

mainly of pine, but mixed with other conifers and a sprinkling of hardwood. The pine may be divided into two or three groups of different ages. It has killed out any deciduous trees that may have been mixed with it except in spots here and there where the pine did not seed. Hemlock, spruce and balsam being shade enduring trees, are often found struggling for life beneath the pine, but so long as pine is the dominant tree the others will make poor growth. If there are any large hemlocks or spruce they should be cut down and marketed, as they will only prevent pine from growing in their place. And now as to cutting the pine, no tree should be cut down unless it measure at least twelve inches diameter two feet from the ground. It is worth more standing, unless it may be that it is one of a group growing too close together, when the woodman's craft should be exercised in selecting which of the group should be cut down, relieving the others from the pressure of its presence. It would not be good forestry to cut down all the trees that would make a ten inch butt log; thinning may be an advantage, but at that stage where favorably situated they are too valuable for further growth. Care should be taken generally to preserve the canopy of the forest, while at the same time admitting enough sunlight for the growth of seedlings; they may be seen growing up in a young forest twenty or thirty feet high in the place where large old trees have been cut down, the requisite sunlight having been thus admitted. In this description of forest all the large old trees and most of the medium age can profitably be cut, leaving the younger timber room to grow, and this treatment by reason of accelerating the growth of the younger timber left would increase rather than retard the annual amount grown per acre. Instruction should be given to the woodsmen on no account to cut down a young pine except where making draw roads or clearing for skidways. The practice of using young pine to make crossways, bridges, or skidways, or even to put up buildings, should be strictly prohibited, just as the cutting down of all varieties not wanted should be encouraged. A little care would produce a valuable second crop for the owner, but it would all be thrown away unless fire was kept out, as it would be particularly destructive to this class of forest.

3rd. A forest composed mainly of hardwood mixed with large pine trees may now be considered; except yellow birch, the hardwood is seldom very valuable for lumber in our northern country, and often too far away from a railway to make cordwood. Pine amongst hardwood is very valuable for square timber and is much sought after; it has no chance for reproduction, as the seed disseminated will not grow under the shade of the hardwood, so when the pines are cut down the forest reverts to a hardwood of very little value. When the locality and soil are more fitted to grow pine, it is simply valuable space lost. To say that white pine seed will not germinate in a hardwood forest is not strictly true. The young trees may often be noticed very small, very sickly looking, and examinations of many specimens show that it will take twenty or thirty years or even forty years to grow one inch in diameter, the stunted trees finally dying for want of sunlight. A young pine tree refuses to live under the close canopy of a thick hardwood forest. Two things are necessary to reproduce pine in a forest of this kind; first of all, defective pine trees not valuable for lumber, and there is always a proportion of them, should be strictly preserved and guarded. All the trees in a high or exposed situation where the seed would have a chance of being carried long distances and over a wide area, should be left standing; and second, it will depend upon the locality and on the kind of hardwood, but as much of it should be cut down as possible, not making a clearing but taking all the large trees and leaving where possible the small ones as a shade for the young pines to grow up amongst. No arbitrary rule can be set the owner will have full scope for all his acumen and individuality in producing the best results. Constant care and attention would be needed, and it should ever be remembered that silviculture is a slow process. Seed cannot be sown one year and reaped the next. This leads up to the question of ownership and fixity of tenure, which is a necessity for all operations extending over a long period of time.

4th. An entirely different method would have to be pursued in the case of a forest where the timber is all within say fifteen or twenty years of being the same age, the bulk of the trees being large but mixed with a good many of small diameter; twenty years is a short time in the life of a pine tree, and the different diameters arise through the large trees existing under more favorable cir-

cumstances. With more space and sunlight they have overshadowed the others, and although the small trees may be nearly the same age and height, they may not be more than one-half or one-third the diameter, and if the large trees were cut down, taking away the shelter from the long slender trees, they would inevitably be blown down. The custom amongst lumbermen operating in a forest of this kind has been to cut down every tree, and the policy was sound enough; but if the object is to keep the bush in timber, then it would become necessary to cut only within certain defined areas, leaving enough standing as the original forest to reseed the cut over spaces. The selections would have to be made on good forestry principles; the timber would have to be left on hill tops and ridges so that the seed could distribute itself over a wide field; if the country were comparatively level then alternate blocks should be selected, not necessarily of any given space or size, but taking advantages of the inequalities of the ground and thickness and position of the standing timber. No exact formula can be indicated, as no two sections of the country are alike; each locality would have to be considered by itself and good judgment exercised in what to cut and what to leave, making sure only that enough is left to fairly cover the ground with seed.

5th. A large number of broad and prevalent types of forest could be cited, but enough has probably been said about what the course of procedure should be in the economic administration of forest lands. Another example only will be given, where hemlock, spruce and balsam are the prevailing trees, mixed it may be with some hardwood and moderate quantity of pine; to increase the quantity of valuable trees and eliminate the others is somewhat difficult; whatever distribution of pine seed there may be from time to time has little chance to come up where the ground is covered by other conifers. Their seed is all more or less shade enduring and will germinate and grow up where small pine would be smothered. The conclusion reached in considering this example is that the much dreaded fire would here be a friend and not an enemy; keeping in mind always that it is a growth of pine that is wanted, a careful survey should be made of this forest and the sections where pine exists, and under favorable conditions for the distribution of seed, should be marked off and a space cleared around them over which a fire could not go; cut all or a portion of the large pine, as the case may be, all the hemlock or spruce of market value, and set fire to the balance on a favorable opportunity.

