ESTABLISHING THE CROP¹

By G. S. ALLEN²

Ask the man on the street what "forestry" means to him. Ten chances to one he will say "planting trees". Even though he knows little else about forestry, he accepts the old sayings,—“that we reap what we sow.”—that “great oaks from little acorns grow”. Foresters to him are people who plant trees. We can all agree that for continuous wood production there must be continuous regeneration of the forest. This is one place at least where the public and we foresters stand on common ground. But the *how*, the *when*, the *where*, and the *what* are the responsibilities of the forester.

There is not time for a thorough treatment of the subject of forest establishment. All we have time to do is to consider briefly a few of the more important aspects of forest regeneration as a basis for open discussion to follow.

RESTOCKING STANDARDS

First I wish to consider the question of restocking standards,—superficially a simple matter but, in actual fact, quite complex. Standards are necessary as a measure of the success or failure of natural regeneration and, hence, as a guide to the need for planting. But stocking standards are little better than educated guesses until we have learned from experience the results to expect from different degrees of natural stocking and from different spacings in plantations. Very meagre information is available to date on this important phase of second-growth management,—in fact, the subject has been largely ignored.

When we set up a standard for restocking, the implication is that we aim to obtain regeneration by *natural* means. If natural means fail, presumably we shall then seed or plant to bring the area into full production without further loss of time. This being the case, and I believe that it should be so, our restocking standards should be such that they are possible to attain under the natural conditions and limitations that exist. Since these vary considerably, so should stocking standards. For example, when it is known that seed years may be as far apart as ten years, it would be quite unreasonable to require 50 per cent restocking by the end of 5 or even 10 years. But where seed years *are* frequent, such a standard might be quite reasonable.

In deciding on a standard we have a choice between selecting a low percentage of stocking say at 5 years, or a higher percentage at say 10 or 15 years. It can be argued that the shorter time limit should be used, on the basis that the sooner the area is planted the better, if it is not going to restock naturally. But can we say with any certainty at 5 years that an area will **not** restock satisfactorily during the next few years? Where conditions are at all

¹ A paper presented to the Annual Meeting of the Canadian Institute of Forestry, October 13-15, 1954, Victoria, B.C.

² H. R. MacMillan Professor of Silviculture and Dean, Faculty of Forestry, University of British Columbia.

limiting or erratic, there may be little restocking at 5 years and ample at 10 or 15 years. If our aim is to obtain natural regeneration, we must allow enough time for the job to be done. If, however, for reasons that I shall discuss later, our policy is to keep the regeneration period to a minimum, then we may resort to seeding or planting rather frequently except following effective seed years. I would suggest, therefore, that if natural regeneration is our objective, we choose time limits that relate to seed-year periodicity and to any other biological and physical limitations over which the owner or operator has little or no control. I suggest, too, that the standard be raised and the period for regeneration be lengthened. Then we would have an objective measure of *actual* attainment rather than an estimate of what *may* be attained, and we would avoid the frustration of having natural regeneration come abundantly into our plantations. If these suggestions meet with approval, then we should consider seriously the use of the 4-milacre quadrat as the basic unit for restocking surveys. It gives a better picture of distribution and is entirely satisfactory in every way provided that the "adequate stocking" standard is set sufficiently high for the time limits chosen.

On the other hand, if we decide to plant, we face an important decision in respect of spacing. If plantations are too dense, growth will slow down drastically before thinning becomes economically possible and thinning will be delayed because of reduced growth. Conversely, sparse plantations may produce poor quality timber and will probably not make full use of the growth potential of the site. Evidence is accumulating to suggest that spacings in the range of 8 by 8 to 10 by 10 feet for the faster growing species on average or better sites will produce good results in terms of growth and early economic thinnings.

The economics of the situation are fairly evident, particularly in the case of natural regeneration. Understocked acres cost as much to carry as do fully stocked stands. If 20 per cent of the area carries no trees, we are weighted down with 25 per cent more area than we need for a given sustained production. This cost is far more than enough to pay for bringing most of the stands up to normal stocking. On the other hand, if reproduction is too dense, the cost in terms of reduced growth and the need for more acres for a given production is likely to be more than equivalent to the cost of correcting the situation.

