STATE OF CANADIAN SWEDISH EXPERIMENT 1990

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This version is edited according to visits Aug-Sept 90. Margareta Karlman has read through the document and added comments and corrections.

Contents

Introduction

This report is essentially based on a document "State of Canadian Swedish experiments 1989". Comments are subjective and some may be revised. Corrections or additional information is of course welcome. From my point of view, those who write about this experiment are welcome to extract information and sentences from this document.

Activities 1990 (known to Dag Lindgren)

* A party consisting of the following persons visited all five Canadian sites during the end of August 1990:
Oscar Sziklai, UBC
Bart van der Kamp, UBC
Margareta Karlman, SLU
Dag Lindgren, SLU
Jörgen Andersson, SCA
Eje Andersson, Domänverket
The notes below marked DL90 sometimes refer to statements by other members of the group or concensus opinions of the group.

Summarizing state of Canadian experiments 1990

The lay-out, staking and identifications are all good. Identifications and documentation are not likely to cause problems in the next five years.

From a pedagogical and demonstrational point of view the experiment will be very instructive in the period 1991-1995 (for Whitehorse 1992-1997), later it will be more difficult to get an overview. It is recommended to make the sites part of tours.

It is difficult for visitors without documentation to understand the lay-out and the codes on the stakes. Therefore I intend to arrange a sign explaining those details. In the future the identifications have to be remade, at that time it would be desirable to have the material identifications given in clear text, so a visitor is not depending on understanding a code system.

On most sites there are some lodgepoles with cones, even two year old cones. No Scots pine cone was observed. It might be of interest to include a "block 5" cone and pollen count in the next inventory.

Plant condition was generally good except at Whitehorse. Survival is around 97% except for a few unfortunate plots or materials. For the last three years mortality has been below 1% per year. Almost no severe damage was observed the last year. No severe weather damage and very little needle damage were observed. No animal damage was observed. Growth, general condition, health and prognosis were very good at all sites except the Whitehorse. At Whitehorse growth was low because of weather-related damage during the first two years. The impression is that the plants are slowly recovering from earlier damage.

The establishment and first years growth in BC is good. Thus managerial skills and biological conditions of BC seems good. The Ft Nelson plantation demonstrates that it is biologically possible to make good forest regeneration even in the remote NE corner of BC.

Present problems

Competing vegetation. The Canadian clear-cuts develop a flora similar to the Swedish flora. Grass, sedge, raspberry, wild rose, fireweed, willows, cottonwood, aspen etc. Some plants suffer. There is not too much vegetation at any site for a practical plantation and the experiment itself is not threatened. The immediate impression on all sites is that competition is weak. (On Ft Nelson a treatment with herbicides was done 1987, before that competition was hard). Still several plants will die and many will be disturbed. (However, the desires of a scientist are higher than that of a silviculturist.)

Naturals of lodgepole pine. They are easy to remove when plants are small and the white sticks marking the experimental plants are easily visible. The naturals made remarkable progress between 1988 and 1990. Even on plots where most naturals were removed 1988, many disturbing naturals developed between 1988-1990. In four years many experimental plants will be undistinguishable from naturals when the white sticks are gone. It will be increasingly difficult to remove the naturals with time from 1990 on (they become too big to just lift by hand, and the time required to identify them will increase).

Identification sticks are needed for orientation at inventories, and for assuring that naturals are not taken for experimental plants. A few centre stakes are laying on the ground. Whenever a group goes out to do measurements it would be good if they could bring a spit in order to erect the stakes. This problem was observed at the Mackenzie, Ft Nelson and Whitehorse sites, but is likely to occur on the two other sites too. Stakes get affected by time, and in the future (1994-96) it will be necessary to revise the identification system.

Snow shoe hare A peak is expected 1990/91. These animals may well ruin a site. It is difficult to take any actions, we just have to pray. The snoe shoe hare likes protection, and on most sites the protection is limited, thus there is a chance to escape damage. On the other hand nearby protection (like at Mackenzie) may be enough. That the exposure is over 1992 may be a reason to make an inventory at that time. If snoe shoe hare hits, it is very fortunate we have had one inventory at least.

