

Newsbulletin

Tree Seed Working Group

No. 10 November 1988

A WORD FROM THE CHAIRMAN

The prospect of holding a Workshop Session for the Tree Seed Working Group at next year's meeting of CTIA/ACAA in Edmonton is coming to fruition. Time is being reserved for Monday, 14 August. The proposed topics are 1./ Cone and Seed Crop Monitoring and 2./ Cone Induction Responses to Practice. Current plans are to handle these topics differently. The first will be more formal in the sense that a small group of speakers will cover the topic. This session should contain something of interest for everyone involved in seed orchards, seed procurement from plantations or natural stands, pollination and cone development, cone and seed insects and diseases, analysis of cones and their content, cone efficiency, seed quality and so on. The second topic will be less structured; more in the form of a 'directed discussion' or 'exchange of experience' of what has been tried, what has succeeded, what has failed, all at the practical field level, rather than at the research level. Researchers may be able to contribute to the discussion by indicating why results vary.

In the next two months, for topic one, Peter de Groot and I will piece together the details and line up speakers. We will try to ensure that the content is practical as well as informative. No doubt, we will call upon others for guidance or to test out ideas.

What is needed for topic two is that several people, who have had hands-on-experience, bring details of their methods and results to the meeting. This needs some forethought and maybe some further prompting. I will arrange for someone to coordinate the conduct of this discussion.

Initially, we had thought of a half-day time-span but we might expand it by an hour or two. We should have full details in time for their inclusion in the March Newsbulletin. Naturally I hope that these ideas will be well received and that the Workshop will prove to be worthwhile.

Graham R. Powell

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

EDITOR'S NOTES

"They've done it --- they've finally done it". Dale Simpson and Ron Smith of the CFS, Maritimes Forestry Centre, require our congratulations for having put together the first Canadian manual for forest tree seed orchard management (Information Report M-X-167). This manual, though designed specifically for use in the Maritimes, could be used to great advantage throughout temperate North America. It is written with a distinct 'how to do it' flavor that will be very useful to orchard managers. The text is divided into seven chapters that follow a logical sequence outlining the steps required for planning, establishing and managing seed orchards. This material is supplemented by a series of appendices that offer additional detailed information and procedures for specific tasks and provide the outlines of forms required for detailed recording of management activities.

The manual is handsomely produced for a loose-leaf-binder so it can be easily updated. Although it presently contains the best of available information, changes and additions to the text will be necessary. I'm certain that this updating will be done because the Maritimes has a very enthusiastic group of orchard managers who are anxious to improve their management skills. All new pertinent research results or developments obtained through practical experience, will be utilized to continually improve the manual.

I expect all TSWG members involved in seed orchard management will want a copy of this manual. When you send in your requests for copies:- include a word of thanks to Dale and Ron for a job well done.

Hugh O. Schooley

A MEMBER'S COMMENTS

Re: Pollen collecting by Peter Copis - Newsbulletin No. 9, March '88

I would like to emphasize the importance of Mr. Copis' concluding remark, "the best results occur when the strobili are collected as close to natural dehiscence as possible", especially with respect to storing pollen for the following season. Forced and immature pollen do not store well at either 4°C or -18°C.

In addition to the two characteristics for efficiently obtaining mature pollen described by Mr. Copis, an other characteristic is that a microstrobilus (pollen cone) about to shed pollen will have a flexible strobilate axis and an elongated stalk.

Heat sum (degree-day or degree-hour) is also a very good indicator to help seed orchard managers to monitor cone crops, especially when the orchard is remote from his office.

Rong Ho

SAF TREE GENETICS AND IMPROVEMENT WORKING GROUP NEWSLETTERS

The Society of American Foresters (SAF) Tree Genetics and Improvement Working Group has produced a newsletter for many years. This publication frequently contains information of interest to our working group membership. For example the most recent issue to pass over my desk (Spring 1988, Vol. 16, No. 1) contains the following information:-

A. Paul Bloese of the Michigan Cooperative Tree Improvement Program reports

- Emphasis continues to be placed on the conversion of progeny test plantations into productive seed orchards. Following the analysis of a 1/2-sib progeny test of jack pine, one of the plantations in the test was marked and is scheduled for roguing this spring.
- Currently, there are 155 acres of seed orchards involving 22 species under development in the Cooperative program.
- A new organization has been started in Michigan which promises to further stimulate the use of improved seed. The Michigan Seedling Grower's Association is composed of many, mainly Michigan, nurserymen who are interested in sharing information and ideas about nursery problems. The major concern of this group is assuring an adequate supply of the best seed available for seedling production.

- B. Millions of genetically improved forest trees are being planted throughout the southern United States every year. Table 1, outlines the sources of seed for plantings, shows the annual average production of genetically improved seedlings and acres planted by organization as of 1987.

Table 1. Tree improvement in the southern U.S. as of 1987

	Organizations in CO-OPS	Seed Orchards (acres)	Improved Seedlings (mm)	Area Planted (Acres ^m)
North Carolina St. Univ. Co-op	28	4000	630	900
W. Gulf For. Tree Impr. Assoc.	17	2050	350	500
Univ. Florida For. Co-op Res. Program	15	2300	300	400
USDA For. Ser.	1	1400	50	60
TOTALS	45*	9750	1330	1860**

*Twelve public and thirty-three private organizations

**Approximately 85% of all southern reforestation

C. The B.C. Forest Ministry reports.

- Provisional seed transfer rules based on 10-year data from field trials of Sitka spruce were prepared for review.
- The tree improvement highlight of the year was the collection of 160 hl. of cones from the interior spruce seed/breeding orchards. This represents the first collection of operational quantities of cones from the interior spruce tree improvement program.
- A tree improvement/seed orchard program for western larch was initiated this year. The breeding plan calls for the establishment of first-generation seed orchards and accompanying wind-pollinated progeny tests. Fifty-five parent trees have been selected to date.

