

Newsbulletin

11

Tree Seed Working Group

No. 11 March 1989

FROM THE CHAIRMAN

In the past two issues of the Newsbulletin I have concentrated my comments on the Workshop to be held by the Tree Seed Working Group (TSWG) on Monday, 14 August, in conjunction with the 22nd Meeting of the CTIA/ACAA. Details of the Workshop, known to date, are given elsewhere in this Newsbulletin. I hope they will generate interest and lead to a useful exchange of information in Edmonton.

As I have worked on ideas and organization of the Workshop, I have been reminded of the group's beginnings and objectives. The TSWG came into being as a result of workshops on seed held at two successive CTIA/ACAA meetings (1981 at Duncan, 1983 at Toronto). The CTIA/ACAA Business Meeting at Toronto recognized the existence of the Working Group, gave it a mandate to organize a workshop at the next meeting (Québec City, 1985), and appointed Ben Wang as interim chairman who was to "establish terms of reference and a mandate" for the Group. Jerry Klein, the current chairman of CTIA/ACAA, has determined that terms of reference for the TSWG have not subsequently been conveyed to the CTIA/ACAA, although Ben did ensure that the objective of the TSWG was defined during the Group's first few months of existence. I will see that the objective is formally conveyed to the CTIA/ACAA to fulfil what Jerry calls the "spirit of the original motion".

Meanwhile, it might be good for us to think, again, about the purpose of this group, and to consider how each of us is doing in relation to that purpose. The objective of the TSWG is to promote tree seed science and technology through:

1. seed research from bud initiation to seed utilization;
2. identification of seed problems relating to tree improvement and forest management;
3. exchange of information on seed related problems;
4. advising on implementation practices.

As Doug Skeates put it in Newsbulletin 2 (November 1984), the work of the TSWG interfaces with that of others involved in the broad spectrum of silvicultural activity including Tree Improvement, Stock Production, Direct Seedling, and Natural Regeneration -- and I would add, those involved with understanding Tree Development and Tree Physiology, especially that related to Reproduction. As Doug also said, whenever and wherever possible, (members of) the TSWG must promote understanding of seed science and technology within the forestry community, and conversely, members must see their own work in the context of the whole forestry field. Recent issues of the Newsbulletin attest

that this is happening to a considerable degree in many spheres of activity. What is it like in your sphere of activity? Maybe, we will get some sense of our success, at our meeting in August. Yes, the TSWG will hold a short "business" meeting at some time during the CTIA/ACAA meeting (not during the Workshop). I hope to see you there.

Graham R. Powell

NOTE THESE ADDRESSES

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

EDITOR'S NOTES

Its time again to thank individuals who have contributed articles to various issues of the Newsbulletin and to ask again why haven't we seen contributions from everyone? Its been mentioned to me several times that most of what appeared in Issue #10 originated in Eastern Canada; the same situation occurs in this issue. Wake up Western Canada!!! Lets have some contributions for the November '89 issue.

Remember, the Newsbulletin is an excellent means of keeping the TSWG informed of its membership's activities. It is also a source of information to non-members who see copies sent to members or to a library.

Our Newsbulletin has a mandate to:

- produce executive notes and editorials and comments on these [5]
- announce meetings [10]
- report on meetings attended [6]
- indicate recent published articles [78+]
- comment on research papers read [4]
- indicate recent appointments or positions available [0]
- show the activities of other associated organizations [8]
- report on members activities, projects, or problems [11]
- request assistance with problems [2]
- and indicate equipment and technological developments [3]

The numbers in brackets indicate the number of submissions in each topic area that appeared in the two 1988 issues. It appears to me that we are doing a reasonable job of fulfilling our mandate. I'm happy with the number of contributions I have been getting but more is better, isn't it?? - and wouldn't you all like to be part of a good thing.

Hugh Schooley

DOUG SKEATES RETIRES

Douglas A. Skeates retired on January 31, 1989 after 36 years of service with the Ontario Ministry of natural Resources. Doug graduated in Forestry from the University of Toronto in 1953 and began working at Queens Park. Subsequent shifts in work responsibilities took him to:

Geraldton District as a Reforestation Supervisor in 1956

Thunder Bay District as a Unit Forester in 1961.

Kenya, Africa in 1964, first as a Reforestation Advisor and later as Director of Research for the Kenyan Forest Service

and then in 1968 to Maple and OMNRs Research Branch. The continuity of his work here was interrupted in 1970 when he returned to the University of Toronto for a Masters degree; and in 1985 when he accepted a 1 1/2 year CIDA assignment as Research Advisor at the ASEAN/CANADA Forest Tree Seed Centre in Thailand.

Early in his career, Doug realized the importance of proper seed collection and handling procedures in reforestation practices. He has been a driving force behind the formation of Ontario's registered and managed Seed Production Areas. He has always been adamant that until seed orchards are established, interim seed sources should be from the best, well managed stands in each district. Doug has on numerous occasions lectured on the importance of seed production and seed collection areas in Ontario's regeneration efforts.

