

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

Tree Seed Working Group



# Newsbulletin 17

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## A WORD FROM THE CHAIRMAN

In the last issue (November 1991) of the Newsbulletin, I mentioned that the proposed topic for our next workshop to be held during the 24th CTIA/ACAA meeting in 1993 was "Seed Testing". This topic was suggested at our last TSWG meeting in Ottawa in response to the creation of the "Tree Seed Processing and Testing Working Party". Since no comments contrary to that suggestion have been received, it is now official! Steps will now be undertaken in preparation for our next TSWG workshop to be held in Fredericton in August 1993. However, a single workshop can not cover all aspects of seed testing. Your priorities will be ours! Let us know what aspects of seed testing you would prefer and we will try to have them incorporated in the workshop. More information about the workshop will be provided in the next Newsbulletin.

Meetings planned with Tim Boyle in the Maritimes and British Columbia last fall to discuss the need and the technical content of the "Forest Tree Seed Regulations" had to be postponed. Tim was away for three months supporting the worthwhile efforts of CIDA in Thailand. Now that he is back, the meetings will be rescheduled sometime this spring. As you recall, inputs from these meetings will be instrumental for the preparation of the third draft of the "Forest Tree Seed Regulations".

The Newsbulletin is a great vehicle for circulating the varied information on "Tree Seed" and related topics. Being in existence since 1983, this newsbulletin has provided a means for all those interested in seed to interact. Your contribution, even if it is short, will be of interest to someone else. Remember, your editor awaits your input!

Guy E. Caron

## NOTE THESE ADDRESSES

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

## EDITOR'S NOTES

I'm sorry, but I again feel it's necessary to point out that many members of this Working Group are not doing their share of technology transfer - especially at the grass-roots-level. Researchers in particular, can become so engrossed in their own work that they pay little attention to the world around them - to the changes - to the emerging problems - and to the evolving demands for

their expertise. They fail to recognize or must be reminded that practitioners depend on research results to focus their work and to help solve their problems.

This issue of the Newsbulletin provides you with a couple of examples of researchers providing immediate access of their results. However, there should be more contributions of this type to our Newsbulletin. If you're a researcher and I have awakened a little guilt in your mind - make yourself feel better by sending a contribution to the forthcoming November issue of the Newsbulletin.

Please note: the last page of this Newsbulletin is a questionnaire that each member (or prospective member) of the Working Group should complete and forward to me. The information from these completed questionnaires will allow me to provide you all with a revised and updated 'Membership Directory'.

*Hugh Schooley*

## THE TREE SEED PROCESSING AND TESTING WORKING PARTY

The Tree Seed Processing and Testing Working Party (TSPTWP) plans to meet June 24-26, in Surrey, BC. Rob Bowden-Green of the Surrey Tree Seed Centre will be our host. Written correspondence, between the coordinator and members of the organizing committee, has produced a rough draft of the Working Party objectives, organizational structure and terms of reference. It is hoped that this Working Party will serve as a vehicle for the exchange of ideas, technical information and trouble shooting on the processing and testing of forest tree seed.

The Party plans to meet every year. Meetings will coincide with the biennial meeting of the CTIA. In the "off" years, meetings will be held at a seed centre or testing facility.

While the primary topic of discussion for the June get-together will be organizational in nature, the scope of the meeting has been expanded such that it will be of interest to all persons in the field of seed processing and testing. Please contact the Working Party Coordinator, Dave Bewick at (506) 453-9101 or by fax at (506) 453-1741 if you are interested in attending the June meeting.

*Dave Bewick*

## STEVE ROSS - WE'LL MISS HIM

Dr. Stephen Douglas Ross died, on November 29, 1991. Stephen leaves his wife, Elaine, and his three children, Geoffrey, Tracy, and Ian.

At the time of his death, Steve was employed by the B.C. Forest Service (Research Branch) as Senior Research Scientist and Project Leader, Seed Supply Research. He also held an appointment as Adjunct Professor in the Forests Biology Program at the University of Victoria.

He obtained his B.Sc. (High Honours) from Humboldt State College in 1965, a Master's degree in 1967 and Doctorate in 1972 both from the University of Washington. On the basis of his academic training in forestry and tree physiology, Dr. Ross pursued a distinguished international career in forestry research spanning 20 years. He was the author and co-author of over 100 scientific publications including journal articles, monographs, conference papers and specialized reports. For 8 years, he acted as Associate Editor for the Canadian Journal of Forest Research; he was a reviewer for several other international scientific journals; and he held memberships in several professional associations including the associations of B.C. Professional Foresters.

His special interest was tree physiology research, in particular, mechanisms of flowering and seed production in Pacific Northwest conifers. His pioneering work on the role of plant growth hormones in flowering and his development of the container seed orchard concept have been widely recognized. Much of his research has been successfully implemented, not only in B.C.'s tree improvement programs but also applied internationally. In 1986, Dr. Ross was nominated for the IUFRO Scientific Achievement Award in recognition of his outstanding accomplishments.

Dr. Ross was highly regarded as a friend, colleague and mentor. He will be sadly missed.

*Bill Chellak*

## CONGRATULATIONS

*Dr. S.K. Kamra*

### GOLDEN ACADEMY AWARD



Dr. S.K. Kamra, Research Leader, Faculty of Forestry, Swedish University of Agricultural Sciences, Umeå, Sweden has been appointed Member of the Lifetime Achievement Academy of the American Biographic Institute. He has also been awarded GOLDEN ACADEMY AWARD 1991

(Corresponding to film Oscar) for Lifetime

Achievement and selected as RESEARCH ADVISOR OF THE

YEAR-1991 (for international studies) by the same institute.