NEW "SILVICULTURE OPERATIONS NEWSLETTER"

The publication of a mechanized silviculture newsletter has been transferred from the CFS, Great Lakes Forestry Centre to the Forest Engineering Research Institute of Canada (FERIC). Vol. 1, No. 1 was issued this past spring.

The purpose of the Newsletter is to increase the awareness of new methods and techniques from across the country, and to promote information transfer through communication between forest managers, researchers and field practitioners.

It highlights a range of upcoming and recent activities of relevance to silvicultural field operations across Canada. Features include: a listing of coming events, such as equipment exhibitions and trials, meetings and symposia; reporting on meetings, equipment developments, demonstrations, trials or

regular operations; updating on research and other activities of interest at FERIC and other agencies; and, a listing of recent reports relevant to silvicultural operations. Many developments relative to site preparation for direct seeding and tree planting are offered.

To keep the Newsletter informative, announcements newsworthy activities Articles from the readership pertaining to silvicultural operations are welcome. Any submissions, additions to the mailing list or address changes should be directed to the following address:

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Silvicultural Operations Newsletter
FERIC
143 Place Frontenac
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Telephone: (514) 694-1140
Fax: (514) 694-4351

RELOCATION OF BIOTECHNOLOGY GROUP FROM MAPLE TO GUELPH

The biotechnology Group of Ontario Tree Improvement and Forest Biomass Institute, Ministry of Natural Resources, was relocated to the campus of the University of Guelph, 620 Gordon Street, Guelph, Ontario N1G 2W1 on September 7, 1988. The group includes two scientists and two technicians and they are Rong Ho, Yesoda Raj, Anne Baird and Wendy Gibbs. Their major research project at present is rejuvenation of Ontario's "bread-and-butter" species, namely black spruce and jack pine, through cell, tissue and organ culture *in vitro*, and minor projects are somatic embryogenesis and haploid plant induction.

Rong H. Ho

WHY TEST SEEDS

Seed testing is an important step in the efficient and economic management of seeds for seedling production and direct seeding programs. It is especially critical for forest tree seeds, the majority of which are still collected from natural, wild populations that are noted for their lack of homogeneity. Differences in the methods of seed collection, handling, processing and seed storage exacerbates this variability.

The objective of seed testing is to scientifically assess the quality of a seedlot so that its field planting value can be calculated. This is particularly important for genetically improved and, therefore, more highly valued tree seeds from seed orchards, which presently are in short supply.

To aid in safeguarding forest renewal, national guidelines for grading and labelling tree seeds in Canada have been formulated by D.G.W. Edwards, D.F.W. Pollard and B.S.P. Wang and published in the Forestry Chronicle (1988, Vol. 64(4):334-344). In addition a manual "Methods and procedures for testing tree seeds in Canada/Methodes de controle des semences forestieres au Canada", by D.G.W. Edwards, published as Canadian Forestry Service, Forestry Technical Report 36(1987), 31 pages,

is available (gratis) from the Pacific Forestry Centre, 506 West Burnside Road, Victoria, B.C., Canada V8Z 1M5.

Both these publications are extremely useful in developing uniformity of seed testing throughout Canada. The transfer of standard tree seed testing technology to seed producers, users and researchers is also facilitated by conducting workshops. Note the following NEWS BULLETIN article describing a series of such workshops.

*D.G.W. Edwards
B.S.P. Wang*

CFS TREE SEED TESTING WORKSHOPS

In 1987/88, the Canadian Forestry Service (CFS) organised and held a unique series of four Tree Seed Testing Workshops at various locations across the country. The objectives of the workshops were:

- i) to review basic seed testing technology for use by seed testing agencies, seed extraction plants and commercial and private nurseries throughout Canada;
- ii) to improve standards and abilities to interpret seed test results in relation to nursery stock production; and
- iii) to reduce seed utilization inefficiencies and waste.

Workshops were held at CFS-Petawawa National Forestry Institute, Chalk River, Ontario (Sept. 1987), Nova Scotia Agricultural College, Truro, (Nov. 1987), CFS-Pacific Forestry Centre, Victoria, B.C. (Dec. 1987), and CFS-Petawawa National Forestry Institute (Mar. 1988). The fourth workshop was conducted in both official languages with the provision of simultaneous translation, and with sign language translation for a disabled participant.

The core instructional materials and the program for each of the 3 day workshops was prepared by the principal instructors, D.G. Edwards (PFC), B.S.P. Wang (PNFI) and C.L. Leadem (B.C. Min. For. and Lands) who instructed at the first three workshops. R.F. Smith (CFS-Maritimes) was local organizer and a lecturer at the Nova Scotia workshop. Participants received an instructional workbook containing summaries of the lecture materials, the hands on exercises, a manual of quick test methods, a Canadian tree seed testing manual, and a workshop evaluation sheet.

