SUMMER PLANTING OF WHITE SPRUCE

IN THE PRINCE GEORGE FOREST REGION

1984 - 1986

SX 84 - 114G

FINAL REPORT
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Ministry of Forests
January 20, 1989
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1. Introduction

Summer planting has been investigated in the Boreal and Sub-Boreal Regions of Canada (Burger and Lyon 1969, Crossley 1956, Decie 1962 and Revel and Coates 1976). All researchers demonstrated the feasibility of summer planting of bare root white spruce seedlings. Revel and Coates (1976) studied summer planting at McLeod Lake under conditions highly representative of mesic to sub-hygic sites in the Sub-Boreal Spruce Biogeoclimatic Zone of British Columbia. Seedlings (cold-stored and freshly lifted) were planted at two week intervals throughout the summers of 1968, 1969 and 1970 and were assessed for three growing seasons after each planting. Survival remained above 75% even under the driest, hottest, planting conditions which infrequently occur under the Sub-Boreal Spruce zone summer weather conditions. Summer weather in the Sub-Boreal Spruce zone is generally cloudy with showers and with high humidity. Summer precipitation for the years of 1984, 1985, and 1986 are listed (Appendix A).

As the planting program in the Prince George Forest Region expanded to more than 50 million seedlings per year, it was obvious that a longer planting season was required. Therefore, in 1982, following a decision by Al Todd, then Silviculture Officer, over 1 million white spruce seedlings were operationally planted using the recommendations of Revel and Coates 1976 (EP668). Successful early results prompted the region to continue and expand this operational summer planting. Bare root stock types were largely replaced with plugs and results were equally as good.
Each year persons in charge of the summer planting program were canvassed and reported excellent survival and growth; "as good or better than spring planting". It was concluded; however, that a representative number of operational summer plantations should be formally monitored. The following is a final report on SX No.84-114G.

2. Report on SX84-114G

During each of the years 1984, 1985 and 1986, five representative operational summer planting projects were selected for monitoring. These plantations represented a variety of zones and subzones in mesic to sub-hygric site associations, a variety of stock types and originating nurseries. They were all operationally planted between mid-July and mid-August.

No attempt was made to study the effects of stock types, nurseries or seedlots. The plantation sample was considered to be a representative cross section of the annual summer planting program.

Staked plots were located at random in each plantation. Four sub-plots of 25 staked seedlings each were measured annually for 3 growing seasons. Survival, total height and leader length were measured (Figure No. 1, 2, 3 and 4).
SUMMER PLANTING 1985
FIRST AND SECOND YEAR LEADER GROWTH

INCREMENTAL SHOOT GROWTH (cm)

PSB 313 2+0
SBS1
ICH1
PSB 313 1+0
SBS2
1.5+1.5
SBS1

BWBSd
SUMMER PLANTING 1986
FIRST AND SECOND YEAR LEADER GROWTH

INCREMENTAL SHOOT GROWTH (cm)

1987  1988
Figure No. 4

SUMMER PLANTING MEAN SURVIVAL AFTER 2.5 GROWING SEASONS

SURVIVAL (%)

1984 1986

82 80

72

100 80 60 40 20 0
Survival for all plantations after 3 growing seasons averaged 78%. Unacceptable survival occurred at Catfish Creek in 1984, which was not related to the time of planting. The site was deep duff suspended over an open water table combined with losses to root collar weevils.

Summer precipitation for 1984, 1985 and 1986 is presented (Appendix A).

Generally acceptable to good root egress occurred in most of the plantations studied. In July and early August on mesic to sub-hygric sites soil temperatures were between 8 - 12°C, which promoted active root egress. However, by late August, particularly on sub-hygric sites, temperatures were in the 5 - 7°C range, which may be marginal for root growth or may cause cessation for root egress.

Root egress is required to establish a "water chain" and to anchor seedlings to reduce frost heaving. Satisfactory root egress is a fundamental factor in successful summer planting, which is recommended before mid-August before low soil temperatures occur in the Boreal and Sub-Boreal Zones. This is very important in sub-hygric sites and sites that have been mechanically prepared to expose mineral soil. On sites prepared by broadcast burning where more than 2 cm of insulating duff are present, frost heaving is not generally a significant problem.
3. **RECOMMENDATIONS**

Based on the current "State-of-the-Art" the following guidelines should be used:

A. Summer planting should be restricted to mesic to sub-hygric moisture regimes (preferably broadcast burned).

B. Summer planting after mechanical site preparation which has exposed bare mineral soil on heavy textured soils should be avoided due to the high risk of frost heaving of container seedlings, particularly after July 31 and on sub-hygric sites.

C. The maximum period between extraction (or lifting) and planting should remain at 3 days. Where this time period is not maintained seedlings should be heeled-in or placed upright in open cartons and watered. Longer periods may cause serious stress to these physiologically active plants.

D. A cautious and carefully monitored program of summer planting of lodgepole pine should be initiated.

E. RGC's (Root Regeneration Capacity) should be periodically measured for all seedlots at the time of shipment from the nursery and correlated with root egress in the forest soil (possibly a research project?). We need more formal knowledge on the relationship between root growth and soil temperature.
F. Soil temperatures in the rooting zone should be measured on a routine basis and correlated with root egress on a representative sample of summer planting projects. **Temperatures below 6°C will not promote rapid root egress.**

G. Seedlots should be designated for summer planting at time of sowing request, and should, where possible, be grown locally. These seedlots should be subjected to special cultural regimes to condition them for summer planting but **not** severely stressed.

4. **SUMMER PLANTING WITH SPECIAL REFERENCE TO BACKLOG SITES**

Experience has demonstrated the high success of planting on well executed prescribed burns. The results of summer planting to date also substantiates this fact. Results are not as predictable or consistent after mechanical site preparation especially on heavy textured soils. Frost heaving, "baking", flooding, etc., are more common than under prescribed burn conditions. Since a major proportion of backlog site preparation must be mechanically prepared, special precautions will be necessary.

Summer planting on mechanically prepared backlog sites should be restricted to associations which are moderately well - to well-drained (mesic) to reduce frost heaving and to plant in warmer soils. Clay loams and silt loams should be planted in the spring to allow a longer period for root establishment (or if summer planted, **not** after July 31).
In general, summer planting should be directed to good prescribed burns and spring planting to good prescribed burns or mechanically treated sites.

If further information on summer planting is required, contact J. Revel, Coordinator of special projects, Prince George Forest Region.

5 Recommended Distribution

- Silviculture Branch
- Research Branch
- All Regions, Attention: Silviculture Officer
- Prince George Region
  All District Managers, Attention: R.O. Silviculture Forestry Manager
  Silviculture Officer
  All Silviculture Section Staff
  All members Northern Silviculture Committee (copy to S.I.S.CO)
  Prince George Research Library
  File

Final Report
January 20, 1989
J. Revel
6 References


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**Growing Season Precipitation (MM)**

Appendix A