A Study of the Effect of Lifting Date and Storage Time on the Early Growth Performance of Interior Spruce Seedlings Planted in the Summer on a Range of Sites in the Nelson Region.

Officer i/c: C. Thompson
Location: Akan Creek, Albert Canyon, Glenogle Creek, Traverse Creek.
Region/District: Nelson/Cranbrook, Revelstoke, Golden, Boundary Forest Districts
Objective: To examine the field performance of summer lifted container stock planted on a series of dates through the summer.

Annual assessments 1989 to 1992
Results to-date reported at SISCO in August 1992
Holding stock past its "ready" date may affect performance
Best results were on sites not accessible before mid-June
Summer planting is not protection against frost damage.

Next Scheduled Assessment /Treatment: None
Report Distribution: Nelson Region Silviculture
                        Nelson Region Forest Sciences
                        Silviculture Branch
Incomplete:
DO LIFTING DATE AND STORAGE TIME AFFECT THE EARLY PERFORMANCE OF INTERIOR SPRUCE SEEDLINGS PLANTED THROUGH THE SUMMER IN THE SOUTHERN INTERIOR

by

Chris Thompson and Alan Vyse

Early tests in northern British Columbia had shown that summer planting was feasible, and this information was used as part of the justification for the big 2+0 spruce program in the early 80's. The summer planting concept was never fully tested in the southern interior, because there was never a great need to extend the planting season on low elevation sites. However this changed as more high elevation sites required planting. This trial examined the feasibility of extended season planting of 2+0 spruce plugs ("hot stock") in the southern interior of British Columbia.

Nine sites were selected in the Nelson and Kamloops regions, representing eight different subzones. Three plantations were established in 1987 and nine more were established in 1988. Planting occurred at two-weekly intervals from mid June (early July in 1987) to mid September (mid October in Nelson). All seedlings were planted within three days of lifting. Additional seedlings were stored in simulated field storage conditions for two weeks, and were then planted with trees from the next lift. A third trial exploring seedling storage for up to 20 days was established at one location in 1989. Stock condition and growth were measured on all sites for the first two years and then as required. Selected climatic parameters were recorded at all locations.

There was some deterioration of stock as it was held in the nursery over the summer. The stock lost colour, and self pruning occurred on the lower branches. Root growth also continued, resulting in increased difficulty of extraction as the season progressed.

Field storage for up to 20 days had no effect on seedling performance. At six of the sites, there was a reduction in average growth from the first to last planting dates. At three sites this reduction was pronounced, and on the Nelson sites appeared to be associated with seedling height accumulated temperatures greater than 900 to 1000 degree days.

Summer frosts were a major hazard on all the Kamloops sites, and summer stock proved to be no better adapted to this hazard than traditional fall lifted stock. Summer stock is more susceptible to frost than natural seedlings if planted early (mid July) or late (mid August). At five sites, frost damage masked treatments effects. Additional reduction in seedling performance in the following growing season was probably due to sublethal frost damage.
No significant soil moisture deficits were detected at any of the test sites.

We concluded that summer stock should not be used on sites that can be planted with conventional cold stored stock before mid June. Summer stock alone will not improve results on frost prone sites. If a frost hazard is identified, planting should be delayed to mid July, when the frost risk is lower, but there is no additional advantage in the second growing season.

Holding seedlings in good conditions for up to 20 days after lifting does not affect performance, but there may be a performance effect from holding seedlings in the nursery after the planned planting date.

BIOGRAPHICAL SKETCH: Chris Thompson

Research Silviculturist, Nelson Forest Region.

1964 B.Sc. University of Edinburgh
1966 M.F. University of Washington
1967 to present Research Silviculturist, B.C. Forest Service, Nelson Forest Region

Address: B.C. Forest Service, Nelson Forest Region,
518 Lake Street, Nelson, B.C. V1L 5P4.
(604) 354-6704

BIOGRAPHICAL SKETCH: Alan Vyse

Research Section Head, Kamloops Forest Region.

1964 B.Sc, (Hons)For University of Aberdeen
1973 MSCF University of Toronto
1966-1973 Forest Economist, Canadian Forestry Service, Victoria, B.C.
1974-1985 Research Forester, B.C. Forest Service, Williams Lake
1985 to present Research Section Head, B.C. Forest Service, Kamloops

Address: B.C. Forest Service, Kamloops Forest Region,
525 Columbia Street, Kamloops, B.C. V2C 2T7
(604) 828-4148
Do lifting date and storage time affect the early performance of Interior Spruce seedlings planted through the summer in the Southern Interior

by Chris Thompson and Alan Vyse B.C. Forest Service Research, Nelson and Kamloops Regions

AUGUST 1992

STUDY OBJECTIVES

We wanted to test the proposition that rising 2+0 summer stock could be planted throughout the summer on a wide range of sites in the Southern Interior, and, if necessary, the stock could be field stored for some time, without any reduction in performance.

Summer planting was originally proposed and tested for Northern conditions by people such as Des Crossley in Hinton and John Revel in Prince George. They wanted to find a way of extending the spring planting season without extending cold storage. The early tests showed that summer planting was feasible and this information was used as part of the justification for the big 2+0 spruce program in the early 80's. The summer planting concept was never fully tested in the Southern Interior because there was never a need to extend the planting season on low elevation sites. However this changed as more high elevation areas required planting.

Stock condition and growth was monitored for five growing seasons. Selected climatic parameters were also measured at each planting site for the first two years.

WHAT WE DID....IN KAMLOOPS FOREST REGION

Three sites were selected in 1987 to represent a range of summer planting sites in the Kamloops Region (Mag Fire, Tsintsunko Lake, and Paska Lake). All were sites where additional studies of climate and site preparation effects were taking place.

One seedlot from 1500m was used. Rising 2+0 stock sown in 1986 was used on each site. Seedlings were lifted and planted within two days at two week intervals from the beginning of July until the middle of September. Half of the stock lifted was field stored in shaded locations with occasional irrigation until the next planting date. Fall lifted 1+0 stock sown in 1986 was also planted on the first planting date.

