canada/yukon economic development agreement

Tree Planting Contract

4133 - 021

WATSON LAKE DISTRICT

JULY 16 TO 28, 1993

COOPERATIVE AGREEMENT

FORESTRY DEVELOPMENT

Canada

Yukon Government

TREE PLANTING CONTRACT

4133-021

WATSON LAKE DISTRICT

JULY 16 TO 28, 1993

COOPERATIVE AGREEMENT:FORESTRY DEVELOPMENT

Prepared for:

Management Committee
Cooperative Agreement:Forestry Development
Whitehorse, Yukon

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Northern Affairs Program
Forest Resources

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1.00 INTRODUCTION

Forest Resources of the Northern Affairs Program has never had a legislated mandate covering silvicultural projects. As a result, none of the forest area harvested in the Yukon has been reforested. In 1980 Cattermole Timber Ltd. scarified an area exceeding 100 hectares in the Coal River Block of the Timber Harvesting Agreement (Hyland River sites). This operation was done as required by their Timber Harvesting Agreement. There was no planting or seeding treatment carried out. Until the Cooperative Agreement:Forestry Development was signed, this was the only operational level silviculture enhancement program to be under taken in Yukon.

In December of 1991 the Government of Yukon and Forestry Canada signed the Cooperative Agreement:Forestry Development (CA:FD). Section 2.3 of the Agreement states, in part, "The overall objective of this Agreement is to promote the sustainable development of the forest resources of the Yukon thereby ensuring a continuous supply of forest resources..." In order to meet this objective the Agreement is to "(c) establish an operational silvicultural program to enhance the timber supply and forest health including the reforestation of up to 500 hectares of forest not satisfactorily regenerated."(NSR).

In December 1992 a contract between Forestry Canada and Pelton Reforestation Ltd. was signed for the production of 900,000 tree seedlings. White spruce (**Picea glauca**) seed was provided by Northern Affairs Forest Resources. This seed was collected under a project paid for by the Renewable Resources Economic Development Agreement in 1990.

The following report documents the site preparation and planting operations for some 200,000 seedlings in the Watson Lake District.

2.00 BACKGROUND

2.10 SITE VIEWING

Advertising for the mandatory on-site viewing was completed throughout western Canada in April, 1993. On May 17th, seven contractors (or their representatives) from Yukon, Alberta and British Columbia attended. They were escorted to the prepared blocks where they were informed of the required planting specifications and allowed to assess the site conditions, access and the planting window to meet those demands and arrive at their final bids.

2.20 TENDER REVIEW

Tenders were received by 2:00 PM (1400 HRS) Pacific Daylight Time, Thursday May 27, 1993. A review committee consisting of employees of Northern Affairs Forest Resources and Forestry Canada reviewed the submissions.

In general, contract reforestation of any kind is new to the Yukon and there is limited expertise in the local logging industry. To ensure that the funding generously provided by the CA:FD was put to the best possible use, evaluation criteria were developed to more soundly assess the technical suitability of tender submissions. Table 1 summarizes the criteria used to make the assessments on the planting proposals.

3.00 METHODS

3.10 SITE PREPARATION

Two methods of site preparation, straight blading and excavator mounding, were undertaken on 222 hectares of NSR lands in November/December 1992. The project was designed to compare the site preparation equipment and microsites (plantable sites) created by each.

The CA:FD had several purposes in carrying out this program including raising the profile of silviculture in Yukon, training of local contractors and operators, raising soil temperatures, creating planting microsites while facilitating natural regeneration, and avoiding areas of established natural seedlings.

The objectives of site preparation on these sites included:

1. raising the soil temperature within the planting micro-site,
2. reducing or eliminating competition from other vegetation in the immediate area around the planting micro-site,
3. improving soil moisture conditions (mounding),
4. reducing soil bulk density,
5. increasing planting density.

Evaluation Criteria	Maximum Points	Weighting Factor
1. Attended Viewing	25	0.114
2.1 Tender Form Part A[1]	Must be included	Missing? Refuse
2.2 Tender Form Part B	Must be included	Missing? Refuse
2.3 Tender Form Part C	Must be included	Missing? Refuse
2.4 Tender Form Part D	Must be included	Missing? Refuse
3.Deposit	Must be included	Missing? Refuse
4.Project Understanding	10	0.045
5.Workplan	25	0.114
6.Experience	20	0.091
7.Ability to Deliver	15	0.068
8.Training & Local Hire	25	0.114
9. Cost	100	0.455
TOTAL	220	1.000

Table 1: Criteria for bid assessment.