Cancelled

## REORGANIZATION OF PNFI'S FOREST GENETICS AND BIOTECHNOLOGY PROGRAM

The start of the new fiscal year represents a milestone in the evolution of the Forest Genetics and Biotechnology Program at PNFI. For two years or more we have been discussing changes in structure and direction of research associated with the establishment of the National Forest Genetic Resources Centre at PNFI. Now it is time, officially, to implement some of these changes.

With a tinge of sadness we are moving the Tree Genetics and Breeding Project into the history books, although its old number, PI-09, will serve on as the marker of a smaller team led by Steen Magnussen and working on the "Genetics of Growth and Yield". Two other new research Projects on "Physiological Genetics and Plasticity" (PI-61), and "Genetic Diversity" (PI-62) will be led by Kurt Johnsen and Alex Mosseler, respectively.

The very able permanent staff in the Tree Genetics and Breeding Project have all accepted new assignments in the Projects of the Genetic Resources Centre. Peter Copis and Bill Selkirk will join the new PI-09, Daryl Hoelke will join PI-61, and Joy Lavereau will join PI-62. Before much longer we also expect that both Kurt and Alex will have the added support of a biologist in each of their Projects.

In addition, the National Tree Seed Bank (PI-17; Bea Kelley and Ernie Gilchrist), the Plant Propagation Project (PI-60; Bazil Corbett and Sandra Keane - plus Helen Markussen), and the research plantation management activities of the old PI-09 (Stan Kranz) are being merged in a new "Genetic Resources Services" Project (new PI-60) under the leadership of Tom Nieman.

The research and development activities of the National Tree Seed Centre (PI-10) under the leadership of Ben Wang have also been subject to review, but news of future directions in this area will be outlined at a later date.

For more than 50 years PNFI has been among the leaders in genetics and seed research in Canada. The changes now being implemented are part of the continuous process of development that will ensure that we retain our leading position.

Gordon Murray  
Program Director

## CALOSCYPHA FULGENS, THE SEED OR COLD FUNGUS, NEW TO NEWFOUNDLAND

The seed or cold fungus, *Caloscypha fulgens* has affected up to 25% of stored seed of spruce, Douglas-fir and fir in British Columbia, and up to 35% of the seeds contained the fungus. The fungus also reduced seed germination in

red and white spruce and eastern white and Scots pine by up to 98% in bareroot nurseries in Ontario.

The disease infects healthy seeds during cold storage, or after being sown into cold soils. Infected seeds die and the percent of seed mortality is difficult to estimate because above ground symptoms are lacking. Seeds killed by *C. fulgens* differed from sound seeds only by a white, crust-like coating on the seedcoats. The fruiting bodies of the fungus grows in the forest litter, and spores produced by the fruiting bodies apparently function only to disseminate the fungus in the forest litter. Cones in contact with infested forest litter are invaded and their seeds infected.

The severity of the disease in stored seed will depend on how long cones have lain on cool moist ground prior to storage. The disease spreads during cold storage at temperatures above freezing. Sitka spruce losses were greatest at about 10°C.

Seed mortality can also occur after seeds are sown into wet seedbeds or container-nursery medium. At higher temperatures the seed will germinate before infection occurs. Young seedlings are not infected.

This cold fungus was recorded for the first time in Newfoundland on stratified white spruce seed at the Wooddale tree nursery in 1990. Infected seed had been soaked in water for 24 h, dried of excess moisture, put into thin 1kg plastic bags and stored at 3°C. The bags had been frequently opened and shaken to aerate the seeds. Unstratified dry seed and stratified seed were tested for presence of the fungus and only 0.8% (n=750) stratified seed and none of the unstratified seed had the disease.

When seed mortality is high, the severity of this disease can be reduced by coating the seed with a registered fungicide. Seed mortality is usually less frequent in container seeding than in bareroot seeding nurseries because the fungus cannot spread among containers.

G.C. Carew  
(Source: Forestry Canada, Nfld. Woody  
Points Newsletter 20(2):10)

## OCCURRENCE OF *ERNOBIUS BICOLOR* (COLEOPTERA: ANOBIIDAE) IN CONES OF BLACK SPRUCE, *PICEA MARIANA* IN NOVA SCOTIA

A species of deathwatch beetle, *Ernobius bicolor* White, previously recorded only in Newfoundland, has recently been detected in Nova Scotia. The beetles infest black spruce cones produced in the previous year's growing season and also damage cones in storage, sometimes reducing seed yields by one-half (Schooley 1983, For Chron. 59:139-142). Rangers from the Forest Insect and Disease Survey, Forestry Canada-Maritimes Region, collected samples of 100 old black spruce cones from each of 23 sites in 1989 and 14 sites in 1990, in New

Brunswick, Prince Edward Island and Nova Scotia. No beetles emerged from the 1989 collections but six beetles emerged from collections made in three Nova Scotia sites in 1990. All specimens were identified as *E. bicolor* by Richard White at the USDA Systematic Entomology Laboratory in Beltsville, Maryland. No beetles emerged from cones collected in New Brunswick or Prince Edward Island. This is the first confirmed record of *E. bicolor* in mainland Canada. A related species, *E. schedli* Brown, has been recorded in black spruce cones in Sault Ste. Marie and Biscotasing, Ontario (Brown 1932, Can. Ent. 64:3-12) but it is clearly different from *E. bicolor* (White 1983, Proc. Ent. Soc. Wash. 85:557-559). A note providing more details of the discovery of this pest has been submitted to the Canadian Entomologist.

*J.D. Sweeney, G. Gesner, and G. Smith*

### POLLEN MONITORING IN TWO SPRUCE ORCHARDS IN QUEBEC

Pollen monitoring was conducted in 1991 for the first time in a 59 ha black spruce [*Picea mariana* (Mill.) B.S.P.] seedling seed orchard and an 11 ha white spruce [*Picea glauca* (Moench) Voss] clonal orchard located in the Estcourt Township, Quebec. The black and white spruce orchards were established in 1986 and 1985-87, respectively. The principal objectives of the study were: i) to evaluate pollen production in the clonal orchard; and ii) to determine the level of pollen contamination in both orchards. Pollen traps were installed around the perimeter and within the orchards. Traps were collected on a daily basis.

