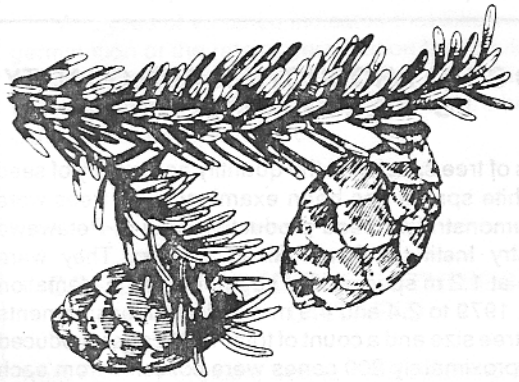
CANADIAN TREE IMPROVEMENT ASSOCIATION/
ASSOCIATION CANADIENNE POUR L'AMÉLIORATION DES ARBRES

Newsbulletin 12

Tree Seed Working Group

No. 12 November 1989



FROM THE CHAIRMAN

Another interesting CTIA/ACAA biennial meeting is now history. It was gratifying to me that our Working Group's two Workshops seemed to be well received and to generate considerable subsequent discussion (after ripening?). One major point that emerged was the dearth of documented information on tree-crown management in relation to cone-bearing in seed orchards.

At our Working Group Meeting it was strongly felt that we should seek support for immediate research on crown management. To this end a motion was put to the CTIA/ACAA Business Meeting and passed. It was to the effect that the CTIA/ACAA would write expressing this urgent need to all appropriate research managers and research organizations in the country and to provincial forestry jurisdictions.

On our part, I urge three things: 1. that any who have results on past crown-pruning efforts, or the like, write a short account of what was done and of the response obtained, and send it to the Editor for a future issue of this Newsbulletin; 2. that those who have ideas to test, but need funding and trees to work on, either send proposals to potential funding sources (stressing the CTIA/ACAA backing), or stand ready to respond to any agency requesting proposals; and 3. that if you are in a position to conduct trials, get going, but remember always to leave some trees untreated as controls, and to document everything that is done.

It is one thing to express a concern, and another to do, or be ready to do, something about it. Having expressed the concern, let us make sure that something meaningful is done about it — and soon — as the trees won't wait for us. They grow! And in a seed orchard, they grow faster than elsewhere!

One other point, a point I made in my workshop presentation: each genus (even species) we grow has a particular way of developing its crown. This means that the response to treatment is one genus may be vastly different from that obtained in another genus. We need to experiment with all the genera, all the species, we grow in seed orchards.

Graham R. Powell

NOTE THESE ADDRESSES

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Queries, comments, and contributions to the "NEWSBULLETIN" are welcomed by the chairman or the editor.

EDITOR'S NOTES

In Newsbulletin #10 I wrote praises to Dale Simpson and Ron Smith who put together the first Canadian manual for forest tree seed orchard management. Now I am again passing out bouquets and congratulations, praises and thanks to the Tree Seed Working Group members who have really accomplished something. During the past summer I obtained two more manuals of significance to our Working Group.

The first one received was the "Operations Manual for Interior Spruce Container Seed Orchards" in British Columbia edited by Andrea Eastham (currently a B.C. Ministry of Forest and Lands, Research Scientist at the Red Rock Research Station in Prince George). This first edition operations manual is intended as a "how to" guide for orchard management technicians looking after two pilot orchards. It includes a great deal of information specific to the operation of the orchards during 1988 (and subsequent years) and is being updated as additional information becomes available. The text is divided into five chapters:

1. Facilities and Tree Culture, by Andrea Eastham;
2. Flower Simulation, by Steve Ross and Andrea Eastham;
3. Pollen Management, by Joe Webber,

4. Cone and Seed Handling (not available yet)
5. Environmental Monitoring, by Steve Ross.

This manual currently has a very limited availability. However, if you are doing breeding hall work on containerized trees or are planning for a container orchard you should try to obtain a copy.

The second manual "Operational Guidelines for Tree Improvement in Ontario" was provided by the Ministry of Natural Resources. This manual is printed on 140 x 215 mm, high quality, glossy paper and is placed in a handsome, three-ring, loose leaf binder. The text which focuses on field procedures is divided into nine sections:

1. Introduction
2. Identification of Seed Sources
3. Plus Tree Selection
4. Types of Orchards and Orchard Design
5. Establishment of Seed Orchards
6. Management of Seed Orchards
7. Flower and Seed Management
8. Clonal Forestry with Conifers
9. Genetic Tests.

Each section is preceded by a table of contents, that allows users to easily focus on a specific topic, and is concluded with lists of literature cited and references for additional reading which encourages users to expand their knowledge beyond that printed in the manual.

These manuals contain a consensus of opinions representing many years of hard work, best-guess-testing and research. We all can benefit from these labours. I'm sure these manuals contain some information that will help every Tree Seed Working Group member get their work done.

Talking about work: — is anybody in Western Canada doing anything. As you read this Newsbulletin note the origin of the articles. There has been very little in the past three Newsbulletin issues from Western Canada. Isn't it time you members from the west shared some of your experience with us?

Hugh O. Schooley

CANADIAN TREES HELP REBUILD ENGLISH FORESTS

A year after hurricane-force winds devastated trees in southern England, a number of Canadian provinces, recently sent forestry aid to help rebuild English forests.

