III. Mr. Jack Long, Superintendent of Nurseries, British Columbia.
Subject: Summary of Progress in the Production of Engelmann or Interior Spruce.

There were no questions.

SUMMARY OF PROGRESS IN THE PRODUCTION OF INTERIOR SPRUCE IN BRITISH COLUMBIA

by
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This year in British Columbia we sowed sufficient seed of Interior Spruce to produce approximately 3 million trees. To date this is the largest amount that we have sown in any one year.

Except for small quantities grown at our Cranbrook Nursery, prior to 1958, no attempt had been made to grow Interior Spruce at other sites in the Interior. It was about this time that our Foresters began to realize the importance of Spruce in our lumbering industry and also to realize the fact that too many acres were being burned and logged without becoming restocked. It was also about this time that we in the Reforestation Division began to realize that we didn't know too much about growing Spruce.

In the spring of 1958 a number of seed beds were sown at various Ranger Stations throughout the Central Interior. The beds were cared for by the Ranger Staff. Incidentally, we are still growing stock at two of these

sites. Although this may not have been the best approach to getting the answers we required, these small pilot nurseries did give us worthwhile information and proved that good stock could be grown at the more northern latitudes and in some cases with less trouble than we were having with Interior Spruce at our Coast Nurseries; the chief reason being that we usually experienced less frost heaving due to the fact that the ground froze in the fall and remained frozen over winter with a good snow cover as well. Also we found that there is little difference in the size of stock produced in the Northern Nurseries compared to stock grown at the coast providing soil conditions and cultural practices are similar. In connection with this it must be remembered that in the Interior Nurseries we are growing stock from seed of local provenance whereas the same seed grown on the lower coast is far removed from its native environment. This may be a very important factor in that the long hours of daylight during the northern summer no doubt have an effect on the local provenances which, when moved south, lose the advantage of an otherwise longer growing season and more moderate climate.

In growing Interior Spruce our aim has been to produce plantable 2-0 stock. Generally speaking, we can hardly say that we have been successful in this. Of the useable stock in a 2•0 bed, 1/3 to 1/2 might be used for 2-0 planting stock and the remainder has to be carried on to 3-0 or, better still, transplanted.

We have found, as I am sure most nurseries have, that 3-0 Spruce is not the most desirable type of planting stock and actually our recovery of plantables from 3-0 beds only averages about 50% of the total and, of course, we hesitate to transplant the smaller trees from 3-0 beds feeling that if they haven't reached a plantable size in three years it is about time to throw them away.

In most cases we have been able to produce fairly good 2•1 stock, but quite often they are not up to the standard of quality that we look for in transplant stock and there have been times when we have had to carry them on to 2-2. These same trees in the second year as transplants do very well and produce fine stock but at rather a high cost.

We haven't found the answer as to why Spruce so often does poorly in the first year after transplanting. We realize that in many cases the stock used for transplanting has been the less vigorous trees from 2-0 beds, but even with good, thrifty 2-0 stock the same thing can happen.

We sometimes wonder if there is not more damage done by frost heaving than we realize. Trees may be damaged by the tearing off of the small feeder roots without being actually heaved from the ground. Without careful observation these seedlings would pass as being quite normal. If seriously damaged in this way, they would have to build up a new root system before normal top growth begins.

We have found that through heavier fertilizing and more careful attention to watering some of this lack of vigor can be overcome.

We are doing a bit of experimenting with summer transplanting to produce 1 1/2 stock, and so far it looks promising in that, providing the trees get through the first winter, they seem to take off with more enthusiasm in the spring than either late fall or early spring transplanted trees.

At Duncan this year, seedlings transplanted on July 17th by August 12th had developed a prolific growth of new roots and were well established in the soil even though, in most cases, little or no top growth had taken place. These seedlings had gone into summer dormancy at time of transplanting. These transplanted seedlings showed more root activity at this time than seedlings lifted from the same bed from which they had been lifted a month earlier. It would appear, at this date, that these transplants will be in just as good shape as 2-0 stock to get through the coming winter.

We realize that in regards to this summer transplanting that we may run into some complications if we start doing it on a large scale.

In view of the cost and the difficulties e:perienced in growing transplant stock and the undesirable qualities of 3•0 stock, we feel that we should continue to work towards a better type of 2-0 plant. As mentioned before, our success to date has been limited but we have made some improvements in recent years.