Pollen contamination during seed-cone receptivity was estimated at 28% in the white spruce orchard. A total of 0.7 grains (@ 1 mm<sup>2</sup> of trap surface/day) or 1 x 10<sup>9</sup> grains/ha during receptivity were orchard produced. Northwest and southwest winds brought over 85% of the white spruce pollen contaminants into the orchard.

All pollen in the black spruce seedling seed orchard were considered contaminants as young 5-year-old trees did not bear pollen cones. A total of 1.1 grains (@ 1 mm<sup>2</sup> of trap surface/day) or 1 x 10<sup>9</sup> grains/ha were trapped during black spruce seed-cone receptivity. Northwest and northeast winds brought over 95% of all black spruce (and red spruce) pollen contaminants in the orchard. In addition, a total of 60% of all pollen contaminants reaching the orchard did so after the period of seed-cone receptivity of orchard trees.

This study will be repeated in 1993 to verify changes in levels of pollen production by orchard trees and of contamination by surrounding stands. Field observation in October 1992 indicated that the young 6-year-old black spruce trees will bear pollen cones for the first time in 1993.

*Guy E. Caron*

(Note: This information is part of an article entitled "Évaluer la contamination pollinique dans les vergers à graines pour mieux la contrer" co-authored by Guy E. Caron, André Rainville, Stéphan Mercier, and Michel Rioux in proceeding of the Ministry of Forests of Quebec "Comptes rendus du Colloque sur les semences forestières" conference held in Quebec City, February 12-13 1992.)



Prime Lindsay Corp. has 5 tons of *Picea abies* seed for sale

#### Price:

\$70 US per kilogram. Payment terms are a letter of credit from any Canadian Bank.

#### Source Description:

Cones were collected 100 km north of the Soviet town of Vologda. Maximal summer air temperature is +34°C, minimal winter air temperature is -48°C. Annual amount of precipitations is 633 mm. Snow cover may last from November till April and is usually 60 cm deep, though in some winters it can be as high as 1 meter. Average annual air humidity is 73 per cent. Average annual wind speed is between 2.7 and 3.8 meters per second. Length of the vegetation period is 160 days when average round-the-clock temperature exceeds +5°C, and is 201 days when average round-the-clock temperature exceeds 0°C. Average elevation of the territory is between 100 and 200 meters above sea level.

#### Collection/Handling Information:

- collected during winter of 1989-90
- extracted in "Kalininski" type cone dryers
- dewinged and cleaned
- packed in sealed double burlap numbered bags
- certified disease free by Soviet Health Ministry: samples tested by Agriculture Canada proved disease free
- contact Bob Bettle, New Brunswick Dept. Natural Resources and Energy for a germination report
- presently held cool dry storage

#### Contact:

John Lindsay, President, Prime Lindsay Corp., Tallinn, Estonia. Telex 19214234. (May be reached indirectly by contacting Doloroes Lindsay in Winnipeg, Manitoba, Tel. (204) 582-0474).



## SEED QUALITY FROM EARLY CONE COLLECTIONS IN NEWFOUNDLAND POPULATIONS OF BLACK AND WHITE SPRUCE

Sporadic cone crops, rapid seed dispersal upon cone maturation, and cone and seed predation by animals make it necessary to take full advantage of the potential cone collection season during the sporadic cone crops experienced by native spruces. In Newfoundland, seed collections from native populations have also been seriously affected by severe insect infestations over the past 20 years, and have prompted the importation of seed from untested mainland seed sources. Seed shortages on the Island have also limited low cost silvicultural alternatives like direct seeding.

An extension of the seasonal period for cone collection would permit more seed to be collected during good cone crops and facilitate planning for operational cone collection. Early cone collections are possible in many conifers but the methods for monitoring seed and cone ripeness rely on physical indices of cone maturity that are often highly subjective or require laboratory assessments that tend to make such methods unreliable or impractical for operational cone collection. A simple and reliable method for predicting seed ripeness in conifers should involve the use of easily monitored climatic indices like cumulative growing degree-days (GDD). The use of GDD as a guide to the seasonal timing of cone collections, together with natural after-ripening under cool, well-ventilated conditions may permit early cone collection without reducing seed yield or seedling quality.

Cones of black spruce and white spruce were collected at intervals of approximately 100 GDD from 6 natural stands across central Newfoundland during a bumper cone crop in 1988. Cones were collected from 4 trees/population at each location beginning at approximately 600 GDD after pollination, and ending at approximately 1250 accumulated GDD. Accumulated GDD were calculated based on the maximum and minimum daily temperatures recorded at the weather station nearest to each population. A minimum of 4 samples of 10 cones/tree were collected at random throughout the upper tree crown on each harvesting date. Cone were stored in a well-ventilated shed at ambient conditions prior to seed extraction.

A statistical analysis indicated that very little of the variation in seed yield or seed viability was attributable to differences among natural populations in either species. Most of the variation in cone and seed traits occurred among individuals within each population, suggesting that our predictions of GDD requirements will be reliable over most of central and western Newfoundland. Seed yield (average number of full seeds/cone) and seed quality (average weight of 1000 seeds) in black spruce did not change significantly after the accumulation of 900 GDD. Seedling survival under glasshouse conditions (at 6 weeks of age) did not change significantly from cones

collected as early as 800 GDD, or almost 500 GDD before natural cone maturation. However, losses in seed number (about 30%) and seed weight (about 24%) were significant in black spruce cones collected earlier than 900 GDD.