Saskatchewan's forest nurseries, operated by Saskatchewan Parks, Recreation and Culture, contributed 3,000 green ash seedlings and 10 kilograms each of jack pine, white spruce and lodgepole pine seeds. The seeds could produce up to an estimated six million trees.

Seeds from a Kentucky coffee tree and other native Ontario trees — black maple, mountain maple and crab apple were donated by the University Guelph Arboretum.

The Canadian project donated one evergreen seed for each Canadian — 26 million — and 35,000 broadleaf seeds to help restore woodland areas damaged in the violent windstorm. The storm destroyed or severely damaged 1,000 trees at Kew alone, one of the world's most important botanical gardens.

(Source: Landmark Vol. 1(1): March 1989)

CONE AND SEED PRODUCTION AND QUALITY VS TREE SPACING

The effects of tree spacing in the quantity and quality of seed produced by white spruce has been examined. The trees were growing in a demonstration seed production area at Petawawa National Forestry Institute, Chalk River, Ontario. They were planted in 1956 at 1.2 m spacing and segments of the plantation were thinned in 1979 to 2.4 and 4.9 m spacings. Measurements to characterize tree size and a count of total 1984 cones produced were made. Approximately 200 cones were collected from each tree and two samples of 25 undamaged cones were randomly chosen for measurement and seed extraction. Average height, dbh, number of cones, cone length, full-seed-yield per cone and full-seed-weight for the different spacings is shown in table 1.

Table 1. Effects of tree spacing on tree height and dbh, seed-cone production, and on physical quality of cones and seeds.

	Tree spacing (m)		
Variable	1.2	2.4	4.9
Tree height (m)	12.30 b	13.91 a	10.36 c
Tree dbh (cm)	17.73 b	24.24 a	21.41 ab
Cone yield (number)	2402 b	7758 ab	12035 a
Cone length (cm)	4.71 a	3.72 b	3.66 b
Full-seed-yield per cone	60 a	44 b	47 b
Weight of 1000 full seeds (g)	2.38 a	2.18 ab	2.08 b

Means with the same letter are not significantly different at p = 0.05.

Trees growing at the 4.9 m spacing were shorter than trees growing at both smaller spacings and had a smaller average dbh than trees at the 2.4 m spacing. Average cone production per tree decreased with decreasing spacing from 4.9 m to 1.2 m. However, on a per hectare or stand area basis, considerably more cones were produced at the 2.4 m spacing. The advantage of the larger spacing in a seed production area is not necessarily increased cone production but rather improved accessibility to the trees for cone picking.

Trees at the 1.2 m spacing produced longer cones than those at the two greater spacings. These longer cones contained more ($F = 7.66$, $p = 0.0137$, $r^2 = 0.3237$), and heavier seed than cones from trees grown at the greater spacings. No reason for these differences attributed to spacing is available but further investigations of a potential relationship between cone and seed size and parent tree spacing are warranted.

Several researchers have reported that the weight of seed from individual trees from different stands can be quite variable and distinctive for white spruce. This study indicates similar variability in seed weight among trees. Full-seed weight (per 1000

seeds) varied from 1.80 to 2.75 g. A portion of this type of between tree variation is thought to have its origin as a result of genetic influences. This may be true, however, in this study the narrowly spaced trees had the heaviest seeds and this demonstrates that the growing environment of trees may play a significant role in determining seed weight.

Analyses of variance indicated that little variation in percent germination or the rate of germination that could be attributed to the different tree spacing. In addition simple linear correlations indicated that the differences in seed weight between spacings did not influence germination

Guy Caron

CONE AND SEED PEST STUDIES IN 1988 IN ONTARIO

(from Forestry Canada, Spring 1989 Report of Forest Insect and Disease Survey, Great Lakes Forestry Centre)

A long-term program together baseline data on various agents that affect cone and seed production of the major coniferous species focused on jack pine in northern Ontario and red pine in southern Ontario in 1988. The methodology was the same in both cases. Each survey ranger collected a total of 100 mature but still green cones from three trees; the full cone-bearing length of the tree crowns was represented in this survey. The samples were shipped to the Sault Ste. Marie laboratory, where dissection and analysis took place.

Jack Pine: In all, 900 cones were examined, and 15.1% of these sustained damage. Average seed loss within damaged cones was 29.5%. The principal agents causing the damage, in order of importance, were: unknown Lepidoptera, unknown agents, a coneworm (*Dioryctria* sp.), the norther pitch twig moth, a midge (*Resseliella* sp.), the fir coneworm (*Dioryctria abietivorella* [Grt.]) and the eastern pine seedworm (*Cydia toreuta* [Grt.]). No diseases were encountered on the cones examined.

Red Pine: In all, 500 cones were dissected and analyzed, 295 (59%) were damaged. The average seed loss within damaged cones was 67.8%. The principal agents causing the damage were: unknown agents, unknown Lepidoptera, the red pine cone borer (*Eucosma monitorana* Heinr.), a midge (*Resseliella* sp.), the Zimmerman pine moth, the red pine cone beetle (*Conophthorus resinosae* Hopk.), the fir coneworm, and the eastern pine seedworm. As in the case of the jack pine cone survey, no diseases were found.