In 1988 a further five sites were planted (Esperon, Birk Creek E, Birk Creek W, Paska, and Tsintsunko). The seedlots used were local. The seedlings were planted on seven dates from mid June to early September. They were planted two days after lifting. In 1989, a mechanically site prepared portion of the Birk Creek site was planted with the same seedlot used in 1988 in mid July and mid August. Seedlings were stored for 1, 5, 10, and 20 days.

Stock condition and growth was measured on all sites for the first two seasons and then as required.

WHAT WE DID....IN NELSON FOREST REGION

Four sites were selected to represent different subzones. Then four seedlots were selected that were appropriate for those sites. Starting on June 15th 1988, seedlings were planted at two week intervals, with the last planting date on October 15th. The stock was held at Harrop Nursery and lifted as required. Half the stock lifted on each date was held in simulated field storage with shade and irrigation for two weeks and planted with the next batch of seedlings.
WHAT WE FOUND

1. There was some deterioration of stock held in the nursery over the course of the summer. The stock lost colour and there was some self pruning of lower branches. These visual symptoms were not reflected in performance.

2. Field storage for up to 20 days had no effect on performance.

3. At the four Nelson sites and at two of the eight Kamloops sites there was a reduction in average growth from first to last planting date. This reduction was pronounced at three sites (ie 25% of sites studied).

4. Frost damage masked treatment effects at five of the Kamloops sites.

5. Summer frosts were a major hazard on all of the Kamloops sites. Summer stock is no better adapted to this hazard than traditional fall lifted stock; mechanical site preparation of some kind is essential on such sites but even this only reduces damage.

6. There is a higher risk of frost and the planting stock is more susceptible to frost than natural seedlings before mid July and after mid August.

7. Visual inspection of frost damage seems to underestimate the actual damage. Frost does cause some rapid tissue death but it also affects the physiological processes of the plant. Thus frost effects may not be evident until the next season.

8. No soil moisture deficits were detected at the Nelson locations in the first two growing seasons. A slight deficit was recorded at the end of the summer on one site in Kamloops.

CONCLUSIONS

1. Storage of summer stock for up to 20 days under good conditions does not affect performance.

2. Holding rising 2+0 summer stock past the planned planting date in the nursery may affect performance.

3. Summer stock should not be used on sites than can be planted with conventional cold stored stock before mid June. In general this would apply to all sites in the IDF and ICH and warmer sites in the MS. The Nelson climate data suggest a lower limit of 900 accumulated degree days.

4. Summer stock alone will not improve results on frost prone sites. Mechanical site preparation is essential.

5. The best planting time for summer stock is mid-June but on frost prone sites planting should be delayed to mid-July when frost risk and plant susceptibility are lowest.
Do lifting date and storage time affect the early performance of Interior Spruce seedlings planted through the summer in the Southern Interior

by Chris Thompson and Alan Vyse
B.C. Forest Service Research, Nelson and Kamloops Regions

AUGUST 1992

STUDY OBJECTIVES

We wanted to test the proposition that rising 2+0 summer stock could be planted throughout the summer on a wide range of sites in the Southern Interior, and, if necessary, the stock could be field stored for some time, without any reduction in performance.

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Stock condition and growth was monitored for five growing seasons. Selected climatic parameters were also measured at each planting site for the first two years.
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In 1989, a mechanically site prepared portion of the Birk Creek site was planted with the same seedlot used in 1988 in mid July and mid August. Seedlings were stored for 1, 5, 10, and 20 days.

Stock condition and growth was measured on all sites for the first two seasons and then as required.

WHAT WE FOUND

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This project was funded under the Canada B.C FRDA programs as backlog reforestation project 3.42
Traverse Creek

Average Diameter Growth 1989-1991

Average diameter growth (mm)

Placning Dates

- Lifted Stock
- Stored Stock

Birk Creek Summer Planting 1988
Unprepared Site

Planting Dates

- Good
- Fair
- Poor
- Moribund
- Dead
Backlog Research
Project BL342

Title  A Study of the Effect of Lifting Date and Storage Time on the Early Growth Performance of Interior Spruce Seedlings planted in the Summer on a Range of Sites in the Nelson Forest Region.

Location
Traverse Creek, Boundary District
Albert Canyon, Revelstoke District
Glenogle Creek, Golden District
Akan Creek, Cranbrook District

Progress to March 31, 1992

Four locations were established in 1988, with one location in each of four districts. Planting started on June 15, and continued at two-weekly intervals until October 15. These plantations were measured twice in 1988. Two other locations were established in 1987, but they are being assessed as part of the Ministry program since both are close to Nelson. Climatic data were collected at each site for at least two years. Measurements were conducted annually in 1989, 1990 and 1991. A final assessment is planned for the fifth year of the plantations (1992).

Progress Reports have been produced annually, and presentations have been made to silviculture groups within the region. No progress report was produced in 1990 as data from one plantation were not collected due to early snow. That plantation is considered to be critical to a full understanding of this project.

A full analysis and report is planned after the fifth growing season (1992).

Changes in Plans
The project is on schedule and on budget.

Goals not achieved
There have been none.
Backlog Research
Project BL342

Title  A Study of the Effect of Lifting Date and Storage Time on the
      Early Growth Performance of Interior Spruce Seedlings planted in the
      Summer on a Range of Sites in the Nelson Forest Region.

Project Leader
BCFS - Chris Thompson, Research Silviculturist.
      518 Lake Street, Nelson, 354-6285

Agency Contacts
BCFS - Chris Thompson (Nelson)
      518 Lake Street, Nelson, 354-6285

Principle Clients
Region - M. Madill
      Districts - A. Barklay, B. Beard, A. Pollard, R. Gay

Location
Traverse Creek, Boundary District
Albert Canyon, Revelstoke District
Glenogle Creek, Golden District
Akan Creek, Cranbrook District

Rationale
The 2+0 spruce plug, grown for summer planting, is a stock type
with the potential for extending the planting season in the
southern interior, and also reducing the pressure to complete the
planting program before July 1st. The sites for which this stock
type is appropriate and the size of the planting window are both
ill-defined. Also the growth expectations of this stock type also
appear to be misunderstood.