Seed yield and seed size in white spruce increased steadily from 900 to 1100 GDD, but these increases were not statistically significant. However, such differences in seed size may be important for subsequent seedling growth performance because larger seeds tend to produce larger seedlings in most conifers. A comparison with data on white spruce cone and seed maturation in New Brunswick indicated that seed from Newfoundland populations of white spruce may require up to 200 GDD less for physiological maturation, and suggest possible differences in reproductive adaptedness between Island and comparable mainland populations. While seed number and seed size did not change significantly in white spruce after 900 GDD, seedling survival was significantly reduced in seed from cones collected before 1100 GDD. This suggests that white spruce seed may be undergoing important physiological changes following attainment of maximum seed size, and that these changes probably continue up to the beginning of natural seedfall.

While cone dry weight in white spruce remained stable from 800 to 1200 GDD, indicating that cones had attained their maximum size by 800 GDD after pollination, a steady reduction in cone moisture content was observed from 800 to 1250 GDD. These changes in cone moisture content have been used to signal cone maturation, and have been suggested as an indicator for early cone collection in white spruce. However, our results demonstrate that cone moisture content is an unreliable indicator of cone ripeness. Important reductions in seed yield, seed quality and seedling survival occurred in white spruce cones collected prior to 1100 GDD.

In conclusion, GDD accumulations may provide a useful, easily obtained physical index for monitoring stages of seed maturation in conifers. The necessary weather information is easily obtained by a phone call to the nearest weather station or airport. With simple calculations based on the maximum and minimum daily temperature, seed maturation can be monitored as the growing season progresses. With this simple procedure operational cone collections can take full advantage of the sporadic cone crops that occur in most conifers.

*Alex Mosseler and Paul Tricco*

### NOVA SCOTIA TREE IMPROVEMENT WORKING GROUP

(Editors Note: In 1990, this Group produced a long overdue (10 years) annual report. The introduction to this report indicated how they operate)

The Tree Improvement Working Group (TIWG) is a co-operative organization with membership from major industry and provincial and federal governments. The

goal of this organization is to develop genetically improved sources of seed for major Nova Scotia reforestation species by a process of recurrent selection, breeding, and testing.

What began in 1977 as an informal arrangement among organizations with similar interests and goals has since become a formal co-operative with the responsibilities of all parties clearly identified. In 1989, the commitment to the TIWG was renewed by the signing of a formal Memorandum of Understanding by the senior management of all member organizations.

Briefly, Forestry Canada provides strategic, technical, and scientific advice concerning breeding strategies, field test evaluation, seed orchard management and other related applied research areas. All other agencies share in the selection, testing, and breeding efforts and manage their own seed orchards which are designed to meet their specific needs. In addition, the Department of Lands and Forests co-ordinates and manages the operation of the TIWG and operates the Tree Breeding Centre at Debert to provide high quality nursery services to the group.

A unique feature of our Memorandum of Understanding is a Seed Distribution Policy, whereby all members managing orchards have an interest in all other members' orchards. This was designed in 1980 as an insurance policy against catastrophic loss, and remains part of the current Memorandum until the year 2000 and affects orchards established up to January 1, 1988.

While the Memorandum of Understanding lays out clear guidelines for the operation of the TIWG, all members have shown a willingness to supplement these minimum required efforts. Specifically, while the Department has handled the bulk of the breeding work to date, other agencies have voluntarily taken advantage of flower crops at their orchards by performing controlled pollinations and harvesting pollen. Since logistics make it virtually impossible for one organization to take maximum advantage of flower crops, this is resulting in time savings to all members by shortening the breeding cycle. The recognition of this benefit, and the willingness of industrial partners to accept such supplemental work, is a clear sign that the co-operative spirit is in excellent health, and promises continued success for our group.

In the spring of 1990, the TIWG formally welcomed J.D. Irving, Ltd. as a full and active member. This new member is an equal partner in all respects but is not subject to the Seed Distribution Policy. In addition to having another agency with which to share the work load, J.D. Irving brings a long history of aggressive pioneering work in tree improvement.

For copies of the Report contact Peter Nitschke, Tree Breeding Centre, Debert, N.S. B0M 1G0

## SUMMARY OF RECENT WORK AT THE SWASTIKA TREE IMPROVEMENT CENTER

The following is a brief description of the methods and results of some trials carried out at the "Center" since 1989. This update summary was presented at the annual Ontario Breeding Hall and Vegetative Propagation meeting held in Kemptville, Ontario.

### Brush vs. Syringe Pollination Technique

The objective of this 2 year study was to determine which was the better method for seed set and viability. Black spruce grafts were treated with GA<sub>4/7</sub> and the following spring they were bagged and pollinated. Seeds extracted from the cones each fall were counted, floated and x-rayed. In the second year, standard 30 day germination tests was done. Analysis of variance showed no statistical differences between the number of viable seeds produced by each technique nor the germination rates of the seeds from each method. X-rays showed no visible differences in embryo or endosperm development.

### Breeding Contamination

The objectives were: 1) to determine if there is contamination under the existing pollination procedures, and 2) if so, how severe is it?

A total of 40 black spruce grafts with female flowers were bagged. Bags were cut and taped; subsequently the tape was removed and replaced twice to simulate the pollination procedure. Bags were removed when cones had fully closed. The cones were collected, seeds extracted, counted and tested.

A total of 578 cones were collected; 1273 seeds were extracted. Of these, 10 seeds from 3 different grafts proved to be viable. While there is a risk of contamination, it is at a very low level.

### Soil Drench vs. Foliar Application of GA<sub>4/7</sub>

This study was first done in 1989/90 and repeated in 1990/91 to compare the defectiveness of the two application methods in promoting female flowering on black spruce grafts.

A solution of 200 mg GA<sub>4/7</sub> per litre was used for both methods. Aromox surfactant was not used in the soil drench. All black spruce grafts in the trial were sprayed or drenched 5 times (once a week for 5 weeks). Composite soil sample were taken weekly on the day following the application of GA<sub>4/7</sub> to the soil.