A total of 132 participants, from almost every province and territory, and including several visiting scientists and trainees from overseas (Thailand, China, Mongolia) attended the workshops. These individuals represented most of the major provincial and private seed extraction and testing centres, private contract nursery growers, and provincial and industrial nurseries throughout Canada. They also represented educational institutions, federal and provincial seed researchers, and foresters working on forest renewal.

The hands-on exercises exposed the participants to the basics of a broad spectrum of testing methods for seed purity, germination, moisture content, seed weight, viability determina-

tions (x-ray, tetrazolium staining, hydrogen peroxide) and seed sampling requirements. Lectures on seed pretreatments, dormancy and seed vigour were included in the program, and opportunities were also taken to review current tree seed research in Canadian laboratories.

Holding the workshops on a regional basis facilitated the attendance of more individuals, and allowed the incorporation of topics specific to the region. From the evaluation sheets, comments during the workshops, and appraisals from third parties, it was concluded that the workshops had been successful and very well received. By means of these workshops, a significant first step was taken in standardizing tree seed testing in Canada. If a majority of the attendees put into practice the lessons learned at the workshops, considerable improvements in operational tree seed testing in this country may be expected in the near future. While the need for further, more specialized/advanced training was also identified, there are no plans to continue the program.

*D.G.W. Edwards
B.S.P. Wang*

TREE BREEDING WORKSHOP

This workshop was held February 10 and 11 at the Hugh John Flemming Forestry Centre, Fredericton, N.B. Forty "tree improvers" attended from the Maritimes and Maine representing industry, university, provincial, and federal governments. Tree improvement programs and in the region are at the stage where controlled crossing is being conducted to test the genetic superiority of first generation selections and to produce progeny for second generation selections. The purpose of the workshop, therefore, was to introduce various considerations and aspects involved in tree breeding. Topics covered were as follows.

1. Flowering Phenology: Monitoring and Management
2. Pollen Contamination in Seed Orchards
3. Stimulation of Cone Crops:
 - Developmental Biology
 - Fertilizer Treatments
 - Hormone Treatments
4. Role of Controlled Pollination in Breeding Strategies
5. Planning and Record Keeping
6. Collection, Processing, and Storage of Pollen
7. Pollen Testing
8. Controlled Pollination Techniques
9. Pollination and Fertilization Biology
10. Collection and Processing of Seed from Controlled Crosses

Dale Simpson

SHORT COURSES ON THE BIRDS AND THE BEES FOR ONTARIO FORESTERS

A Short Course on Controlled Pollination in Eastern White Pine

The two-day course was organized by Tree Improvement Specialist, Ken Eng, and held in the Provincial Forest Station, Orono Nursery June 21 and 22, 1988.

Principles, management, and field exercises in controlled pollination were given to 25 foresters involved in seed orchard management, breeding, and progeny testing. The lectures included an overview in tree breeding, pollen- and seed-cone development, pollination mechanism, pollen collection and handling, embryo and seed development, planning of breeding work, pollination techniques, and managing cone crops. Most presentations consisted of 30 minutes each of lecturing, and laboratory or field work. The lecturers were employees of either Ontario Ministry of Natural Resources or Petawawa National Forestry Institute. They were George Buchert, Peter Copis, Celia Graham, Oldrich Hak, Rong Ho, Jim Hood, and Mary Moore.

In a post-course evaluation the foresters indicated that the three most valuable topics were 1) cone developmental stages; 2) pollen management; and 3) pollination techniques. Suggested inclusions in the future courses were 1) correlation between cone developmental anatomy to field identification; 2) species specific information on cone development; and 3) breeding hall management.

Breeding Hall and Vegetative Propagation Meeting

This meeting was organized by Rong Ho and held at Maple June 23, 1988. It was attended by 25 people (private greenhouse operators, industrial and provincial foresters in management, research and development, and by federal workers in research and development).

Progress with cone induction in a breeding hall environment was reported for eastern white, red and jack pines, Norway, black and white spruces, tamarack, and Japanese larch. In addition to application of gibberellin (GA_{4/7}), heat treatment, root pruning, water stress and gravitation, alone or in combination, were employed to induce cones on grafts of plus trees and mature trees from seedlings. Optimal concentration of GA_{4/7} appeared to be at 400 mg l⁻¹ for foliar spraying during the period of lateral shoot elongation in white spruce, and the whole growth season in eastern white pine and jack pine.

Vegetative propagation by rooting of cuttings was carried out for tamarack, European larch, Japanese larch, black spruce, Norway spruce, jack pine, and eastern white pine. Hedging orchards were established to prolong the juvenility of donor plants for cutting. A cytokinin (BAP at 300 mg l⁻¹) was also applied to eastern white pine seedlings to induce multiple lateral shoot development for cutting.

The next meeting will be hosted by Petawawa National Forestry Institute, Chalk River, Ontario, in 1989.

Rong H. Ho

FIRST ANNUAL MARITIME SEED ORCHARD MANAGERS WORKSHOP

The first annual Maritime Seed Orchard Managers Workshop was hosted by the Canadian Forestry Service - Maritimes on Oct. 25-26, 1988. There were close to 40 participants from the three Maritime provinces, Newfoundland, Québec, Ontario, and British Columbia.

The first day consisted of informal discussions on various seed orchard management topics, followed by technical discussions on the theme 'Monitoring pests in seed orchards'. Maritime seed orchards are just now starting to produce large quantities of genetically improved seed (in 1988, approximately 75 million seed were collected). With the onset of commercial quantities of orchard seed, the need for pest monitoring is becoming very important.

