DRAFT

WORK PLAN

COASTAL SEED ORCHARDS' DEMONSTRATION PLANTATIONS

- 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 50% of the seed annually sown on the coast. 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 wide spread 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, Saanichthon, 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 tremuloides x P. trichocarpa) 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**

To establish demonstration plantations to comprehensively represent all orchards established for the coast would be a formidable task. Breeding programs do not exist for all orchards, and for those that do the tested material has only recently become available. As the purpose of these plantations is to compare improved to unimproved stock 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 Chilliwack and Squamish Forest Districts. The possibility of establishing the Hw, Ss and Ax demonstration plots adjacent to these Fdc demos should be assessed.

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. ie 69x623, 243x38, 101x623, and 38x408; where the first number represents the male parent tree, and the second number the female parent tree.
b) **First generation orchard seed**: a representative mix of several seedlots from existing first generation orchards. These orchards currently account for the reforestation stock in the Maritime seed planning zone. Seed lots available include: 5000, 6529, 6383, 9556

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

possibly
d) **Poor cross**: control cross seed from parent trees selected in wild stands for good form and vigour which have performed poorly in progeny tests.

Western hemlock  INSERT UPON COMMUNICATION WITH JOHN KING.
4 Seed lots

Sitka spruce  INSERT UPON COMMUNICATION WITH JOHN KING.
4 Seed lots

**Poplar (Cuttings)**

a) **Hybrid Populus tremuloides x P. trichocarpa**: cuttings of a very vigorous cross between a eastern cottonwood and a western trembling aspen.(?)

b) **P. trichocarpa** (Kitimat); cutting of north coast origin.(unimproved)

c) **P. trichocarpa** (Local); cutting of local origin.

possibly
d) **P. niagara x P. maxmiowcsii**; cuttings of a cross between an Ontario and Japanese poplar of good vigour.

**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 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 should be of good or medium quality and representative of the area. Sites should be fairly 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.

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 the block.

In the future a sign will be erected on the site explaining the objectives of the plantation with a map of the seed/cutting lots established.

Sites will be marked on a 3 x 3 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.

There are two design options for the demonstration plantations.
**OPTION 1: FOUR SEED/CUTTING LOT GROUPS PER SPECIES**

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Fdc    Hw    Ss    Ax

Each block will contain 4 rows of 10 trees each. Rows A, B, C, and D correspond to the seed/cutting lot groups as listed above for each species. Each row will consist of a single (or mix of) seed/cutting lot(s) representing a specific group. With 3 m x 3 m spacing the block size will be 12 x 30 m². Total area required is 48 m x 30 m or 0.144 ha.

**OPTION 2: THREE SEED/CUTTING LOT GROUPS PER SPECIES**

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Fdc    Hw    Ss    Ax

Each block will consist of 6 rows of 6 trees each. Each seed/cutting lot group will be represented by two rows. Each row will consist of a single seed/cutting lot. Rows A, B, and C correspond to the seed/cutting lot groups as listed above for each species. In this option the seed/cutting lot group 'D' for each species has not been included. By repeating the ABC sequence two seedlots per group may be included and site variation can be slightly accounted for. At 3 m x 3 m spacing each block is 15 m x 15 m. Total area required is 15 m x 60 m or 0.09 ha.
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. Spacing between the Ax and the adjacent conifer plot may be increased to 4 meters.

**STOCK**

Most of the conifer stock is currently being grown as PSB 1+0 615 at the Cowichan Research Station. This stock was sown in the spring of 1993 by their respective breeders. Seedlings will be randomly selected if possible. Only those seedlings which meet the Ministry standards will be included in the demonstration.

The poplar cuttings, with the exception of local cottonwood 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.

The following is a summary of the seedling/cutting requirements:

**OPTION 1: FOUR SEED/CUTTING LOT GROUPS PER SPECIES**

a) single demonstration plantation*:

<table>
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<th>Description</th>
<th>Value</th>
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<tbody>
<tr>
<td>Number of Blocks:</td>
<td>4</td>
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<tr>
<td>Number of Species:</td>
<td>4</td>
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<tr>
<td>Number of genotypes/species:</td>
<td>4</td>
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<tr>
<td>Number of seedlings/seed lot/species:</td>
<td>10</td>
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<tr>
<td>Number of seedlings/species:</td>
<td>40</td>
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<tr>
<td>Total number of seedlings/demo:</td>
<td>160</td>
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<tr>
<td>Total area per site:</td>
<td>0.144 ha</td>
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b) Coastal demonstration plantation project*:

<table>
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<tr>
<th>Description</th>
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<tr>
<td>Number of Sites:</td>
<td>11</td>
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<tr>
<td>Number of seedlings/species/demo:</td>
<td>40</td>
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<tr>
<td>Total number of seedlings/seed lot/species:</td>
<td>110*</td>
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<tr>
<td>Total number of seedlings/species:</td>
<td>440*</td>
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<td>Total number of seedlings:</td>
<td>1560*</td>
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<td>Total area; all sites:</td>
<td>1.456 ha*</td>
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*Note: Since there are already Fdc demonstration plantations established at 6 of the proposed sites the number of Fdc seedlings required is 50 /seed lot and 200 total, thus, reducing the total number of seedlings from 1760 to 1560 and the total area of the project from 1.5 ha to 1.456 ha.
OPTION 2: THREE SEED/CUTTING LOT GROUPS PER SPECIES

a) single demonstration plantation:

Number of Blocks: 4
Number of Species: 4
Number of Seed-cutting lot groups/species: 2
Number of seed-cutting lots/species 6
Number of seedlings/seed-cutting lot/species: 6
Number of seedlings/species: 36
Total number of seedlings/demo: 144
Total area per site: 0.09 ha

b) Coastal demonstration plantation project:

Number of Sites: 11
Number of seedlings/species/demo: 36
Total number of seedlings/seed lot/species: 66**
Total number of seedlings/species: 396**
Total number of seedlings: 1338**
Total area; all sites: 0.86 ha**

**Note: Since there are already Fdc demonstration plantations established at 6 of the proposed sites the number of Fdc seedlings required is 30 /seed lot and 150 total, thus, reducing the total number of seedlings from 1584 to 1338 and the total area of the project from 0.99 ha to 0.86 ha.

PLANTING

Planting will be conducted in the fall of 1993 or 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 done 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 pre-determined distance and orientation for ease of future identification. Vexar tubing, where it is deemed necessary, will be placed over the trees the same day as planting.
PLANTATION PROTECTION AND MAINTENANCE

Protection and maintenance of the sites will be of primary importance. As there will be no replacements for mortality the plantations must be cared for more so than operational sites. The seedlings will be protected from browsing using Vexar tubing where needed. The sites are to be visited at least one a year following planting to assess survival and required maintenance. 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 the stock selection 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 the District forester or designate. CSO will provide the stakes, labels, and Vexar tubing.

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.

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 and Mike Carlson for their advise 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

1993

Selection of sites (June-July) 15
Site Preparation (Fall 93-Spring 94) 5
Inspection of stock (Aug-Sept) 2
Collection of local poplar cuttings (Nov-Feb) 5
Obtaining stakes and materials (Feb) 1

1994

Lifting and sorting stock (Jan) 2
Transport of Stock to sites (Feb-March) 5
Plantation layout (Feb-March)
(0.5 days/site x 11 sites) 5
Planting (Feb-Mar)
(1690 trees @ 40 tress/hr) 5
Mapping and Reports (March) 5

1995+

Maintenance (1 day/site/year) 11
Sign construction and erection 16

TOTAL TO 1995 61
(excluding signs)