant and uncared for, which exist within the limits of the state, were protected from forest fires, for say 40 years, the timber then growing would be worth not less than one billion, two hundred million of dollars (\$1,200,000,000). It is quite certain that if this growth were destroyed by fire when but a year old, the loss to the Commonwealth directly would be absolutely unimportant. The same might be said if we were to see it destroyed at two, three, four or even five years of age. But when we remember that in burning these seedlings, which are but a year old, we destroy a crop which in point of time is one-fortieth of its way to a money value of \$1,200,000,000, the damages are consequential or indirect in character and if expressed in figures must equal not less than thirty millions of dollars as the loss to the Commonwealth."

If these figures be correct for Pennsylvania, and they are not disputed, how much greater would be the loss to Ontario by the destruction of our much larger area of second growth forest? As in the case of the Burleigh township woodlands, many of these young forests will be sufficiently far advanced to be cut long before 40 years. These considerations inevitably lead to the conclusion that the main factor in reclothing the burned-over lands is the question of fire protection. While there have been even within recent years extensive and devastating fires destroying large amounts of timber, the saving to the province effected by the system of fire-rangings adopted in 1886 has nevertheless been very great. During the course of their investigations your Commissioners had brought to their notice a great many instances in which incipient fires that, unchecked, would have been disastrous in their consequences, were successfully fought and suppressed by the rangers. Wherever the system has been employed by the various limit-holders the results have been very marked. It is to be noted, however, that as the employment of fire rangers is optional with limit-holders, some of them have failed to take advantage of the system, at the risk not only of their own limits, but of those of their neighbors in addition. During the summer your Commissioners made a short trip north of the Height of Land, on the headwaters of the Missinabi river, flowing into the Hudson Bay. It was found that the Indians in this territory are to some extent careless in regard to fires, with the result that considerable territory along the borders of the streams has been from time to time burned over. This is due largely to want of knowledge on their part that the immense forests of that country have any particular value. The Commission was advised by a gentleman of the Hudson Bay Company that if the matter were brought to the attention of the Indians, most all of whom are able to read their own language, a great improvement in this respect might be effected. The Hudson Bay officials expressed a willingness to co-operate with the government in any effort that might be made to educate the Indians as to the importance of looking after their camp-fires and extinguishing any incipient fires that might be started.

It was found that in most cases burned-over areas growing up to small timber are on lands not suited for agricultural settlement, and in order that the Government should reap the full benefit of the annual increment by the protection of these lands, they should be exempt from the possibility of settlers squatting on them, ostensibly to cultivate them, but really to secure and dispose of the growing timber.

METHOD OF LUMBERING.

Though, possibly, it may be regarded as somewhat beyond the scope of the enquiry specifically assigned to them, your Commissioners desire to draw the attention of the Government to the great loss of revenue and the detriment to the standing forests occasioned by the practice pursued by some lumbermen of taking out trees in the beginning of the most profitable period of their growth. Whereas, at an earlier stage of the lumbering industry, few trees of smaller diameter at the butt than 14 inches were taken out, it is now not unusual to see some drives largely made up of mere poles—sticks as low in diameter as six inches. No doubt this improvident method of lumbering is to some extent the belief that these young trees, if left standing, would probably be burned, and to the expectation that the land might be needed for settlement.

It must be admitted that under former conditions the fear of fire was to some extent justified, but since the danger has been so greatly minimized, the conditions are altogether different. The small revenue derived by the Province from these half grown trees renders it desirable that the practice should not be followed unless under very exceptional circumstances indeed.

RATE OF GROWTH.