Dr. Gordon Miller, research scientist with the CFS, - Pacific Forestry Centre, was the invited speaker. He provided an excellent overview of seed orchard pest monitoring based on his experiences in the west, and provided some valuable insights into the kinds of problems and concerns which we will have to address as our programs develop.

Discussion groups debated the desirable attributes and components of an orchard pest monitoring system, and how best to establish and implement such a system. The discussion resulted in, 1) agreement on the need for a Maritime-wide pest monitoring program, and 2) a preliminary outline of the kinds of information needed by orchard staff to efficiently manage such a program. These discussions provided the all important first step in establishing these monitoring systems.

In the morning of the second day, a prototype cone harvester designed and built by TEMCON Ltd. of Oromocto, N.B. was demonstrated at the J.D. Irving Ltd. jack pine seed orchard at Dubee Settlement. A number of forest agencies had input into the design of this unique piece of equipment, conferring many advantages to the harvester not presently available with other equipment. The afternoon was hosted by J.D. Irving Ltd. with the group visiting the company's tree improvement facilities at Sussex, and their seed orchard complex at Parkindale.

This and future workshops, will provide a venue for seed orchard managers in the Region to discuss common problems and to exchange ideas on how best to remedy them. The location of these workshops will rotate to allow managers to see some of the equipment and management innovations employed at different orchards.

Workshop summaries are available from Ron Smith, CFS - Maritimes, P.O. Box 4000, Fredericton, N.B. E3B 5P7.

ISTA FOREST TREE AND SHRUB SEED COMMITTEE WORKSHOP

The ISTA workshop was organized by Bob Karrfalt, and his staff, and held at the National Tree Seed Laboratory, Dry Branch near Macon, Georgia, August 1-5, 1988. The workshop was attended by 14 participants from Canada, Germany, India,

Sweden, U.K., and U.S.A. Eight of the 14 participants are members of the ISTA Forest Tree & Shrub Seed Committee.

The three-day workshop program included the following topic sessions and leaders:

-Welcome and opening messages	Bob Karrfalt Ben Wang
-Moisture testing	Frank Bonner
-New purity definitions and computations	George Edwards (Ben Wang)
-Seed health testing	Anderson and John Knighten
-Abnormal seedling descriptions	Bob Karrfalt
-Vigour tests	Ben Wang
-Paired test concept	Frank Bonner
-ADSA germination trials with <i>Abies</i> spp. and ISTA germination	Bob Karrfalt
-Trials with <i>Pinus strobus</i>	Ben Wang
-Field trip to a Georgia State Nursery	Bob Karrfalt
-Tetrazolium tests	George Edwards (Gisela Eicke)
-X-ray and germination	Milan Simak
-Excised embryo tests	Ellen Chirco
-Wrap up session	all participants

There were extensive and lively discussions on a newly proposed definition for "Fresh seed". It was agreed that a letter summarizing the comments of the Committee members present at the workshop be sent to the chairman of the ISTA Germination Committee by Ben Wang.

Another topic extensively discussed was the "Tetrazolium tests", which has been developed and prescribed in the ISTA rules for a long time, but its application on tree & shrub seeds has not produced uniform results. Obviously, the prescribed rules require further refinements to obtain uniform results. A survey will be conducted among the ISTA accredited and tree seed laboratories to find out whether there is sufficient interest in a specially designed workshop for testing tree seeds by tetrazolium methods.

A post-workshop field tour organized and guided by Bob Karrfalt took a small group of four through the northwestern part of Georgia, South and North Carolina, and Alabama to see some of the magnificent southern hardwood forests and visit the seed testing and seedling production operations of the International Forest Seed Company. The tour concluded at Starkville, Mississippi and everybody enjoyed it immensely.

Ben Wang

CONE AND SEED PEST UPDATE

Work by Jean Turgeon (FPMI, Sault Ste. Marie)

The study on the mortality factors of black spruce cones, using a life table approach, is continuing in 3 plantations in Northern Ontario. This is a long term study and should continue for another 2 or 3 years. In other work, cone samples from different stands have been collected for the past two years, to develop sampling techniques for the spruce cone maggot and two cone

maggots infesting tamarack. As a part of this work, the within-tree distribution of each of the three cone maggots and of *Megastigmus laricis* is being examined. Development of a monitoring tool for seed maggots by using colored sticky traps is also being pursued. Because of the lack of success in capturing flies, this study will examine fly behavior to identify which stimuli the traps should mimic and what is the best location for the traps. Finally, the levels of infestation and damage caused by insects on black and white spruce cones and seeds of various clones is under investigation. Two seed orchards from Northern Ontario were sampled for the latter study.

Work by Peter de Groot (FPMI, Sault Ste. Marie)

Two major studies on cone and seed insects are in progress. The first study concerns an analysis of the mortality factors of jack pine cones and seeds. The field work for a jack pine cone life table study, and for a study of the within-tree distribution of jack pine cones have been completed. This winter cones harvested from a clonal seed orchard in Prince Albert, Sask. and a familial seed orchard in Algonquin Park, Ont. will be examined to determine losses due to seed insects. It is expected that these cones will contain damage from a seed worm, *Cydia torea*, and a seed bug, *Tetyra bipunctata*. The study will examine if there is clonal or familial differences in susceptibility to these insects. This work is being done in cooperation with Hugh Schooley and Willard Fogal of PNFI. The second study is a taxonomic investigation of the cone beetles (*Conophthorus*) which are serious pests of white and red pine cones. An expected spinoff of the taxonomic research that will be useful for pest management is the development of a pheromone-based monitoring and pest management system. Future work for this project will be aimed at developing methods for control of cone and seed insects.

