WORK PLAN

SX 93602Q

COASTAL SEED ORCHARDS' DEMONSTRATION PLANTATIONS

July 16, 1993

- Brian Barber 1-

INTRODUCTION

Tree improvement in B.C. dates back to the late 1950's when the first Douglas-fir "Plus trees" were selected for the breeding program. The first seed orchard was subsequently established in 1963. Today, there are 47 seed orchards established on the coast representing 9 species. These seed orchards, combined, produce enough seed to account for over 40% of the seed annually sown in the Vancouver Forest Region. This percentage is projected to increase to 85% by the year 2000. Present policy requires that seed orchard (A Class) seed, if available, shall be used for reforestation.

The intent of using this improved material is to increase our ability to produce a greater volume of wood on less land. Most breeding programs are aimed at increasing gain in volume but a few are aimed at breeding for resistance to specific pests, such as the spruce weevil (Pissodes strobi) and white pine blister rust (Cronartium ribicola).

Despite the widespread use of A Class seed many seed users remain uncertain of the benefits derived from using it. The need to establish demonstration plantations has been recognized for many years, however, tested material has only recently become available.

OBJECTIVE

The objective of these plantations is to visually demonstrate to those in the forestry sector and the general public some of the benefits of investing in tree improvement.

1 Coastal Seed Orchards Projects Officer, Ministry of Forests, Saanichton, B.C.
Specifically, these plantations will be established in each south coast Forest Service District and seed orchard and designed to:

A) demonstrate the genetic variability within a tree species.

B) visually compare the performance of Douglas-fir, Sitka spruce and western hemlock seedlings derived from improved (seed orchard) seed to unimproved seed.

C) visually compare the performance of hybrid poplar (Populus trichocarpa x P. deltoides.) to local poplar.

D) provide a medium through which information concerning seed use, transferability, adaptability and variability may be addressed.

The intent of this work plan is to provide a general guide for the establishment of such plantations in the coastal Forest Service Districts and seed orchards. It is realized that this plan will vary depending on the site location and size.

SCOPE

The purpose of these plantations is to compare improved to unimproved stock. Thus, only those species with tested proven material will be used. These species are: Douglas-fir (Fdc), western hemlock (Hw), Sitka spruce (Ss) and poplar hybrids (Ax).

The material will be selected to show the benefits of using improved material. Volume gain has been the main criteria for selecting the Fdc, Hw and Ax improved material. The Sitka spruce improved material has been selected for its resistance to spruce weevil. The intent of using poplar is show the gains from selective breeding more readily. Differences between the conifer seed lots may not be apparent for 5-10+ years following establishment.

Material for the plantations will largely be provided by the species' respective breeder. Jack Woods will provide the Fdc seedlings, John King the Ss and Hw seedlings, and Mike Carlson the Ax cuttings. Coastal Seed Orchards will obtain samples of local cottonwood cuttings.
DEMONSTRATION PLANTATION LOCATIONS

Demonstration plantations will be located at each of the following BCFS Seed Orchards:

- Saanich Seed Orchard
- Cobble Hill Seed Orchard
- Bowser Seed Orchard
- Surrey Seed Orchard

and within the following Districts:

- Chilliwack
- Squamish
- Sunshine Coast
- Duncan
- Port Alberni
- Campbell River
- Port McNeill

Due to the seed transferability rules of Fdc seed the Mid Coast and Queen Charlotte Islands Forest Districts will not be eligible for the Fdc demonstration plots. However Hw, Ss and Ax material may be available.

Fdc demonstration plantations have already been established at the Bowser, Saanich, Cobble Hill and Surrey Seed Orchards and in the Duncan, Chilliwack and Squamish Forest Districts. Due to the difficulty of establishing new demos beside existing ones, new sites will be sought to accommodate all 4 species.

SEED/CUTTING LOT GROUPS:

The following seed/cutting lot groups will be used for the demonstration plantations:

Douglas-fir A) **Top cross;** crosses amongst the best available clones selected on 12-year volume data from existing progeny tests (EP 708). This will approximately equal the genetic quality of second generation orchard seed, which will be widely used from about 1996 to 2010. Seed lots are grouped by family, i.e. 69x623, 243x38, 101x623, and 38x408; where the first number represents the female parent tree, and the second number the male parent tree.
B) **First generation orchard seed:** a representative mix of several seed orchard seed lots which are currently being used for reforestation within the maritime seed Planning Zone. Seedlots include: 5000, 6529, 6383, and 9556.

C) **Wild-stand seed:** a representative mix of several wild stand seedlots which could be possibly be used on the site. Seedlots available include: 1092, 419, 409, 1334.

Western hemlock

D) **Top cross:** Improved material from the Hw breeding program. This will approximately equal the genetic quality of second generation orchard seed. Three crosses/seedlots per demo are available.

E) **"Standard":** a representative mix of several wild stand, coastal provenance seedlots.

Sitka spruce

F) **Weevil resistant provenances:** material from Miracle Beach, Burnaby Lake and Green Timbers which has been identified as being resistant to the western white pine weevil.