Doug has also maintained an interest in other subject areas. He has collaborated with researchers at Petawawa National Forestry Institute in provenance research. He has conducted research on containerized and mechanized stock production: growing seedlings in peat blocks and micro-containers or cigarette plugs, whereby the efficiency of use of valuable seed could be increased. Under Doug's direction all significant remanent white spruce stands in Southern Ontario have been located and

described, thus preparing the way for a concerted effort in the conservation of this unique genetic resource.

Perhaps closest to Doug's heart has been his work on monitoring the periodicity, volume, and quality of seed production in seed orchards and seed production areas across the province, for both black and white spruce. Doug's studies offer strong evidence that, although cones may be produced every year, the quality of seed from an individual tree, as measured by seed weight and germinant vigour, vary from year to year. Additionally, his findings indicate that silviculturally managed stands produce better quality seed than do unmanaged, natural stands.

Doug hasn't really retired. He plans to do consulting work in seed quality and utilization, to continue summarizing and publishing his research results and to continue his involvement in international forestry. We wish Doug all the best and look forward to his continued interest and participation in our Tree Seed Working Group.

TREE SEED NEWS FROM J.D. IRVING LTD. IN NEW BRUNSWICK

In 1988 J.D. Irving Ltd. constructed a breeding hall at the Sussex Tree Nursery and installed a seed extraction and processing facility at Parkindale Seed Orchard. The breeding hall is a 40 m x 13 m structure with two independent sections. It will accommodate our accelerated breeding program for black, white, and Norway spruces and jack pine. This program has been developing since 1985 and is aimed at reducing generation intervals through accelerated growth, flower induction, and accelerated progeny testing. The seed extractory consists of a combination cone tumbler/seed dewinger, a liquid separator, a scalper/sizer station, gravity separators and a cone/seed drying kiln, all of which were manufactured by BCC of Sweden. The facility is designed to handle 730 hectolitres (hl) of cones per year but the capacity can be expended. Partial funding assistance was received from the New Brunswick Department of Commerce and Technology and the Atlantic Canada Opportunities Agency (ACOA) for the breeding hall and from ACOA for the seed extractory.

Cone production from seed orchards is increasing each year. In 1988, 48 hl of jack pine cones were collected from seedling and clonal orchards. All jack pine seed sown in 1989 will originate from seed orchards. A total of 14 hl of cones were harvested from black spruce seedling seed orchards and a clonal orchard. These collections will provide seed for one quarter of this year's seedling crop. White spruce clonal orchard collections yielded 5.5 hl of cones which translates into half the seed required for 1989 seedling production. In addition to this, 8 hl of tamarack cones were harvested in a clonal seed orchard. Seed statistics are currently being compiled for these collections. Seed testing and storage is being done at the Sussex Tree Nursery.

Greg Adams

GIBBERELLINS AND FERTILIZERS IN JACK PINE SEED ORCHARDS

Flower induction trials with gibberellins (GA₄₊₇) and fertilizer (NH₄NO₃) were initiated in 1987 in jack pine seed orchards established by Petawawa National Forestry Institute (seedling orchard), and the Saskatchewan Division of Weyerhaeuser Canada

(clonal orchard). Experiments have been established to investigate the long term effects of treatments on flowering, cone production, seed yields, and seed quality. Preliminary analysis of Flower counts to date indicate that trees in both seedling and clonal orchards produce equal numbers of female flowers. However, male flower production is 5 to 10-fold lower in the clonal orchard. Gibberellin sprays and fertilizer application both enhance female flowering (Table 1). The best combination is gibberellin spray with 400 kg N/ha. This provided a 2-fold increase in the clonal orchard and a 4-fold increase in the seedling orchard. Gibberellin spray alone increased male flower counts 3-fold in the clonal and seedling orchard. Fertilizer application depressed gibberellin induced male flowering in both orchards whereas without gibberellin, 200 kg/ha nearly doubled production.

These experiments are being accompanied by analyses of soil and foliar mineral nutrient levels in cooperation with the Forestry Canada, Great Lakes and Northern Forest Research Centres to define the nutrient status of trees relative to flowering. Losses of flowers conelets and cones to squirrels and insects are being assessed in cooperation with the Forest Pest Management Institute. Long term effects of the treatments (3-4 years) will include analyses of cone crops, seed yields and seed quality. Results of these experiments will help us develop rational prescriptions for improving cone production in soil-based seed orchards.

Willard Fogal and Hugh Schooley

WHITE SPRUCE CONE CROP STIMULATION BY NITROGEN

Ammonium nitrate fertilizer (N) was tested as treatment for increasing seed production by white spruce in the Ontario Ministry of Natural Resources Glencairn Seed Orchard. On May 21-25, the fertilizer was hand broadcast at rates of 50 to 400 kg/ha beneath 8, 7, and 4 year old grafted trees. Subsequent data collections, in the following year determined that these treatments did not increase the number of female flower bearing trees but did increase the occurrence of flowers, cones, and seed on 8 and 9 year old flower bearing trees but not on 5 year old trees. The rate of production response was highest with applications of 100 kg/ha but overall productivity increased up to the maximum rate of 400 kg N per ha. As a result of treatment the seed production by 9 year old trees increased from a mean of about 1100 seed per control tree to a mean of 2800 seeds on trees receiving 400 kg N per ha. Similarly seed production increased from about 55 to 740 seeds per 8 year old trees receiving 300 kg N per ha. This was the largest crop produced by these white spruce trees, but it was really just the beginning of seed production in this orchard. Mature cones were produced on only 68% of the 279 trees studied and this level of performance must be characterized as unsatisfactory for the orchard as a whole. However, seed crops can be expected to be much higher in the future as the trees become older and larger, particularly if N applications are used to stimulate the formation of abundant female flowers.