We have found that in most cases fall sowing of Spruce has been more successful than spring sowing. Germination may not be quite so good due to winter losses, but normally fall sown stock will attain twice the growth of spring sown by the end of the first growing season. These larger seedlings have a better chance of surviving the winter and getting away to a good start the following spring. Damping-off losses are usually less in the case of fall sown stock. Because of earlier germination the seedlings are past the susceptible stage before weather conditions are optimum for the development of the disease.

The most promising development in the growing of Spruce is the work done in Ontario and about which Mr. Meagher will be speaking later in this meeting. For that reason I will not go into too many details of what we are doing along this line. What it amounts to is an increased use of fertilizers applied periodically rather than in the normal two or perhaps three heavier applications. Watering is watched closely and continued into late summer and early fall. This continuous supply of fertilizer and water seems to discourage the tendency of the seedlings to go into summer dormancy and growth con tinues into the fall, resulting in a much longer growing season. Spruce seems to be more frost hardy than most species and so early hardening-off to prevent frost damage is not so essential.

Following is a summary of fertilizer treatments used on Spruce beds:

<u>First Year Spruce</u>

Prior to sowing:

<u>For fall sown beds</u> - 600 lbs/ac treble superphosphate (46% P2 05) supplying 120 lbs/ac of P.

<u>For Spring Sown Beds</u> - 570 lbs/ac of monammonium phosphate (11-48-0) supplying 120 lbs/ac of P. and 62 lbs/ac of N.

<u>For both fall</u> and <u>spring sown</u> beds - 60 lbs/ac potassium sulphate (0-0-50) supplying 30 lbs/ac of K20. The above is not used if the soil contains more than 0.3 m.e. K/100 gms. of soil.

After sowing:

First application about the end of June or when secondary needles commence to show. Second application 4 weeks later and third application about September 1st - each of 120 lbs/ac of monammonium phosphate. These three applications will supply approximately 90 lbs/ac P. and 40 lbs N.

Second Year Spruce

Three applications of 120 lbs/ac of monammonium phospate, approximate dates May 15th, June 18th and September 7th. These will supply a total of 90 lbs. P. and 40 lbs. N. A further 40 lbs. N. is added in form of 190 lbs/ac of ammonium sulphate in 2 applications, mid-July and mid-August.

About mid-June 30 lbs/ac of Potash is supplied in form of 60 lbs. of sulphate of Potash.

No doubt modifications in these fertilizer treatments will be needed from time to time to suit local conditions. A close check will be required to detect changes in the level of soil nutrients and DH. The heavy use of acid fertilizers, such as monammonium phosphate will probably lower the soil pH, which is desirable in most of our Nurseries but could be overdone.

At our Telkwa nursery in the Northern Interior some interesting results have been observed in the use of organic materials. Spruce litter, leaf-mold, and bog peat were used in varying amounts and combinations both with and without commercial fertilizers. They have, in all cases, made an appreciable contribution to the quality of the stock. Even when used in small quantities these materials have produced larger and more thrifty seedlings than were grown in untreated beds. Perhaps this response is understandable when we consider the fact that the soil in this nursery is an alluvial type, not too well supplied with humus. The introduction of mycorrhizea could be another factor.

A study in the growth behavior of Interior Spruce in the nursery is being undertaken by our Research Division. The objective of the study is as follows:

1. To initiate a record of growth performance of Spruce provenances at the nursery stage so that this record can be carried through to the plantations.

2. To determine difference in growth behavior at each of four nursery sites.

3. To provide data which can be utilized in the future to refine the experimental design, sampling and measuring techniques applied to the nursery stage of provenance research.

Last year 16 different seedlots were sown at four nurseries, and this year 40 seedlots were sown. These lots cover the full range of our seed collections throughout the province as well as some exotic provenances.

A record is kept of first emergence, total germination, date of flushing and dormancy, incidence of disease or other losses; and also measurements

are taken to determine height variation. These data from each nursery will be subject to analysis of variance.

Already a great variation in growth behavior is showing up. One seed lot in particular has made outstanding growth at all the nurseries. It is too early to predict what the final results may be, but we are sure that some very worthwhile information will come from this study.

In conclusion I would say that during the last few years we have acquired some knowledge and gained some ground in the production of Interior spruce. Generally speaking, our stock is of better quality and we have been able to increase the amount of useable stock lifted from our beds. We still have many problems, some of which we may have to learn to live with, but we hope to find a solution to most of them.