

some work to do with the spade and axe. Small stumps are well blown to pieces, so one gets fuel enough to pay expenses. The fun pays for the time of using the dynamite, so one is not out much. For large stumps, the dirt is not solid enough for resistance to raise the stump, even if a large charge is used; but the dirt will be blown away, which is the cheapest way of getting it away if one must have the stump up, but, if one can wait, on the use of the land, the large stumps are better removed by the saltpetre-and-fire route. When firing a stump with dynamite, be sure that the fuse is lighted before leaving, and when it is lighted get away, but don't go where the unused dynamite is. I do not consider it dangerous work when properly performed; a person who is a little afraid of it will take no risks.

Another economical and quite rapid means of removing stumps is by the aid of a good stump-puller. Those who do not care to work with dynamite will prefer this method. With very large stumps, the dynamite and stump-puller can both be used to advantage.

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Forest Revenue and Forest Conservation.

(Paper read by Judson F. Clark, Ph. D., Forester for Ontario, before the Forestry Convention, Vancouver.)

In the case of most crops produced by the soil there is a distinct seed-time and harvest, and the methods of the seed-time are as different as may be from the methods of the harvest. Wood crops form a notable exception to this rule, for, normally, the new crop is launched by the act of harvesting the crop which is mature. Where there is no wood crop to harvest, artificial sowing or planting must be resorted to if a wood crop would be grown, but in Canada the areas which must be so treated are limited and comparatively unimportant.

Nature, unaided by man, has produced vast and magnificent forests, and maintained them for ages. The earliest foresters went to Nature centuries ago to learn her method of forest reproduction. They found that wherever trees were removed by decay, windfall, or other cause, so as to make a break in the forest cover, and thus admit light to the soil, the opening became quickly filled with a vigorous reproduction of young trees. Trees are tolerably prolific seeders, but tree seeds on germination require light, if they are to develop into forest trees. The more light they get the more rapidly they grow, and light may be given them by the removal of the mature trees. Such were the lessons learned from Nature by the first foresters, and the natural laws behind these lessons must ever form the basis of all natural methods of forest conservation.

The forester was quick to see wherein man might aid Nature to the advantage of the forest. Nature's method of waiting an age for the trees to disappear after they had passed their prime was wasteful alike in time and material. The forester with his axe saved the material and the time. In the virgin forest the fittest to survive occupied the soil, but the fittest to survive were not always the best fitted to supply the needs of man. This was remedied by the forester in the succeeding crop, by favoring as seed trees those kinds which, because of rapidity of growth or quality of product, were regarded as the more desirable.

THE CANADIAN FOREST PROBLEM.

There can be little doubt but that the most important problem before any Canadian forest administration is that of translating the facts of these introductory observations into everyday business practice. The solution of the problem will be reached when a system of sale of public timber is reached and made effective, by which the State and the lumbermen become partners with mutual profit in the work of renewing the forest, by the act of logging the mature trees.

Lumbering is very much like any other business, in that it is conducted for what profit may be made by the operators, and rightly so. This being the case, it is evident that the nature of the agreement entered into by the State as the seller of the timber and the lumberman as purchaser will have very much to do in determining the subsequent course of events. If the State offers its timber for sale under conditions which put a premium on forest destruction, the forests will surely be destroyed, all kinds of forestry propaganda to the contrary notwithstanding. If, on the other hand, the terms of sale put a premium on forest conservation, there is no reason why the forests should not be conserved as a purely business proposition.

Present lumbering methods are devastating the Canadian forest. Why is this? Lumbering is the business of removing the mature timber, and this should improve the forest. It has done so elsewhere for centuries. Not in Europe and Asia alone, but in many places in North America. Why does it not do so on the Canadian timber limits? There are, indeed, isolated examples of improvement by lumbering even here, which show the possibilities, but the exceptions to the rule but emphasize the failure of the present policy as a whole.

It is my belief that the fatal weakness of the present system of disposing of Provincial timber is to be found in the fact that the provisions of the agreements entered into by the Provinces as sellers, and the lumbermen as purchasers, place a premium on destructive lumbering.

In other words, the terms of sale which have found general acceptance make it to be in the financial interest of the operators to despoil rather than to conserve the forests.