This study identified an 8.9 to 30.4 per cent mortality of potential cones during the flowering and seed development stages due to unknown causes. In addition, between 4.6 and 23.5 per cent of the developing cones on each tree were killed by cone and seed insects. Neither the loss of flowers nor the occurrence of insect damage was related to the amount of ammonium nitrate applied.

The N treated trees produced seed with mean 1000-seed-weights consistently lower than trees receiving no N, although, these differences were not correlated with the amount of N applied.

The per cent germination of seed after 3 weeks of moist stratification was much higher than that obtained with unstratified seed. Therefore, the results of tests from stratified seed better represent the germination quality of seed. The per cent of normal germinants obtained was not significantly influenced by the N used, however, there was a tendency for more seeds from trees receiving a N application to germinate. The mean percentage of seed that germinated abnormally did not exceed 9.5 per cent in any treatment. Similarly the mean percentage of seed that did not germinate was fairly uniform and did not exceed 9 per cent. Generally more than one-half of the ungerminated seed were full of endosperm and probably still viable. Neither the occurrence of abnormal germinants nor the occurrence of ungerminated seeds were correlated with N treatments.

Further studies are required to determine what effects repetitive use of N to stimulate flower bud formation will have on the nutrient status of the trees and their growing site. It is not known if long term use of N will decrease effectiveness or if periodic changes in the rate of application are necessary for treatments to be effective.

Hugh Schooley and Moe Anderson

FERTILIZING BLACK SPRUCE SEEDLING SEED ORCHARDS FOR CONE PRODUCTION

In New Brunswick black spruce seedling seed orchards, applications of nitrogen fertilizers have been used to increase cone production but the effectiveness of treatments varied with tree size, tree spacing, the type of fertilizer used and the rate and timing of applications.

Our studies showed that applying ammonium nitrate at 200-300 kg elemental nitrogen (N)/ha (240 to 360 g/tree) in 10 to 12 year old orchards can double cone production the year following treatment whereas applying urea has no effect. Application of smaller quantities are less effective while greater than 300 kg N/ha negatively affected cone and pollen flower production. In addition, fertilized trees also produced more cones than control trees two years after treatment. This can be attributed to increased tree vigor following fertilization.

Trees growing at a spacing that never limits crown development have full crowns with a maximum of potential cone sites and a corresponding maximum potential to respond to treatment. Such trees produced the most cones and pollen flowers. In addition, the largest trees (not necessarily the tallest) generally bore both cones and pollen flowers in greater numbers than intermediate or small trees.

Fertilizing must be done before the reproductive buds are formed. Treatments applied from mid-May to early June significantly increased cone production the following year. These treatments did not increase the total number of buds produced but did increase the proportion of buds which developed into reproductive structures rather than new shoots. Also treatments did not increase the percentage of trees bearing cones, however, this percentage increased with orchard age.

The response to fertilization varied between years with the greatest increases in those years when there was a naturally occurring good crop. Fertilizing only slightly increased cone production in poor crop years. Generally only the largest trees produced cones in poor years.

It is expected that ammonium nitrate applications will become a common orchard management technique for increasing cone production in black spruce.

Ron Smith

1988-89 A RECORD EXTRACTION YEAR FOR THE MARITIME SEED CENTRE

The Maritime Forest Seed Centre's seed plant was constructed with Federal Government funding in 1976. Currently the Federal/Provincial Forestry Development Agreement pays about two-thirds of the plants operating costs. The balance is paid by charging for cone storage and extraction.

Although the New Brunswick Department of Natural Resources is responsible for the plant and its operation, the facility was established to serve all three Maritime Provinces. It has operated with a mandate to provide uniform service to provincial government forestry authorities, industry and private companies. In addition cones are occasionally extracted for the Québec and Newfoundland forestry authorities and for organizations in the state of Maine.

Coniferous species in most areas of the Atlantic provinces produced bumper cone crops in 1988. The Maritime Forest Seed Centre will be extracting 3600 hectolitres (Table 1); compared to 1060, 760, 1160, and 2430 hectolitres collected in 1987, 1986, 1985, and 1984, respectively. This is the Seed Centre's biggest year to date.

The plant is expected to operate continually until the beginning of July. To date, 2000 hectolitres of cones have been

processed. Extraction of most black spruce collections and most of the seed lots needed for sowing in the spring has been completed.

Presently, the Maritime Forest Seed Centre is acquiring equipment and adapting procedures to bring its seed quality testing up to International Seed Testing Association standards. This move is primarily to provide better service to our customers and to standardize our test procedures as much as possible with other seed testing labs.