Analysis showed no significant difference between the two methods in the number of flowers per tree, however, both produced significantly more flowers than the control group. Electrical conductivity and PH of the soil was not different between the trees in the soil drench treatment and those in the foliar treatment.

### Graft Fertilization

The objectives were: 1) to compare the effectiveness of different formulations of slow release and water soluble fertilizers to maintain the required nutrition; 2) to compare different slow release fertilizers that would be appropriate to our growing season; 3) to determine any nutritional differences and carryover effects to the next year.

Black spruce grafts were equally assigned to one of the four fertilizer treatments:

- |    |                              |                                 |
|----|------------------------------|---------------------------------|
| 1. | 17-6-10<br>plus minors       | Sierra<br>9 months release      |
| 2. | 17-6-12<br>plus minors       | Sierra<br>4 months release      |
| 3. | 14-14-14<br>plus nutriltrace | Nutricote<br>40 day release     |
| 4. | 20-20-20                     | Plant products<br>water soluble |

Twenty five random grafts were measured for 1) colour using a Munsell Plant Tissue Colour Chart. These were recorded in the spring of 1990 before treatment began, in the fall of 1990 and in the spring of 1991; 2) total height increment in 1990 and 1991. Electrical conductivity was taken weekly. Soil temperature was recorded at 8:30, 12:30 and every hour thereafter until the temperature reached 21°C on the Sierra treatment and 25°C for the Nutricote treatment.

While all of the grafts were initially chlorotic, they recovered soon after bud burst. Chlorosis was not evident in the slow release treatments in the spring of the second year but was evident with the 20-20-20. There was no significant difference in growth among slow release fertilizer treatments; all had greater shoot growth than the 20-20-20. There were only 10 days that the temperature reached the optimum of 25°C for the Nutricote treatment and 16 days that the temperature reached 21°C for the Sierra treatment. Soil samples taken in the spring of 1991 showed no carryover of fertilizer.

### Pollen Management

To determine the optimum drying time for black spruce pollen to reach about 6% moisture content necessary for long term frozen storage.

In 1990 a preliminary Pollen Moisture Content study determined that black spruce pollen reached a moisture content of 6% when kept in the vacuum dryer for 15 minutes after "boiling" had stopped. In the spring of 1991 we took this process further by determining the moisture content and viability of jack pine pollen after 4 set drying times to boiling, and 5, 10, and 15 minutes after boiling.

Moisture contents were 8, 7.5, 6, and 5.5% respectively for the treatments. Pollen viability was 46, 84, 77, and 76% respectively following treatment compared to a pretreatment viability of 81%. This study will be

repeated in 1992. A pollen storage method study was also started in 1991. Pollen was vacuum sealed and placed into storage at +12°C and at -18°C. The viability of this pollen will be tested annually for five years.

*Randy Ford*

### SEED ORCHARDS IN QUÉBEC: PRODUCTION CHOICES ARE AT OUR DOOR

Since 1987, 241 hectolitres of cones have been collected in nine different seed orchards representing five species of conifers. The major part of this production (82%) is jack pine from three seedling orchards established in 1978-1979 (Briand County), 1981 (Harrington County) and 1983 (Chasseur County).

Seed orchard efficiency of these unrogued jack pine orchards was evaluated using seed yield per hectolitre of cones (kg/hl) as an indicator. While Provincial means based on cones collected in natural stands, plantations, seed production areas and seed stands were 0.535 kg/hl in 1989 and 0.575 kg/hl in 1990, the figures were respectively 0.412 kg/hl, 1.28 kg/hl and 0.957 kg/hl for Briand (1989), Harrington (1990) and Chasseur (1990). The standard for jack pine, set by the New Brunswick Tree Improvement Council, is one kilogram of seed per hectolitre of cones (Simpson, 1989: 7th annual report).

Seeds from the orchards were also larger and heavier. In 1989, one kilogram of seeds from natural stands was composed of 310 000 seeds compared to 289 000 in Briand County. In 1990, these numbers were 278 000 for wild populations, 219 000 in the Harrington orchard and 265 000 in Chasseur.

Seed orchards in Québec are just entering in a production phase following their establishment (mainly between 1982 and 1992), and juvenile production such as presented above give promising results. We expect a continued diversification of the production in terms of numbers of seed orchards and species represented in the total cone collections of the Province until the year 2000. However, the amount of seed the Province will require from its orchards is being reassessed and management decisions will have to be made on how the orchards are utilized.

While reforestation objectives were of 300 MM in 1984, they have decreased constantly since then in order to adjust to reality. Moreover, in December 1986, the "Loi sur les forêts" was adopted, setting a new approach to forest management. As a consequence, management practices have emphasized natural stand silviculture to favour regeneration instead of plantations. The end result is that reforestation is expected to be in the vicinity of 150 MM seedlings annually by the year 2000, while production capacity of the seed orchards is estimated at 235 MM.



In the future, management goals in seed orchards will focus on seed quality. Numerous possibilities are opened, such as:

- 1) restrict intensive management to a well-chosen portion of the seed orchard;
- 2) rogue less intensively the border rows in order that they may act as a barrier to foreign pollen and a source of pollen of good quality for the orchard trees;
- 3) utilize genetic gain from the best mother clones or families by selective cone crop harvesting (as practiced in Sweden);
- 4) use of isolated parts of the orchard to test management procedures pest control, etc.).

The efforts invested in seed orchards establishment and management should not be considered as worthless or overdosed; these new orientations are an opportunity to retain only the best of what was done. At worst, seed orchards will have been the reason to bring together the best material for a specific region and these genetic resources are of great value.