[1]If a bidder did not attend the viewing or failed to submit any of the required documents in points 2.1 through 3., the bid was automatically rejected. Ability to Deliver was assessed through interviews with previous contracting agents supplied by the bidder.

Each type of site preparation treatment has its respective strengths and weaknesses. These attributes become apparent under different slope conditions, season of treatment, soil types, competitive vegetation type and season of harvest. These sites were harvested in the mid- to late 1980's during summer and winter in the Upper Liard area, Yukon (see Fig. 1).

3.11 AREA PREPARED BY TREATMENT TYPE

3.111 BLADING

Blade scarification was completed on 141.4 ha's while 32.6 ha's were treated with an excavator mounder. A total of 174 ha's were treated from October 9 to December 14, 1992.

Prime movers were selected based on their availability in the Watson Lake area and presence of the treatment equipment required to meet the objectives of the site preparation program (six-way blades and mounding buckets with appropriate mounting fixtures).

Two crawler tractors were used in this program. A John Deere 850 (D-6 equivalent) and a Komatsu D85 (D-7 equivalent). Both were equipped with 6-way blades. The John Deere worked well at the beginning of the program when frost penetration was not great and larger stumps were not frozen hard. With temperatures below -35 degrees celsius and ground conditions very hard, this machine was unable to create the disturbance required. The Komatsu had no difficulties with any of the sites or the conditions under which it worked. In the extreme cold it tended to shear through the stumps with little difficulty.

The blading was done in strips across the blocks. Orientation was done to compare east-west and north-south orientation of the strips. A strip was left untreated to contain debris piled off of the scarified strip with an untouched strip on the other side of the scarified strip. This pattern was alternated across the block.

The operators of both machines were experienced, conscientious and from Watson Lake. Both machines were contracted from The North Contracting. A total of 141.4 hectares of ground were site prepared using the crawlers.

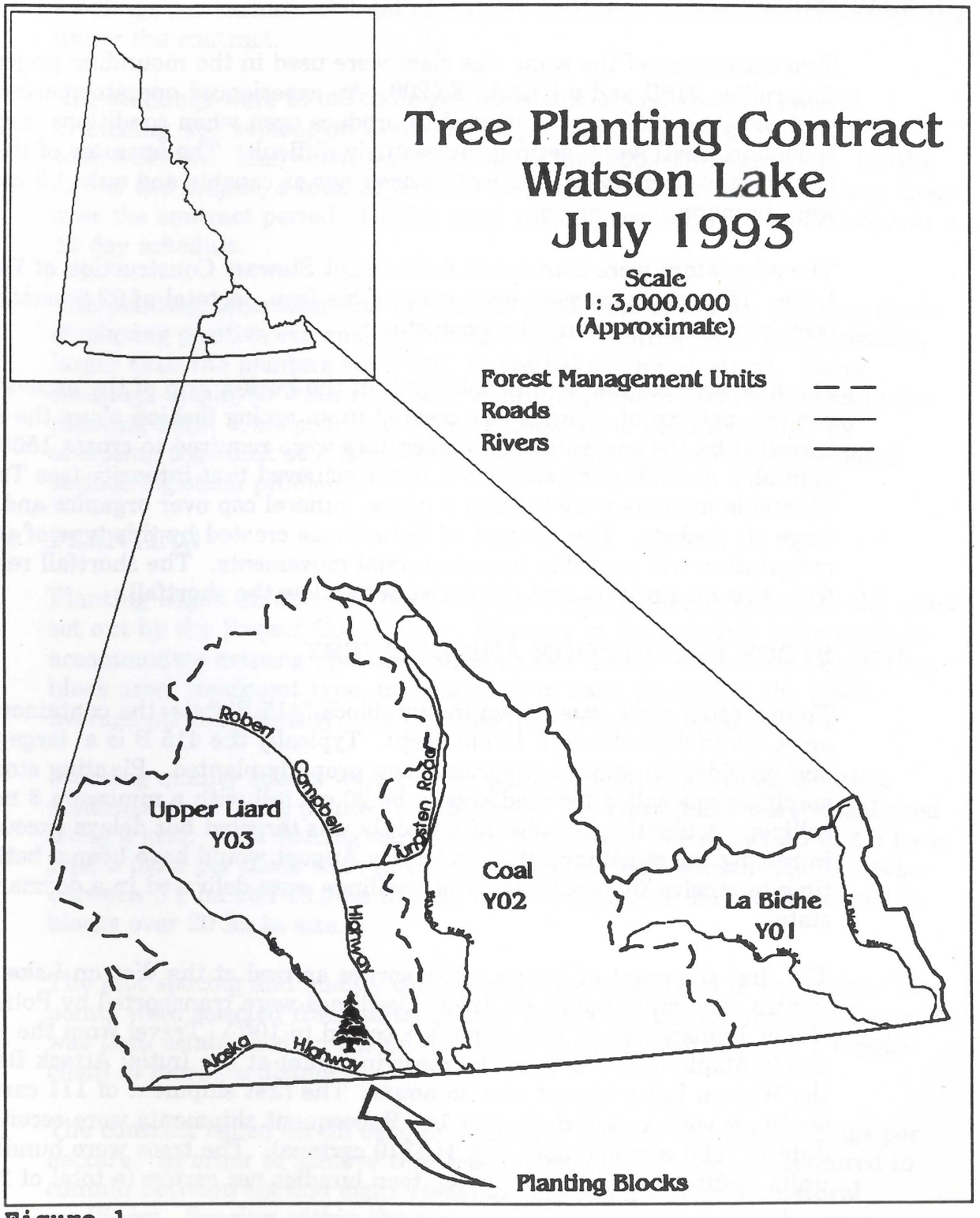
Tree Planting Contract
Watson Lake
July 1993
Scale
1: 3,000,000
(Approximate)
Forest Management Units
Roads
Rivers
Robert Campbell
Tungsten Road
Upper Liard
Y03
Coal
Y02
La Biche
Y01
Alaska Highway
Planting Blocks