Objectives
To explore the effect on survival and early growth of 2+0 plug
seedlings planted through the summer, and

To compare these results with those obtained from conventional
cold-stored 1+0 plugs planted in spring and fresh-lifted 1+0 plug
seedlings planted in the fall, by:

      Planting seedlings at two weekly intervals through the
      entire growing season, and

      Measuring seedling performance annually for five years.

Proposed Research Approach

Four locations were established in 1988, with one location in each of
three districts. Planting started on June 15, and continued at two-
weekly intervals until October 15. These plantations were measured
at least twice in 1988. Two other locations were established in 1987, but they
are being assessed as part of the Ministry program since both are
Close to Nelson. Climatic data were collected at each site for at least two years. Measurements were conducted annually in 1989, 1990 and 1991.

End Product

Better understanding of the limitations of the 2+0 plug, which will enable more appropriate use of this stock type.

Proposed Technology Transfer

Progress Reports have been produced annually, and presentations have been made to silviculture groups within the region. No progress report was produced in 1990 as data from one plantation were not collected due to early snow. That plantation is considered to be critical to a full understanding of this project.

A full analysis and report is planned after the fifth growing season (1992).

Duration

This project should be maintained for at least five years, to enable appropriate analysis of the early performance of these plantations. The fifth growing season is 1992. Measures at 3 year-intervals are planned after that.

Approximate Costs

1992/93 Fiscal Year

| Research |  
|-----------|--------------------------------------------------|
| Transportation and travel | 0.00  
| Materials and supplies | 0.00  
| Equipment | 0.00  
| Labour |  
| Seedling Assessments | 7,500.00  
| (J.M.J. Holdings) |  
|  
| RESEARCH SUBTOTAL | 7,500.00  
|  
| Technology Transfer |  
| Transportation and travel | 0.00  
| Materials and supplies | 0.00  
| Publication costs | 2,000.00  
|  
| TECHNOLOGY TRANSFER SUBTOTAL | 2,000.00  
|  
| Five Year Budget |  
| 1992/93 | 9,500.00  
| 1993/94 | 0.00  
| 1994/95 | 0.00  
| 1995/96 | 8,000.00  
| 1996/97 | 0.00  

RE: Research Project Approvals: Forest Renewal (FRDA II) and Reforestation Research (FRP) Sub-programs

The attached project(s) for which you are the ministry contact, has been approved for funding in 1991/92. You may start spending your budget if you are in agreement with the following administrative procedures and with the approved project proposal attached.

WORKING PLANS

Project leaders of new projects must submit draft working plans for review by July 12, 1991. Release of further funds could depend on review and revision of working plans. If your project is a problem analysis an action plan is required.

CONTRACTS

Contracts should be prepared by the Ministry Contact and submitted to Karen Edgell, two weeks prior to the start date of the contract. Schedule "A" and Schedule "B" must be completed for each contract. If a contract over $10,000.00 does not go out for bid, a sole source justification letter is required. Sole sourced contracts must be pre-approved by your Section Manager or Forest Sciences Officer, unless they have made delegation arrangements. All contracts must state "subject to the availability of funds in FY 1991/92", until such time as the Ministry budget allocation is finalized. Please ensure you include sufficient contract days and expenses to cover contingencies such as delays because of weather,
equipment failures, and revision of reports. If contractors are responsible for submitting administrative reports, and/or technical reports, these responsibilities should be included in their contracts and sufficient time allocated.

If your contracts are not submitted to Research Branch for preparation (i.e. those under $1000.00 or one time payment) please FAX a copy of the contract to Branch so that office staff can prepare a commitment against your project.

Workers’ Compensation Board coverage is the responsibility of the Contractor. All contracts must include a WCB number or, for those contractors who do not meet the criteria for WCB coverage, a memo should be submitted detailing the reasons. Upon Director’s approval, WCB coverage will be waived and this will be noted in the contract.

EQUIPMENT PURCHASES

Equipment purchases of items over $500.00 must be approved by the Working Group, and are to be purchased by the Ministry of Forests. Merchandise exceeding $200.00 should NOT be included in contract expenses. Once purchased, equipment can be loaned to contractors or universities, upon the signature of the Ministry of Forests contact. The MOF contact will ensure that equipment is returned in good condition to the Ministry at the end of the project, or upon notification.

The loan form, which contractors must also sign, places the responsibility for repairs and replacements on the contractor. In most instances if equipment on field installations is damaged, it will be repaired or replaced by the MOF. However, if equipment on loan is damaged or stolen from the Contractors home or office repair or replacement is the responsibility of the Contractor. The Ministry does not insure its property and contractors may need to make special provision for insurance coverage.

ACCOUNTS

Due to the various funding envelopes, all project expenditures MUST have proper identification for processing. Project numbers have been modified to simplify Branch accounting procedures. Please note the following.../3
prefixes which identify the funding source for your particular project:

BL__ = reforestation research  PMA contact: I. Graeme
FR__ = forest renewal  PMA contact - I. Graeme
IR__ = integrated resources  PMA contact - J. Peterson
B__ = hardwood  PMA contact - K. Hopkins
C__ = vegetation management  PMA contact - K. Hopkins
D__ = site degradation  PMA contact - J. Peterson

FMIS budgetary sheets with accounts and coding information will be forwarded to you once they are available.

REPORTING REQUIREMENTS

Project leaders are responsible for preparing the following administrative reports:

1) Midyear progress report October 1, 1991
2) 3/4 progress report December 31, 1991
3) Year-end report March 31, 1992

Administrative reports are brief reports primarily giving financial status and progress to date. They should be a maximum of 2 pages. Further details on these reports will be sent to you closer to their due date.