It is my purpose in this paper to discuss two or three salient features, and at least one notable omission in these agreements, with special reference to their influence on the character of the logging which they authorize, and should, but do not, control.

THREE AXIOMS.

Before entering on what may prove to be controversial ground, it seems fitting to state three propositions which, I think, will be accepted as axiomatic for Canadian conditions. These may later serve as landmarks when weighing the pros and cons of individual propositions.

1. The main object of all forest management should be to ensure the permanency of the lumbering and other wood-cutting industries, by providing a permanent supply of logs, which is their raw material. Incidentally, or, at least, secondarily, forest management aims to regulate the flow of streams, to secure a revenue, to ameliorate climatic conditions, and to provide a playground for the people.

2. Wherever forests naturally flourish they may be perpetuated and improved by conservative lumbering. The white pine and the Douglas fir are among the best trees in the world for this purpose.

3. If the forests are to be saved, it must be with the sympathetic co-operation of the men who cut the trees. Nor is this at all a matter of regret, for no class of citizens are more vitally interested in the perpetuation of the forests or would do more to that end than the lumbermen.

SALE BY PUBLIC AUCTION.

The principle of valuing stumpage for sale purposes, by offering it at public auction, has long found favor in the older Provinces, and I note that British Columbia has recently taken legislation providing for its adoption. There can be no doubt but that public auction, after ample advertisement and opportunity for inspection, is by far the simplest, most equitable, and, above all, the most satisfactory method of determining the market value of standing timber.

This sale by public auction may take either one of two forms: (1) The stumpage dues (i.e., the price to be paid per thousand feet when the timber is cut) may be fixed in advance of the sale, and bids may be asked for a lump sum or "bonus," which will represent the estimated value of the stumpage over and above the fixed stumpage dues; or (2) bids may be asked on the amount of stumpage, dues to be paid per thousand feet, board measure, when the timber is cut.

THE BONUS SYSTEM OF AUCTION.

The first method, which may for short be termed the bonus system, has found general acceptance almost to the exclusion of the second. The advantages claimed for it are:

(1) That it yields at once a large revenue to the Provincial treasury; and
(2) That it gives the purchaser of the stumpage a larger interest in protecting the forest from fire.

ADVANCE PAYMENT ON FOREST REVENUE.

The payment in advance, in the form of a bonus of a portion of the estimated value of the stumpage to be cut during a period of years, is in reality a discounting of the future revenue-producing capacity of the forest. This method of realizing a large present return from what is a permanent Provincial asset, capable of yielding a regular annual income, can, it seems to me, be justified only as a means of meeting a financial emergency of the gravest character. It is worthy of remark in this connection, that even the stress of war has never led the forest-owning countries of Europe to resort to this method of temporary relief for their depleted treasuries.

FIRE PROTECTION.

It is evident that the payment in advance of a portion of the value of the timber must give the lumberman a larger interest in the protection of the timber purchased from fire. The advantage to the forest of the interest thus created is, however, more apparent than real. The interest created centers, naturally, in the protection of such timber as is available for the axe under the terms of his purchase. The greatest danger from fire is not, however, on areas bearing mature or semi-mature timber, but on cut-over land, and such as bear quite young coniferous stands. It is evident that the motive for protecting an area from fire, created by an advance payment of stumpage, disappears as soon as an operator removes all the timber in which he has a financial interest. It might be added that it is a mistake to suppose that, in determining the amount of bonus which he is prepared to bid on a proposition, the lumberman or pulp manufacturer does not discount for the danger of subsequent loss by fire, and the expense involved in future fire ranging.

It will bear emphasis in this connection, that a Province's ultimate financial interest in young coniferous stands and cut-over lands may be quite as great as in areas at present bearing mature timber; and, also, that any division of interest or responsibility in so vital a matter as forest fire protection is attended with the gravest dangers.

DISADVANTAGES OF THE BONUS SYSTEM.

The disadvantages of the bonus system may be discussed (1) from the standpoint of the operator, and (2) from that of the Province.