Figure 1.

3.112 MOUNDING

Two excavators of the same size class were used in the mounding project, a Caterpillar 215B and a Hitachi EX200. An experienced operator performed well with the 215B and continued to produce even when conditions (depth of snow and frost) were getting increasingly difficult. The operator of the EX200, however, was not as experienced nor as capable and only 4.8 hectares were prepared.

The excavators were contracted from Grant Stewart Construction of Watson Lake. The operators were employees of his firm. A total of 32.6 hectares were site prepared using the excavators.

Mounds were created within the reach of the bucket arm of the excavator. A random pattern of mounds was created in an arcing fashion along the route travelled by the excavator. The operators were required to create 1500 plantable mounds per hectare but never achieved that intensity (see Table 2). Plantable mounds were to have a hinge, mineral cap over organics and no large air pockets. The amount of disturbance created by this type of site preparation will probably impede animal movements. The shortfall resulted from this observation and the decision to allow the shortfall.

3.20 STOCK PRODUCTION AND DELIVERY

The planting stock was grown in styroblock "415 B's" (ie. the container cells are 4 cm in diameter and 15 cm deep). Typically the 415 B is a large plug and provides for good root egress when properly planted. Planting stock specifications called for seedlings to be 20 cm tall with a minimum 3 mm root calliper. A planting window of mid-July was targeted but delays encountered in raising the stock indicated that early August would have been a better time to receive the seedlings. The seedlings were delivered in a dormant state.

The first shipment of Yukon white spruce arrived at the Watson Lake Fire Centre at midnight July 14, 1993. Seedlings were transported by Points North Transportation Inc. in reefers cooled to 10^0C. Travel from the nursery site in Maple Ridge, B.C. to the receiving point at the Initial Attack Base at the Watson Lake Airport was 36 hours. The first shipment of 111 cartons of seedlings were received on July 14. Subsequent shipments were received on July 17 (260 cartons) and July 24 (370 cartons). The trees were bundled in units of fifteen seedlings with eighteen bundles per carton (a total of 270

seedlings per carton). A total of 200,070 seedlings were delivered as required under the contract.

The seedlings were found to be generally robust and sturdy. Lateral branching was evident on some seedlings. Shoots appeared to be vibrant with buds set. Many root tips were white and apparently growing. By the end of the project, a total of 200,070 seedlings were received in Watson Lake over the contract period. Of this total 199,395 seedlings were planted over a 12 day schedule.

The planting contractor had favourable comments about the planting stock displaying positive external signs of growth. Planting stock was generally larger then the planters were used to (verbal communication). Some seedlings displayed week root balls where plugs were breaking down in the planting bags. This poor development could have been alleviated by accepting the stock at a later date, however this delay would have posed serious logistical problems.