We look forward to seeing your research results this fiscal year. Please call if you require further assistance.

[Signature]
Ian Graeme
Program Administrator

IG:1g/4122M
Title:
BL342  A study of the effect of lifting date and storage time on the
erly growth performance of interior spruce seedlings planted in
the summer on a range of sites in the Nelson Forest Region.

Project Leader:
C. Thompson - MOF, Research Silviculturist

Agency Contacts:
MOF - C. Thompson

Principal Clients:
Region - M. Madill
Districts - A. Barklay, B. Beard, A. Pollard, R. Gay

Rationale:

Objectives:
To explore the effect on survival and early growth of 2+0 plug seedlings
planted through the summer.

To compare these results with those obtained in conventional cold-stored
1+0 plugs planted in spring and fresh-lifted 1+0 plug seedlings planted
in the fall, by:

a. Planting seedlings at two weekly intervals through the entire
growing season, and

b. Measuring seedling performance annually for five years.

Proposed Research Approach:
Four locations were established in 1988, with one location in each of
Boundary, Revelstoke, Golden and Cranbrook Districts. Planting started
on June 15, and continued at two-weekly intervals until October 15.
These plantations were measured twice in 1988. Two other locations were
established in 1987, but they are being assessed as part of the Ministry
program since both are close to Nelson.
Measurements were continued in 1989 and 1990, but the 1990 measures were incomplete due to early snowfall.

8) **End Product:**

Better understanding of the limitations of the 2+0 plug, which will enable more appropriate use of this stock type.

9) **Proposed Technology Transfer:**

Progress Reports have been produced annually, and presentations have been made to silviculture groups within the region. No progress report was produced in 1990 as data from one plantation were not collected due to early snow. That plantation is considered to be critical to a full understanding of this project.

A full analysis and report is planned after the fifth growing season.

10) **Duration:**

This project should be maintained for at least five years, to enable appropriate analysis of the early performance of these plantations. The fifth growing season is 1992.

11) **Approximate Cost:**

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Project Proposal

1. Title: A Study of the Effect of Lifting Date and Storage Time on the Early Growth Performance of Interior Spruce Seedlings planted in the Summer on a Range of Sites in the Nelson Forest Region.

2. Project Leader:
   
   BCFS - Chris Thompson, Research Silviculturist.
   518 Lake Street, Nelson, 354-6285

3. Contacts:
   
   a. Agency Contacts:
      BCFS - Chris Thompson (Nelson)
      518 Lake Street, Nelson, 354-6285
   
   b. Principle Clients:
      Region - M. Madill
      Districts - A. Barklay, B. Beard, A. Pollard, R. Gay

4. Objectives:

   To explore the effect on survival and early growth of 2+0 plug seedlings planted through the summer, and

   To compare these results with those obtained in conventional cold-stored 1+0 plugs planted in spring and fresh-lifted 1+0 plug seedlings planted in the fall, by:

   a. Planting seedlings at two weekly intervals through the entire growing season, and
   b. Measuring seedling performance annually for five years.

5. Proposed Approach:

   Four locations were established in 1988, with one location in each of Boundary, Revelstoke, Golden and Cranbrook Districts. Planting started on June 15, and continued at two-weekly intervals until October 15. These plantations were measured twice in 1988. Two other locations were established in 1987, but they are being assessed as part of the Ministry program since both are close to Nelson.

   Measurements were continued in 1989 and 1990, but the 1990 measures were incomplete due to early snowfall.

6. End Product:

   Better understanding of the limitations of the 2+0 plug, which will enable more appropriate use of this stock type.
7. Extension and Demonstration:

Progress Reports have been produced annually, and presentations have been made to silviculture groups within the region. No progress report was produced in 1990 as data from one plantation were not collected due to early snow. That plantation is considered to be critical to a full understanding of this project.

A full analysis and report is planned after the fifth growing season.

8. Duration:

This project should be maintained for at least five years, to enable appropriate analysis of the early performance of these plantations. The fifth growing season is 1992.

9. Cost:

This project was originally funded by FRDA I as project 3.42

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<td>To be combined with Alan Vyse and Kamloops plantations</td>
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<td>h. Five-year budget</td>
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BASIS for FRDA 3.42 Budget

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Total Cost 8,480.00
Subject: 3.42

Please tell Robbie what you need for maintaining plots etc. All I need is $6 for publication of the results if I can get time to even look at the damn file. Perhaps we should get together before the field season at some remote mountain hideaway. Would John approve??

Regards,
Alan Vyse, Kamloops Region 828-4158

Need 2-pager to cover $ for this project.

Spring

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A study of the effects of lifting date and storage time on the early growth performance of interior spruce seedlings planted in the summer on a range of sites in the Nelson region.

Officer i/c: C. Thompson
Location: various
Region/District or Nursery: Nelson/Various

Objective: To explore the effect on survival and early growth of 2+0 plug seedlings planted through the summer, and to compare the results with those obtained with conventional cold-stored 1+0 plugs planted in the spring and fresh-lifted 1+0 plug seedlings planted in the fall.

Progress: Six different sites were selected and were planted at two weekly intervals starting in mid-July in 1987 and mid-June in 1988.

Survival was good at all locations, except for the 1987 plantations. The performance can be related to characteristics of the site. Plantations in the ICH did not do well, especially where summer droughts were recorded. Sites with higher summer warmth limit planting to June and July. Planting after that produces poorer performance. Cooler sites essentially have a season-long planting window.

No improvement in performance was detected on any site, when compared with conventional spring and fall planted stock.

