NATURAL REGENERATION OF SPRUCE IN ALBERTA.

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In 1924 the Alberta foresters in the Dominion Service, at a conference in Calgary, passed a resolution to the effect that they were unanimously of the opinion that the problem of obtaining adequate reproduction of spruce after cutting was of paramount importance in this province and its study should take precedence over all other silvicultural work not of a routine nature. Since then much work has been done in an effort to arrive at some solution of the problem. The following outline of the work done and tentative deductions arrived at is submitted in the hope that it may prove interesting and perhaps of some value to workers in other regions.

Prior to 1924 some work had been done on this problem. It had been noted that the reproduction, particularly of spruce, on old cutting areas was very inadequate or almost non-existent except in such places where the mineral soil had been laid bare at the base of windfalls, by brush burning or on old logging trails. Accordingly some simple experiments were undertaken with direct seeding on spots chosen to represent different types of seed beds varying from a six inch depth of duff or surface litter to bare mineral soil. Two hundred spruce seeds were sown on each and protected by wire screens from rodents and birds. The study was by no means complete for there was little or no attempt made to take into consideration such factors as aspect, shade, quality of soil and other things which might conceivably affect the germination and survival of seedlings. The results, however, were significant in that they showed that none of the seedlings survived on a thickness of duff or moss over two inches in depth. Survival on the one inch layer and on the bare mineral soil was good in each case.

As an extension of these experiments an extensive examination of burned and cut-over areas was made in several parts of the province in order to determine if these findings could be confirmed in the field. The most interesting of these was the examination by Forester G.R. Barnes on the Lesser Slave in 1926 of nine cut-over areas and fourteen burned areas. The examination was made systematically according to the method used by W.C. Lowdermilk in similar work in the Rocky Mountain region in 1920 and 1921. The areas were regularly crossed by strips one tenth of a chain wide on which the reproduction was counted and the following data recorded:-

1. The depth of the surface layer of duff.
2. The depth of the layer of decayed, compact humus.
3. Roughly, the character of the mineral soil.
4. Roughly, the amount of moisture present in each soil layer.
5. The distance of seedlings from the probable source of the seed supply.
6. The density and character of other vegetation on the area.

Of the cut-over areas examined, the earliest cuttings took place during the winter of 1916-17. Moss and duff were found to cover this area to a depth of three or four inches as compared with four to six inches on adjacent uncut areas. Part of the area had been burned over but, even here, the duff was still two inches in depth. Patches were found where the duff had been completely removed by the fire and here both spruce and balsam fir seedlings were found -- the spruce generally being found on the bare mineral soil and on the edges of the patch where the moss was less than one inch in depth. Balsam seedlings were found mixed with the spruce but it was noted that the outer ring of seedlings was, in almost every case, pure balsam, indicating that they were able to survive on a deeper layer of duff than that on which spruce could survive. The balance of the area, that is to say, all of the area where the loose duff was two inches or more in depth, was covered with a dense growth of grass and herbaceous plants and with poplar coppice wherever poplar had occurred in the original stand. Willow and other shrubs were also found to be coming in in places.

Space does not permit of a description and a detailed record of the data collected on each of the areas examined. It may be said, however, that all the areas examined were strikingly similar to the area described above. Where the moss and duff had been removed by fires or by other means, and where such areas were within four chains of a seed-tree or seed-trees, conifer reproduction was found invariably. Where the moss, or duff, still remained on the area to a depth of two inches or more no seedlings whatever were found even when such areas were within easy seeding distance of good seed-trees. The latter areas were invariably covered with herbaceous vegetation.

As a result of the investigations which have been undertaken in Alberta we have arrived at the following deductions:

1. That the layer of moss and duff, from three to eight inches deep, which is formed under all our mature spruce stands, must be removed before seedlings can establish themselves.
2. That the duff layer is inflammable and can be burned when thoroughly dry but that most forest fires which occur in the spring of the year when the duff is moist do not remove sufficient duff to secure good results. Fall fires are generally more satisfactory in this respect.

6

3. That the distance from seed-trees at which good reproduction can be expected, seed bed conditions being favourable, is not over four chains in the direction favoured by prevailing winds and about equal to the height of the tree in the opposite direction.

4. That on duff surfaces, when light is let in by removing the stand, a dense growth of grass and herbaceous vegetation may be expected. Such growth is very light where the duff has been removed.

It is not expected that the above findings will be found to be applicable in regions where conditions, and especially moisture conditions, differ from those found in Alberta. To those of us who have studied the problem here, and have confirmed our findings time without number by general observations in the field, the evidence in support of them appears to be conclusive. We are, however, endeavouring at the present time to confirm them by means of carefully laid out sample plots which are examined at regular intervals and to discover some practical method of cutting, or of treating cut over areas, so that such areas may be left in a desirable condition for reproduction to come in.