This project that will continue in 1989; white pine cones will be examined in southern Ontario, and black spruce will be the focus of cone and seed surveys in northern Ontario.

ORCHARD PEST MONITORING PROGRAM OF THE NEW BRUNSWICK DEPARTMENT OF NATURAL RESOURCES & ENERGY

Commencing in the latter months of 1987, the Forest Pest Management Section began to develop and implement an insect and disease pest monitoring program in the Department's seed orchards. Our objective is to develop in-house expertise on the identification and sampling methodologies needed to assess population levels of insects and diseases which could have either a direct or indirect impact on seed production and where appropriate, implement control actions. An in-house manual was compiled to educate staff on conifer reproduction and insect life cycles, and to create a check-list of potential insect and disease pests. The manual is intended to be updated on an ongoing basis. A strong link was established with the Tree Improvement staff who manage the orchards.

Pest monitoring of the seed orchards as we see it requires (1) routine "walk-abouts" to assess trees for pests and their symptoms; (2) planned surveys for specific pests and their damage; and (3) reactive surveys to guide the response to an unpredicted and immediate pest problem. The more thorough the first two requirements are conducted the less often the need to implement the third.

During the past two years pheromone trapping was conducted for six lepidoptera species; overwintering larval surveys were conducted to forecast spruce budworm, spruce coneworm, and jack pine budworm population levels. Sticky traps were evaluated as a possible monitoring tool at time of pollination and to survey spruce cone maggot in several orchards. A data base is being developed to correlate various trap catches and overwintering larval counts with the following year's larval population and cone damage.

Several control programs and pesticide trials were implemented by the Department. There was an evaluation of pesticide treatments to larch at time of pollination; black spruce seed production stands were aerially sprayed to protect a bumper cone crop against spruce budworm and spruce coneworm and assessments of efficacy was conducted. Gall-infested shoots of white spruce were manually pruned to control aphids. The Department looks to research organizations to help fill the numerous voids in our knowledge base concerning pest biology, appropriate sampling technique, and control options. Of special interest is the work being conducted by the "Cone and Seed Pest Management Action Group" (CASPMAG). The CASPMAG project is designed to develop practical orchard pest monitoring systems which orchard managers can operationally implement. As a Department we will take advantage of such developments to further improve our pest monitoring program.

Lester Hartling and Danny O'Shea

WHAT'S YOUR PROVINCIAL TREE?

It is only recently that the naming of official provincial trees began. It is strange that it took so long. We have had provincial flowers for a long time but never got around to adopting arboreal emblems.

Ontario was first to have an official tree when white pine was given this distinction in 1984. This was followed soon in the same year when Alberta designated lodgepole pine. Since then all provinces and the Northwest Territories have named their tree emblems. Only the Yukon has not made their choice.

Other designated tree species are western red cedar for British Columbia, white birch for Saskatchewan, white spruce in

Manitoba, white elm for Quebec, balsam fir for New Brunswick, red spruce in Nova Scotia, red oak in Prince Edward Island, black spruce for Newfoundland, and jack pine for the Northwest Territories.

Strangely enough, although the maple appears in Canada's coat-of-arms and flag, it has not yet been granted legislated status as our national tree.

Bill Fullerton
Canadian Forestry Association

MONTEVERDE CLOUD FOREST

Editor's note: *The author of this article was a Canadian participant in a Canada World Youth Program exchange with Costa Rica. She and her Costa Rican counterpart spent a month working at the National Tree Seed Centre at Petawawa National Forestry Institute before leaving Canada to spend ten weeks in Costa Rica. While in Costa Rica her Group visited Monteverde Cloud Forest and this account of the trip was prepared:*

– – – With two weeks left in our host community, Santa Cruz, I am feeling many emotions that are difficult to put into thoughts, let alone words. Suffice to say, that when I made the commitment to participate in a cross-cultural exchange known as Canada World Youth, I was told to be prepared for "a world to experience". Wow: now I realize what an understatement this phrase is.

4:45 AM, Friday, February 10th, 1989. I have just closed the door to my house as quietly as possible, so as not to awaken my host family. My backpack and I show up at the designated meeting place. Gradually, the rest of our group drifts in and sleepiness melts into energy as the minutes tick by and the reality of our adventure sets in. This is really happening: we are going to Monteverde.

It is important here to explain that what turns an experience into a singular HAPPENING are the seemingly secondary details. It isn't simply just a matter of where you go, but also how you get there. For example, it would have been great to drive to Monteverde with friends and stay in a hotel for a couple of days. But I must say that I will remember this weekend for the rest of my life because I went with seventeen other people who did not exist for me seven months ago, because we all piled into the back of a dump truck lent to us by the municipality of Santa Cruz, because local shopkeepers had cheerfully given us more than enough food for our journey, and because we were allowed to spend two nights in a school which was closed for vacation. In other words, our trip was the result of a series of interactions with our host community; and we found out that people are interested in us and what we are doing.