Dan McCurdy

1988: A BUMPER CONE CROP YEAR IN EASTERN CANADA

Newfoundland spruce cone crop

Early in the summer of 1988 an abundant cone crop was recognized on black and white spruce in Newfoundland. Province wide, 34 cone collecting proposals were drawn up and when the crops matured all available resources were employed to meet these proposals. About 12,000 bags - 240,000 kg of cones were collected. We are expecting to extract about 2500 kg of black spruce seed and 700 kg of white spruce seed.

We have doubled the extraction capacity of our seed extraction plant but even with the increased capacity we are probably looking at a couple of years work to handle the 1988 collections. Extraction of the white spruce was completed in mid-February and we have started on the black spruce. The black spruce cones are presently stored in a large hanger at Gander Airport. We will be shipping 1000 bags to the Maritime Seed Extraction Plant in Fredericton, N.B. to help ease the load on our plant.

Thom McDonough, Manager of the Wooddale Nursery attributes the good crop to 1987's dry season. The bumper crop couldn't have come at a better time for the Nursery. Seed stocks

Table 1. Volume of cones (hl)

Agency	bS	wS	rS	nS	JP	wP	sP	bF	tL	Other sp	Total
NB Dept. Nat. Res.	301.5	-	-	0.6	197.8	-	4.4	268.6	11.2	10.4	794.4
NS Dept. Lands & For.	208.4	257.4	19.4	10.6	-	-	-	250.1	-	-	745.8
NFLD Dept. Lands & For.	360.0	-	-	-	-	-	-	-	-	-	360.0
PEI Dept. Energy & For.	57.6	27.0	-	-	-	-	-	227.5	154.8	-	466.9
Scott Paper Co., Maine	56.4	129.6	-	256.0	-	-	-	18.0	11.0	0.3	471.3
Scott Worldwide Inc., N.S.	112.3	52.9	-	19.8	-	-	-	-	10.8	-	195.8
Stora Forest Ind., N.S.	141.5	21.6	-	-	-	-	-	-	-	-	163.1
Fraser Co. Ltd., N.B.	63.5	19.7	-	21.2	-	25.9	-	-	-	-	130.3
NB International Paper, Maine	8.5	-	-	-	-	-	-	-	-	-	8.5
Nova Tree Seed	45.7	3.6	4.3	-	-	-	-	-	0.9	1.3	55.8
Private Individuals	-	40.2	20.2	7.7	-	15.3	-	126.2	-	5.9	215.5
Total	1355.4	552.0	43.9	315.9	197.8	41.2	4.5	890.4	188.7	17.8	3607.4

were very low; only about one-half a year's supply was available. The Nursery would like to have a ten year supply of seed on hand. This is about 1500 kg. The 1988 cone collection will more than satisfy this requirement and some seed will be used for direct seeding projects.

Lorne Boyd

Nova Scotia collections

Table 2 summarizes Nova Scotia collections.

Peter Nelly

Table 2. Nova Scotia collections

	Bushels						
	wS	rS	bS	tL	nS	bF	eH
Government	1076	56	573*	27	126	652	0
Seed Orchards	12	2.5	-	-	-	-	-
Pulp & Paper Companies	167	0	652	30	55	50	0
Others (seed & nursery companies)	10	12	126	3	25	50	4

* Collected by contract in New Brunswick by N.B. Dept. of Natural Resources

Québec collections

L'année 1988 est en voie de devenir la meilleure des quatre (4) dernières années semencières (1985-88). Par contre, si on se compare à la période 1978-88, on ne peut que la qualifier de moyenne.

Les données partielles compilées en novembre 1988 font état d'une récolte de plus de 10 700 hl de cônes de résineux et de semences de feuillus. Ceci pourrait se traduire par un niveau de cueillette estimé à plus de 5000 kg de semences de résineux et environ 42 000 000 de semences de feuillus.

Les cueillettes furent dirigées sur l'ensemble du Québec, au sud du 52° de latitude nord. Elles ont été échelonnées de la fin août jusqu'en décembre de la même année, selon les essences considérées. Le degré de fructification variait alors de faible à très bon, selon les essences et les secteurs. Près d'une trentaine d'essences résineuses et feuillues ont été récoltées. Finalement, au-delà de 250 projets de récolte ont été réalisés; l'importance de ceux-ci varia considérablement, passent de quelques dizaines de litres de cônes ou de fruits, pour le plus petit, à plusieurs centaines d'hectolitres, pour le plus gros.

Globalement, les résineux ont fourni 96% de la récolte totale alors que les feuillus, pour leur part, ont représenté 4% des quantités récoltées. A elles seules, les épinettes ont fourni 86% du volume total. Ainsi, l'épinette noire vient en tête de liste avec 51% (5081 hl), suivie des épinettes blanche (19%), rouge (15%) et de Norvège (8%). Par ailleurs, les pins gris, rouge et blanc ne totalisent que 10% de la récolte totale alors que les mélèzes et autres résineux sont limités à moins de 1%.

D'autre part, les principales essences feuillues récoltées en 1988 sont représentées par les moyers cendré et noir, le chêne rouge, l'érable à sucre et le frêne blanc. Celles-ci totalisent 121 hl de semences (3,9% de la récolte totale).