3.30 PLANTING

Planting began on July 16, 1993. Blocks were planted according to the order set out by the Project Coordinator. Changes in the schedule were made to accommodate existing ground conditions and access. The order of planting, block area, treatment type, total number of trees planted in the block, average planting density, and planting quality are listed in Table 2.

Planting quality checks were carried out over each block to ensure that seedlings were being planted to standard. The check plots were established using a grid. Grid spacing varied with block size. For blocks up to 4.9 ha in size, 5 plots per block were put in; twenty plots were established in blocks between 5.1 ha and 19.9 ha in size; while one plot per ha was measured in blocks over 20 ha in size.

The plot spacing and quality control maps were compiled in the office. Tie points were selected from aerial photos, flagged on the ground, and the grid was then established on the ground using compass bearings and a topofil chain to measure distance.

The contract called for an optimum planting density of 1500 seedlings per hectare. In order to achieve this density, each 50 m^2 plot was required to contain between six and eight seedlings (including acceptable natural seedlings). Spacing within the plot was to average 2.5 metres between

planted seedlings or planted seedlings and acceptable naturals with an acceptable range of 2.0 to 2.9 metres. Seedlings had to be within the 3.99 metre radius plot to be included in the sample.

BLOCK NUMBER	AREA HA	TREATMENT TYPE	TREES PLANTED	DENSITY (TREES/HA)	PLANTING QUALITY %
Y03Q1-1	49.2	BLADE	59,660	1,212	94.1
Y03Q1-32	7.9	BLADE	9,660	1,222	96.8
YO3Q1-30	6.9	MOUND	5,820	843	95.7
Y03Q1-29	4.0	BLADE	5,690	1,422	96.4
Y03Q1-28	5.4	BLADE	8,000	1,481	93.3
Y03Q1-34	5.1	MOUND	3,610	708	98.9
Y03Q1-35	5.6	MOUND	5,535	988	97.8
Y03Q1-33	9.6 5.2	BLADE MOUND	11,995 6,500	1,249 1,250	92.0
Y03Q1-40	19.4 4.8	BLADE MOUND	18,180 4,500	937 937	97.9
Y03Q1-31	15.3	BLADE	21,060	1,377	97.0
Y03Q1-38	19.1	BLADE	24,030	1,258	96.7
Y03Q1-39	11.5 5.0	BLADE MOUND	10,561 4,594	918 918	96.6
12 BLOCKS	141.4 32.6 174.0	BLADE MOUND	168,836 30,559	1,194 937	96.1

Table 2: Planting Production and Quality

At each plot centre, (1) a permanent stake was set in the ground, marked with geo-flagging, labelled with plot and line number, date and time of the check, and initials of the checker; (2) a metal plot cord was used to delineate the 3.99 m radius; (3) all seedlings that were planted were identified using geo-flagging; (4) all seedlings within the plot were checked for:

- plug tightness
- root plug exposure
- stem angle
- planting spot selection
- spacing

(5) two or more seedlings were excavated to check for root deformation, air pockets, and integrity (whether the roots were cut during the planting process); (6) any improperly planted seedlings were identified with a second piece of flagging. All information was recorded on a tally form to derive payment on a block basis.

Natural conifer seedlings which were 30 cm or more in height showing good form and vigour were accounted for in the assessment procedures.

Any or all the plots could be visited and their assessments discussed with the planting contractor.

Planting quality checks were conducted by Andre Savaria, Don White, Debbie Wortley, Conrad Baumgartner and Mike Sparks, often while accompanied by the planting contractor

4.00 PROBLEMS

4.10 PLANTABLE SPOTS

It became evident almost immediately that the number of plantable spots created during site preparation was less than anticipated. This was verified during the initial quality check surveys when plantable spots and seedlings per plot did not fall consistently within the targeted range. Although the blading work seemed adequate in the spring viewing of the sites, a warm wet spring gave rise to a significant flush of competing rhizomatic species.

The planting specifications were made clear to all contractor representatives at the time of the viewing. Included in the specifications were the requirements to take the best advantage of the microsites created by the site

treatment, handscalping to meet density requirements and counting naturals as part of the planting density. Better use of the available microsites may have improved the density performance as would more diligent handscalping in the untreated strips. Tighter crew supervision may have resulted in higher planting densities.