G) **Non-resistant provenances:** a representative mix of several wild stand, coastal provenance seedlots, which are not weevil resistant.

Poplar (Cuttings)

H) **Populus trichocarpa x P. deltoides:** cuttings of a very vigorous hybrid cross between an eastern cottonwood and a western Washington poplar.

I) **P. trichocarpa (Local):** cuttings of local origin.

J) **Other poplar hybrids:** a cross of various poplars used to demonstrate the variability of growth and form of the Poplar genus.
SITE DESCRIPTIONS AND PREPARATION

Locations will, of necessity, be partially dictated by the availability of suitable areas which have been recently logged. It may be necessary to rehabilitate an existing plantation to accommodate the demo.

The sites must be easily accessible, preferably throughout the year, and located within easy reach of the local population centre or District Office. They should be located beside a main road, preferably along an existing tour route or within a demonstration forest. The terrain should be such as to permit easy viewing from the road side and easy maintenance of the site.

Due to seed transfer rules sites should be located in the Maritime Seed Planning Zone and below 700 m in elevation. In order to accommodate 4 species on a small area the site should be ecologically suited to optimize the performance of each species.

Sites must be of good (or medium) quality. They should be homogenous to reduce the amount of variability expressed within and between seed/cutting lots due to environmental factors. Low sites will be avoided due to the time required to demonstrate results. Dry, very wet, root rot and frost prone sites are to be avoided. Any other potential hazards, such as vandalism, should also be considered when selecting the site.

Site preparation will vary depending on the site's condition, but will generally be similar to that for operational planting for the area. They should be prepared in such a manner as to facilitate high planting survival and easy site maintenance. In some cases it may be necessary to remove large debris to allow for the planting of seedlings in straight rows.

The Fdc and Ax will be protected from browse with the erection of fencing (chicken wire) around individual trees.

DESIGN

Site availability may dictate the overall design of the demonstration plantation. Generally, the demo plantations will consist of 4 blocks, each block containing representative seed/cutting lots from the following species: Douglas-fir; Western hemlock; Sitka spruce and Poplar.

Ideally, the 4 blocks should be located side by side adjacent to an existing road. The design is such that it will facilitate easy comparison of the performance and variability between the different seed/cutting lots within each block.
In the future a sign will be erected on the site explaining the objectives of the plantation and a map of the seed/cutting lots established.

Sites will be marked on a 3 x 3 (or 4 x 4) meter grid using wooden or plastic stakes. A stake with an identification label will be placed in the front of each row for identification purposes. This label will list species, seed lot identification, stock type and planting date.

**Demo design**

<table>
<thead>
<tr>
<th>Block 1 (3 x 3 m)</th>
<th>Block 2 (3 x 3 m)</th>
<th>Block 3 (3 x 3 m)</th>
<th>Block 4 (4 x 4 m)</th>
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The column’s alphabetic character corresponds to the seed or cutting lot group, as listed above for each species. Each block will consist of 6 rows of 6 trees each. Each seed or cutting lot group will be represented by at least two rows. Each row will consist of a single seed or cutting lot. Replication of the group sequence, ie. ABCABC, is to account for seed or cutting lot and site variation. At 3 m x 3 m spacing for blocks 1, 2 and 3 and 4 m x 4 m for block 4 the total area required is 0.15 ha. Blocks 1, 2 and 3 are 18 m x 18 m. Block 4 is 24 m x 24 m. 78 m of road front will be required for this demo.

The design of the demo will vary according to each site. The orientation of the block will dictate the positioning of the poplar plot, as the poplars will readily have the potential to shade and influence the growth of any adjacent conifers.
STOCK

The Fdc and Hw stock is currently being grown as PSB 615 1+0, and the Ss as PSB 415 1+0, at the Cowichan Lake Research Station (CLRS). This stock was sown in the spring of 1993 by their respective breeders. Only those seedlings which meet the Ministry standards will be included in the demonstration.

The hybrid poplar cuttings are to be grown in 1993 at the Kalamalka Research Station. Local cottonwood cutting lots will be obtained, following bud set, in late fall to early spring by the Coastal Seed Orchard staff. Cuttings will be approximately 60 - 75 cm in length.

Conifer stock will be lifted and sorted in December 1993 and held in cold storage at CLRS. The hybrid poplar cuttings will be obtained in the winter of 1994 from Kalamalka Research Station.

Extra stock will be planted in nursery beds at CLRS, spring 1994, to replace any mortality in the demos the following year.