Next Scheduled Assessment: Fall 1991

Report Distribution: Silviculture Branch
Silviculture, Nelson Region
Cranbrook, Golden, Revelstoke, Arrow, Boundary and Kootenay Lake Districts
Forest Sciences Section, Nelson Region

Incomplete
FALL ASSESSMENTS - BL342 - 1991

ALBERT CANYON:

The stakes and tree markers are still in place and mostly legible. There is yellow ribbon tied to the first and last stake in each block. Please ensure that the stakes are re-pounded if necessary, and that the line numbers on the stakes are renewed, the rest of the identification is not essential. The tree markers are still present, but the red has faded.

This is a generally good location - some of the trees can be called excellent, but look at the trees surrounding the plots to judge what this location can do - they are the same age as "our" trees. Look for lamas growth, and for free growth, they could produce trees that are a little misleading. There could be some really good growth on some of these trees.

I noted:
- a few double tops - Sn or Ln.
- some seedlings stressed by being overtopped - FV
- a few trees with chlorotic tops - FN
- a few trees with "cup hook" stems (snow?) - SX
- one tree with what looked like severe frost damage (unlikely) - code as SU

GLENOGLE CREEK:

The lines all appear to be intact. The red tree markers have faded, but the blue are intact. There are no line labels, but the lines are all numbered from left to right, looking up-hill. There are now white plastic pipes marking the start and end of each base line. The beginning tree and the ending tree in each line are also marked with yellow ribbon, you may want to add another colour to the beginning tree. Also the wire for each tree should be stood up.

The opening was planted in summer 1991 using summer stock. Some trees were planted in our plots. These are obvious due to the screef. FULL THEM OUT. Occasionally it seems that the planters "borrowed" the odd tree marker for their own trees, watch for this and return the marker to where it should be. There are survival plots in the study plots, the trees in these are marked with blue ribbon - don't let this confuse you, particularly those lines that were originally marked in red.

I noted:
- Aphids, both on branches and terminals - BI or TI, TI has priority.
- Occasional Chlorosis - FN
- Double stems and double leaders - Ln and Sn
- What looks like frost is aphid damage.
- In the denser fireweed patches there is some - FY

Some trees have multiple defects. Choose the most important for recording.

Watch out for Naturals.

There is free growth on some trees, so leaders of 30 to 40 cm will occur.

AKAN CREEK:

The line numbers on the stakes are mostly still legible. They need renewing, and those stakes that have fallen over need re-pounding. There are white pipes with yellow flagging at either end of the base lines of plots 2, 3 and 4. Plot 1 has large wires with yellow flagging. Some wires have lost their flagging. Re-flag these, using alternate lines of blue and red (orange if you want).

Generally looks OK. Some lines are excellent. There appears to be a treatment related response developing, in that some lines are doing better than others.

I noted:
- Aphids on leader and branches - LI or BI
- Stem Dieback - SU
- Multiple Stems and Leaders - Sn or Ln - some of these still have no dominance expressed. Choose the tallest one to measure.
- Weak Foliage in the thicker patches of Fireweed - FY - often this is identified by the nature of the vegetation surrounding the tree!
- Looks like browsing on a few trees - LB or SB
- A stem buried by surface erosion - SX - not really mechanical, but growth was being continued by a low lateral.

TRAVERSE CREEK

There is active logging with skidding down the road, between K5 and K6 on the Traverse Creek Road.

BL 342

Overall good growth, with some trees now over 100 cm and leaders of over 40 cm. In some rows the trees are still quite short, looks like a treatment effect.

I noted:
- major stem die back, with low laterals taking over (SU)
- adelges on branches and terminal (TI or BI).
- browsing on one tree (LB)
- multiple stems are still present, and one case of double leader, in all cases dominance seems to be resolved (Ln or Sn).
- root rot, displayed by mortality - the tree grew well this year, but died suddenly. Code these trees as (ORD)
- browsing on the needles, probably by insect (FI).

All markers from spring are still evident. No maintenance should be required here.

**BL 309**

The pins for the fifth trees need standing up, and re-flagging.

This plantation is very similar to that of 342. Codes from that trial at this location can be used here. If anything it is doing better than 342 in terms of growth.

There are three trees in plot 2 that have also died of root rot. Code them the same way.
Active logging with skidding down the road between K5 and K6 on the Traverse Creek Road.

**BL 342**

Overall good growth, with some trees now over 100 cm and leaders of over 40 cm. In some rows the trees are still quite short, looks like a treatment effect.

I noted:
- major stem die back, with low laterals taking over (SU)
- adelges on branches and terminal (TI or BI).
- browsing on one tree (LB)
- multiple stems are still present, and one case of double leader, in all cases dominance seems to be resolved (Ln or Sn).
- multiple leaders are usually due to rosette buds, but double leaders usually have the original leader and a lateral in competition.
- root rot, displayed by mortality - the tree grew well this year, but died suddenly. Code these trees as (ORD)
- browsing on the needles, probably by insect (FI).

All markers from spring are still evident. No maintenance should be required here.

Need to decide on the future of this trial, and replace the wooden stakes with plastic, if it is to continue.

**BL 309**

The pins for the fifth trees need standing up, and re-flagging.

This plantation is very similar to that of 342. If anything it is doing better than 342 in terms of growth.

There are three trees in plot 2 that have also died of root rot.

**Both Studies**

Vegetation is coming in quite slowly, Fireweed, thimbleberry, Azalea and rhododendron are both re-sprouting. 309 has quite a bit of elderberry, in contrast to 342. height and cover are about the same on both sides.
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<tr>
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<td>13 - 16</td>
<td>TRAV, ALBE, GLEN, AKAN</td>
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<td>L = leader, T = terminal bud</td>
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<td></td>
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<td>B = branch, R = root collar</td>
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<td>A = OK, Z = missing</td>
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<td>Z = missing, n = multiple</td>
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<td>other codes can be used if required.</td>
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<tr>
<td>Final Height</td>
<td>35 - 39</td>
<td>to base of new terminal bud</td>
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<tr>
<td>Final Diameter</td>
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<td>mm. to nearest 0.1mm</td>
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<td>Treatment</td>
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<td>SPRI, LIFT, STOR, FALL</td>
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AXAN CREEK - 1991-08-29

The line numbers on the stakes are mostly still legible. They need renewing, and those stakes that have fallen over need repounding. There are white pipes with yellow flagging at either end of the base lines of plots 2, 3 and 4. Plot 1 has large wires with yellow flagging. Some wires have lost their flagging. Re-flag these, using alternate lines of blue and red (orange if you want).

