Project #: SX 82110 H

Project Title: The Effect of Apple storage Facilities on the
Field Performance of Planting Stock

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Reviewed by: D. Simpson 82.04.05  H.Q. vault
N. Burdett 82.04.07  Simpson
H. Bemisson 82.05.03  Burdett

Approved By: [Signature] 12.05.03
The Effect of Apple Storage Facilities on the Field Performance of Planting Stock

As nursery production in the province increases to meet the goal of 150 million, there is increasing pressure to move fall-lifted stock to more local storage facilities at an early date, to make room for spring-lifted stock. The only available facility in the Nelson Region is the apple packing plant at Erickson.

Horticulturists are very careful to avoid storing plants with apples, and indeed the Ministry Nursery Division is most concerned about the use of apple facilities for the storage of seedlings (Drew Brazier pers. comm.). David Simpson (pers. comm.) described the damaging agent as being ethylene produced by ripening apples. Hinesley documented the deleterious effects on growth (but not survival) of Abies fraseri of 17.5 ppm ethylene exposure for eight weeks. They suggest that in closed cold storage, ethylene concentrations can reach 80 to 150 ppm. The Erickson plant is closed, but not sealed; no measures have been made of ethylene concentrations, but the "nose" suggests that they are significant. There is consequently concern over what happens to seedlings that are stored there.

Objective
To determine the effect of the use of apple storage facilities on the performance of spruce bareroot seedlings, as measured by growth and survival.

Method
Two seedlots of spruce, 2005 and 1996, both scheduled for planting near Invermere will be split in storage at the nursery (Skimikin) with half of each lot being moved to Erickson in early March. The other half will be retained in cold storage at Skimikin. The boxes at Erickson will be marked for identification with paint. Just prior to planting, the two halves will be recombined in the company's (Crestbrook Forest Industries Ltd.) reefer at Parsons.

The intended location of both seedlots is roughly equidistant from both storage facilities.

Design
At each of the planting locations the two treatments will be operationally planted in blocks, at least ten planters wide. The layout of the blocks will depend on the geography of the opening, and every effort will be made to ensure that the dividing line between the two treatments falls on uniform terrain.

The dividing lines between the two treatments will be clearly marked with stakes and Rn-Silvic Markers.

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Design (continued)

Ten plots will be installed along those dividing lines as shown in the Silviculture Manual (Appendix 6.21). Each sub-plot will contain 40 seedlings as 8 trees in 5 planter lines. Each tree will be staked and numbered for identification.

Sample size is based on:

\[ n = \frac{t^2 s^2}{E^2} \]

using \( s = 2.0 \) cm (as indicated in EP 858)
\( t = 1.96 \)
\( E = 0.2 \) cm (Hinesley 1980)

thus \( n = 384 \).

Measures

1. Spring 1982:
   a) Planting Quality Assessment – use F.S. 704 criteria, but no seedlings in the plot to be excavated.
   b) Planting Height (nearest centimetre)

2. Fall 1982
   a) Seedling Condition (see appendix)
   b) Growth in 1982 (nearest millimetre)

Only two visits are required, one at establishment and one in fall (late September?).

Analysis

The data will be analysed by ANOVA for survival, condition and growth, as described in the Silviculture Manual (Appendix 6-18), after stratification for ecosystem association.

Format for the analysis will be finalized after discussion with H. Stauffer.

Follow-up

The concern in this project is over the first-season performance of these seedlings. Second year assessments will only be required if the "treated" seedlings are in significantly poorer condition at the end of the first season. If this is the case, and increased mortality is anticipated in the second growing season, then a second year assessment will be justified.

Responsibilities

Both seedlots are routinely requested lots and will be planted normally by the licensee, except for the division into blocks. Assistance in the block layout will be provided by Regional Research. All additional measures and assessments will be the responsibility of Regional Research, as will all analyses and reports.

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<tr>
<td>1 FT 2/1 for one month at $1,650</td>
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<tr>
<td>1 FT 1/1: for one month at 1,490</td>
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<td>Travel eight man-weeks at 200</td>
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<td><strong>Total</strong></td>
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APPENDIX

Seedling Condition Classes

4. Excellent - A superior tree, better in appearance and vigour than trees in class 3. This class would be used sparingly.

3. Good (Thrifty) - Generally a vigourous and healthy tree
   
   Foliage - green to dark green
   - full compliment of needles
   - needles normal spacing and length, no evidence of moisture stress

   Growth - no apparent growth check, normal for its age

   Buds - readily evident, and firm

   Stems - no sign of physical damage

2. Fair - A seedling less than 3 (above) but likely to overcome any defect

   Foliage - often pale to medium green
   - irregular needle compliment
   - occasional signs of moisture stress (short, dense needles)

   Growth - limited, less than normal for its age

   Buds - inconspicuous, small

   Stems - minor scars or damage
Appendix

Seedling Condition Classes, cont

1. Poor  - A seedling with little prospect of recovery, likely to die

   Foliage  - yellowish to pale green throughout crown
   - many branches without needles
   - frequent signs of moisture stress

   Growth  - poor, may be absent

   Buds  - very small, very inconspicuous

   Stems  - severe damage due to browsing or chewing.
   - Note deformation is not a "vigour" defect. Form is of no concern here.

0. Dead  - After examination by "thumbnail test"

   on stem  - green cambium - alive (poor)
   - brown cambium - dead

   on root  - white cambium - alive (poor)
   - brown cambium - dead

   "Missing" counts as dead

NOTE: Seedling Condition Classes are applied relative to that stock type.
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**LOCATION:**
- 01 = Parsons T.F. #14 - Conrad Creek
- 02 = Lussier River - Nichol Creek

**TREATMENTS:**
- EKS = Erickson
- SKN = Skimikin

**CONDITION:**
- 00 to 04 = Dead
- 01 = Poor
- 02 = Fair
- 03 = Good
- 04 = Excellent

**PLANTING FAULTS:**
- TD = Too Deep
- TS = Too Shallow
- TL = Too Loose
- LE = Significant Lean
- SP = Poor Spot Selection
- SC = Screem Inadequate

**DAMAGE:**
- Col. 1 = Major & minor
- Col. 2 = Unknown cause
- Nutrient
- Frost
- Insect
- Mechanical
- Disease
- Rodent
- Moisture
- Planting Shock
- Needle Damage
- Foliage Damage
- Branch Damage
- Stem Damage
- Leader Damage

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80