1. From the operator's standpoint:

(1) Capital Tied Up.—The payment of a portion of the stumpage, cash in advance, locks up a large amount of capital (or credit) which should normally be used in the development of the business. This prevents the participation in the competition of persons or corporations having no surplus capital (or credit) over and above what would be sufficient to conduct a lumbering business on the plan of paying for their raw material when they require it. This unfair discrimination in favor of the large capitalists, as against others of less but sufficient means, cannot but have an undesirable effect on the prices realized, in that it limits the number of persons in a position to compete.

(2) Increased Cost of Inspection.—It greatly increases both the cost and the time required to make an adequate inspection of the tract offered, in that the prospective purchaser must estimate the amount as well as the value of the stumpage offered before he is in a position to bid on the proposition. This, again, limits the competition to the detriment of the interests of the public.

(3) Cost of Raw Material.—The estimates of the amount of available stumpage which can be made by prospective buyers being, necessarily, only approximate, this method of sale introduces a large speculative element, in the cost of the raw material. As a matter of fact, an operator purchasing under the bonus system never knows what his raw material actually costs him until the logging of the tract has been completed.

2. From the standpoint of the Province as seller:

(1 and 2) That the bonus system of auction operates disadvantageously to the Province, in that it causes much irregularity in the forest revenues, has already been commented upon; as has also its undesirable tendency to limit the number of competitors in a position to bid at timber sales.

(3) Large Losses to Revenue.—In the absence of accurate knowledge as to the amount of standing timber on a limit, the purchaser must bid on the basis of an amount which he is confident is here and available located, after discounting for all uncertain factors. Should there prove to be twice or three times as much merchantable timber found before he is through cutting (as has repeatedly occurred), the difference between the market value of this "found" timber and the nominal stumpage dues finds its way into the pocket of the operator instead of the Provincial Treasury, as would have been the case had the amount of the dues been the consideration determined by public competition.

A similar condition obtains on limits on which the right to cut extends or is extended over a long period of years. Advances in market prices, together with changes in uses, methods of manufacture, and means of transportation, are constantly adding to stumpage values. These influences, together with the natural increment by growth, have made valuable much timber which, because of its small size or unfavorable location, was thought to be wholly unmerchantable at the time of the sale, and as such failed to have any influence on the amount of bonus paid. The whole value of this timber belongs in equity to the Province, but under the bonus system of sale the nominal stumpage dues, only representing, in many cases, but a small fraction of the market value, reach the treasury.

On the other hand, it is true that if the amount of merchantable timber should prove to have been over-estimated by the purchaser, and he should fail to find as much as he has paid for, the Province stands to gain at the expense of the lumberman. Such a contingency is rare indeed, and is quite as undesirable as the reverse.

(4) Bonus System Means Close Cutting.—Quite overshadowing any objection which may be taken to the bonus system of sale, from the standpoint of present revenue returns discussed above, is its baneful influence on the future production of the forest. Its whole tendency is towards clean cutting, as contrasted with the opposite tendency where the amount to be paid per thousand feet cut is made the basis for the auction.

Assume, for illustration purposes, a pine stand estimated to cut ten million feet of mature timber, which has an average market value of ten dollars per M as it stands, or a total of \$100,000. If sold at public auction, on a stumpage basis for \$10 per M, the operator will cut no trees which when manufactured will not yield at least \$10 per M, over and above the cost of manufacture. Suppose, however, that \$80,000 of the purchase price be paid cash in advance, in form of "bonus," with the stipulation that the remaining \$20 per M be paid as stumpage dues when the timber is cut. The same operator, who in the first case found it in his interest to cut no trees which were not worth \$10 per M on the stump, will now find it in his interest to cut whatever may have a stumpage value of \$2 per thousand. The cutting of the young pines having a stumpage value of between two and ten dollars per M, may, under some circumstances, be the main difference between good forestry and destructive lumbering.

(5) Bonus System Places a Premium on Violation of Cutting Regulations.—Should it have happened that in the sale of this block of pine the Province should have reserved trees required for seed purposes, or all trees below a set diameter limit that they might form the basis of future cuttings, it is evident that a purchaser under the bonus system, having advanced \$80,000 in cash, and being in a position to reap a large profit from cutting the reserved trees (because of the low dues), would be under a very great and constant temptation to do so. It may, indeed, well be doubted if