Work by Gary Grant (FPMI, Sault Ste. Marie)

Cooperative research across Canada, literally from coast (Newfoundland) to coast (B.C.), has discovered an effective sex attractant for the spruce seed moth, *Cydia Stobliella*, that is useful for monitoring this pest in spruce stands and seed orchards. Pheromone trapping of this moth is most effective when traps are placed at cone height, as observed for other cone pests. A manuscript describing this work has recently been submitted for publication. Additional cooperative research on identifying sex pheromones for other lepidopterous pests of cones and seeds is continuing. The aim of this work is to develop pheromone trapping systems that will aid in determining the presence or absence of pests, determine their flight periods to assist in timing control operations, and to provide additional information on the biology of the insects.

Monitoring Pests in Maritime Orchards by Victor Steel

In June 1988 a contract was awarded to develop monitoring systems for cone and seed pests in Maritime seed orchards. With the first generation orchards beginning to produce operational quantities of cones, managers have become increasingly aware of the potential for losses due to pests. Minimizing these losses is a major part of seed orchard management, thus the rationale for the contract.

The contract addressed three basic questions: 1) what pests are present; 2) how much and what type of damage does each

pest cause; and 3) what are the life histories and habits of each pest. The collection of data to provide the answers involved an extensive survey of as many orchards as possible with all the important tree species represented. Twenty-two orchards, out of an available thirty were included for sampling. The tree species, province and number of orchards sampled follows - eastern larch (NB-3, PEI-2), white spruce (NB-2, PEI-1, NS-3), black spruce (NB-5, PEI-1), red spruce (NS-2) and jack pine (NB-3).

Sample trees in each orchard were examined three times throughout the field season. Each time all the cones on each tree (or a sample of several branches) were counted and their condition, whether healthy or damaged, assessed. If possible the cause of damage was identified or a collection taken for identification. A general assessment of insect and disease conditions on the trees was also made. Just prior to operational cone collections all of the cones on the sample trees were collected for damage assessment in the lab. The work this winter will involve a combination of cone slicing, complete cone dissection and x-raying the seed of both healthy and damaged cones. Data will provide damage assessment on a per cone and a per tree basis.

Results should provide positive identification of most of the cone and seed pests present, the association of a pest with a typical damage type, the quantification of damage in terms of a reduction in seed potential and the construction of partial life tables to document cone losses. A literature search in addition to field observation will provide an overview of the life histories and pest habits.

1987 CONE AND SEED STUDIES IN ONTARIO

CFS, Forest Insect and Disease personnel are conducting a long-term study to gather baseline data and to determine the impact of various insect pests that affect seed production in the major coniferous tree species in Ontario. Every year, each ranger collects 100 mature but still green cones; these are submitted to the Sault Ste. Marie laboratory for dissection and analysis. Although the 1987 effort was hampered by a rather poor cone crop, white spruce cones were collected from 10 of the Provinces 14 Ranger Districts.

Of the 1000 cones collected, 54% were damaged. Seed loss averaged 30% over all, although within the damaged cones it averaged 57%. The principal damage agents were the spruce cone maggot (*Lasiomma anthracina* Czerny), the spruce cone axis midge (*Dasyneura rachiphaga* Tripp), the spruce seed moth (*Cydia youngana* [L.]), and the spruce gall midge (*Dasineura canadensis* Felt.) In addition, there was damage by unknown lepidopterous insects and by other unknown agents. A complete summary of the damage and its principal agents is given in Table 2.

Table 2. Summary of white spruce cone and seed amage in Ontario in 1987.

Ranger District	Cones damaged (%)	Seed loss in damaged cones (%)	Principal causes of damage (in order of importance)
Red Lake	24	68	1. spruce cone maggot 2. lepidoptera
Fort Frances	37	54	1. unknown 2. lepidoptera 3. spruce cone maggot
Thunder Bay	63	48	1. unknown 2. lepidoptera 3. spruce cone maggot
Sault Ste. Marie	66	68	1. spruce cone maggot
Kirkland Lake	42	66	1. spruce cone axis midge 2. spruce cone maggot 3. lepidoptera 4. spruce seed moth
Bancroft	87	53	1. spruce cone maggot 2. spruce cone axis midge 3. spruce cone gall midge 4. spruce seed moth
Carleton Place	95	37	1. lepidoptera 2. spruce cone maggot 3. spruce seed moth 4. spruce cone gall midge
Minden	62	33	1. lepidoptera 2. spruce cone maggot
Huron	67	59	1. spruce cone maggot 2. spruce seed moth 3. fir coneworm
Simcoe	14	57	1. spruce cone maggot 2. lepidoptera 3. unknown

Source: Ontario FIDS Survey Bull. Spring 1988

TREE SEED SUPPLY IN VIETNAM

The ravages of war carried on in one form or another for over 50 years in Vietnam have had devastating effects on the forests. In addition, current estimates indicate that the country loses over 200,000 ha of its forest land base annually. As a result, it is feared that by year 2,000 there will be little or no primeval or managed forest left in Vietnam.