Much of the disturbed area was overgrown with a variety of forbs including fireweed (**epilobium spp.**), a variety of grasses (**graminae**), horse tails (**equisetum spp.**), lungwort (**mertensia paniculata**) and various shrubs including rose, willow, alder and raspberry. While a planting density of 1500 stems per hectare was targeted, that density was never achieved on either site preparation type (blading or mounding) due to a variety of influencing factors including:

(1) the bladed area was done in a pattern that had a pattern of brush pile, bladed strip, natural strip, bladed strip repeating across the blocks giving a 40% to 60% coverage of prepared ground (see Figure 2);

(2) the mounded sites were prepared at less than 1500 mounds per hectare which predetermined density of the planting prescription;

(3) disturbance within the bladed strips was not sufficiently deep or continuous to remove dormant rhizomes but was rather designed to expose the soil surface and nutrient rich "A" soil horizon.

It was felt that disturbance to the intensity that was seen in other jurisdictions would not be acceptable due to soil type, moisture regimes, flooding history and biological factors related to nutrient removal, excessive albedo around the seedling root collar, and excessive surface drying.

The bladed areas were treated in a manner that had two treated strips left between three untreated strips. The outer strips received logging debris and duff from the scarified strip while the middle strip was left untouched (in the natural state).

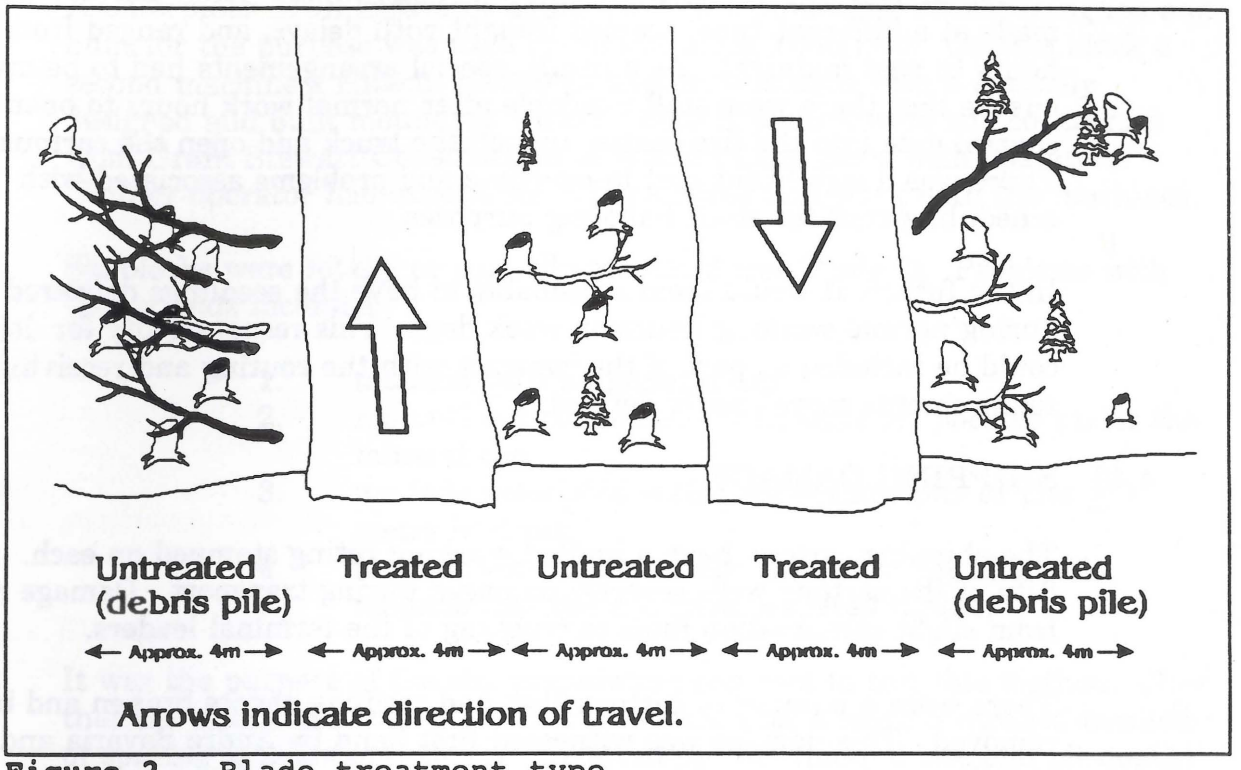

Figure 2. Blade treatment type.