Your Commissioners, after close investigation, conducted under varying circumstances and covering a wide area, with different conditions of soil and density of growth, endeavored to arrive at an average rate of growth and consequent commercial value of young white pine, from a period at which a tree would make an eight

(8) inch butt log 16 inches long, and produce a butt log 14 inches in diameter and 16 feet long, and submit the following conclusions, which are very conservative:

A young tree which would cut only one log 8 inches in diameter and 16 feet board measure, would, if allowed to stand for thirty years, grow in diameter at the rate of one inch in five years, (in some cases the growth is as rapid as an inch in two years) and hence would give a butt log of 14 inches diameter, 16 feet long, or 100 feet of lumber, board measure. In addition to this, however, this tree would have grown in height sufficient to give two more logs, one say of 11 inches and one of 8 inches diameter, both 16 feet long, measuring respectively 49 feet and 16 feet B.M., or a total for the tree of 164 feet B.M. Thus a tree that required 40 years to make its first 16 feet of merchantable timber, would in 30 years more have increased to 164 feet. This may be considered the period of greatest relative growth. After attaining a diameter sufficient to make a 14 inch butt log, your Commissioners estimate that the tree would continue to gain at the rate of $3\frac{1}{2}$ per cent. per annum. This bare statement of the case shows the necessity of protecting the young growth of the pine in the interests of the Province. The advantage to the lumberman in holding his trees till they have reached the larger diameter is still more marked because of the greater price per 1,000 feet commanded by lumber cut from the larger logs.

But this is not all—pine trees do not begin to bear fertile seed in profusion until they reach nearly the age required to produce a diameter of six inches, and the process of forest reproduction is likely to be retarded by the removal of the seeding trees.

MARKET FOR WASTE MATERIAL.

As previously intimated, your Commissioners, in consequence of a comparatively limited amount of attention they have been able to devote to the matter, do not feel themselves justified in making a final report, especially as the important lumbering region of the Ottawa Valley has not been inspected by them. They are desirous, moreover, before concluding their labors, of making a full investigation into one phase of the question which has hitherto been but slightly considered, viz., the possibility of securing a remunerative market for the waste and refuse of lumbering operations, as well as for those of our forest trees not now commercially valuable. In economic forestry practice it frequently happens that the development of a young forest can be greatly enhanced by the thinning out of the trees where they stand too thick, and the cutting down of less valuable varieties. At present the difficulty of disposing of these thinnings to any advantage makes this practice impracticable in Canada. Could such a market be found it would be a decided advance towards the adoption of more economical and less dangerous methods of lumbering, and would of itself do much to decrease the extent and frequency of forest fires.

From inquiries thus far made, your Commission are inclined to believe that much of this apparently useless forest material, particularly in the old lumbered-over districts, can be utilized in the manufacture of pulp and small wood goods, or for the production of charcoal for smelting ores, etc. Further investigation will no doubt assist in coming to a more definite conclusion on this most important part of the subject. A prolific source of forest fires in some parts of the Province is the carelessness of many mining prospectors in the matter of their camp fires. Some plan of lessening this danger by regulations that will make the prospector more responsible to the authorities would seem advisable, and is under consideration.

Thus, while it is obvious that the work of the Commission is far from complete, yet deeming that some phases of the situation require present action, your Commissioners make this brief but preliminary report, and beg to recommend:

1. That the present system of fire-rangings inaugurated by the Government in 1886 be extended so as to be compulsory on all the holders of timber berths, and that all unlicensed timber lands contiguous thereto be also protected by rangers employed by the Government. That all fire-rangers be subjected to the inspection and control of the Department of Crown Lands.

2. That the officials of the Hudson Bay Company be asked to co-operate with the Government in preparing and printing fire proclamations in the language of the Indians of the northern districts, to be posted along the canoe routes throughout the territory.

3. That for all unworked limits on which the ground rent shall be two years in default on the termination of the present license year, the licence shall not be renewed, but that the berths be held by the Crown as forest reserves.

4. That license-holders be not allowed to cut any trees for logs smaller than will measure twelve inches across the stump two feet from the ground, unless under special forest conditions, with the sanction and under the supervision of the district forest ranger.

5. That the Government take power by order in Council to withdraw from sale or location and set aside, to be kept in permanent Crown forest reserves, such areas of territory as are generally unsuitable for settlement and yet valuable for growing timber.

All of which is respectfully submitted.

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