Generally looks OK. Some lines are excellent. There appears to be a treatment related response developing, in that some lines are doing better than others.

I noted:
- Aphids on leader and branches - LI or BI
- Stem Dieback - SU
- Multiple Stems and Leaders - Sn or Ln - some of these still have no dominance expressed. Choose the tallest one to measure.
- Weak Foliage in the thicker patches of Fireweed - FV - often this is identified by the nature of the vegetation surrounding the tree!
- Looks like browsing on a few trees - LB or SB
- A stem buried by surface erosion - SX - not really mechanical, but growth was being continued by a low lateral.

The first two lines in plot 2 are in a depression. This has resulted in heavy herbaceous vegetation, and heavier than typical competition to the trees.

The burn at this location had quite a high impact. Even after four years, the vegetation is still at an acceptable level posing little obvious threat to the seedlings. Originally it was predominantly Menziesia, Vaccinium and Rhododendron, with some Lonicera utahensis in the slight depressions. Fire reduced these species considerably, resulting in a large component of fireweed, with some thimbleberry, together with many sub-alpine herbs, mostly in the slight depressions. These include Indian hellebore, Thalidichum, and Arnica. The shrub species are recovering, but are still clumps of no more than 40 cm high, except black elderberry which is about 70 cm high. The only places where vegetation appears to be posing a threat are in the few dense patches of fireweed, and the slight depressions where the sub-alpine herbs are coming in.

Other species noted include Tiarella, Clintonia, Valeriana, V. scoparium on the slight humps, Carex sp.
Soil:
0 - 6 cm organic mat (Mor)
6 - 15 cm bleached horizon
15 - 24 cm orange brown horizon
24 - 55 cm gradual darkening of soil with depth

Majority of rooting occurs in the top 45 cm, though roots occur to 55 cm.

Gravelly silt derived from colluvial parent material. No large coarse fragments, but numerous large gravel of angular dark fine grained material.

Probably a podsol.
GLENOGLE CREEK - 1991-09-27

Noted:
Aphids, both on branches and terminals - BI or TI, TI has priority.  
Occasional Chlorosis - FN  
Double stems and double leaders - LN and SN  
What looks like frost is aphid damage.  
In the denser fireweed patches there is some - FV

Some trees have multiple defects. Choose the most important for recording.

Watch out for Naturals.  
There is free growth on some trees, so leaders of 30 to 40 cm will occur.

The opening was planted in summer 1991 using summer stock. Some trees were planted in our plots. These are obvious due to the screef. PULL THEM OUT. Occasionally it seems that the planters "borrowed" the odd tree marker for their own trees, watch for this and return the marker to where it should be. There are survival plots in the study plots, the trees in these are marked with blue ribbon - don't let this confuse you, particularly those lines that were originally marked in red.

The lines all appear to be intact. The red tree markers have faded, but the blue is intact. There are no line labels, but they are all numbered from left to right, looking up-hill. There are now white plastic pipes marking the start and end of each base line. The beginning tree and the ending tree in each line are also marked with yellow ribbon, you may want to add another colour to the beginning tree. Also the wire for each tree should be stood up.

This plantation has a great range of trees in it. The current size need to be related to the initial size - remember there is a substituted seed lot in this plantation.
Stakes and tree markers are still in place. The line stakes will need re-pounding. The blue flags are still evident, but the red ones have faded to white. The line numbers on the stakes will need renewing to last another year. The other treatment information on the stakes is not important. There is a yellow ribbon on the first and last line stake in each block.

One looks like severe frost damage - doubtful. Foliage damage due to vegetation was noted. The tops of a few trees are chlorotic. A few trees have cup-hook stems due to snow damage.

Generally Good. Occasional double top - inconsequential. Many are clear of the vegetation which is relatively low - consisting of raspberry (opportunism), some thimbleberry and fireweed. Probably due to the aggressive site treatments. Some seedlings under fireweed, etc. are showing signs of vegetation stress.

Warmth and moisture in mid-July have stimulated free growth in some seedlings - these may have very large leaders.

Need to accommodate trees over 100 cm in the data format.

When assessing this study, try picking the best treatment at each location, and then comparing all other treatments at that location against it.
a. Project Title:

3.42 A Study of the Effect of Lifting Date and Storage Time on the Early Growth Performance of Interior Spruce Seedlings planted in the Summer on a Range of Sites in the Nelson Forest Region.

b. Project Leader: C.F. Thompson (BCFS), Research Silviculturist, 518 Lake Street, Nelson. 354-6285

c. Contacts: MOF - Chris Thompson (Nelson)
FORCAN - W. Coombs

d. Clients: Region - M. Madill
Districts - A Barklay, W. Beard, A. Pollard, R. Gay

e. Objective:

To explore the effect on survival and early growth of 2+0 plug seedlings planted through the summer, and

To compare these results with those obtained in conventional cold-stored 1+0 plugs planted in spring and fresh-lifted 1+0 plug seedlings planted in the fall.

f. Accomplishments:

Plantations were created at six locations. These were in the ICHa1, ICHa2, ICHb, ESSFa and ESSFc. The first two were planted in 1987, and remainder in 1988. There were seven planting dates at two-weekly intervals in 1987 and ten in 1988. Selected soil and atmospheric microclimatic parameters were monitored at each location. At five of the locations, this continued for two years. Seedling assessments were conducted once or twice annually.

g. Continuing Works:

Seedling assessments are planned to continue until the fifth growing season, except for the first two locations, where survival was unacceptably low.

h. Further Research:

Additional work is required to understand the changes in the physiology and morphology of 2+0 stock as it is held in the nursery through the season.
This is of particular concern, given the frequent practice of holding "summer" stock for planting as "cold-stored" stock the following spring. A comparison of seedling performance from the two treatments is required.

i. E and D Products:

Similar plantations were created in the Kamloops Region. They will eventually be reported jointly, but final reporting is not planned until the plantations have completed five growing seasons.