Les cônes de résineux et les semences de feuillues sont expédiés au Centre de semences forestières de Berthierville, après la récolte. Dans la premier cas, les semences y sont extraites des cônes, puis traitées (nettoyage, désilage, etc.) avant d'être entreposées en chambre froide en attendant leur utilisation. Les semences ainsi obtenues doivent constituer une réserve pour quelques années. Pour plusieurs essences résineuses, cependant, la récolte de 1988 ne sera pas suffisante pour combler entièrement la banque de semences. Il faudra profiter des prochaines années semencières.

Dans le second cas, étant donné qu'en général les fruits de feuillus sont difficiles à conserver, il faut procéder rapidement à leur ensemencement en pépinière, l'année même de leur récolte.

Luc Masse

New Brunswick collections

New Brunswick had a bumper cone crop in 1988. The last time we can recall having such a widespread crop was in 1984.

The Department of Natural Resources (DNR) collected 104,421 liters of cones. Of these, 20,836 liters of black spruce cones were a special collection carried out for Nova Scotia Lands and Forest (NSLF).

It will be some time before all the seed lots are extracted so Table 3 has some estimated seed yields. The average cost figure reflects direct costs only. An extra 20% administrative/supervisory charge would better reflect the actual cost.

For more detailed information on seed orchard collections see the November 1988 Newsbulletin article by Kathleen Tosh.

Bob Bettie

Table 3. NBDNR cone collection summary

Sp	Volume (liters)	Ave. cost (\$/liter)	Seed yield (kg)	Seed yield (kg/hl)
bS ¹	1990	2.12	14.2	0.7
bS ²	28056	2.18	225.0	0.8
bS ³	25922	2.07	140.0	0.5
jP ¹	7200	3.75	79.0*	1.1*
jP ²	12575	1.96	64.0*	0.5*
bF	26856	0.87	496.0*	1.8*
tL	1120	1.14	11.6*	1.0*
wC	257	1.70	6.0*	2.3*
sP	445	1.02	3.3*	0.7*

¹ Cones collected from seed orchards

² Cones collected from reserve tested stands

³ Collections without a ¹ or ² were from natural stands/plantations

* Estimate only

Ontario collections

In Ontario the 1988 cone crop does not appear to be as abundant as the situation in the eastern provinces. To date the Ontario Tree Seed Plant at Angus has received approximately 5,635 hl. The Dryden Plant has received an addition 7000 hl of jack pine.

The Angus breakdown is as follows:

Jack pine	2800
Red pine	83
White pine	192
Black spruce	1962
White spruce	87
Norway spruce	262
White cedar	169
Others	80
Total	5635

The new modernization of the Angus plant is well underway and we hope to be operational by mid March 1989. The reasons for modernizing the plant are primarily for the health and safety of the staff employed at the facility. It was discovered that employees were exposed to high levels of dust which resulted from airborne cone resins escaping into the workplace environment during the processing.

The modernization will feature an enclosed processing system similar to the set up at Berthierville, Québec. The equipment will eliminate exposure to dust thereby eradicating the workplace environmental concerns. At the same time the new facility has created an improved system for shipping and receiving cones from the various districts.

Brian Swail

CONE CROP PRODUCED BY A WHITE SPRUCE SEED ORCHARD

A demonstration grafted white spruce seed orchard located at Petawawa National Forestry Institute is now producing large quantities of cones. The orchard was planted in 1974 with up to 5 ramets from each of 100 superior Southern Ontario clones and currently contains 422 trees.

The first cones were produced in 1985 by 148 trees but only a small number of trees had more than a few cones. In 1986 24 trees produced a few cones - most of these trees also had cones in 1985. Almost no cones were produced in 1987. In 1988 however, production substantially improved over previous years. The orchard crop was ranked as follows:

- no cones	21% of trees
- few than 25 cones	26% of trees
- 25 to 100 cones	25% of trees
- 100 to 300 cones	16% of trees
- 300+ cones	12% of trees

The cones were collected from 22 randomly selected trees in the 300+ cone class. They yielded about 180 litres of cones. Production ranged 2 and 17 litres and between 310 and 3220 cones per tree. Overall production on the sample of trees averaged 8.2 litres and 1400 cones per tree. Cone size was quite variable. It ranged from 117 to 261 and averaged 165 cones per litre. There was no correlation between crop size (cones per tree) and cone size (cone per litre).

The seed yield from about one third of the trees in the 300+ cone class were severely affected by cone insect damage and would have benefited from insect control treatments had they been applied.

Undoubtedly, the number of productive trees and the level of production will increase as the orchard becomes older and the trees larger in size.

Moe Anderson and Hugh Schooley

FOREST SEED CENTRES FIGHT DESERT FORMATION

Nine African countries: Burkina Faso, Cape Verde, Chad, Gambia, Guinea Biseau, Mali, Mauritania, Niger, and Senegal have banded together to counteract the problems of desertification. Reestablishing and maintaining the forests of these countries has for a long time been recognized as essential, but has proven difficult because of seed related problems. At a recent meeting the countries discussed seed problems in detail and decided to establish a Region Seed Centre in Burkina Fasco to coordinate research and other work on the subjects of Information training, Exploration, Seed Physiology and Genetic Improvement that will be conducted at National Seed Centres in each country. In addition, the Forest Seed Centre in Burkina Fasco which has a good laboratory facility and trained personnel has been requested to carry out research on problems in genetic improvement, handling, physiology, technology, storage, and phytopathology of forest seeds on behalf of the Regional Seed Centre. Cooperation of a

grandiose nature such as this may at last show significant progress in combatting desertification.