HoChiMinh foresaw the consequences of forest destruction long before his death. In 1963 he established a National Forest Seed and Planting Materials Company (also called the Seed Company) under the Ministry of Forests. The Company supports planting programs by making seed collections and by purchasing tree seed from remote regions.

By 1985 the Seed Company was providing up to 70 tones of tree seed annually but it was recognized that this was only about one sixth the amount needed for all tree plantings in the country. Provincial forestry organizations, communes and

private citizens also collected, and still collect, most of the seed which the Ministry cannot supply. An estimated 760 million tree seedlings are planted annually in Vietnam, 260 million for forestry and 500 million for agroforestry and amenity purposes.

In Vietnam only the ministry for science has permission to initiate or maintain direct contacts with other countries. As a result, the only tree seed which is entering the country is brought in by aid projects like the Swedish Bai Bang project, F.A.O. and World Food programs or other development projects via U.N.E.S.C.O. etc. Because out of country sources of good seed are limited, Vietnam must collect seed from depauperate, logged over stands, from badly degraded plantations, from city and boulevard plantings and from distant natural stands.

Vietnam is a land in need. Its people have few resources to work with, i.e., limited and poor seed supplies, no capital equipment, very limited budgets, minimal training in good forestry principles and practices. It is very hard to visit such a state of affairs where people are keen to get going at repairing their country but are so hampered by poverty.

A.K. Hellum

Editor's Note: Dr. Hellum was in Vietnam in 1986, 1987 and again this year on a F.A.O. project dealing with tree seed supply.

CURRENT ACTIVITIES OF THE MOLECULAR GENETICS LABORATORY, PNFI

For conifers, studies at the molecular level dealing with seed embryogenesis and germination have been few. In a couple of recent reports dealing with seed germination of jack pine (*Pinus banksiana*) and tamarack (*Larix laricina*), for embryos, the activity of several enzymes is low in dry and imbibed seeds but increases dramatically with radicle emergence and further germination (e.g., Pitel and Cheliak, *Physiol. Plant.* 67:562-569, 1986; and Pitel and Cheliak, *Can. J. Bot.* 66: 542-547, 1988). For gametophytes, however, enzyme activity decreases with later germination of jack pine. We are now in the process of making cDNA (complementary DNA) libraries at several stages of imbibition and germination to examine changes in gene expression during this period of growth and differentiation.

A cDNA library represents all the genetic activity of a tissue at a specific time or stage of development. To construct these libraries, total RNA is extracted, and a specific type called mRNA (messenger RNA) is purified. A typical cell may have about 30,000 different mRNA sequences. Mimicing elegant biological processes, by using special enzymes and DNA substrates, cDNA is produced from the mRNA. The cDNA pieces are then individually incorporated into special viruses and cloned using bacteria to create recombinant cDNA libraries. These libraries can be screened using a variety of techniques to identify specific genes. At present we are trying to isolate and characterize genes expressed at one stage of germination and not expressed in other stages.

Jack Pitel

POLLEN MONITORING IN A YOUNG BLACK SPRUCE ORCHARD

Pollen monitoring was conducted in 1987 and 1988 in a 2.8 ha black spruce seedling seed orchard in northwestern New Brunswick to evaluate the level of within-orchard pollen and pollen-cone production and to estimate the level of pollen contamination from residual spruce stands in the vicinity of the orchard. Orchard trees were aged 10 years in 1987. Pollen traps were installed around the orchard at the level of the seed-cone zone and were collected and replaced daily.

Pollen production from orchard trees, during seed-cone receptivity, was established at 0.9 and 3.3 pollen grains per mm² in 1987 and 1988, respectively. Contamination level by unselected black spruce and red spruce pollen grains from residual stands, during seed-cone receptivity, was established at 32.4% in 1987. In 1988, owing to a 37-fold increase in pollen production (16.6 pollen grains trapped per mm²) by contaminant sources and to the roguing of 40.3% of the orchard trees, contamination level increased to 83.3%.

The low increase in pollen production by orchard trees from 1987 to 1988 and the incapacity of the orchard to buffer pollen contamination are attributed to the roguing operation. Hence, it is recommended that roguing be progressive over the life of an orchard instead of single operations, as presently done in New Brunswick, after 10 and 15 years. In addition, windbreaks should be considered for the present orchard, especially on the north side of the orchard as 70% of spruce contaminants were channeled by northern winds in 1988.

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CONE COLLECTION IN NEW BRUNSWICK SEED ORCHARDS - AN ENCOURAGING SCENARIO!

For many tree species in NB, 1988 was a bumper year for cone production. The Tree Improvement Unit of the New Brunswick Department of Natural Resources made large cone collections in 3 seedling seed orchards. Two of the orchards, Bettsburg (total 32 ha) and Otter Brook (total 25 ha) are located in central NB, while the third orchard, Pokiok (total 5 ha) is located near Fredericton. Jack pine was collected at Otter Brook while black spruce was collected in the other two locations. All three orchards were planted at 2 x 1 m spacing with the 1979 and 1981 plantings of jack pine rogued once, to approximately 45% of the original trees.

A summary of the total cones harvested, the time involved and the cost of collections are given in Table 3. Ladders were necessary for collection in the 1979 planting of jack pine and this is reflected in the cost, which is almost double that of collecting in the 1981 and 1982 areas. Ladders were also used in some areas within the 1980 Bettsburg orchard but the cost does not escalate the same as the jack pine. This can be attributed to the compact concentration of cones in the upper crown of black spruce which reduces the time to collect and therefore the cost.