The drive to Monteverde was an adventure in itself. The road there was of the sort you see in movies — mountains on the right hand side and drops down, down, down on the left — and just wide enough for two vehicles to get past one another, slowly; maybe. I had never been part of a cloud before, and it was really something to see my own feelings mirrored in the grinning-toddler faces of the other participants; as the cool fine mist enveloped us, but with sunshine overhead all the while. Around a hairpin curve and then we see it. A valley — a spectrum of green: every shade imaginable — a lone white horse on a hillside, cows lazily grazing. The trees look like broccoli, and yet we are somewhere over a rainbow, looking down upon it for the first time ever. This is not a yogurt commercial. This is Monteverde.

But Monteverde is alot of other things, too. It is also a biological cloudforest reserve — meaning that it is one of the protected green spaces in Costa Rica. Unfortunately, deforestation has become a problem in this country to the extent that, aside from national parks and reserves, there are very few mature forested areas left.

As we followed one another through the twisty and slippery path of the cloud forest, I was struck with a sense of wonderment at the whole thing. "Here is some life that is older than our country — when this now immense tree was a seedling, Canada probably did not yet exist". It's such a contradiction. We meticulously covet old, dead, manmade things such as hundred-year-old letters, newspapers and photographs; while we pay such incredibly little attention to the living world which is communicated in these same letters, newspapers and photographs. Maybe humankind has some sort of complex: "Well, we did not create our natural world, so let's destroy it physically so that we can recreate it through synthetic ways. After all, you don't need to walk through an ancient rain forest. Instead you can look at pictures and read about how tall the trees were.". — Or something like that — how else can we rationalize what is happening? How can we reconcile this reverence for tradition and antiquity in culture, while we heedlessly continue to destroy what is sacred to all human beings: the Ultimate Antique, "Our Planet Earth".

So now we can talk about alternatives, and these we did encounter in Monteverde as well. We had the welcome opportunity to go to a Coffee House sponsored by the Quaker community there. The cold rainy weather and the homemade muffins and cakes, made this experience akin to going to Canada for the evening. It was also an opportunity to observe how the American-based Quaker community can and does function within the Costa Rican community surrounding it. On this point, I drew many parallels between our group and the Quakers: because our group of 16 participants is a community of sorts. We have all been living as newcomers in the host community of Santa Cruz, both Costa Rican and Canadian participants alike.

So before we knew it, our visit was over and our dump truck was speeding us back to our host families, work projects, community investigations, and various other responsibilities in Santa Cruz. In a program such as ours, there was constantly many projects to accomplish. We are so busy getting things done, that sometimes it's easy to forget we are in another country. The Monteverde weekend was an important opportunity to stop and smell the roses, a time for reflection, and for appreciation of Costa Rica's unique and precious natural environment. And for me, it was also a reaffirmation of the belief: — I would rather walk through the forest than read about the trees.

Natalie Edelson

A HELPFUL HINT FOR TECHNICAL WRITING

Seed, Seeds, and Seedlings

Seeds and seedlings are vitally important in natural regeneration and reforestation. Foresters frequently write about them. The exact moment when a seed becomes a seedling is vague. Consequently the words "seed" and "seedling" sometimes are used incorrectly. For example:

Incorrect: Jack pine seeds were planted on April 5, and emerged April 10.

Correct: Jack pine seeds were planted April 5, and seedlings emerged April 10.

To avoid errors, always be sure that seeds germinate and seedlings emerge.

The name of the tree can apply to any stage of the tree's life cycle. Consequently, any confusion about "seed" and "seedling" in the above example can be avoided and the sentence can be shortened by writing, "Jack pine was seeded April and emerged April 10."

The plural of "seed" can be either "seed" or "seeds." Having chosen one form, do not change from one to the other.

If "seed" is used as the plural, then only the verb will indicate whether the word is singular or plural, e.g., The seed were planted in each plot. If "seeds" is used as the plural, then both the noun and verb indicate the plural form, e.g., The seeds were planted in each pot.

Something called a "collective singular" can complicate the use of seed (singular) and seed or seeds (plural). A collective singular is a collection of many individuals that is considered to be singular because it forms a unit with an individual identity. When "seed" means a collection of many individual seeds used for planting, the word is singular. For example:

The pine seed is (not are) in cold storage.
The spruce seed was (not were) harvested.
The cedar seed was (not were) sown.

A sample of more than one seed taken from a seed lot would be considered plural if individual seeds are considered, even if the sample is a small fraction of the total singular lot. For example:

From each bag of seed, 100 seeds were collected.
After planting, 50 seeds were dug up to determine seeding depth.

In the above example, the choice of "seed" (collective singular) or "seeds" (plural) is fairly clear cut. Sometimes a quantity of seeds logically could be a unit (collective singular) or a number of individual seeds (plural). Then the choice of which one it shall be is entirely up to the author.

Remember:
After seeds begin to sprout
Then seedlings they become;
And the choice of seed or seedling
Need not be troublesome.

This is an article slightly modified by your editor written by J.H. Dawson for Weed Technology Vol. 3: p. 207. 1989.

WANTED

Information:

Information from anyone who has experience with handling "cones" and seeds, or raising seedlings of any species of *Juniperus*. We have at UNB a graduate student from Kenya who is working on their species of *Juniperus*. Please send any information to Dr. G.R. Powell, Dept. of Forest Resources, University of New Brunswick, Bag Service No. 44555, Fredericton, NB, Canada E3B 6C2.