(Extracted from IUFRO News No. 60 [3/1988]).

CONE AND SEED PEST UPDATE

Work by Peter de Groot (Forest Pest Management Inst., Sault Ste. Marie)

This summer I will complete the taxonomic study of the cone beetles in eastern North America. Part of the work includes an investigation of the pheromones which may have an important role in pest management for these beetles. Cone beetles are one of the most serious pests of white and red pine seeds.

Collaborative work with PNFI on the cone and seed insects of jack pine is expected to continue this summer. Current investigations include an examination of genotype differences in susceptibility to cone and seed insects.

Future work will focus on the control of cone and seed insects of pine. Most work is expected to concentrate on white and jack pine. If any reader of the Newsbulletin has a problem or concern with cone and seed insects of pine, now or in the future, please contact me.

Work by Gordon Miller (Pacific Forestry Centre, Victoria)

Due to current circumstances (lack of a study leader and the planned retirement of Dough Ruth in mid 1989), on-going research on cone and seed insects at the Pacific Forestry Centre has been limited. Data collection in the evaluation of cone slicing as a method for indexing seed crops and insect damage in most commercial conifers in B.C. is nearly complete. Analysis and manuscript preparation are expected to be completed in 1989. Identification of the pheromone of Douglas-fir cone gall midge continues.

Dr. Jon Sweeney, a Post-Doctoral Fellow, is working on damage prediction systems for spruce seed moth and spruce cone maggot. He is also determining the attractiveness of colour traps to Douglas-fir cone gall midge and seed chalcid and spruce cone maggot.

Work by Rick West (Newfoundland Forestry Centre, St. John's)

Stem implants:

In a previous study, stem implants of orthene (Acecaps) at the time of bud flush were effective against the spruce cone maggot, *Lasiomma anthracinum* (Czerny), and reduced attacks by various lepidopterous species in black spruce trees. Further research is now underway to determine the efficacy of acecaps implanted in the fall and early in the spring. If earlier implanting is successful then work crews would have considerable latitude for treating trees and could do so when weather and road conditions permit. Second-year effects of the implants will also be examined.

Red squirrels:

Squirrels will be live-trapped and removed from a black spruce study area in an attempt to reduce cone predations. The area used will be the same as for the acecap study.

Effects of cone insects on seed yields:

In association with the acecap study, black spruce cones will be processed individually to determine the effect of various cone insects and permutations of cone insects on seed extractability and viability.

Call for information:

Information is requested from any reader on possible or currently employed strategies for controlling the red squirrel in seed orchards, seed protection areas and natural stands. Categories of control for which we need information include early cone harvesting, repellents, physical barriers such as metal banding, live-trapping and removal, shooting and poisoning. We would also appreciate receiving information on any other method - even if you know of any orchard that uses mean cats and dogs, tell us! Please contact Rick West, Forestry Canada, Newfoundland Forestry Centre, Box 6928, St. John's, Nfld. A1C 5X8.

Rick West

NEWFOUNDLAND HELPS BRITISH FORESTRY COMMISSION

In recent years, a significant quantity of improved tree seed has been obtained from the British Forestry Commission for use in the Newfoundland Forest Nursery and Forestry staff have traveled to Britain for training. Now Newfoundland has been able to do the Commission a favour. A disastrous wind storm in October of 1986 destroyed large areas of Forestry Commission Woodlands, particularly in the world famous Bedgebury Forest Pinetum. Newfoundland has provided black and white spruce seed to replant a large section of the destroyed forest.

(From Forestinfo, Nfld. Dept. For. Vol 1(1))

IUFRO CONE AND SEED INSECTS MEETING A SUCCESS

The third conference of the IUFRO Working Party S2.07-01 Cone and Seed Insects took place June 26-30 1988 at the Courtyard Inn in Victoria, B.C. The conference was co-sponsored by the Forestry Canada and the B.C. Forest Service. Twenty-three attendees from five countries, including Finland, France, Switzerland, the United States, and Canada, registered for the meeting.

The program included the presentation of 23 technical papers in four sessions: Identification and Distribution (Moderator: Alain Roques, France; seven papers), Biology (Moderator: Jean Tugeon, Canada; seven papers), Monitoring and Damage (Moderator: Harry Yates III, U.S.A.; five papers) and Control (Moderator: Willard Fogal, Canada; four papers). Three additional papers, though not presented at the conference because the authors were not able to attend, will also be included in the proceedings. The proceedings will be published in early 1989. The program also included a day-long field trip to several seed or-

chards on southern Vancouver Island, during which general orchard management practices as well as entomological problems were discussed. On the last day of the conference an open discussion of current research activities of the attendees was held along with the Working Party business meeting.