4.20 STOCK QUALITY

A delivery window of mid-July was targeted for. Seedlings were to be culled if they did not meet the minimum specifications of 3 mm calliper and 20 cm height. Mr. David Lloyd of Pelton Reforestation confirmed that the target size would not be entirely achievable unless we were willing to accept the seedlings at a later date (two to three weeks later). This was not feasible given the delivery and start up dates that had been discussed with the planting contractor. Therefore the decision was made to accept all seedlings that Pelton Reforestation felt were suitable with no culling and ship according to the already agreed upon schedule.

4.30 SEEDLING DELIVERY SCHEDULE

Pelton Reforestation contracted Points North Transportation Inc. to deliver the boxed seedlings to Watson Lake. The delivery of the seedlings was dependant on the pick up time of the individual trips.

It is unknown how the pick up time was determined. Each delivery was made at a different time, seemed fraught with delays, and ranged from 2100 hours to past midnight. As a result, special arrangements had to be made to ensure that there were staff available after normal work hours to open the control gate into the fire centre, unload the truck and open the cartons. There was a significant cost in overtime and problems associated with scheduling staff for stock handling purposes.

In the future, it would seem reasonable to have the seedlings delivered during normal working hours on week days. This responsibility for delivery could be included as part of the contract with the routing and receiving requirements more clearly defined.

4.40 SHIPPING DAMAGE

The shipping cartons have a limited stacking rating stamped on each. About fifty of the cartons were severely damaged during transport. Damage ranged from slight compression folds to crushing of the terminal leaders.

There were a number of cartons that had seedling shoots broken and buds removed. This damage was witnessed first hand by Andre Savaria and the planting contractor as the cartons were being unloaded.

To prevent crushing damage during transport from the production facility it is recommended that Pelton Reforestation ensure that cartons are not stacked more than three high without pallets spacing out the loads. Failing this, that the cartoons are stacked in a cross-over fashion so that the weight is spread out over several boxes and not straight down from top to bottom onto one. The Alaska Highway has seen significant improvement over the last few years but it is still very rough and hard on material being transported over it.

Future shipments of such damaged stock will not be accepted and will be returned to the grower at the growers expense.

4.50 MOUNDING QUALITY

The mounded sites suffered from a variety of deficiencies. Density of seedling spacing was directly controlled by the density and spacing patterns of the mounds. Density of the mounds on all sites treated with this method were less than the 1500/ha target averaging at 937 seedlings per hectare (see Table 2).

A Caterpillar 215B excavator equipped with a mounding bucket designed and built for the purpose was used on all but block Y03Q1-40. On this block a second machine,a Hitachi EX200 excavator, was used with a specially designed and built mounding bucket. Both machines were sub-contracted from Grant Stewart Construction of Watson Lake along with operators. Neither operator had experience doing silvicultural work with the machines.

Six blocks were totally or partially mounded (see Table 2). Problems with the mounds included:

1. mounds with no mineral cap,
2. mounds not compressed with large air pockets under the mineral cap,
3. mounds associated with very shallow pits or pits $\geq$ 1 metre in depth,
4. mounds with mineral caps that were not plantable.
5. mounds that did not have prepared hinges.

It was the purpose of the site preparation contract to test this method. Now that the sites have been planted it is evident that a more controlled method of spacing is necessary, that a "preferred profile" (mound size and pit depth) be included in the contract specifications and that non-performance penalties be assessed.

4.60 BLADING QUALITY

The problems associated blading were noted earlier. Blading treatments must be evaluated in terms of:

- effective competition control
- increased mineral soil exposure
- higher soil temperatures
- target planting densities

versus

- loss of available nutrients
- soil compaction
- plantability
- loss of plantable area

The only other time that blading had been tried in the Yukon was as part of the Liard Reforestation Trial established in 1974. The suitability of the site disturbance created in the trial was not documented in the final report "White Spruce Regeneration Options on River Floodplains in the Yukon Territory" by Gardner (BC-X-240). (This publication is no longer in print.)

Based on the experience gained with this project this question needs to be asked, "Are blade scarification or excavator mounding appropriate treatments for the soil type, soil moisture and temperature regimes, and competition conditions that exist on these sites or other sites in Yukon?"

