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EFFECT OF THE C & H PLOUGH ON THE SURVIVAL AND GROWTH PERFORMANCE OF INTERIOR SPRUCE SEEDLINGS

Interim Report
1980

V. Grainger
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INTERIM REPORT

Effect of the C & H Plough
on the Survival and Growth Performance
of Interior Spruce Seedlings

BY

Vicky V. Grainger

WELDWOOD OF CANADA LIMITED
MERRILL & WAGNER DIVISION
WILLIAMS LAKE B. C.

November 25, 1980
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SUMMARY

The object of this project is to assess the effect of the C & H Plough on the survival and growth performance of Interior Spruce seedlings. Three trials were set up with bare root seedlings and plugs in each. There were three treatments per trial: ploughed, unploughed and ploughed and clipped. The seedlings were planted in the spring and measured after one growing season. Temperatures were taken on each strip once a week. Results were then tallied for all treatments and interim conclusions drawn.
INTRODUCTION

The majority of our logging operations are carried out in the interior wet belt, Spruce – Balsam type. Sites are usually sub-hygric and fertile with heavy subordinate vegetation and medium to heavy slash. We are constantly faced with the challenge of how to prepare these sites for reforestation.

Traditional methods, such as pile and burn, and windrow and burn often do not prepare a suitable site for the seedling and appear too expensive for the unsatisfactory return. In our attempt to try new methods, we have tried the C & H Plough on several areas for two years. We now hope to see if this treatment is suitable for these areas by measuring our return in terms of growth and survival of the seedlings.
DESCRIPTION OF SITE

This project was carried out on T.S.H.L. A01964, C.P. 47, C.B. 1 in the Matthew River Watershed in the Cariboo Forest Region (Appendix 1 and Fig. 1). The area was winter logged in 1977 and, after two unsuccessful attempts at burning, was treated with the Forest Service version of the C & H Plough in the fall of 1979. Only the east portion of the block was ploughed (Fig. 1) as there were many wet organic deposits on the upper slopes, too soft to support a machine.

The soils in this area are on atypical Orthic Humic-Ferric Podzol. Broken down charcoal found below the Ah layer indicate a previous devastating fire. Subsequent erosion is indicated by silt apparent in the Ah layer. The B horizon is composed of fines and so is an atypical Podzol. This keeps the moisture and nutrients in the upper horizons within reach of root systems. Thus, vegetation composition is of a sub-hygric site type.
MATERIALS AND METHODS

Three trials were set up in three different sites within the same block. 2-0 bare-root seedlings (Seedlot #2869) and 1-0 - 211 plugs (Seedlot #2874) were planted in each trial in three different situations; ploughed, unploughed, and ploughed and clipped; for a total of 600 seedlings per trial (Fig. 2).

The unploughed strips were used as a control. Clipping was carried out on ploughed strips. All subordinate vegetation was clipped to a one metre diameter circle around each seedling. Three times per year seemed adequate for 1980.

Planters were instructed to plant as usual, except in unploughed strips, where spacing was tightened up to facilitate manageable project boundaries. Each tree was checked for quality and proper placement immediately after planting.

Soil thermometers were placed in each trial to a depth of 10 cm and temperatures taken once a week as near to 4:00 p.m. as possible (Fig. 3).

Each strip was staked and labelled. Each tree was numbered with an orange wired flag and every fifth tree was staked. This was found especially necessary in the unploughed strips.
SOIL TEMPERATURE
SEASONAL FLUCTUATIONS

TEMPERATURE IN CENTIGRADE

DATE OF MEASUREMENT

WEEK NUMBER (JUNE 11+)

- - - unploughed
- - - clipped-ploughed
- - - - - - ploughed
Measurements were taken after one growing season on August 19th and 20th. Total height and 1980 growth in centimetres was recorded. Condition (good, poor or dead/missing) was recorded as well (Table 1)

A good tree was classified as green with no wilted or dead branches, which had put on some leader growth in 1980.

A poor tree was defined as one that had either wilted or dead branches, or some brown needles or extremely chlorotic, or a green tree which had put on no leader growth in 1980.

A 'dead' tree was defined as one with no live needles or buds.

* Seedlot #2869 is from Chillawack Nursery. Seed is from Sellars Creek from 1067m; picked in 1975.

* Seedlot #2874 is from Surrey Nursery. Seed is from Swift River area from 1067m; picked in 1975.
PRESENTATION OF DATA

(a) **Percentage Survival** (Table 1)

With 2-0 bare root stock, on ploughed strips, survival of all live trees was 98.2%, compared with 78.3% in the unploughed strips. 11.7% of trees in the unploughed strips were dying; another 15.3% were green but had put on no leader growth this year for a remaining figure of only 51.3% in good condition. Corresponding figure for the ploughed strips was 90.7%. There was no significant difference between clipped and ploughed treatments.