THE TIME ELEMENT IN REGENERATION

Next I would like to consider the time element itself in reforestation. It can be shown that, in the case of an operation on sustained yield, there is a definite economic limit to the length of the regeneration period. A delay of 10 years in starting the crop on a 100-year rotation means that we carry over 10 per cent more area than should be necessary, which, in turn, means that costs are up 10 per cent or more for roads and road maintenance, administration, protection, and taxes. On most sites a delay of 5 years or longer in crop establishment costs more than would planting soon after logging. The choice between waiting for natural regeneration, and replanting immediately,

will depend on other things as well, but every year that regeneration is delayed results in a definite increase in the cost of our future wood supply.

THE METHOD OF ESTABLISHING THE CROP

Another matter of importance is the method of establishing the crop, over which the forester and owner have considerable control. The method is important for several reasons, not the least of which is its effect upon the length of the regeneration period and, hence, upon costs. The choice lies between natural and artificial methods. Natural can be hastened and improved by due attention to seed sources, ground preparation including slash disposal, and rodent control.

Artificial methods include direct seeding, with rodent control if necessary, —and planting, with or without protection from browsing and grazing.

The choice is not a simple one. What is good one year in one place may not be so the next year in the same place, or during the same year in a different place. Regeneration poses serious problems simply because we do not clearly understand Nature's ways. Because we lack knowledge about many basic things such as seed production, population trends of rodents and other animals, weather, etc., we are forced to analyze the situation as best we can and act accordingly, and accept some mistakes as inevitable.

Our methods are these. We can set the stage for natural seeding by leaving and protecting suitable seed sources. We can help Nature by preparing the ground and protecting the seed. Or we can sow seed artificially on suitable ground and protect that seed,—or we can plant seedlings. We know how to do these things through experience,—ours or someone else's. But how do we decide *when* and *where* to use a particular method?

First we estimate the chances that natural regeneration will be successful,—primarily an assessment of seed production since we can control seed distribution and survival and ground conditions. If we know that seed production is spotty, infrequent, and unreliable over long periods for the primary species, then our choice is between probable delay and immediate establishment by seeding or planting. If seed crops occur frequently, then we can turn our attention to making the best use of the seed that is produced. If we decide that seeding or planting will be necessary in most years, or that the economies that go with immediate establishment and full stocking more than offset the costs involved, then we must choose between seeding and planting. If seed is nearly always in short supply we will probably be forced to plant. If ample quantities of suitable seed are frequently available, then we can consider direct seeding. Techniques of seeding and planting have improved greatly and the mechanics of large scale production developed to fairly efficient levels. But there is more involved than scattering seed, or raising seedlings and planting them out at a reasonable cost.

The moment we choose seeding or planting we take things out of Nature's hands and accept new responsibilities. We choose the species and the race that is to grow on the site for 50 or 100 years. We grow seedlings *en masse* in the nurseries with not too much regard for their physiological requirements, and

then plant them out in the field by the millions with little concern for their physical needs. Then, too often, we proceed to forget about them, turning instead to the next year's job of planting more millions. Because we are able to do this work economically does not necessarily mean that our responsibilities have been met. We know *so* little and are doing *so* little to increase our knowledge of how to choose better stock, how to raise better seedlings, and how to plant them as naturally as possible. Our objective should not be to grow and put out *so many trees* but to establish the best possible plantations for the future. What do we know about species' requirements, provenance limitations, and tree physiology at present? Can we afford not to increase our research effort to a point commensurate with present production and with the future importance and value of the new forest?

In the meantime forest establishment must go on. But we as foresters have a tremendous responsibility to be truly conservative in what we do. Large scale trial and error has no place in forestry; complacency about current practices is equally dangerous. The only insurance against long-term mistakes is a vigorous research program to accompany each phase of production that will seek every improvement possible in every phase of forest establishment.

In conclusion I would like to emphasize two things: (1) that our responsibility for establishing the new forest is a tremendous one. What we do today and tomorrow will affect generations to come,—favorably or unfavorably. We do not know enough yet to work in complete harmony with Nature, and so we will make mistakes. But mistakes can be minimized if we will be exceedingly conservative in a biological sense and follow Nature as closely as we can, (2) that we acknowledge frankly that we have a lot to learn about forest establishment before we can be reasonably certain that what we do is wise; hence, that we put far more energy into research that will provide the guidance that we need.