SEEDLING/CUTTING AND AREA REQUIREMENTS:

a) single demonstration plantation:

| Number of blocks: | 4 |
| Number of species: | 4 |
| Number of trees/row: | 6 |
| Number of rows/block: | 6 |
| Number of trees/species and block: | 36 |
| Number of Fdc seedlings/group (A,B,C) | 12 |
| Number of Hw seedlings/group (D,E) | 18 |
| Number of Ss seedlings/group (F,G) | 18 |
| Number of Ax cuttings/group (H,I,J) | 12 |

Total number of seedlings and cuttings/demo: 144

Total area blocks 1,2,3 (18 m x 54 m) : 0.10 ha
Total area block 4 (24 mx 24 m) : 0.05 ha

Total area per demo 0.15 ha
b) coastal demonstration plantation project:

Number of Sites: 11
Number of seedlings/species/demo: 36
Total number of Fdc seedling/group (A,B): 84*
Total number of Hw seedling/group (C,D): 198
Total number of Ss seedling/group (E,F): 198
Total number of Ax cuttings/group (G,H): 132

Total number of Fdc seedlings: 252
Total number of Hw seedlings: 396
Total number of Ss seedlings: 396
Total number of Ax cuttings: 396

Total number of seedlings and cuttings: 1440

Total area; all sites: 1.52 ha*

*Note: Since there are already Fdc demonstration plantations established at 4 seed orchards the total number of Fdc seedlings required is 252. The total area of the project has therefore been reduced from 1.65 ha to 1.52 ha. (Due to the difficulty of establishing new demos beside existing Fdc demos, in the districts, new demos with all species will be established).

PLANTING

Planting will be conducted in the spring of 1994. If stock or sites are not available by these times planting will be deferred to the fall of 1994 or the spring of 1995.

Layout of the block, using wooden or plastic stakes, will be conducted prior to the planting of the stock. Planting will be conducted with a high emphasis on quality. The poplar cutting will be established directly on the site. The ends should be inserted into the soil as far as possible to allow 2 or 3 buds to remain at least 10 cm above the surface.
The trees will be planted as close as possible to the location of the stake. The stake will be moved away from the tree at a predetermined distance and orientation for ease of future identification. Seedling protection (fencing), where it is deemed necessary, will be erected the same day as planting. Where fencing is used identification stakes will not be necessary.

PLANTATION PROTECTION AND MAINTENANCE

Protection and maintenance of the sites will be of primary importance. The sites are to be visited at least one a year following planting to assess survival and required maintenance. Mortality will be replaced the following year using extra stock held at the Cowichan Lake Research Station. However, as there will be no replacements after this the plantations must be cared for more so than operational sites.

The Fdc and poplar seedlings will be protected from browsing using fencing or chicken wire where needed. Competition control, elimination of wildlings, and stake replacement will be completed as required.

RESPONSIBILITY

Coastal Seed Orchards (CSO) will have overall responsibility for the planning of these demonstration plantations. All activities related to these plantations will be discussed with CSO.

CSO, in consultation with the tree breeders and District foresters, will be responsible for stock and site selection. CSO will be responsible for the lifting, sorting, packaging and delivery of the stock to the site. CSO will be responsible for the layout, mapping and reporting of the demonstration plantation. Planting will be conducted by both CSO and District (or designate) staff. CSO will provide the stakes, labels, and fencing materials.

CSO would prefer the District and seed orchard offices to be responsible for site preparation and maintenance of these plantations as they are most familiar with local operations and conditions. Districts have the option of selecting and collecting local cottonwood cuttings to be used for their own demonstration plantation. This will otherwise be conducted by CSO.

CSO will provide the information sign which will be erected several years after plantation establishment. CSO will provide the information related to the demonstration plantations to be used for tours etc. All other tour outlines and reports related to these demos will be approved by CSO prior to distribution.
ACKNOWLEDGEMENTS

Special thanks to Jack Woods, John King, Charlie Cartwright, Bob Hatey, and Mike Carlson for their advice and supplying the stock to make this all possible! This working plan and plantation design largely follows those developed by Jack Woods and Clare Hewson, Interior Seed Orchards Projects Officer.
SCHEDULING

<table>
<thead>
<tr>
<th>Year</th>
<th>Task Description</th>
<th>Person Days</th>
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</thead>
<tbody>
<tr>
<td>1993</td>
<td>Selection of sites (July-September)</td>
<td>15</td>
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<tr>
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<td>Site Preparation (Fall 93-Spring 94)</td>
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<tr>
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<td>Inspection of stock (July)</td>
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<tr>
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<td>Lifting and sorting stock (Dec)</td>
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<tr>
<td>1994</td>
<td>Collection of local poplar cuttings (Nov-Feb)</td>
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<tr>
<td></td>
<td>Obtaining stakes, labels and materials (Feb)</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Transport of Stock to sites (Feb-March)</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Plantation layout (Feb-March)</td>
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</tr>
<tr>
<td></td>
<td>(0.5 days/site x 11 sites)</td>
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</tr>
<tr>
<td></td>
<td>Planting (Feb-Mar)</td>
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</tr>
<tr>
<td></td>
<td>(1440 trees @ 40 trees/hr)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mapping and Reports (March)</td>
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<tr>
<td>1995+</td>
<td>Maintenance (1 day/site/year)</td>
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</tr>
<tr>
<td></td>
<td>Sign construction and erection</td>
<td>16</td>
</tr>
</tbody>
</table>

**TOTAL TO 1995**
(excluding signs) 60