*André Rainville, Ing.f.*

### NOTE OF INTEREST

**A** National 1991 survey of Canadian Public opinions on Forestry Issues concluded that:

"Almost three-quarters of Canadians (74%) say replanting seedlings is superior to allowing nature to take its course in replenishing the forest. Only 17 percent think it is best to let the area re-grow naturally."

### SEED FEVER

**G**ardeners across the country again this year have come down with an affliction called "seed fever". There appears to be no cure, it can't be arrested and it invariably strikes when winter is in full swing, when the days are crystal bright and the ground is frozen rock hard.

The malady is named seed fever because it coincides with the arrives of the seed catalogues. The symptoms are invariably the same, disorientation and overindulgence, with the victims compulsively repeating the same mistakes very year. They seed a garden of Eden in their homes, placing little peat pots or large plastic flats under fluorescent lights in the basement, on window sills, on every available flat surface near a good light source. They can't resist the lure of the catalogues, which aren't selling seeds but promises.

And what promises! Fat, red, dew-kissed tomatoes; plump, emerald-green peppers; blush-orange candle-straight carrots; a kaleidoscope of ruffled, two-tone petunias; marvelous marigolds; giant geraniums - a siren's song of plants that could be, but seldom are. It's fantasy, even though the dreams the catalogues spin go a

long way toward making dark winter evenings a little more pleasant.

(Extracted from: Gardener's Corner by Ross Hawthorne: Canadian Gardening, Dec. 1990-Jan. 1991). Editor's Note: Aren't we all glad we grow "just trees".

### NEW IMPLEMENTS FOR DIRECT SEEDING

**S**eeding simultaneously with site preparation is being viewed as a seed-conservative yet effective means to regenerate certain sites. In 1991, new seeding devices were introduced to and tested under Canadian and northern United States conditions.

#### TTS Sigma

**I**n Dryden, the Ontario Ministry of Natural Resources used the TTS Sigma Seeder, imported from Finland, for a trial in conjunction with their regular TTS Delta disc trencher operations. This seeder, which has been under development for several years, uses two electric motor-driven augers to deliver seeds from separate hoppers to an airstream in the seed delivery tubes. Seeding density is preselected by the operator, and seed output rate is controlled by an electronic travel speed sensor. The Canadian-made Bartt MKIV Direct Seeder was also included in the trial. For further information, contact: Max Pletch, Ontario Ministry of Natural Resources, P.O. Box 730, Dryden, Ontario P8N 2Z4, Tel. (807) 223-3341.

#### SK Design Drum Seeder

**A** Minnesota silvicultural contractor, Sundance Silviculture Inc., has purchased the first SK Design Drum Seeder prototype, made in Florida. The seeder was used with a TTS Delta disc trencher with powered discs, and was mounted on a Supertrak SK 250 Forester wheeled skidder. A Forest Lease V-Rake mounted at the front of the machine was used to part slash and thus improve the scarification result for seeding.

The seeder consists of a drum having two rows of holes under vacuum pressure, around its perimeter. Seeds are picked up from a single hopper and deposited in the airstream of the seed delivery tubes. The implement has an optional drive shaft speed sensor which regulates seed output rate so as to maintain a pre-selected spacing of single seeds. Other optional features include a seed counter and an area measurement function.

For further information, contact: Rich Hendricks, Sundance Silviculture Inc., Box 12, Cambridge, Minnesota, USA 55008, Tel. (612) 689-5538.

#### Alberta Forest Service Drag Seeder

**T**he Alberta Forest Service has developed a drag seeder using the seed metering mechanism which has proven so successful in the AFS aerial seeder. The drag seeder has been designed to supplement naturally-occurring seed on pine sites harvested with roadside delimbing systems. Improved distribution of seed while scarifying is expected to reduce seed costs and subsequent thinning costs.



For further information, contact: Dave Patterson, Equipment Development Coordinator, Alberta Forest Service, 9920-108 Street, Edmonton, Alberta T5K 2M4, Tel. (403) 427-8474.

(Source of the above 3 items: Silviculture Operations Group, FERIC. Silvicultural Newsletter, Vol. 4, No. 2, Fall 1991.)

### Shelter Cone Seeding Trials with Red and White Pine - A Good Forest Year

When planting is not possible because of unavailable stock, a tight planting budget or a shallow, stony, or hard-to-reach site, then seeding with shelter cones may be an alternative.

Central Ontario Forest Technology Development Unit (C.O.F.T.D.U.) and client districts established two seeding trials in May of 1990 to test the effectiveness of Cerkon shelter seeding versus shelterless seeding, at a low and a high seed rate. Cerkon shelter cones are the size and shape of transparent dixie cups with the tips cut off, and work like mini-greenhouses. Set on the ground outdoors, they create a relatively humid, warm environment for seed and seedling. The plastic walls break down under sunlight in the course of one to several years and release any seedlings established within.

While Cerkon shelters have long been successfully used with jack pine in the boreal forest, we wanted to know how well they work for red and white pine in the Central Region. We measured performance as the percentage of seed spots having at least one live seedling, and the number of seedlings per stocked spot. Statistical confidence in the results is very high. The cane-shaped Accuseeder, supplied with the shelters by KBM Forestry Consultants of Thunder Bay was used for all the seeding and handled very well.

#### Red Pine:

The red pine trial site in Sudbury District was a pure jack pine clearcut, powertrenched in 1988. The moderately dry moisture regime combined with 2-4-D ground-sprayed at 3.5 kg/ha in 1988 successfully controlled non-crop competition throughout 1990.

In fall of 1990, 87% of those shelters with 1.8 seeds were stocked, averaging 1.7 seedlings per spot. Raising the seed rate to 4.4 per shelter yielded no less than 99.5% stocking, but also produced an over-abundant 3.7 seedlings per stocked spot. The fifth-year or later assessments should tell us whether the initial clump size of 3.7 seedlings is so excessive as to warrant thinning.