Rusts

Western gall rust, comandra rust and stalactiform rust were found on experimental lodgepole pines at Mackenzie, Ft St John and Ft Nelson sites. It was found on naturals at Whitehorse. In spite of inoculations, no rust was observed at Ft St James. With exception of single trees at Mackenzie no rusts were found on Scots pine. This indicates that Scots pine might be less susceptible or at least that rusts develop at a later stage. It is quite clear that the experiment has been succesful in exposing Scots pine to a number of typical lodgepole pine diseases. The most infected site is Mackenzie, and this site will be measured 1991.

Maintainance

There were only limited actions on the local level for removing on competition and naturals between 1986 and July 1990 (application of herbicide on Ft Nelson 1987, some removal of wildlings at Ft St John and Whitehorse). In late August 1990, however, actions were going on, (a contractor was with us at the Ft St James site, wildling removal and brush control was mainly finished at Ft St John and a considerable part of the wildlings were removed at Whitehorse.) If all clearly initiated actions are finished (as it looks like this autumn), there will not be any

urgent need for maintainance assistance by local people in the future.

Plans for the future

The current intention is to measure all sites 1992 and 1997 by crews. Between these times visits and inventories will be made for specific disease occurrances on specific sites.

Material comparisons 1990

Siberian larch suffered from dieback during the first years after planting, but 1990 the dieback was not serious. There are many larches with an impressive height growth, especially at the Ft St John and the Ft Nelson sites, even if the percentage height superiority is declining. The good growth of larch focus the local peoples attention. Probably they tend to overestimate the production potential as the height growth superiority is likely to decrease by time.

Norway spruce suffered much from earlier injuries and mortality particularly at Whitehorse and Mackenzie. 1990 it seemed that most plants recovered well from earlier damage. At Ft Nelson the spruce may develop well.

Lodgepole pine seems to grow a little faster than Scots pine. It can not be claimed that the "Swedish improved" lodgepole materials are better than Canadian wild sources. For lodgepole provenances the experiment does not seem to contradict that "the local provenance is the best". Provenances originating south of lat 60° got severe injuries at Whitehorse. (It seems that southern provenances do better in a nearby provenance trial than in our trial, which supports that our experiment get an unlucky start.)

The best provenances of Scots pine look healthy, undamaged and straight, but are somewhat smaller than the lodgepoles. The general impression is that the superiority of lodgepole pine compared to Scots pine pine is smaller in this series than in other Swedish series. One explanation is that the Scots pine in this experiment is the best possible, and actually more improved than can be used in present Swedish forestry (plus tree crosses). The experiment does not support that good provenances of Scots pine are more sensitive to the Canadian weather conditions or pathogens than the native pine, at present Scots pine seems less susceptible to Canadian pests. Scots pine provenances south of 61° do not do well at Whitehorse. Trees originating south of 58° seem to be of too southern origin and trees originating north of 64° too northern in order to be welladapted at Mackenzie.

Other inventories

There are other persons who have made observations in the

experiments. Those observations are summarized in the site sheets. CC stands for Charlie Cartwright, MK for Margareta Karlman, Pat inv for Officers from Pacific Forest Centre making an insect and pathological survey, BvK for Bart van der Kamp.

Other Scots pine plantations in NW America

There are plots where lodgepole and Scots pine may be compared SE of Prince George ("Telegraph Road"). As this experiment was established a decade ago, it is of interest for the present study to follow what happens in this plantation. Dag Lindgren made a comparison of Scots pine and lodgepole pine on that plot 1988, and a documentation is available on request. There are galls on Scots pine which probably are caused by Western gall rust and comandra rust in those experiments.

There are also a number of other Scots pine plantations in Canada and in other places of the world. It is not only lodgepole which may introduce foreign pathogens into Sweden. Actually it is more likely pathogens go with people. Thus, there are reasons to combine the surveys of this trial with surveys of what happened to other Scots pine and Norway spruce plantations in Western America.