Table 3. Volume cost and yield of cone collections in three NB seedling seed orchards

Species Orchard Year of Planting	Jack Pine Otter Brook			Black Spruce Bettsburg Pokiok	
	1979	1981	1982	1980	1979
Area collected (ha)	5	3	8	6	5
Cones collected (L)	3042	544	3614	1548	442
Person days required	175	17	110	50	13
Cost/litre (\$)	5.20	2.76	2.76	2.58	2.35
Total cost (\$)	15,818	1501	9975	3994	1039
No. cones/litre	75	91	105	219	230
No. full seed/cone	37	38	29	17	12
Est. seed yield (M)	8.4	1.9	11.0	5.8	1.2

Although seed extraction is not complete, a sample was taken from each of the orchard collections and the total seed yield was estimated (Table 3). In addition to jack pine and black spruce, we also made a small collection of white spruce cones from a 1984 clonal orchard. The 61 litres of white spruce cones yielded 217,000 seed and had an average of 32 full, seeds per cone.

At the present time, New Brunswick's annual planting requirements are approximately 8 million jack pine and 16 million black spruce. Therefore, according to the seed yield estimates, this years orchard collections will meet the planting requirements totally for jack pine and will provide a good proportion of improved black spruce seed. To have such a high proportion of our seed collected from first generation orchards is indeed a very encouraging scenario. With most of the orchards starting to produce substantially quantities of cones, we estimate by 1995 all of the seed for reforestation of the major species will come from orchards.

Kathleen Tosh

FACTORS AFFECTING WHITE SPRUCE GERMINATION ON BURNED FOREST LITTER

(An abstract of a paper given at the 1988 Mtg. of Can. Bot. Ass.)

The potential impact of seedbed temperatures and ash from burned forest litter upon white spruce seed germination following slash burning were studied. In a field study, the presence of ash was noted and surface soil and air temperatures of 65 C on exposed and 43 C on shaded burned sites were recorded. A factorial experiment in controlled laboratory conditions, tested the germination response to two white spruce seed sources on four seedbed conditions (distilled water, fresh ash, leached ash and leachate from ash) in five regimes where temperatures were elevated daily for two hours (30 C, 35 C, 40 C, 45 C, 48 C) from a constant base temperature of 20 C. Germination percent

decreased as temperatures increased. None of the seeds germinated at 48 C. Germination was lowest on fresh ash, and highest on distilled water for all temperature treatments. The number of days to fifty percent germination on ash increased as temperature increased. Chemical analysis of the soluble components of ash extracts suggested that the low responses on fresh and leached ash were not simply due to salinity, and that pH may have played a partial role.

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UPCOMING MEETINGS

Canadian Tree Improvement Association

The 22nd ^{Aug} biennial meeting of the Association will be held in Edmonton, Alberta, Aug 14-17, 1989. The program theme is Test Results and Their Use in Practical Tree Improvement and will include:-

- Technical sessions for contributed papers on forest genetics, tree breeding and related fields.
- Field trip to Pine Ridge Forest Nursery (Alberta Forest Service) to view genetics and tree improvement field trials, nursery operations, seed orchards and seed extraction plant.
- Pre-conference workshop on selection indices organized by University of Alberta.
- Pre-conference Tree Seed Working Group workshop on cone and seed crop monitoring.
- Post-conference field trip to Whitecourt area to view lodgepole pine management, E.S. Huestis Demonstration Forest, lodgepole pine and Siberian larch field trials, subject to later confirmation.

For further information contact:

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SEED PROBLEMS SYMPOSIA

The next international Union of the Forest Research Organizations, Project Group P2.04-00 dealing with Seed Problems will be held in Gympie, Australia in August and September of 1989. The theme will be "Seed Problems of Multipurpose Trees." The Symposium and following field tour in North Queensland is scheduled for August 19-30. Immediately following the tour we will hold a 5-day "Seed Radiography Workshop" at the CSIRO Division of Forestry and Forest Products in Canberra. Our host will be the CSIRO Division of Forestry and Forest Products and

the Queensland Department of Forestry. The entire meeting -- symposium, tour, and workshop -- will last 18 days (August 19 - September 7). ~~There will be a AUS \$150 dollar non-refundable registration fee. The call for papers and other details will be published very soon, but start your planning now.~~

Some copies of the Proceedings from our 1987 Symposium in Harare, Zimbabwe are still available. Write to Dr. S.K. Kamra, Dept. of Forest Genetics and Plant Physiology, Faculty of Forestry, Swedish University of Agricultural Sciences, S-901 83 Umea, SWEDEN.

Contact:

F.T. Bonner (Chairman)
Forest Exper. Station
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20th SOUTHERN US FOREST TREE IMPROVEMENT CONFERENCE

This conference will be held in Charleston, South Carolina June 27-29, 1989. Session topics with invited speakers include the following:

- tree improvement accomplishments in the South
- seed orchard management
- genetics of stand establishment and management
- advanced-generation breeding strategies
- biotechnology
- global concerns of tree improvement

For further information contact, Dr. D.S. Canavera, Westvaco Corp., Forest Research, P.O. Box 1950, Summerville, SC 29484, USA.