By contrast, the same two seed rates without shelters produced less than 50% stocking. Cerkon-sheltered seedlings were about twice as large as unsheltered ones.

#### White Pine:

The white pine trial in Temagami District lies on a gently sloping patch-clearcut, root-raked in 1989. The

former stand (balsam fir, white pine, white birch and poplar according to FRI) grew on moderately fresh to fresh, loamy soil.

Unsheltered spots were less than 40% stocked. The use of shelters doubled stocking, with 3.1 sheltered seeds yielding 83% stocking and 2.1 seedlings per stocked spot. Seed rate did not affect stocking significantly, since 6.2 sheltered seeds produced a similar stocking of 80%. They yielded 2.9 seedlings per stocked spot, more than may be desirable in white pine.

Judging by these first-year data, the rate of 3 seeds per shelter seems ideal. It provided as much stocking as the higher rate, but in smaller clumps less likely to need eventual thinning. It remains to be seen which of the average clump sizes of 2.1 and 2.9 seedlings actually constitutes the more appropriate amount of mortality insurance in the long run.

Competition from raspberry and other species is heavy on the white pine trial site. Five of the ten blocks were ground-sprayed manually with 1.8 kg/ha of Vision after the second growing season to find out how effective and necessary this release would be for shelter-seedlings versus planted trees.

*Martin Focken  
(Reprinted from Fall 1991  
On Line to Central Ontario Forest Ech.  
Development, OMNR, North Bay)*

### Relocating Sown Seed

This summer, the Silvicultural Operations group, evaluated the Bartt MKIV Direct Seeder, used under typical operational conditions with a powered TTS Delta disc trencher, in terms of seed distribution with respect to slope and ground roughness conditions. The trial was conducted with the support of Boise Cascade Canada Ltd. (Kenora Division) who engaged the required prime mover and operator, and provided the study area. KBM Forestry Consultants Ltd., the Bartt Seeder distributor, was responsible for mounting the seeder.

For the trial, jack pine seed were radio-tagged with the radioisotope Scandium46 Chloride by the Department of Chemistry at Lakehead University. FERIC then monitored the seeding trial and relocated the seed within measured plots using a portable scintillation meter so as to assess variability in spatial distribution and microsite location. A report on the results is expected later this year. Lakehead University's School of Forestry is conducting a follow-up study to examine seed displacement over time.

(Source: FERIC Quarterly Rep., Autumn 1991)

### CROSS TALK

A second issue of Cross Talk was produced in March 1992. This new "Communications Link for Tree Breeders" is produced and distributed by the Ontario

Ministry of Natural Resources. The current issue contains one article; 2 from British Columbia, 2 from New Brunswick and 5 from Ontario. This Canada wide distribution of contributors makes the Newsletter especially valuable.

Contributions from tree breeders regardless of their position or employers will be accepted. This is a great newsletter; I recommend that everyone subscribe. Address requests to be on the mailing list, inquiries, and submissions to: Cross Talk, Fast Growing Forest Group, Ministry Natural Resources, P.O. Box 605, Rockville, Ontario K6V 5Y8.

Editor

## TREE AND SHRUB SEED HANDBOOK

The International Seed Testing Association (ISTA) has finally published their Tree and Shrub Seed Handbook (work on the Handbook began in 1977). This book was edited by A.G. Gordon, P. Gosling and B.S.P. Wang and contains contributions from most of the world authorities in Seed Work. The text has 14 chapters covering the following topics: sampling, purity analysis, seed definitions and drawings, testing germination, germination of dormant seeds, testing seeds by weighted replications, seedling evaluation, the tetrazolium test, the indurmine test, the embryo excision test, measurement of moisture content, seed storage, and testing by x-radiography.

The Handbook is designed as a comprehensive reference book for anyone interested in testing tree and shrub seed anywhere in the world. In particular, it is an excellent guide for anyone with little or no experience who wants to begin testing seeds. It must be stressed, however, that this Handbook does not replace the International Rules, whose prescriptions for the purpose of issuing international certificates are definitive.

Copies of the Tree and Shrub Seed Handbook may be obtained from 'The International Seed Testing Association, P.O. Box 412, CH-8046, Zurich, Switzerland.

## UPCOMING MEETINGS

### Symposium on Pollen Banks and Genetic Resources

A symposium on pollen banks and genetic resources will be held in Aix-en-Provence, France in the setting of the 8th International Palynological Congress (IPC) from September 6-12, 1992.

The symposium will cover all the stages of the use of pollen banks - as much on the biological and technical point of view as on the administrative - as well as the roles and techniques of the conservation of genetic resources.

The scientific program of the congress will consist of subjects as varied as physiology, biology of reproduction, biochemistry, ontogeny, morphology, organic matter,

paleoenvironments, biostratigraphy, aerobiology, melissopalynology, allergology, and treatment of data and models.

In addition, the annual meeting of the American Association of Stratigraphic palynologist will be held in Aix-en-Provence during the 8th IPC.

Contributions can be made in the form of oral communications or as posters. Abstracts will appear in a proceeding and a selection of articles will be published in several international reviews.

For more information on these subjects please contact: Stéphan Mercier, Ministère des forêts, Service de l'amélioration des arbres, 2700, rue Einstein, Sainte-Foy (Québec) G1P 3W8, Tél: (418) 643-7994.

### IUFRO Seed Problems Project Meeting

The IUFRO Project Group on Seed Problems - P2.04.00 - will hold a symposium on "Tree Seeds to Control Desertification" from November 23-27, 1992 in Ouagadougou, Burkina Faso, West Africa. The symposium will be followed by a field tour from Nov. 29 - Dec. 3, 1992. A workshop entitled "Control of Viability and Storage of Seeds" will take place from Dec. 4-8, 1992. For further information, please contact: Mr. L.M. Some, Director, National Forest Seed Centre, (CNSF), B.P. 2682, Ouagadougou, Burkina Faso, West Africa.