MATERIALS

Identities of "provenances" DL900323

Material		Description			lat
11	18	Scots	Full sibs	Haradstorp	55
21	28	Scots	Polycross	Skogsgård	57
31		Scots	Orchard	Långtora	59
32		Scots	Orchard	Askerud	61
33		Scots	RTK9		60
41	48	Scots	Full sibs	Domsjöä+RTK	63
51	58	Scots	Full sibs	Brån	64
61	68	Scots	Full sibs	Östteg	65
71	78	Scots	Full sibs	Skatan+RTK	66
81	88	Scots	Polycross	Klocke	67
101	104	Cont	Open poll	Summit Lake	54
105	108	Cont	Open poll	Phil Creek	55
111	114	Cont	Open poll	Beatton R	57
115	118	Cont	Open poll	Saddle Hill	56
121	136	Cont	Full sibs	Bogrundet	59
137	140	Cont	Open poll	Ft Nelson	59
141	148	Cont	Full sibs	Bogrundet	61
151	158	Cont	Full sibs	Bogrundet	63
159		cont	Stand	Ft St James	54
160		cont	Stand	Hazelton	55
161		cont	Stand	Beatton Rive	57
162		cont	Stand	Ft Nelson	58
163		cont	Stand	Squanga	60
164		cont	Stand	Carmacks	62
165		cont	Stand	Rusty Creek	64
166		Norway	Orchard	Lustnäset	60
167		Norway	Orchard	Sör Amsberg	61
168		Larix	Orchard	?	61

Comments and explanations:

* Some provenances are composed of several materials, each material being a family.
* Full sib and Polycross families are made by controlled crosses between grafts of selected plus trees.
* RTK refers to Full sibs used as standard checks in Sweden.
* Open pollination refers to seeds collected in Canadian stands from selected trees. At the Canadian sites one of these samples can be regarded as "local" and is better represented.
* Stand refers to samples from commercial seed lots collected in Canadian stands.
* Orchard refers to samples from commercial collections in seed orchards.
* lat refers to approximate average latitude of origin of seed parents (not there grafts grow).
* The Norway spruce did not germinate well in Canada. Therefore there were plants available only for a few plots in Canada and for use in block V.
* The Sibirian larch is included only in Canada and not in Sweden for specific Canadian interest.
* All families are in other experiments in Sweden, which increases the number of potential comparisons in the future.

SITE SHEETS

Each site is described by a site sheet. A map of the outlay of the 64-plant plots is enclosed in this documentation.

The spacing is 2 x 2 m. Each origin (provenance) is (at least in principle) represented on each site by four 8 x 8 square plots (64 plants). (4 replications of 64 plant plots, each in a block numbered I-IV). In addition 64 trees are planted in single tree plots where all origins and species are mixed in a separate block (block V). There may also be some "special" origins, which are only represented in block 5.

If the seed lot is of structured origin, there are (when possible) 8 different families within each origin. Each plot will then be composed by 8 seedlings from each of 8 families. However, because of low number of seeds per cross, sometimes higher number of families and lower number of seedlings per family occur. Within the plot the families are distributed randomly using the single-tree plot-design. There are usually 3 border rows surrounding the experiment.

In the Canadian site maps (and on the center stakes in the field) the "provenances" are described by species
C = "**C**anadian" (lodgepole) pine (**c**ontorta)
S = "**S**wedish" **S**cots pine
N = **N**orway spruce
L = **L**ocal **L**odgepole
SIB = **Sib**erian larch