Comments:

We need your comments, suggestions or criticisms about cone and seed pest information provided in the Newsbulletin. Do you find the information useful? Is there too little or too much information? What kind of information about cone and seed pests do you need. Please take a few moments of your time and send me a note. Help us help you. Thank you.

Peter de Groot
Coordinator, Cone and Seed Pest Working Party

Important Notice For All You Aspiring Barbers (Tree Pruners)

There is an increasing interest in crown management for trees both in seed orchards and those potted for intensive culture. The subject of crown management has been suggested as a potential topic for our next newsletter. Since I was one of those who suggested the subject, our illustrious Editor, Hugh, suggested that I volunteer to follow up on the matter.

There are a lot of studies currently going on in this area which would be of interest to many of us, unfortunately little has been published. Here is an opportunity for all of us to benefit by finding out what is going on across the country. Also, given that crown manipulation is quickly becoming a necessary part of our management regimes, it would certainly be nice to know what wheels we do not have to reinvent.

I will be contacting as many people as I can over the next few months soliciting contributions. However, it would be much easier if contributions came forth voluntarily without my having to run up a big phone bill.

The next newsletter is scheduled for March. Please try to jot down a few words of wisdom and send them to Hugh or myself before January 31, 1990.

Ron Smith
Forestry Canada - Maritimes Region
P.O. Box 4000
Fredericton, N.B. E3B 5P7

TREE BREEDING IN FINLAND

Is your name on the mailing list to receive the annual report and announcements of publications from "Metsanjalostussaatio", the Finnish "Foundation for Forest Tree Breeding"? If not, it should be. Their 1988 report has just been issued and contains several summaries of work being done in Finland that would be of interest to Canadian tree seed workers. For example Jouni Mikola explains a recently established long term breeding program for Scots pine as follows: "The country is divided into 11 breeding zones based on variations in climate. Within each zone, a breeding population of 500-600 trees will be built up, mainly of existing phenotypic plus trees. The present plus tree material will be moderately culled by progeny test results, and a few hundred carefully selected new plus trees per zone will be included. Within each breeding zone, all individuals of the 1st generation breeding population will be single-pair mated to produce 250-300 unrelated full-sib families, which will be grown in common gardens at 2 or 3 locations. At the age of 15-20 years two individuals from each family will be phenotypically selected to form the 2nd generation breeding populations of 500-600 trees per zone.

Second-generation plus trees will also be control-crossed to produce a maximum number of unrelated full-sib families. The large size of the breeding population is maintained from generation to generation, and consaguineous matings are avoided as far as possible.

This suggested long-term strategy, with its maintenance of a large breeding population and no or very little family selection in each generation, brings about genetic gain but at a slow rate. In order to maximize the rate of progress and to make full use of the potentials of tree breeding in forestry practice, short-term breeding operations with more effective mating designs and as intensive combined family and individual selection as possible are inevitably also needed. Short term breeding alone, however, would lead to a rapid exhaustion of genetic variation and to the complete loss of genes which might eventually prove valuable. The main purpose of the long-term breeding population is to serve as a gradually improving broad base for the initiation of continually new intensive short-term selection programmes, which must meet the needs of the changing ecological and economical environments of the future."

Foundation for Forest Tree Breeding
Viljatia 4A5, SF-00700 Helsinki, Finland

DANIDA FOREST SEED CENTRE

The Danida Forest Seed Centre has become an excellent source for information on seed procurement, etc. Many of their reports are of both a practical and instructive nature and could be useful in solving problems or requirements for information here in Canada. I would suggest TSWG members contact the Centre and ask to be informed of reports as they become available. The Centre's addresses is as follows: KROGERUPVEJ 3A, DK-3050, HUMLEBAEK, DENMARK

Their recent reports include the following:

#A2 - Benefits from tree improvement; compiled by R.L. Willan. 1988. 21 pp.

#B1 - Classification and selection of seed sources; compiled by H. Barner, K. Olesen and H. Wellendorf. 1988. 33 pp.

#A1 - The strategies and procedures for an integrated national tree seed program for seed procurement, tree improvement and genetic resources; compiled by H. Barner and B. Ditlevesen. 1988. 15 pp.

#34 - Seed procurement through the Danida Forest Seed Centre & Seed Catalogue January 1989. 22 pp.

#C11 - Control measures in transfer of forest seed; compiled by R.L. Willan and H. Barner. 1988. 20 pp.

#C1 - Planning national seed procurement programs; compiled by S. Moestrup. 1988. 28 pp.

Editor

ASEAN-CANADA FORESTRY TREE SEED CENTRE, THAILAND, PHASE II

Following satisfactory completion of Phase I and the Interim Phase programs of the Project, and an appraisal of a request by the Association of Southeast Asian Nations (ASEAN) for Canada's continued assistance in developing the Seed Centre, a Memorandum of Understanding was signed in April 1988. Subsequently, a management proposal for Phase II of the Project was prepared by the Petawawa National Forestry Institute (PNFI) and accepted by the Canadian International Development Agency (CIDA) in August 1988. In June 1989 PNFI was appointed as the Canadian Executing Agency for the Project by CIDA, an inception tour was conducted and a report prepared by the PNFI Management Team together with the Director of the Seed Centre in October 1989. The PNFI Management Team consists of a Project Supervisor, A.B. Case, a Scientific Coordinator, B.S.P. Wang, and a Canadian Project Manager, C.W. Yeatman.