With 1-0 211 plug stock, survival was high for all treatments. In the unploughed strips, however, 8% were green but had put on no growth this year and 5.7% were dying. Corresponding data for ploughed strips was less than 2%.

(b) **1980 Growth** (Table 1)

With bare root stock, 1980 growth was 39% less in unploughed strips than in ploughed strips. With plug stock, growth was 20% less in unploughed strips than in ploughed strips.
<table>
<thead>
<tr>
<th>TREATMENT</th>
<th>SEEDLOT</th>
<th>STOCK TYPE</th>
<th>NO. OF SAMPLES</th>
<th>% DEAD OR MISSING</th>
<th>% GOOD</th>
<th>% POOR</th>
<th>% ALL ALIVE</th>
<th>AVE. TOTAL HT. IN CM.</th>
<th>AVERAGE 1980 GROWTH IN CM.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ploughed &amp; Clipped</td>
<td>#2869</td>
<td>S 2-0 br.</td>
<td>300</td>
<td>4.7</td>
<td>90.0</td>
<td>5.3</td>
<td>95.3</td>
<td>14.6</td>
<td>6.0</td>
</tr>
<tr>
<td>Ploughed</td>
<td>#2869</td>
<td>S 2-0 br.</td>
<td>300</td>
<td>1.8</td>
<td>90.7</td>
<td>7.5</td>
<td>98.2</td>
<td>15.6</td>
<td>6.1</td>
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<tr>
<td>Unploughed</td>
<td>#2869</td>
<td>S 2-0 br.</td>
<td>300</td>
<td>21.7</td>
<td>51.3</td>
<td>27.0</td>
<td>78.3</td>
<td>13.2</td>
<td>3.7</td>
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<tr>
<td>Ploughed &amp; Clipped</td>
<td>#2874</td>
<td>S 1-0 P211</td>
<td>200</td>
<td>1.3</td>
<td>96.0</td>
<td>2.7</td>
<td>98.7</td>
<td>16.6</td>
<td>8.2</td>
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<tr>
<td>Ploughed</td>
<td>#2874</td>
<td>S 1-0 P211</td>
<td>200</td>
<td>1.0</td>
<td>97.5</td>
<td>1.5</td>
<td>99.0</td>
<td>17.0</td>
<td>8.1</td>
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<tr>
<td>Unploughed</td>
<td>#2874</td>
<td>S 1-0 P211</td>
<td>300</td>
<td>2.3</td>
<td>84.0</td>
<td>13.7</td>
<td>97.7</td>
<td>14.3</td>
<td>6.7</td>
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**GROWTH AND SURVIVAL DATA**

**MATTHEW PLOUGH RESEARCH**
DISCUSSION

With 2-0 bare root, there was a definite difference in survival and growth between ploughed and unploughed strips. It could be that this seedlot is genetically sensitive to lack of light and warmth. The large percentage of dying trees and green trees that have put on no growth this year in the unploughed strips are in a grey zone that may all die next year, or may hang on for several years before dying.

With 1-0 plugs, there was a growth advantage with ploughing, but survival did not differ as strongly between treatments. There is, however, a 13.7% grey zone to watch here as well.

All stock was requested of seedlot #2874. Only 1-0 #2874 arrived. For this reason, the stock types cannot be compared to each other due to probable genetic variables. In trial 3 we ran out of seedlot #2874, so we had to use #2873 - 313 plugs for the ploughed and unploughed and clipped plug strips. The results of these two strips are therefore for interest only and cannot be tallied for final results.
The ploughed strips were greening in quite rapidly by the end of August. T.S.L. A07024 - C.P. "H", the next block on the Matthew Road, was ploughed in 1979. By 1980 there appeared to be virtually no advantage to the seedling on the ploughed sow, as it had greened in so rapidly. It will be interesting to see whether or not a one year head start is enough to ensure a high rate of growth and survival.
ORTHODOXUMIC FERRIC PODZOL

Podzol is atypical due to fines in B horizon, which
keep site hygric. Water and subsequent nutrients
stay in root zone.

Trial 1 & 2

Charcoal in Ah horizon suggests
former devastating fire and
subsequent erosion (note silt
in Ah horizon).

Trial 3

Is very steep (15-30%). The
absence of large H horizon
seems to indicate former
erosion. Eroding humus layers
probably settled on Trial 3 just below.

---

TRIAL 1

<table>
<thead>
<tr>
<th>silty humous</th>
<th>LFH</th>
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<tr>
<td>charcoal</td>
<td></td>
</tr>
<tr>
<td>(discontinuous)</td>
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cl si

shale

ploughed

---

TRIAL 2

<table>
<thead>
<tr>
<th>silt + humous</th>
<th>Ah</th>
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<tbody>
<tr>
<td>charcoal</td>
<td>Ae</td>
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cl sa si

shale

ploughed

---

TRIAL 3

<table>
<thead>
<tr>
<th>Lf</th>
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</thead>
<tbody>
<tr>
<td>Ae</td>
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H(buried)

shale

unploughed