4.70 LOCAL PLANTERS

Local employment was offered by the planting contractor. The planting contractor made every attempt to hire members of the Liard First Nation (and arranged personal meetings with the Chief). In addition, an advertisement was placed in the local newspaper, with no response. Prior to arriving in Watson Lake a number of applications were received. There were five Yukon residents hired. One was from Whitehorse while the other four were from Watson Lake.

None of the Yukoners had planted trees before. Although the contractor stated that he made every effort to inform them of the difficulties of the job, they were generally not prepared for the demanding physical labour and not willing to accept the costs involved (purchase of equipment, camp charges, or hold backs). All abandoned the work before it was completed. Three left after the second day, the other two after 4.5 days.

This case presents what might be a normal scenario for hiring locals to plant in Yukon. Although most planters are students, those who are good and return to plant year after year are also professional in their attitudes. A good planter acquires his/her skill over time. They have a definite beginning and ending to their season. Production incentives are a normal policy and tend to induce greater production. The locals who were hired had difficulties dealing with an "outsider" whose attitude was production oriented. It is probable that even if a "local" contractor had hired these same individuals that they would have met with similar success. The planting contractor indeed stated that planting of trees is high risk high reward for those who stay committed to the task.

5.00 RECOMMENDATIONS

5.10 QUALITY CONTROL OF SITE PREPARATION

Quality control plots must be a part of any future site preparation contract. Methodologies are outlined in the booklet "Fundamentals of Mechanical Site Preparation, FRDA Report 178". For areas where plantable spots are being directly created, control and measurement of the number and quality of spots follows similar methods to the random plots used to measure seedling planting quality.

In the case of disc trenching, ploughing or blading, a different method must be used. It is assumed that spacing along a profile is constant and that a set number of planting furrows must be created over an area to allow for the prescribed planting density. Again, the method of measuring the planting density is outlined in the booklet mentioned above.

5.20 MONITORING STOCK PRODUCTION

Monitoring stock production must be co-ordinated with the grower. In this case Pelton Reforestation must be asked not only to provide us with bi-monthly growth charts, but to interpret the information and relate the significance in terms of seedling delivery for out planting.

We must keep current with improvements in seedling production methods. Tighter communications with the production facility and possibly visiting the facility is recommended. The difference in apparent quality of stock produced for the Yukon may be directly related to this being the nursery's first experience growing Yukon stock. Genetic differences related to provenance must certainly have impacted on the final quality based on the growing regime. I would expect that future stock will be improved on because of the learning curve now being expanded on.

Target planting windows are just that--targets. Tighter communications with the grower will allow for improved planning in terms of planting start dates, and seedling delivery schedules.

5.30 SHIPPING

Shipping practises have to be improved. Crushed cartons containing crushed seedlings are not acceptable and will be returned. Delivery time must be arranged so that receipt at the delivery site occurs preferably during business hours.

The delivery schedule is, to a degree, dependant on the time of pick up, other material which may be transported of the same vehicle but to an on route destination, vehicle/driver problems, delays due to highway construction or destruction (washouts, slides, accidents, etc.) and so on. Over stacking of the cartons can be controlled.

5.40 LOCAL TRAINING

Planters are born, not many are made. Many people learn to plant trees and many become proficient planters. The work is hard, it is repetitive and it is not for everyone.

It may be possible to train locals to be tree planters over three to four seasons. Difficult working conditions, measurable production standards, equipment and camp costs are all realities of piece rate planting operations.

It is anticipated that successful planting projects will occur with greater training efforts and with more planting opportunities on behalf of government and industry in the Yukon.

6.00 SUMMARY

Almost 200,000 white spruce seedlings were out planted in the Yukon in the summer of 1993. This was the first commercial planting to take place in the Yukon's history. Although the event was significant to many of us it seems to have been missed by many.

Despite all of the administrative and logistical problems encountered, quality seedlings were planted over 174 hectares of once non-satisfactorily regenerated forest lands. This is the first significant attempt at addressing backlog reforestation in the southeast Yukon.

7.0 ACKNOWLEDGEMENTS

Special thanks is extended to the district staff of Northern Affairs Field Operations for their assistance in receiving, unloading, storing and watering the stock. Without their timely assistance at the receiving end the project would have run into significant logistical problems.

Developing contract specifications was a collaborative effort spearheaded by Conrad Baumgartner working under contract for the CA:FD. His diligence and perseverance was responsible for getting the contract completed and signed.