The objective of Phase II is to further develop the Seed Centre's capability for providing technical and scientific support for the provision of improved tree seeds and the genetic management of natural forests and plantations in ASEAN. To achieve this goal, the planned program of Phase II focusses on four functional elements: Research and Development, Operational Support, Information Exchange, and Training. Phase II will be operative for six years with an estimated funding of $14.5 million Canadian dollars of which Canada's contribution is 64%. The planned program is delivered by the PNFI Management Team supported by a number of PNFI administrative, scientific, and professional staff plus specialists and consultants from other Canadian agencies.

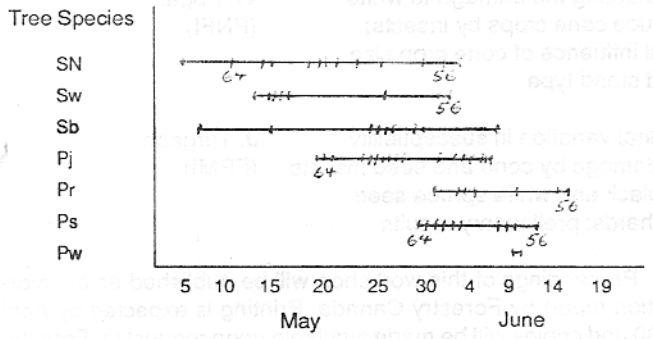
The Canadian Project Manager, Dr. C.W. Yeatman, and his administrative assistant, Richard Eaton, have been in Thailand since August 1989. The first Project Steering Committee meeting Phase II is scheduled to take place in Thailand in late November 1989.

Ben Wang

ANNUAL VARIATION OF POLLEN RELEASE

Variation in pollen release from year to year due to temperature and weather conditions is no secret. However few people realize just how large this variation can be at a given location. Here in the Tree Genetics and Breeding Project of Petawawa National Forestry Institute we have been keeping records of pollination dates for various species since 1951. Figure 1 shows the observed range in pollination date/pollen release data during the 1951 to 1989 observation period. This information clearly depicts the variation one can expect when conducting a breeding program. It also indicates why pollen monitoring for a given species requires careful planning.

Figure 1: Summary records showing occurrence of pollination on different dates.



The length of the period required by tree buds to proceed from the winter dormant stage to flushing is primarily controlled by the total heat received by the buds. Pollination records for 1956 and 1964 are noted on Figure 1 to show the extremes documented for various tree species. A cold spring in 1956 delayed pollination while a mild spring in 1964 resulted in earlier than expected pollen shed. The range in spring temperatures for these two years is summarized below in Table 2.

Table 2: Temperature Summary.

Temperature °C	April		May		June	
	1956	1964	1956	1964	1956	1964
mean daily	2.9	4.5	7.9	13.6	17.3	16.1
mean maximum	7.9	10.4	14.3	21.0	23.9	23.4
mean minimum	-2.1	-1.4	1.4	6.2	10.6	8.8

Peter Copis

POLLEN CONES ON RED PINE

I had an inquisitive student working for me who asked many questions about the reproductive cycle of the red pine trees he was working on. He was counting female flowers at the time and wondered out loud — "what about the male pollen cones?". I was able to answer, "Counts or estimates of the number of pollen cones per tree have been made for some tree species but of course any such counts would depend on tree crown size, the degree of crown exposure, the inherent productivity of the tree for pollen cones, the general health and nutrient status of the tree and the influence of the previous year's weather on cone bud initiation." He looked at me without saying anything so I went on with my dissertation: — "Of course it isn't just the number of pollen cones that is important to the reproductive cycle but also the amount of pollen produced in these cones. In red pine, this quantity is influenced by the number of pollen sacs (microsporangia) clustered in each pollen cone and the pollen content of each sac." Our conversation went on from there, but came back several times to his original question, "What about the male cones on these trees?" Needless to say, before the day was over I admitted my ignorance and the student learned something very important. He learned that if you ask a question often enough, you usually end up with the job of answering it yourself. The following is a description of his counts of pollen cone production and pollen sacs per cone from one randomly selected tree. Pollen volume or weight was not measured.

The 32-year-old selected red pine tree was located in a seed production area near Ottawa, Ontario. It was planted at a 1.8 m spacing and thinned 10 years later to a 5.5 m spacing. When examined it was about 10 m tall, 23 cm DBH and had a broad crown containing 20 years of living branches. In a total tree count, 81 pollen cone bearing branches, 1207 pollen cones and 26409 pollen sacs were tallied. This averages at 15 cones and 326 pollen sacs per branch. The largest cone observed contained 62 sacs but the average number per cone was only 21.9 sacs. The number of cones with from six to 30 sacs were present with a fairly uniform frequency on the tree. Cones with five or fewer or more than 30 sacs occurred less frequently. When the tree was divided into crown quarters (by branch age), the top or 4th quarter was least productive followed by the bottom or 1st quarter, the 3rd quarter and the 2nd quarter which was most productive. The specific results per crown quarter are shown in Table 3.

Table 3: Distribution of branches, pollen cones and pollen sacs by crown quarter (5 years growth/quarter).

