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A PLANTING TRIAL WITH WHITE SPRUCE, FORT BABINE

by

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In the early 1960's there was a lack of familiarity with planting white spruce in the Prince Rupert Forest District Some doubts existed as to whether the experience on the lower coast or southern Interior of British Columbia could be applied without modification to planting sites in the northern Interior. Small studies were initiated to test the applicability of previous experience and to provide the basis for any modifications. One of these studies was a planting stock trial established in October 1964.

Objective

The objective of the trial was to assess differences in survival and growth of four nursery stocks of one provenance of white spruce for five years after planting.

Description of Stock

The registered number of the seedlot was 93K/B3/42 and the cones were collected at an elevation of 2200' near Fort St. James in 1956. The seed was extracted at Aleza Lake.

The four kinds of stock, grown at Telkwa nursery, were:-

2+0	-	Standard planting stock
2+1 R	-	Reclaimed undersize 2+0 stock transplanted for one year
2+1 L	-	Standard 2+0 stock transplanted for one year
3+0	-	Standard 2+0 stock left in bed for one year

Morphological measurements at the time of lifting indicated marked differences.

Table 1 - Morphology of White Spruce Plants at Telkwa Nursery (1964)

Stock	Length (cms.) Top	Length (cms.) Roots	Root Collar (cms.) Diameter	Top/Root Ratio Length	Top/Root Ratio Weight
2+0	14	20	0.23	0.7:1	4.0:1
2+1 R	14	23	0.36	0.6:1	3.0:1
2+1 L	20	29	0.54	0.7:1	2.7:1
3+0	32	35	0.51	0.9:1	3.8:1

Basis: Averaged measure of 30 seedlings per stock.

Description of Planting Site

The planting test-site was situated at an elevation of 2400 to 2700 feet above sea-level on the west shore of Babine Lake. It was on a gentle slope of 2 to 15 per cent with an easterly aspect and lay within the area burned over by the severe'John' fire of 1952. Most of the vegetation had been destroyed and much of the upper soil horizons had been damaged. Even after fifteen years organic layers were still absent and there were only thin patches of litter interspersed with exposed mineral soil. The soil is a till complex with moderately retarded drainage. Horizon development is indicative of a weak podzol with mottling apparent at a depth of two feet in the heavier silt-clays of the complex. Gravel is present in all horizons varying in quantity from 15 to 25 per cent. Site Index is estimated to be 90 at 100 years for white spruce, possibly lower where soil dessication was severe.

At the last examination in 1969, snags and windfalls are light and there is a shrub-cover of aspen, willow, alder and wild rose. The herbaceous cover is sparse with fireweed, bunchberry and grasses being most prevalent. A thin broken cover of *Polytrichum* spp. is present throughout most of the burn.

Method

Two replicate blocks were established on each of four sites within the plantation. Sites were selected to sample the range of slope and aspect occurring within the reserve, with the pairs of replicated blocks sampling local variations partly related to the severity of the burn. On each block, four rows of 50 spots were marked by stakes and one of the four stocks assigned to each row. The rows were established 10 feet apart with four-foot spacing between seedlings along the rows.

A four-acre block, consisting of four, one-acre plots, was laid out in addition to the randomized block design and seedlings of each of the four stocks that were surplus to the needs of the experiment were planted, one stock to each plot. The growth and survival of these seedlings is recorded with the experimental results (Table 2).

Planting within any one block was done by one planter and a standard method was used, i.e. slit-hole mattock planting on screefed spots.

The experiment was examined and reported in the first, third (Armit 1966, 1968) and fifth growing season after planting.

Results

Stock and weather conditions at the time of planting during October 1964 favored good survival, but the planting quality was rated merely adequate. By June 1965, some seedlings had frost-heaved, while others had dried out. The spring and summer of 1965 were unusually dry and warm; upper soil horizons were powdery on the lighter-textured soils. Severe losses were expected at the end of the first growing season.

The October 1965 examination indicated further mortality was confined to a few trees already in poor condition the previous spring. Survival was exceptionally high, in view of marginal planting quality and adverse environmental conditions. It is suspected that detrimental effects were ameliorated by the herbaceous shrub cover.

The third-year examination indicated that subsequent mortality was not significant, restricted to miscellaneous factors, such as browsing, trampling, and falling snags. Fifth-year observations confirmed that survival levels had stabilized.

The data for both survival and height-growth indicated that all significant differences in this study were stock-related, and that block-site influences were not significant. Block averages are given in Table 2.

Survival was satisfactory for all classes of stock by operational planting standards. However, the survival per cent for the 2+1 R class is significantly less than for the other three stock classes, which are not significantly different from each other (Table 2).

The height-growths are also significantly different. The rate of growth of the 2+1 L was best and that of the 2+0 the poorest (Table 2).

Table 2 - Stock Performance after Five Years (1969)

Stock	Average of all Blocks			One-acre Plots		
	Survival Per cent	Height cm.	Ht. Growth cm.	Survival Per cent	Height cm.	Ht. Growth cm.
2+0	92	33.5	15.2	90	33.5	15.2
2+1 R	86	39.6	21.3	85	42.7	21.3
2+1 L	97	54.9	27.4	94	64.0	33.5
3+0	92	57.9	21.3	90	61.0	21.3

Conclusions

Because of their high survival, the 2+0 seedlings are the most economical of all the planting stocks but currently they are growing at a slower rate than any of the other classes. It will be interesting to observe whether the present cost advantage is maintained during the next five years in relation to the more rapidly growing transplants, particularly the 2+1 L. The poor field performance of the 2+0 may have been due in some measure to the low average root collar diameter of 0.23 cms (q.v. Table 1) at time of planting. Since 1966 the minimum acceptable diameter during culling in the nursery has been 0.24 cms.

The study indicates that the use of reclaimed 2+0 culls as 2+1 R stock may be justified, but only when other stocks are in short supply for planting projects. In the absence of such shortages nursery transplant areas would be more effectively used in the production of large 2+1 transplants.

3+0 plants performed very well in this trial. They are seldom produced in quantity in Forest Service nurseries because they are very difficult to lift from broadcast beds without severely damaging the small amount of fibrous rootlets commonly found on a few coarse lateral roots. This class of stock seems to have a potential that is being overlooked. Perhaps they should be grown in drills at controlled and wider spacing than in broadcast beds and frequently root-pruned. Their thick roots should favour root regeneration if, as has been reported by Sutton (1969), the production of new root buds is directly related to the diameter of the root. If the quality of 3+0 could be improved in the nursery by drill sowing and root-pruning so that they equal the performance of 2+1 L transplants in the field, the cost saving would be considerable.

There are other classes of stock that should be tested also. Quantities of 1½ + 1½ are now being produced successfully and the practice fits well into a more evenly balanced schedule of work at nurseries. Mullin (1968) comments on the performance of 4+0 spruce and suggests that this age class merits further testing in Ontario.

There is a continuous need for these planting trials and they should be carried out on a wide scale in all regions of the Province in a manner very similar to the experimental design of this study. Plots should be re-examined at five-year intervals to confirm whether early advantages are maintained.

References

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