Informal presentation of the results from this trial have been as opportunity was presented.

The project is producing a better understanding of the limitations of the 2+0 plug, which will enable more appropriate use of this stock type.

j. 1989/90 Budget (Actual):

<table>
<thead>
<tr>
<th>Description</th>
<th>Amount</th>
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<tbody>
<tr>
<td>Contract Fees and Expenses</td>
<td>3119.00</td>
</tr>
<tr>
<td>Ministry of Forests Travel</td>
<td></td>
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<tr>
<td>Materials and Supplies</td>
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<tr>
<td>Equipment</td>
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</tr>
<tr>
<td>Extension and Demonstration</td>
<td></td>
</tr>
<tr>
<td>Other</td>
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</tbody>
</table>

**TOTAL 1990-91** 3119.00

C.F. Thompson  

April 15, 1991
Canada–British Columbia
Forest Resources Development Agreement (FRDA)
1985–90 Backlog Reforestation Program
Research and Development Sub-Program

MIDYEAR REPORT

a. Project Number and Title:

3.42 A Study of the Effect of Lifting Date and Storage Time on the Early Growth Performance of Interior Spruce Seedlings planted in the Summer on a Range of Sites in the Nelson Forest Region.

b. Project Leader: C.F. Thompson (BCFS), Research Silviculturist, 518 Lake Street, Nelson, 354-6285

c. This year's objectives:

To reassess each plantation in this study in the Nelson Region, and to continue climatic monitoring for another growing season. The project will be reported internally by March, 1991.

d. Accomplishments to September 30, 1990

Assessments at all location will be completed by October 10th, and the climate stations were continued. The stations will all be removed in mid-October.

e. Budget:

- spent to September 30, 1990 0.00
- forecast to December 31, 1990 6300.00
- forecast to March 31, 1991 6300.00

- the budget is fully committed, a slight underexpenditure is anticipated, however its magnitude is not known at this time.

f. Publication Progress:

Similar plantations were created in the Kamloops Region. They will eventually be reported jointly, but final reporting is not planned until the plantations have completed five growing seasons. This is their third season.

The project is producing a better understanding of the limitations of the 2+0 plug, which will enable more appropriate use of this stock type.

C.F. Thompson

October 4, 1990

1
Notes for the FALL 1990 Assessment of FRDA 3.42

1. Akan Creek

a. Access:

km = 00.0 Start on Bridge over Elk River by Morrissey Provincial Park. Right turn, then Left Fork over bridge.
3.1 Fork right onto River Road.
3.9 Straight ahead onto Lodgepole Road (KM16.5). There could be logging traffic all the way to the Howell Creek Road.
12.4 Left Fork stay on Lodgepole Road. Follow Chevron Sign (KM25.2). Watch out for sharp bend at KM26.
29.7 Right fork at "Flathead Access Plan"
31.7 Lodgepole Pass, road changes to Harvey Creek
34.6 Turn right onto Howell Creek Road
34.8 Left Fork
35.6 Fork Right onto landing, swing round through landing and follow road up round hill. Road has been waterbared recently.
37.3 Landing for parking. Look for multicoloured flagging on left. You are right above plot 1.

b. Layout:

There are four plots. Plot 1 is immediately below you, with plot 2 in line with it to the left as you look at them from the landing. Plot 2 is staggered slightly up hill from plot 1. Plots 4 is on top of plot 3 a little further up the road, but still on the down hill side. The Climate station is by line 10 of plot 3.

At all locations in this study, line 1 in each plot is on the left hand end of the plot when viewed uphill. The baseline of each plot is marked by a numbered stake. The line numbers are mostly legible. Lines were spaced at 2 m apart.

Each seedling is marked by a wire flag. The wires appear to be all there, but some of the flags have weathered off. The rows were red and blue alternately. Seedlings were spaced at 1 m in the line.

Take care that you do not mix tree 10 in plot 3 with tree 1 in plot 4!

c. Seedling Notes:

In my walk through I noticed: Unflushed leader CODE TU
Aphids
Chlorosis
Weak foliage from competition
Dead leader or stem
Frost damage

CODE BI or LI depending on where it occurs
CODE FN
CODE FV - mostly in arnica patches
CODE LU or SU
CODE FF

Multiple Leaders - only count these if they occurred this year. CODE L1 or L2 or L3 etc depending on how many. If more than 9 use L9. Multiple tops on both double leaders from 1989 could make quite a large number. Multiple leaders per se are no reason for reducing condition from 3 to 2. In many cases these do not look like leaders, but more like a flat topped rosette of branches. Remember the dominance rule of measurement. If there is a well established obvious leader measure it, in that case the "also-ran" leaders don't count. To measure growth in the case of multiple leaders - use the longest branch of the rosette.