Variable	Crown Quarter 1	2	3	4
# branches	20	24	27	28
# cones/branch	13	21	15	2
# sacs/cone	18	23	23	22
% of total cones	21	42	33	4
% of total sacs	17	45	34	4

Hugh O. Schooley

UPDATED RULES FOR TESTING SEEDS IN NORTH AMERICA

The Rules for testing seeds published by the Association of Official Seed Analysts and updated in 1988 were distributed to users in September 1989. The Rules have been published in a looseleaf format since 1970 to facilitate changes and revisions. The updated version was published as Volume 12, Number 3 of the Journal of Seed Technology.

The major amendments to the Rules that related to tree and shrub seeds include an addition of 44 tree and shrub species to Table 1, (Weight of working samples of tree and shrub seeds), and of 16 species to Table 5, (Methods of testing for laboratory germination tests). In the new version, light prescription was removed from the column of additional directions but explained in the main text of the Germination Tests (Chapter 4). Also, paired tests of four 100 seed replicates for each test condition of with and without prechill were prescribed for species whose seed dormancy may vary by geographic origin or year of collection. Paired tests were recommended for seeds of *Abies concolor, Betula alleghaniensis, Curpressus arizonica, Larix occidentalis, Picea engelmannii, P. glauca, P. sitchensis, Pinus contorta* var. *latifolia, P. echinata, P. jeffreyi, P. pinaster, P. strobus, P. sylvestris, P. taeda, Pseudotsuga menziesii* (var. *glauca* and var. *menziesii*), *Sequoidendron giganteum*, and *Tsuga heterophylla.*

Ben Wang

REPORT OF MEETINGS

Regeneration problems in high altitude stands

This international meeting was held from 18-22 September 1988 at the University of Savoie in Chambery, France. 21 papers on natural regeneration problems in Norway spruce, Silver Fir, Mountain Pine and European Larch were delivered. Most of the lectures dealt with germination conditions and soil influences, but a very interesting and critical discussion between foresters and entomologists followed the presentation of two papers considering cone insects (Dr. M. Skrzypczynska — *Megastigmus suspectus* Barr. (Hymenoptere, Torymidae) and *Reseliella picea* Seitn. (Dipt. Cecidomyiidae) in the natural range of fir (*Abies alba*) in Poland in 1986" — ; Dr. A. Roques — "Cone and Seed Pests Influences upon natural regeneration potentialities"). This discussion convinced many silviculturists and tree physiologists of the importance of seed loss before seedfall (primarily caused by insects), which limits the number of seeds exposed to detrimental factors after seedfall (especially severe at high altitudes). The meeting concluded by constituting an international research network, called Mountain Forest Network which will serve to enhance communication among European botanists, entomologists and field foresters.

(Source: IUFRO, Cone and Seed Insect Working Party S2.07-01, Newsletter Vol. 12 #1, June 1989)

Cone and Seed Pest Workshop

Many members of the CTIA's cone and seed insect working party attended a workshop sponsored by Forestry Canada on 4 October in St. John's. The workshop was held in association withthe Entomological Society of Canada's annual meeting and attracted about 35 participants. The nine papers presented were as follows:

Research on cone and seed insects in North America: past, present and future	G.L. DeBarr (USDA Forest Service)
A review of the biology and taxonomy of Conophthorus (Coleoptera: Scolytidae) in eastern North America	P. de Groot (FPMI)
Sampling seed and cone insects in spruce	J. Sweeney (PFC)
Potential control of cone insects using semiochemicals	G. Grant (FPMI)
Establishing seed orchards to minimize infestations by insects	Y. Prevost (Lakehead University)
Red squirrels and cone crops: Damage and management	R.J. West & P. de Groot (NeFC) (FPMI)
Cone and seed diseases in Canada	J. Sutherland (PFC)
Evaluating the damage to white spruce cone crops by insects: The influence of cone crop size and stand type	W. Fogal (PNFI)
Clonal variation in susceptibility to damage by cone and seed insects in black and white spruce seed orchards: preliminary results	J. Turgeon (FPMI)

Proceedings of this workshop will be published as an information report by Forestry Canada. Printing is expected by April 1990 and copies will be made available upon request to: Forestry Canada, Newfoundland and Labrador Region, Box 6028, St. John's, Newfoundland, Canada, A1C 5X8.

Rick J. West

Maritime Seed Orchard Managers Meet

The second annual Maritime Seed Orchard Managers Workshop was held in Truro, Nova Scotia, October 16-18, 1989. There were 36 participants from Ontario, New Brunswick, Nova Scotia, Prince Edward Island and Maine. The workshop, hosted by the Nova Scotia Dept. Lands and Forests, consisted of both indoor sessions and visits to seed orchards and tree improvement operations. Two main topics were discussed: a) the use of fertilizers for operational cone induction and, b) Ray Leblanc of Fraser Inc. and Laurie Philips of Forestry Canada — Maritimes, presented preliminary results from cooperative trials with black spruce in cone induction and topping. On the 16th and 17th, participants visited the seed orchards of Scott Worldwide and Nova Scotia Dept. of Lands and Forests. The third day consisted of a field trip to the Annapolis Valley to visit orchards operated by Stora Forest Industries and Bowater Mersey.