Fire over a district, if not so fierce as to kill all the timber, is no much to be dreaded; it is the second and recurring fire, killing the young trees which may have sprouted and burning the soil, which is most to be dreaded. A fire that kills the useless trees and burns up the old needles and debris of the forest, leaving the large timber, is often a great benefit, as it brings the ground into a fit condition for receiving seed, and young trees will grow much faster than where overshadowed by an old forest; there is and can be no set formula in these matters, but much room for the exercise of observation and good judgment.

These questions of forest treatment have all to be considered from an economic standpoint, and as entirely within the scope of the owners of forest land in Ontario. No great expense need be incurred and no looking forward for a hundred years to obtain returns. A set of rules could easily be framed to govern all licenses, that while not depriving the licensees of anything of value, would at the same time preserve for the province a very valuable asset in young timber, dues for which would be collected in after years.

Much has been said and written on the annual growth of young trees, but as that matter was dealt with recently in the preliminary report of the Ontario Forest Commission, it need not be gone over now; one thing, however, may be said, that in a preserved pine forest a crop may be gathered every twenty years, more or less, without reducing the growth of the forest per annum.

And now to conclude with the most difficult question of all, what can be done with those areas of land burned over again and again; many of them can be seen from the windows of the railway car passing up the beautiful valley of the Ottawa river. They are evidence of the carelessness that should be amended as soon as possible; left alone they are a disgrace to the country. We are not the only sinners on the continent, the great State of Michigan is to-day earnestly engaged in an endeavor to reforest some three or four million acres of mostly abandoned lands within the State. When the regrowth of pine on such

lands is spoken of, the idea is often met with unbounded jocularity, and the only question in the mind of the listener is what particular asylum the speaker should be sent to. In imagination a gang of men are seen putting in seedling trees much as young cabbage are planted; why it would cost millions upon millions, and the whole matter is dismissed with a laugh; nevertheless, the question is up for solution.

Covered again with forest these desolate areas would be of incalculable benefit to the country, and when the people fairly grasp its significance they will see that the government take proper measures to reclothe our bare hills and desolate valleys.

It is not here pretended that a full solution has been found; much thought and study will be needed, men of practical minds and experience will be found to undertake the work and a beginning can be made now.

It can be seen that on some of the burnt over districts a quantity of young pine has been left standing here and there; they should be regarded as a nucleus for future seed distribution, a keeping away fire, nature will do the rest.

There are localities, however, where fire after fire has swept over the country until not a single tree is left. This is the case often near settlements; carelessness and worse have produced the inevitable results, and it will be with much labor and difficulty that favorable conditions can again be attained. Individual planting over wide areas is in this country out of the question, and the only alternative that would seem to be left is to carefully select small patches, so situated as to effectually cover the country with seed, and by the inexpensive process of putting some seed in the ground raise clumps of trees of the desired species that would grow and by reproduce themselves.

At the age of from 25 to 30 years more or less young pine would commence to bear cones and scatter seed; just how far seed will fly depends on many circumstances, but from observations made in burnt districts, which have been reseeded by solitary trees, and also noticing seed floating in the water, there seems little doubt but what the seed of conifers will distribute itself anywhere from the vicinity of the parent tree to a mile, or even more. Cones open in the fall when storms prevail, and no doubt the seed is detached very often during a violent wind, and from the vantage ground of the high tree-top and with the beautiful sail attached to the kernel, will fly great distances in stormy weather. Sufficient time being allowed, the reforesting of burnt over districts presents no economical difficulty. It is the ordinary process that takes place in a longer or shorter time in all forest countries. What is really needed by man's interference is to shorten the period of non-production and to assist nature to give us the varieties most wanted. The length of this paper leaves no time to speak of the benefits to be derived by having bleak barren wastes again covered with forest verdure. Neither can anything be said about the desirability of again causing white pine to grow in that very interesting region around the north shore of Lake Superior; that it can be done is proven by the evidences of pine growth north of the watershed. It would be an interesting pastime for some member of the association, with leisure on his hands, to devote some time and thought in demonstrating how pine can be made to take the place of the less valuable spruce in that most interesting region; and it is to be hoped that the zealous inspector of forestry will be able to induce someone to undertake the work.

DISCUSSION.

The discussion was opened by Schenck, who referred to the different forestry policies as adopted by Professors Pinchot, Fernow, and others. Scientific forestry, he said, was practical forestry, or a knowledge of forestry. He was quite in sympathy with the lumberman who cut over his limits as speedily as possible, as they were in great danger of being destroyed by fire. With them it was a business proposition. He advocated the selling of timber to lumbermen in large blocks, as in this way they would be more likely to protect the forest from fire.

Mr. W. N. Hutt said that in Southern Ontario it seemed that the climate was changing owing

(Continued on page 12.)