Watch especially for trees with very short growth (1cm) in 1990. I did not see any trees that had not grown in 1990. If you find some, then obviously height89 will be the same as height90.
2. Glenogle Creek

a. Access:

km = 00.0 Start at junction of Hwy 95 and Hwy 1, and proceed East on Hwy 1 (towards Field).
16.9 Start of Glenogle Creek Road at Transport brake-testing location on Hwy 1. (KM 19)
20.8 Fork left to descend into canyon
22.0 Cross bridge over Glenogle Creek (KM 23.5)
Climb long steep hill with two long switch-backs.
26.2 Straight Ahead as you enter clearcut (KM 27.5)
27.5 Straight Ahead
28.9 Straight Ahead
29.0 The plots are below you on your right. Look for multi coloured flagging at road side. Note Climate Station.

b. Layout:

There are four plots with the right edges (as you look up the hill) immediately below the climate station. There is a yellow flag at the right and left end of the base line of each plot. The plots are stacked ladder like, with no vertical space between each plot. Each line of 10 trees is marked by alternating red (used to be) and blue flags. There are 25 lines in each plot, each line with 10 trees. Line #1 is at the left end of each plot (looking up the hill), and line #25 is at the right end. Plot 1 is at the bottom, Plot 4 is at the top. The start of each line is marked by the remnants of square red flags, with the line ID written on them. The line numbers (all you need) are just legible. During measurement, you may want to tie a flag to the last tree in each line to avoid confusion with the first tree in the plot above it.

c. Seedling Notes:

The seedling are generally doing well. In my walk through I noted some occurences of:

Frost CODE FF
Damage to the stems by fireweed CODE SV
Chlorosis CODE FN
Browsing CODE LB
Dead tops CODE LU if to this year, SU if to more than this year
Multiple leaders - see notes on Akan Cr

Watch out for short growth in 1990 (see Akan Creek)

Also watch for aphid attack. At first glance it looks like frost damage. CODE as BI or LI depending on where it occurs. Obviously LI has priority over BI.
3. Albert Canyon

a. Access:

   km = 00.0 Start at stop light by Shell station on Hwy 1
   18.2 National Parks Check Point
   33.5 There is a borrow pit on the left hand side, just
   before the highway bridge over the Incompleaux
   River (I spelled that wrong) at Albert Canyon,
   just before the Highways Yard. Go through it and
   up the narrow steep road on the other side. You
   will probably want to use 4WD. Once into the
   opening follow that road to
   34.1 and look for multicoloured flagging on the left.

b. Layout:

   There are four plots at right angles to the road. Each plot
   is between two windrows, with one windrow between each
   plot. There are two windrows between plots 3 and 4. The
   climate station is by line 10 in plot 3. Plot 1 is the
   furthest west.

   The base line is on the west of each plot, which means that
   line 1 is furthest away from the road. All line numbers are
   visible on all stakes and there is yellow flagging tied to
   the first and last stake in each plot. Some of the wire
   markers are not very clear, and the spacing between lines
   varies a little to accommodate debris.

c. Seedling Notes:

   I noted:
   chlorosis CODE FN
   bend stems due to vegetation CODE SV
   wires wrapped round trees CODE SX
   weak foliage due to vegetation CODE FV
   dead tops CODE SU (or IU)
   double tops, but in most cases dominance is expressed, and
   you should have no trouble.

   This should be a straight forward plantation - your biggest
   challenge will be finding the trees in the vegetation. The
   spacing was good when planted, but this location has the
   highest mortality, so there are some dead trees.

   Don't be afraid to call some of these excellent - some of
   them are! But don't be too generous, look at the
   plantation that surrounds these plots, it was created the
   same spring. Watch out for these plantation trees, some of
   them get quite close to our trees.
4. Traverse Creek

a. Access:

You are familiar with this location. If in doubt, consult the establishment report of FRDA 3.09. This project is in the same opening. The plots are on the right as you fork left to go to 3.09.

b. Layout:

There are three plots in line right beside the road on the right hand side. These are plots 1, 3 and 4. Plot 2 is immediately west of plot 1 and there is a small gap between plot 3 and plot 4. Line are numbered with your back to the road.

There is yellow flagging tied to the stakes for lines 1 and 25 in each plot. The stakes are all there, and the numbers are legible.

There were no trees planted in one treatment - use your layouts. Obviously there is no need to measure this line.

c. Seedling Notes:

This is mostly a good plantation, with little of concern. Many trees are doing very well, but a few have grown very poorly (1 cm) - measure these with care. There are also a few that are trying to put on lamas growth. Measure these with care.

I noted: occasional browning of needles, (rodents in the grass) (FB) stems pressed down by vegetation (SV) and a few multiple tops (fewer than at Akan or Glenogle). Treat these like at Akan and Glenogle.
FRDA PROJECT 3.42  
1990 Data Format

<table>
<thead>
<tr>
<th>Item:</th>
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<th>Remarks:</th>
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<tr>
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<tr>
<td>Year</td>
<td>10 - 11</td>
<td>90</td>
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**Husky format start here....**

<table>
<thead>
<tr>
<th>Location</th>
<th>13 - 16</th>
<th>TRAV, ALBE, GLEN, AKAN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Block</td>
<td>17</td>
<td>1 - 4</td>
</tr>
<tr>
<td>Line</td>
<td>19 - 20</td>
<td>1 - 25</td>
</tr>
<tr>
<td>Tree Number</td>
<td>22 - 23</td>
<td>01 - 10</td>
</tr>
<tr>
<td>Condition</td>
<td>25</td>
<td>0 = dead, 1 = poor, 2 = fair, 3 = good, 4 = excellent, 9 = missing</td>
</tr>
<tr>
<td>Damaged Portion</td>
<td>26</td>
<td>S = stem, F = foliage, L = leader, T = terminal bud, B = branch, R = root collar, A = OK, Z = missing</td>
</tr>
<tr>
<td>Damaging Agent</td>
<td>27</td>
<td>D = disease, I = insect, B = browsed, R = rodent, F = frost, N = nutrition, M = drought, S = snow press, H = herbicide, X = mechanical, T = high temperature, A = none, U = unknown, Z = missing, n = multiple wound (count), other codes can be used if required.</td>
</tr>
</tbody>
</table>

**Initial Height** 29 - 32 cm. to nearest 0.5cm
**Final Height** 34 - 37 to base of new terminal bud
**Final Diameter** 39 - 42 mm. to nearest 0.1mm

**Note Add later....**
**Planting Date**
**Treatment** SPRI, LIFT, STOR, FALL
Access to opening is up steep narrow road in borrow pit just before bridge over river.