Within plot maps
For the surveys till now plants are numbered within the 64-plant plots. The numbering on all sites except Garsås is the following

```
 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
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There are four possible ways to orientate such a map. Choose the right one!
It is good if future inventories keep to this numbering system. When it is easy to associate different measurments on the same plants.

DL 900825

Canadian-Swedish project. Site sheet for Fort St James site.

Contact person (organization):
Juha Salokannel, Silvicultural forester
Canadian Forest Products Ltd. (CANFOR)
PO Box 254
Ft St James BC VOJ 1PO
tel office 936-5401, home 996-7076
Note that RW Baker, who was earlier contact person, is not with the company any more.
Mr Dougl Rixon, Chief Forester at Headoffice in Vancouver may be kept informed.

Location: Lat 54°26' Long 124°02' Elev 885
Teardrop Road
Located 13 km east from Ft St James.
Elevation read by Mr Baker from maps. By barometer we measured it to about 100m above the surface of Stuart Lake.
The plot is located at km 13, Teardrop Forest Road, UTM grid 10.43.603. Approx 3 km east of Nahounli Lake, on map sheet 93K, Fort Fraser. Plot is in CANFOR Forest licence A-18170, CP 372, Timber supply area 22-FSJ-E.

Description of way: Directions written by Mr Baker are enclosed.

Particular about access: The access road is radiocontrolled, but I do not feel this is a reason to worry to use it, it is just a way to increase safety. Accessible by ordinary car. There is a marked track through the trial for the benefit of visitors.

Soils and site details: Generally sandy with gravel and in some areas silt. The organic layer is 1-3 cm thick. Near the southern boundary of a moderate sized, progressive, clear cut. There is a mature Douglas-fir, white spruce, lodgepole pine stand 0.5 km south of the plot. However, the area is generally open (recently logged) with no other mature timber within several kms. The site is flat but slightly elevated compared to surroundings. Thus exposed to wind but not to cold air.

Site history: Harvesting was completed in the Summer of 1983 and operational site preparation (drag scarification) followed the next summer. In 1985, after the selection of the site, windrow piling of the larger debris took place, followed by burning of the piles that fall. Piles were concentrated outside the test area.

Experimental history: Late summer/fall 1985, the test area was staked and prepared for planting using a contractor for all five sites in the project. In May 1986, this same contractor (Charlie Cartwright) supervised the planting of the test seedlings, using a regular planting crew, with payment being provided by the hour. Planting of Indian paint brush at 16x16 m across the experiment was done 880428. These were inoculated 880527 with aeciospores of Cronartium. Gall rust infected lodgepole seedlings were planted in spring 87. 1987 white plastic sticks were used to mark

the position of experimental plants. 1988 height and condition were classified. In block 5 also diameter was registered.

Field notes:
CC 85: Cone left may lead to many naturals.
Pat inv 86 (Turnquist): Dwarf mistletoe, western gallrust, Indian paintbrush and pine needle cast within 1 km. Mortality <1%, all seedlings appeared healthy and well-established.)
MK 86: Vitality of the seedlings high, better growth than on other sites. Wet pockets.
CC 87: 98% survival, .4% frost damage. Healthier trees than on other sites. Brush beginning to develop. Natural regeneration evident.
BvK 88 (Bart van der Kamp May 1988): Scots pine suffered severely from snow pressure, many of the taller seedlings were flat on the ground. Some had pronounced crooks. Little evidence of snowpress on lodgepole. Most lodgepole seedlings were somewhat shorter and had a greater diameter compared to Scots. Wild lodgepole seedlings are beginning to appear on the site.
DL 88: Fireweed dominates. Very little competition, some alder brush. Naturals small, and not abundant, they are more and bigger in the more distant part of the plantation. The gall rust infected lodgepole seedlings planted 1987 seems healthy. Something has pushed our white sticks in part of the area rather vigorously. The Scots pine looks healthy and upright, but a closer inspection reveals several non-serious stem bends, which could be the result of the snow-pressure mentioned by BvK. However, also lodgepole get some bends. Not much late shoots. There was a syndrome on tops and other leaders with some similarity to what was observed at Ft Nelson. Needles dropped on the SW side (SE at Ft Nelson, but that could be caused by differences in exposure). No "halved" needles were observed, but some needles with reduced growth. On some plants all needles facing south were lost, and some made a "thin" impression. There was no or only weak stem-damage (in contrast to Ft Nelson). The overall impression is excellent. Almost no increase in mortality or severe damage occurring in the last year.
Pat inv 890601. Generally healthy with good growth and few problems. An average of 10% of the foliage on 50% of the lodgepole and Scots pines suffered from foliar discoloration and browning, likely caused by winter damage (winter flecking/winter drying). There were no other problems evident.
DL90. No activity on the site was made since my previous visit.The condition is excellent, no plants that have died during the previous two years were observed. The tallest larches are approaching 200 cm and the tallest pines 150 cm. A very low number of plants probably attacked by insects. Some brush (aspen, birch, cottonwood) is coming, it is no real serious threat to the conifers. The staking seem to work well. The diseased plants and the Indian paintbrush seemed to develop satisfactorily.

The plants inoculated with Western gall rust are expected to die by themselves during the next 5-10 years, and thus do not constitute a long term problem.

Management for 1990-94. Besides the Swedish group Mr Salokannel and a contractor participated. The site is a arranged as a stop for excursions, and some type of city program for developing excursion points can pay for cleaning up costs. It was agreed that removal of naturals and disturbing brush should be made under supervision of the contractor. It is no reason to wait any longer for removal of naturals, it will just be more difficult the longer it is postponed. But watch for the inoculated plants, better to tag these before any person who was not participating is allowed to work on the plants. We felt that chemicals are not needed, if all brush disturbing experimental plants are removed mechanically, sprouts will have very small chance to disturb. At the moment we do not now foresee any other need the next five years. Later some action with tagging will be required. It is unlikely the experiment will be considered as closed before final harvest. We cannot say if we at some point in the future want it thinned or not, but it is possible we never want it thinned.