Proceeding of the conference will be mailed to all Working Party members. Others interested in receiving a copy should send a request to:

Gordon Miller

CTIA 1989 WORKSHOPS

Tree seed working group

It is four years since the Tree Seed Working Group held a Workshop. Because the Working Group was formed as a result of workshops on seed-related matters, and because at its inception it received a mandate to conduct workshops, it is important that we again address some of our objectives through a workshop setting. To this end, the 1989 Workshop of our Working Group will be held on Monday 14 August in Edmonton, immediately before the associated 22nd Biennial Meeting of the parent organization, the CTIA/ACAA.

The Workshop will be in two parts. The Morning Session with Jim Coles (Ontario Tree Improvement Council) as Moderator, will deal with **Cone and Seed Crop Monitoring**. Presentations are planned on (1) what there is to monitor - from bud stage to mature cones, (2) monitoring of pollen, (3) inventory-monitoring systems, and (4) monitoring and seed-crop quality. It is expected that useful, practical discussion will follow.

The Afternoon Session, with Steve Ross (BC Ministry of Forests and Lands) as Moderator, will deal with **Cone Induction: Responses to Practice**. Brief presentations are planned on what is being done and what responses are being achieved. These will be from persons knowledgeable of what is happening in the different regions of the country. It is hoped that others who have results, positive or negative, or views to share, will add information. Following the presentations and discussion, Steve will summarize and develop the general themes of (1) an overall strategy for cone induction, and (2) research needs in cone induction.

Plan now to attend this Workshop and stay for the CTIA/ACAA meeting. Watch for the general mailing concerning the meeting and respond accordingly.

Wood quality working group

Organizers of the 1989 CTIA meeting in Edmonton (August 15-18) have made available (Monday August 14), for optional working party workshops. The executive of the CTIA Wood Quality Working Group will organize, based on interest and participation, one half-day Workshop similar to that held in Québec City in 1985.

If you are interested in attending or presenting a paper at this Workshop, please contact A. Yanchuk, B.C. Ministry of Forests, Research Branch, 31 Bastion Square, Victoria, B.C. V8W 3E7, Tel. (604) 387-3338.

UPCOMING MEETINGS

Canadian Tree Improvement Association

The 22nd 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 Wood Quality Working Group (note separate announcements) workshops.
- 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:

Dr. J.I. Klein
Chairman, CTIA/ACAA
Northern Forestry Centre
5320-122 Street
Edmonton, Alberta
CANADA T6H 3S5

SEED PROBLEMS SYMPOSIA

The next International Union of the Forest Research Organization, 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 and Other Tropical and Subtropical Species." 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 AUS \$150 dollar non-refundable registration fee.

F.T. Bonner (Chairman)
Forest Exper. Station
P.O. Box 906
Starkville, MS 39759
U.S.A.

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:

R.J. West, Forestry Canada
Newfoundland Forestry Centre
P.O. Box 6028
St. John's, Newfoundland A1C 5X8

IUFRO INTERNATIONAL SYMPOSIUM ON FOREST GENETICS, BREEDING, AND PHYSIOLOGY

USSR, Voronezh September 24-30, 1989

The Symposium is planned to sum up the results of studies on problems of forest genetics, breeding and physiology, to define perspective trends of investigations in this field and to hold a Working Party meeting on *Pinus sylvestris* breeding (S2.03-05). Participants will arrive in Moscow on September 23-24, depart from Moscow to Voronezh by train in the evening on September 24, arrival at Voronezh and register in the morning on September 25. Plenary and Working Party sessions will be on September 25-27, and Voronezh region - study tours - on September 28-30.

The programme will cover different aspects of geographical variability, populational genetics, gene pool preservation and rational utilization, breeding strategy, biology of flowering, fructification and vegetative propagation and establishment of seed orchards. Preference will be given to invited and position papers, concerning the results of International programmes.

A circular with the Symposium and study tour programmes and the requirements for registration fees' will be sent by June 1, 1989 to people expressing an interest in attending. Contact T-SNIIIGIS, IUFRO International Symposium-89, 105 Lomonosov str., Voronezh, 394043, USSR and/or State Committee of the

USSR for Forest, 69 Novocheremushkinskaya str., Moscow, USSR. Telex 411667 SU "Kedr".

BOOK REVIEW

Collecting, Processing, and Germination Seeds of Wildland Plants by James A. Young and Cheryl G. Young. 1986. Timber Press, Portland, OR 236 pp.

This is a comprehensive guide to growing seed of predominately native Western North American plant but include plants from other parts of North America and other temperate areas.

There are chapters on What is a Seed?, Seed Collection, Post-Harvest Handling of Seeds, Seed Cleaning and Separators, Seed Storage, Seed Technology Germination of Seeds of Trees, Germination of Seeds of Shrubs, Germination of Herbaceous Species, and Germination of Seeds of the Grass Family. These last four chapters occupy a large part of the book and treat specific genera and/or species and their particular needs.

The book contains a good compilation of references sites for further information on specific related subjects. It will be a useful reference book for anyone who may be trying to grow a specific plant or group of plants from seed and needs to know the treatments for successful collecting, storage, or especially, germination of the seed.

