INTERIM REPORT
SX 82308 R
DIRECT SEEDING TRIAL
AT
OOTSA LAKE

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F. van Thienen

November 30, 1982
SILVICULTURE TRIALS and TESTS

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TITLE Direct Seeding Trial at Ootsa Lake

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(b) Limited X
   (i) Internal - Branch only
   (ii) External - Designated X
   (iii) Ministry Only

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- Silviculture Branch
- Research Branch
- Eurocan Pulp and Paper, Ltd.

Approved:
Manager (Signature)
(B.P. Downie, R.P.F.) (Typed)
1. **Trial Number**
SX 82308 R, Direct Seeding Trial at Ootsa Lake.

2. **Objectives**
The objective of the trial was the operational evaluation of a direct seeding method widely used in Finland for pine species.

3. **Site Description and History**
The trial was established in the Morice and Lakes T.S.A.'s, Prince Rupert Forest Region, with the cooperation of Eurocan Pulp and Paper Ltd. A general location map for the three test blocks is shown in Figure 1. Site descriptions and histories are presented in Table 1.

4. **Trial Installation and Sampling**
A total of 44.8 ha. were direct spot seeded between May 4 and 11, 1981. Target sowing density was 2,500 spots/ha. The seeding method consisted of 40 unstratified lodgepole pine seeds placed in a trowel-cug drill on the shaded side of a disc-trenched furrow, and covered with a thin layer of soil. Five seedlots and three blocks were involved. Three 30-spot plots per seedlot per block were established for a total of 720 permanent sample spots in the project. Not all seedlots were used on all blocks. Eurocan's cooperation allowed one seedlot - 3805 - to be incorporated in all three blocks such that provenance and seed storage effects could be eliminated. Assessments were made in the fall after the first and second growing seasons.
5. **Operational Considerations**

Table 2 presents the operational statistics for the trial.

Important points from the summary include:

A. Sowing densities ranged from 1,958 to 2,572 spots/ha. Variation from the target density (2,500 spots/ha.) were caused by patches of slash on the unburned blocks and areas of cobbles. These obstacles caused the disc trencher to skip and create the occasional discontinuous furrow, thus reducing the plantable area per hectare.

B. The cost and average daily production of the project were comparable to planting 1+0 PSB 211 stock on similarly easy terrain. Average cost per spot was 17.89¢ and ranged from 17.65¢ to 18.36¢. Production rate was determined at the Lakes T.S.A. site, and averaged 1,150 spots per manday. Despite the easy ground, this low productivity was caused by the use of flagging tape markers on all spots. These markers were required to judge spot location for survival plot layout and quality control. It was estimated that production could be increased by at least 50% if the markers were eliminated.

C. Seed requirements for the project ranged from 0.302 to 0.420 kg/ha and averaged 0.328 kg/ha.

6. **First and Second Year Results**

Examination of the second year data showed that between-block variation greatly exceeded between-seedlot variation. Thus, results were pooled for all seedlot within each block.
Important points from Table 3 include:

A. The seeding method produced an average of 1.26, 0.90 and 4.28 germinants per spot in blocks 6, 19 and 7 respectively after two growing seasons.

B. The use of unstratified seed resulted in delayed germination in all blocks. The mean number of germinants per spot in block 6 increased from 0.67 to 1.26 between the first and second growing season. Similar increases were noted in blocks 19 and 7. Additional evidence of delayed germination can be seen in Figures 2 and 3 which illustrate the frequency distribution of germinants per spot in block 7. Figure 2 shows 39.3% of all spots did not contain germinants after one growing season, whereas Figure 3 shows this percentage has dropped to 21.1% after two growing seasons. It should be noted that Figures 2 and 3 represent the best, and not an average, block in the trial.

C. The mean number of germinants per spot is deceptive when one attempts to determine the success of the trial. Although block 7 contains an average of 4.28 germinants per spot after two years, 42.6% of the spots contain less than 3 germinants. Given the assumption that 3 germinants per spot are required to produce an established seedling, only 1,124 spots/ha. of the original 1,958 spots/ha. now meet this criteria. Mortality in the second year germinants will be high in the winter of 1982/83; thus, further reductions in stocking are probable.
D. Although the trial's success should be evaluated on the basis of established seedlings in the fifth year assessment, the second year results indicate that only block 7 is a regeneration success to date. Block 19 is borderline, and 6 can be considered a potential failure due to the low number of stocked seeding spots which are stocked after the second year, and the erratic, clumped distribution of the stocked plots.

The statistics of the second year assessment suggests that the Finnish direct spot seeding method produces erratic results and highly variable stocking levels. The third growing season assessment will provide an answer as to the ability of second year germinants to survive winter.

7. **Conclusions**

The trial suggests that the method is unsuitable for operational use. Production rates and costs equalled the rates and costs of conventional planting programs. A large proportion of the seeded spots remained empty, and stocking/ha. was unacceptable or marginal on two of the three blocks. Further mortality of new germinants is expected as many germinants occurred in the spring of 1982.

8. **Status**

The third assessment of the trial is scheduled in the fall of 1983, with the final assessment in 1985.
Figure 2. Frequency Distribution of Germinants per Spot after one Growing Season on 270 Seeding Spots, T.S.H.L. A01479, C.P. 156, Block 7.