CONE AND SEED PEST WORKSHOP

A cone and seed pest workshop will be held on 4 October 1989 at the Radisson Plaza Hotel in St. John's, Newfoundland in association with the Annual Meeting of the Entomological Society of Canada. The agenda includes presentations of the following: an overview of research on cone and seed pests, control of cone and seed insects using systemic chemicals, cone and seed insects of jack pine, monitoring cone insects of spruces and predicting damage, potential of semiochemicals in controlling cone insects, establishing seed orchards to minimize infestations by insects, red squirrels and cone crops, diseases of seeds and cones, and the influence of cone crop size and stand type in evaluating insect damage to white spruce cone crops. The proceedings of the workshop will be published by Forestry Canada.

For further information, please contact:

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and other Tropical and Subtropical Species

SEED-RELATED INFORMATION IN LAKEHEAD UNIVERSITY GRADUATE AND UNDERGRADUATE THESES

Newsbulletin #8 provided a list of theses of interest that were produced by students at the University of New Brunswick. Following the lead of U.N.B. the Newsbulletin now offers a list of theses produced at the Lakehead University in Thunderbay, Ontario. Arrangements for borrowing copies can be made through inter-library loans or by contacting the University.

BARRETT, John. The mating system and population structure in a black spruce (*Picea mariana* (MILL.) B.S.P.) clonal seed orchard in Northwestern Ontario. Theses MSC 1986, 096P.

BROUGHTON, Kenneth R. The effect of *Arceuthobium americanum* on the cone and seed production of *Pinus banksiana*. Theses BSC 1987, 39P.

CHARRETTE, Paul D. Influence of light on black spruce seed germination. Theses BSC 1984, 41P.

CURNISKI, Gregory B. Moisture retention and subsequent irrigation for three seed orchards in the Kenora district. Theses BSC 1985, 178P.

EDWARDS, Micheal K. The effects of controlled pollinations on the seed set of green alder (*Alnus viridis* ssp. *crispa* (Aiton) Turill). Theses BSC 1986, 39P.

ELLIOTT, Kenneth A. Height, growth and performance of a *Larix laricina* open-pollinated progeny test, established in 1979 at Furcate Creek. Theses BSC 1986, 48P.

GEERINCK, Linda M. Controlled pollination of balsam fir (*Abies balsamea* (L.) Mill.) Theses BSC 1983, 46P.

GRAY, Andrew H. Quality and maturity of white spruce (*Picea glauca* (MOENCH) Voss.) Theses BSC 1981, 94P.

LEGG, David C. Simple field determination of viable jack pine seed. Theses BSC 1986, 29P.

MACDONALD, Brian J. Inheritance of cone serotiny in jack pine. Theses BSC 1987, 51P.

MALEY, Madeline Louise. Germination and seed yield of green alder (*Alnus crispa* (AIT.) Pursh). Theses BSC 1983, 42P.

MILLARD, Michael A. Effect of topping on seed production in white spruce. Theses BSC 1981, 20P.

NELSON, Corrinne L. Germination and early growth of white spruce (*Picea glauca* (MOENCH) Voss) from ten central and western Canadian sources. Theses BSC 1984, 60P.

O'BRIEN, Darlene M.A. Influence of lichens on seed germination and early seedling growth of jack pine (*Pinus bankstana* Lamb.) black spruce (*Picea mariana* Mill. B.S.P.) and trembling aspen (*Populus tremuloides* Michx.) Theses BSC 1985, 75P.

O'REILLY, Conor. Vegetative and sexual phenology, reproductive dynamics and bud differentiation in a clonal seed orchard of white and black spruce. Theses MSC 1981, 195P.

REID, Scott Russell. Differences in seed and early seedling growth of white spruce related to provenance. Theses BSC 1976, 37P.

SLIZ, Janet S. Investigation of pollen tube growth of *Abies balsamea* and applications to tree improvement. Theses BSC 1983, 92P.

STOCKERMANS, Barnard J. Study on pre-germination and separation of seed from three coniferous species. Theses BSC 1981, 34P.

STOEHER, Micheal U. Genetic and environmental variation in seed, cone and progeny characteristics of black spruce clones in a northern Ontario seed orchard. Theses MSC 1985, 105P.

THOMPSON, James. Influence of geographic variation on seed germination of eastern White Pine (*Pinus strobus* L.) Theses BSC 1987, 27P.

TRACEY, Jacqueline L. Fertilization program for three seed orchards in the Kenora district. Theses BSC 1984, 100P.

VERHEGGEN, F.J. Effects of temperature and stratification on the Germination of seed from clones of black spruce (*Picea mariana* (Mill.) B.S.P.) Theses BSC 1982, 83P.

WITT, Douglas R. Analysis of black ash seed germination. Theses BSC 1982, 51P.

YOUCK, Frances R. Theoretical family selection in a black spruce (*Picea mariana* (Mill.) B.S.P.) seedling seed orchard one year after planting. Theses BSC 1984, 66P.

ZOTZ, Richard B. Study of the effects of pregermination treatments on the germination and embryo length of black ash seeds. Theses BSC 1985, 81P.

RECENT PUBLICATIONS

Anon. 1988. Forest tree seed sources in asean countries and contact agencies for seed supply. ASEA/Canada Forest Tree Seed Centre, Muak-Lek, Saraburi Thailand September 1988. 61 p.

Barnett, James P. 1988. Eastern white pine cone and seed maturity in the Southern Appalachians. orthern Journal of Applied Forestry 5:172-176.

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