Ron Smith

22nd International Seed Testing Congress, 21-30 June, 1989, Edinburgh, Scotland

It was a successful congress attended by more than 300 delegates from 62 countries. The congress was divided into a series of three consecutive sessions: Preliminary Technical Committee meetings (four days), Seed Symposium (three days), and Ordinary Meeting (two days).

It was most interesting to note at the Congress Opening Ceremony that the Secretary of Agriculture and Fisheries of the Government of Scotland used nearly one third of his time addressing the importance of forestry and environmental issues.

The Seed Symposium covered five sessions: plant breeding, seed technology and the not so distance future (a keynote address by Professor Simmonds of the University of Edinburgh); developments in production and storage of seed; progress in seed testing; seed laboratory management; and a poster exhibition. As usual, because there were 110 papers, the presentation was not only limited to selected authors but also to limited time. Eight of the 110 papers were related to forest tree seed. There were some excellent papers which will be published in future issues of Seed Science and Technology.

There were over 80 posters on display with a wide range of subject matters on seed research and development. I found the poster display an effective and efficient means for technology transfer.

The two day Ordinary Meeting was spent on technical committee reports and discussions of proposed changes in the current ISTA Rules. Because major revision of the ISTA Rules is scheduled to take place in 1992 Congress, there were relatively fewer amendments at this Congress. The changes adopted that affect forest tree and shrub seeds are: (1) a new method for testing *Fusarium moniliformae* var. *subglutanans* on *Pinus elliottii* and *P. taeda*, (2) a minor change in calculating and expressing results of purity analysis, and (3) addition of "cut seed" pretreatment to break dormancy for *Leucaena leucocephala* which is a tropical multipurpose tree species but listed under agricultural and horticultural seed in the current ISTA Rules. There were some hot discussions on the "definition of fresh seeds" but no definite change was proposed. The Congress owes its success to the able local Organizing Committee of the Official Seed Testing Station for Scotland under the leadership of Simon Cooper.

Ben Wang

***Editor's Note**: The following two articles are abstracts of papers presented at the TSWG workshop of the 1989 CTIA Meeting.*

An Overview of Cone Development for Spruce, Larch and Pine

Three genera of Pinaceae, spruce (*Picea* Dietr.), larch (*Larix* Mill.), and pine (*Pinus* L.), have Canada-wide interest for tree improvement. They represent three subfamilies and have different patterns of shoot and cone development and distribution. Thus, they demand different monitoring procedures. *Picea* produces cones laterally or terminally, depending on shoot vigour. *Larix* may produce cones laterally on long shoots or terminally on short shoots: positioning on parent long shoots depends on shoot vigour and previous occupation of possible positions by cones. *Pinus* produces seed cones in place of lateral long shoots on vigorous parent shoots, and pollen cones in place of proximal short shoots on weak parent shoots. Hence, multiwhorled pines possess more positions where seed cones can occur than do uniwhorled pines. In all cases, pollen cones last only a few weeks in the post-bud condition. Seed cones of *Picea* and *Larix* complete post-bud development to maturity in three to five months: those of *Pinus* in about 16 months. Developmental differences exist among those three genera in the pollen "catching" and seed-cone closing mechanisms, and in seed-cone orientation at different stages of development.

Graham Powell

Effects of nitrogen fertilizer on the quality and yield of seed from a black spruce seedling seed orchard

Ammonium nitrate was applied in 1987 to 8-year-old black spruce (*Picea mariana* (Mill.) B.S.P.) trees in a seedling seed orchard of Fraser Inc. near Plaster Rock, New Brunswick to stimulate flowering and seed production. Trees spacing in the orchard is 2.0 m between and 1 metre within rows. Fertilizer was applied in a band along the tree rows at the following dosages per 50 metres (50 trees): no fertilizer (control), 2.5 kg on one side, 2.5 kg on two sides, 5.0 kg on one side, 5.0 kg on two sides, 7.5 kg on one side, and 7.5 kg on two sides.

In 1988 all of the cones produced in each 50-tree row were collected, and from the bulk collections, 50 cones were randomly selected. The fertilizer had no effect on seed weight, but greatly improved the seed yields and seed quality. Seed yields from fertilized trees ranged from 35 to 45 seeds per cone as compared to 30 seeds per cone for the control, an increase of 14 to 33%. Although fertilizer had no effect on seed germination, it greatly improved seed vigour as measured by stress tests and response to prechilling treatment.

Ben Wang and Ron Smith

UPCOMING MEETINGS

7th International Congress on Plant Tissue and Cell Culture
June 24-29, 1990
Amsterdam, The Netherlands

Contact:
RAI Organisatie Bureau Amsterdam bv
Europaplein 12
1078 EZ Amsterdam
The Netherlands

19th World Congress of the International Union of Forestry Research Organizations (IUFRO)
August 5-11, 1990
Palais des Congrès
Montréal, Québec

Contact:
D.K. Lemkay, Secretary
IUFRO 1990 Inc.
Box 1990, Place d'Armes
Montréal, Québec
H2Y 3L9

International Congress of Ecology - Development of Ecological Perspectives for the 21st Century
August 23-30, 1990
Yokohama, Japan

Contact:
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Yokohama National University
Yokohama 240 Japan
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