Figure 3. Frequency Distribution of Germinants per Spot after two Growing Seasons on 270 Seeding Spots, T.S.H.L. A01479, C.P. 156, Block 7.
<table>
<thead>
<tr>
<th>Location</th>
<th>Ecological Association</th>
<th>Slope/Aspect</th>
<th>Elev.</th>
<th>Original Stand</th>
<th>Logged</th>
<th>Burned</th>
<th>Disc trenched</th>
<th>Seeded</th>
</tr>
</thead>
<tbody>
<tr>
<td>C.P. 79, Block 6 SBSd/04(a)</td>
<td></td>
<td>Flat</td>
<td>850</td>
<td>Pl(S) 633-M</td>
<td>Winter, 1977-78</td>
<td>-</td>
<td>1980</td>
<td>May 6-8, 1981</td>
</tr>
</tbody>
</table>

Note:

Soils on these submesic sites were well to rapidly drained brunisols with sandy loam textures. The average pedon at the block 7 site contained 33 to 50% gravels and 10% cobbles.
Table 2. Production Results of the Direct Spot Seeding Trial at Ootsa Lake.

<table>
<thead>
<tr>
<th>Location</th>
<th>Block</th>
<th>Area Seeded (ha.)</th>
<th>Target Density (Spots/ha.)</th>
<th>Actual Density (Spots/ha.)</th>
<th>Total Seed (kg)</th>
<th>Seed Cost/ha.</th>
<th>Cost/Spot</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lakes T.S.A.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>T.S.H.L. A-00130</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C.P. 79</td>
<td>6</td>
<td>8.2</td>
<td>2,500</td>
<td>1,970</td>
<td>2.472</td>
<td>0.302</td>
<td>$360.69</td>
</tr>
<tr>
<td>C.P. 24</td>
<td>19</td>
<td>7.4</td>
<td>2,500</td>
<td>2,572</td>
<td>3.107</td>
<td>0.420</td>
<td>$472.27</td>
</tr>
<tr>
<td>Morice T.S.A.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>T.S.H.L. A-10479</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C.P. 156</td>
<td>7</td>
<td>29.2</td>
<td>2,500</td>
<td>1,958</td>
<td>9.127</td>
<td>0.312</td>
<td>$345.51</td>
</tr>
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<td>TOTALS</td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>WEIGHTED AVERAGES</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* = Weighted average.
Table 3. Germination Statistics after One and Two Growing Seasons

<table>
<thead>
<tr>
<th>Location</th>
<th>Block</th>
<th>n</th>
<th>Growing Season</th>
<th>X</th>
<th>S</th>
<th>Min.</th>
<th>Max.</th>
<th>% Empty Spots</th>
<th>% &lt; 3 Germinants</th>
<th>% Stocked (≥ 3 Germinants)</th>
<th>Stocked spots per hectare</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lakes T.S.A.</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>T.S.H.L. A-00130</td>
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<td></td>
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<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>C.P. 79</td>
<td>6</td>
<td>360</td>
<td>1</td>
<td>0.67</td>
<td>1.30</td>
<td>0</td>
<td>10</td>
<td>67.5</td>
<td>90.6</td>
<td>9.4</td>
<td>185</td>
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<td></td>
<td>2</td>
<td>1.26</td>
<td>2.28</td>
<td>0</td>
<td>12</td>
<td>60.6</td>
<td>60.6</td>
<td>81.9</td>
<td>18.1</td>
<td></td>
<td>356</td>
</tr>
<tr>
<td>C.P. 24</td>
<td>19</td>
<td>90</td>
<td>1</td>
<td>0.62</td>
<td>1.43</td>
<td>0</td>
<td>8</td>
<td>70.0</td>
<td>92.2</td>
<td>7.8</td>
<td>201</td>
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<tr>
<td></td>
<td>2</td>
<td>0.90</td>
<td>2.21</td>
<td>0</td>
<td>17</td>
<td>66.7</td>
<td>64.4</td>
<td>35.6</td>
<td></td>
<td></td>
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<tr>
<td>Morice T.S.A.</td>
<td></td>
<td></td>
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<td></td>
<td></td>
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<td></td>
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<tr>
<td>T.S.H.L. A-01479</td>
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<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C.P. 156</td>
<td>7</td>
<td>270</td>
<td>1</td>
<td>2.89</td>
<td>3.98</td>
<td>0</td>
<td>26</td>
<td>39.3</td>
<td>61.9</td>
<td>38.1</td>
<td>746</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>4.28</td>
<td>4.36</td>
<td>0</td>
<td>26</td>
<td>21.1</td>
<td>42.6</td>
<td>57.4</td>
<td></td>
<td></td>
<td>1,124</td>
</tr>
</tbody>
</table>

Notes:
1. Each block was disc-trenched in 1980 and direct spot seeded between May 4-11, 1981.
2. Approximately 40 unstratified lodgepole pine seeds were sown in a 30 cm long trowel-prepared drill and covered with a thin layer of soil.
3. Drills were located on the shaded side of the trench and on the berm when possible.
4. Approximately 1,970 and 2,572 spots/ha. were sown in blocks 6 and 19, T.S.H.L. A-00130, respectively and 1,958 spots/ha. in T.S.H.L. A-01479.
5. \( n \) = the number of seeding spots measured
   \( x \) = the average number of germinants/seeding spot
   \( s \) = standard deviation
6. The first assessment was made between Sept. 29- Oct. 6, 1981. The second assessment was made between Sept. 29 - Oct. 7, 1982.