### 4th IUFRO Cone and Seed Insects Working Party Conference, China

IUFRO working Party S2.07-01 conference will be coupled with the 19th International Congress of Entomology (ICE) to be held 1./ in Beijing, June 28 - July 4, 1992, and 2./ include a session in Northeastern Forestry University, at Harbin (Heilongjiang), followed by excursions in Northeastern China, July 6-15.

1./Beijing meeting The 19th ICE is planned with the following schedule: June 28, Opening ceremony; June 29-30, working sessions; July 1-3, working sessions; July 4, closing ceremony.

The Cone and Seed Insects WP meeting is one of the 7 following symposia to be held within the section "Forest Insects".

- \* 11S-1 Recent advances in forest entomology in northeast Asia;
- \* 11S-2 Inter-relationships among fungi, bark beetles and their host trees;
- \* 11S-3 Characteristics of forest insect pests and outbreaks;
- \* 11S-4 Cone and seed insects; July 1, 8:30 to 18:00
- \* 11S-5 Insects affecting reforestation;
- \* 11S-6 Integrated management and control of forest insect pests;
- \* 11S-7 The ecological problems of insects in forests.

It will include 4 sessions, each lasting 2 hours to be held the first day of the Congress as follows: a) Biology

and distribution of cone insects; b) Visual and olfactory signals in cone-insect relations; c) Population dynamics and longer diapause in cone insects; and d) Promising ways of control in seed orchards.

Each session will include an invited speaker and 4 volunteer papers.

2./Harbin meeting. The WP will travel from Beijing to Harbin on July 5, after the ICE. The Harbin meeting at the Northeastern Forestry University (NEFU), schedule includes: July 6, Morning: Business meeting including the election of new chairman and co-chairman. Afternoon: lectures about cone insect problems, open discussion; July 7, Morning: lectures and discussion. Afternoon: visit of Harbin; July 8-11, Excursion to Heilongjiang forest stations; July 12-15, Excursion to Inner Mongolia forest stations.

Contact the organizing committee of the 19th ICE, in Beijing (Address: 19th ICE, 19 Zhongguoan Lu, Beijing 100080, China; Tel. 861 2563011; Fax 861 2565689; Telex 222337 ICCST CN), and one of the following: Alain Roques, Chairman, IUFRO Working Party S2.07-01, INFRA-CRF, Ardon, 45160 Olivet, France. Fax: 33 38417879; or Gary L. DeBarr, co-chairman, IUFRO Working Party S2.07-01, Southeastern Forest Experiment Station, Forest Service USDA, Carlton Street, Athens, Georgia 30602, USA. Fax: 1 404 546 2478.

### 23rd ISTA Congress 1992

Mar del Plata, Argentina. Theme Quality Seed for the Present and the Future. Keynote speakers to cover Synthetic seed, seed banks, seed technology training - their influence and importance for continuing development of seed technology around the world.

Symposium topics:

1. Producing quality seed
2. Seed lot potential performance
3. Seed hygiene
4. Seed testing for tropical and sub-tropical species
5. Seed programs for developing regions

### Centennial Meeting of IUFRO, 1992

This meeting will be held in Berlin, September 1992. A Pilgrimage to Eberswalde, the birthplace of IUFRO, is planned.

### IUFRO International Symposium on Population Genetics and Gene Conservation of Forest Trees

Sponsored by IUFRO working parties on Biochemical Genetics (S2.04.05), Population and Ecological Genetics (S2.04.01), Provenance, Breeding and Genetics Resources (S2.02.00) and by Laboratoire de génétique et amélioration des arbres forestiers de Bordeaux-Cestas (INRA) France. The symposium will include 7 sessions with both invited and voluntary papers in Bordeaux, France, August 24-28, 1992. The sessions topics are: 1) Utility of classes of markers to assess for different levels of genetic variability;

2) Patterns of geographic variations; 3) Characterization of polymorphism and structuration of genetic variability; 4) Study of gene dispersal patterns using gene markers; 5) Consequence of gene dispersal patterns on structuration of genetic variability and inbreeding level; 6) Relationships between structuration of genetic diversity and gene conservation procedures; and, 7) Practical examples of genetic diversity conservation.

Contact: P.H. Baradat, INFRA, B.P. 45 33611, Gazinet Cedex, France. Tel: +33-56-680303, Fax: +33-56-680223.

### IUFRO Molecular Genetics and Forest Trees

This meeting supported by IUFRO group S2.04-06 will be held in Bordeaux, France June 16-18, 1992. For further information contact Antoine Fremer, I.N.R.A., Laboratoire de Génétique et Amélioration des Arbres Forestiers, Pierroton, F-33610 Cestas, France, Tel: +33-56 68 0303, Fax: +33-56 68 02 23.

### IUFRO: Results and Future Trends in Larch Breeding on the Basis of Provenance Research

This meeting supported by IUFRO group S2.02-07, Larch Provenances and Breeding, will be held in Berlin, and Waldsiedersdorf Germany and in Czechoslovakia, September 5-10, 1992. For further information contact: Horst Weisgerber, Department of Forest Tree Breeding, Hessian Forest Research Centre, Prof.-Oelkers-Strasse 6, D-W-3510 Hann.-Münden, Germany, Tel: +49-5541-7004-48, Fax: +49-5541-7004-73.

### IUFRO: The Biology and Control of Reproductive Processes in Forest Trees

This meeting supported by IUFRO group S2.01-05, Reproductive Processes, British Columbia Ministry of Forests and University of Victoria, August 15-20, 1993. For further information contact: B.C. Ministry of Forests, Research Laboratory, 1320 Glyn Road, Victoria, B.C. V8W 3E7, Canada, Fax: +1-604-356-8543.

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