Gerald B. Straley
University of British Columbia Botanical Garden
Vancouver

SEED-RELATED INFORMATION IN UNIVERSITY OF BRITISH COLUMBIA GRADUATE AND UNDERGRADUATE THESES

Newsbulletins #8 and #10 provided lists of theses of interest that were produced by students at the University of New Brunswick and Lakehead University. The following is a list of work produced at the University of British Columbia. Arrangements for borrowing copies can be made through inter-library loans or by contacting the universities.

Baender, H.E. Effects of time of cone collection on viability of Douglas-fir seed. BSc 1969.

Bickerton, D.E.L. Direct seeding as an alternative to planting. BSc 1986.

Bientjes, W. Coniferous tree seed germination with particular reference to the effects of temperature, seed moisture, and stratification on germination behaviour of western hemlock seed. M.F. 1954.

Bradford, P.A. Direct seeding: history, methods, and use. BSc 1987.

Caldow, T. Effect of method of seed extraction and seed cleaning in lodgepole pine germination. BSc 1979.

- Carr, W.W. Hydroseeding of forest road slopes for erosion control and resource protection. M.Sc. 1977.
- Chernoff, J.F. Scarification and forage crop seeding as an attempt to improve seedbed conditions in the interior Douglas-fir zone of the Cariboo Forest District. BSc 1976.
- Cockerill, J. Some seed-borne fungi of Douglas-fir and their effect on germinating seed. M.F. 1959.
- Ebata, T. Rearing studies of the Douglas-fir cone moth. *Barbara colfaxiana* (Kearfott) (Lepidoptera: Tortricidae). M.Sc. 1986.
- Gowan, K.J.C. Some observations on the effect of gamma irradiation of germination of Douglas-fir and sitka spruce seed. BSc 1971.
- Hawkins, B.J. 1983. Direct seeding: the effects of plastic and shade shelters on the germination and survival of black spruce. BSc 1983.
- Jones, S.R. A new method of direct seeding. BSc 1987.
- Kozak, A. Analysis of some factors associated with distribution and intensity of attack by cone and seed insects in Douglas-fir. Ph.D. 1963.
- Lacelle, L.E.H. A comparison of three methods of testing Douglas-fir seeds for viability. BSc 1969.
- MacAuley, J.D. Mechanical seed extraction of lodgepole pine. Ph.D. 1975.
- McGee, A.B. Seed bank, seed rain, and forest succession following clearcutting. Ph.D. 1988.
- McKedry, C. A floatation separation technique to improve the quality of lodgepole pine seeds. BSc 1984.
- Moller, K.M. The effect of seed treatment on seeds eaten by *Peromyscus maniculatus* (Wagner) BSc 1969.
- Norris, D.J. The effect of juglone on germination growth and survival of Douglas-fir, red alder, and vine maple. BSc 1968.
- Orr-Ewing, A.L. An investigation in to the effects of self-pollination on *Pseudotsuga menziesii* (Mirb.) Franco. Ph.D. 1956.
- Pond, S.L. Determination of optimum germination temperatures for six provenances of lodgepole pine using a two-way thermus-gradient plate. BSc 1981.
- Richkum, G.A. Cone and seed characteristics of fertilized lodgepole pine. BSc 1986.
- Schroeder, R. Variation in seed production and seed viability from provenances of Douglas-fir at the UBC Research Forest. BSc 1986.
- Wang, B.S.P. The effects of stratification and incubation temperature on the germination of grand fir (*Abies grandis* (Dougl.) Lindl) seed. M.F. 1960.
- Yao, S.C. Geographic variation in seed weight, some cone scale measurements and seed germination of Douglas-fir *Pseudotsuga menziesii* (Mirb.) Franco. M.F. 1971.

RECENT PUBLICATIONS

- 1987, Many Authors contributing to: - 1985. International Symposium on Flowering, Kornik, Poland. Special issue of Forest Ecology and Management, Vol. 19 (1-4).
- Bonnet-Masimbert, M. 1987. Flowering induction on young Douglas-fir (*Pseudotsuga menziesii*) and Norway spruce (*Picea abies*) with gibberellins 4 and 7. *Annales De L'Anpp (FRA)* 1(3):135-147.
- Bonnet-Masimbert, M.; Laerr, J.B. 1987. Hormonal control of tree growth. 2 The role of plant growth regulators to stimulate flowering. *Plant Growth Regulation (NLD)* 6:13-35.
- Bramlett, D.L. 1987. Protection of pine seed orchards in the Southeastern United States. *Forest Ecology and Management* 19:199-208.
- Dombrowski, S.A. 1988. Inventory monitoring for estimating impact of insects on seed production in a Douglas-fir seed orchard in western Oregon. *Jour. Economic Entomology* 81(1):281-285.
- Frank, C.J.; Jenkins, M.J. 1987. Impact of the western spruce budworm (Lepidoptera: Tortricidae) on buds, developing cones, and seeds of Douglas-fir in West Central Idaho. *Environmental Entomology* 16(1):304-308.
- Prévost, Y.H.; Laing, J.E.; Haavissto, V.H. 1988. Seasonal damage by insects and squirrels to female reproductive structures of black spruce, *Picea mariana* (Mill.) B.S.P. *Can. Ent.* 120:1113-1121.

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