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

Tree Seed Working Group

Newsbulletin 18

No. 18 November 1992

A WORD FROM THE CHAIRMAN

The meetings planned on "Forest Tree Seed Regulations" (see Newsbulletins 16 and 17) never materialized, so there are no new developments to report.

Dave Bewick (Coordinator of TSPTWP) and I have arranged for speakers for the upcoming Workshop on Seed Testing, August 16, preceding the CTIA/ACAA meeting. It was not an easy task to find speakers but we will have an interesting program. Meetings of the "Tree Seed Working Group" and the "Tree Seed Processing and Testing Working Party" are planned for the same day.

Please provide me and readers of the News Bulletin with your insight as to the status of seed requirements in Canada and needs in seed research. Over the last few years, I've noticed some major reductions in seed requirements for reforestation programs in some regions of Canada. Are these cuts a reaction to present economic uncertainty or a change in the procedures adopted to guarantee future wood supply? In 1978, the Workshop on "Tree Seed Production and Tree Improvement in Canada. R. & D. Needs 1977-87 (For. Can., Inf. Rep. PS-X-74) provided good information on where we were headed in terms of seed requirements, and related activities such as tree improvement, and seed research. Large reforestation programs were then fully operational or planned for most provinces to meet future wood supply needs. Reforestation statistics (see Kuhnke, D.H., Inf. Rep. NOR-X-301) indicate increasing needs for seed until the mid-eighties for all provinces. More recent reports (Lanteigne, Burns, and Hallett, 1989-91: For. Can. — Maritimes Tech. Notes No. 265-267) indicate a possible "plateau" being reached in seed requirements for the Maritimes. What about other provinces? Are these signs of stabilization in seed requirements, or are we facing decreasing needs for seed? Artificial reforestation is just one way managers will meet future needs in wood supply. They are also intensifying silvicultural treatments such as thinning, cleaning, and selective cuts instead of artificial reforestation. Do you think that these changes will have repercussions on overall seed requirements?

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

There seems to be a great interest towards biodiversity in the scientific community. Are we considering biodiversity in our reforestation programs? Have we limited our reforestation programs to a few species? Which provinces have expanded their scope to include more species in their tree improvement programs? Are you really concerned by biodiversity?

What about seed research? What do we know about hardwood seed? Come to think of it, we don't know much

about softwood seed either. Are we doing enough in Canada? Where are the centres of excellence on seed research? Where are the scientists working on seed problems; what universities and Federal or Provincial government labs are involved? What are the needs in seed research in Canada?

For many of the questions raised, little information seems to be available. Most often, this information exists but is not being communicated to others. I have my own answers to some of these questions, but I want to hear yours. If I'm in the dark, I can't but imagine how some of you feel. We need to share information so that we can formulate opinions on the subject of seed requirements and seed research needs in light of today's changing times. The NewsBulletin is a great way to begin this exchange of ideas and information! I am anxious to read all your comments!

Guy E. Caron

EDITOR'S NOTES

Our Tree Seed Working Group presently consists of 213 individuals; an additional 30 research or educational institution libraries also receive our News Bulletin.

The 'Membership Questionnaire' sent out with the last issue of the News Bulletin sparked a little additional interest in our Group. Ten individuals secured copies of the questionnaire from somewhere — filled them out and sent them in with a request to join our Group. We also lost two members; one retired, the other is now working in a non-forestry job.

Of our membership of 213, 124 or 58% completed the questionnaire. To this was added information on an additional 32 members that was extracted from the original 1985 survey. Some of this original information is certain to be out of date but it is the best available.

Many thanks to all of you who participated in the membership survey. I hope everyone makes good use of our new 'Membership Directory'.

Hugh Schooley

COMMENTS AND SUGGESTIONS

Item IV of the recently circulated 'Tree Seed Working Group Questionnaire' provided space for 'COMMENTS AND SUGGESTIONS'. You, the membership, made use of this space by writing:

- I continue to find this a most interesting and worthwhile publication. I read it cover to cover, and plan to submit an article for the November issue (editor's note — and he did).
- We would like information on liquid separation and IDS sorting of seed. White spruce is a particular problem. We can't acheive high enough germination capacity for single sowing with our precision sowing equipment for container stock production. (in Manitoba).
- Southern Ontario nurseries have entered the precision seeding era for bareroot production. We have considerable interest in all aspects of seed improvement and seeding technology.
- Don't have much time to devote to research (applied or otherwise) — tech-transfer takes all my time.
- In the News Bulletin, it would be helpful if the address and phone number of contributors were included after their names.
- Seed only serves as the source for the material (trees) that I do studies on.
- We are not in the business of tree improvement: we believe that not enough understanding of natural diversity exists. We work only with wild gene pools, and avoid any non-natural hybridization.
- What is the possibility of having E-mail linkage for seed topics?
- We have considerable interest in all aspects of seed imporvement and seeding technology.
- Remove ---- from your mailing list. He has retired.
- I remain interested in tree seed pathology research and look forward to an opportunity to do more of this type of work.
- Please say Hi! to Ben — all the best.
- Great idea to update information on membership!
- I'm now responsible for the Provincial tree improvement program for deciduous species.
- I'm no longer employed in the field of forestry.
- I wonder if we could have some kind of special feature on a selected subject area presented in each issue of the News Bulletin. (Not the whole issue devoted to the selected topic).
- I recently had an article on ---- accepted. It should be out soon — I'll send you a copy.
- I find the Newsbulletin very helpful and informative and I appreciate receiving it.
- Remember me? I work for --- who is involved in many aspects of seed/cone research.
- I have indicated areas of concern at work; however, at this point, I am not intimate with every topic.
- At present our organization is in its infancy ----. Any information you could provide would be helpful.
- I am interested in sponsering, developing, or assisting any research interests in seed at our jack pine/black spruce seed orchard.
- I am very grateful to you for publishing ---- in News Bulletin No. 17. It is very kind of you and I appreciate your help and cooperation very much.

STATUS OF QUÉBEC'S SEED ORCHARD PROGRAM

Yves Lamontagne's report on "First generation seed orchards and progeny tests established in Québec for coniferous species" is now avaliable (Québec Ministère des Forêts, Memoire de recherche forestière, No. 106).

This report provides detailed information on the first generation seed orchards and the progeny tests established up to now in Québec. Since the beginning of the program, 83 seed orchards, covering a total area of 1 083,9 ha were established with 12 coniferous species. The expected production is 236 million seedlings per year. To test the selections included in the seedling seed orchards, 75 progeny tests with 6 coniferous species were established. Some orchards have already been rogued and produce cones. The others will be rogued during the coming years. It is expected that by the year 2000, all seedlings needed for the provincial reforestation program will come from genetically improved seeds.

REGENERATING ONTARIO'S FORESTS - A COMPENDIUM

Ontario Ministry of Natural Resources has made detailed plans to produce a book entitled "Regenerating Ontario's Forests" that will serve as a state-of-the-art compendium on the principles, practice, and importance of forest regeneration in Ontario. The book will be a practical guide consisting of eight Sections: 1) History and social importance, 2) Scientific principles, 3) Preparing the site, 4) Seedling production and establishment, 5) Seed-based regeneration, 6) Stand tending and protection, 7) Relation to other forest resources, and 8) Program monitoring and management. Three to five chapters will cover the principal topics in each section.

The target audiences for the book are forest managers, technicians, researchers, students, and other natural resource professionals. In addition, policy makers and interested members of the general public will find the book a useful reference on the subject. The goal is to produce a frequently-used guide to forest regeneration in Ontario.

The book is being written because Ontario based researchers have dedicated substantial effort over the past 30 years to improve forest regeneration in Ontario. Significant gains have been made in the science and technology of reforestation during this period, but there has been no effort to compile and synthesize this knowledge into a single reference. A practical guide on all matters related to forest regeneration is clearly needed to transfer much of this knowledge to those that need it.

Chapters of the proposed text of particular interest to our Working Group include:

Chapter 7: Genetic Resource Management: author: Dennis Joyce, Ontario Forest Research Institute. The text will describe the effects of forestry practices, past and present, on the genetic base of crop tree and other plant species: reviews tree improvement practices in Ontario with respect to the production of genetically improved propagules for use in forest regeneration; and provides numerical information on seed orchard number, their distribution and amount of seed produced. Future trends for tree improvement and likely rates of progress will be reviewed.

Chapter 14: Seed: author: Tom Noland, Ontario Forest Research Institute. The text will describe procurement, processing, storage, handling, and stratification practices used on forest tree seed. Details of the equipment and techniques used, and on how current practices affect seed viability, will be presented.

Chapter 19: Direct Seeding: author: Rob Fleming, Forestry Canada/Ontario Region. The text will review the equipment and procedures employed for direct seeding including aerial and land-based seed distribution methods. Historical use and success of direct seeding will be discussed. Techniques that increase success for major tree species will be emphasized.

Chapter 24: Insect Pests: author: Sandy Smith, University of Toronto. The text will describe the major insect pests that limit regeneration success. Integrated pest management techniques to reduce or eliminate insect problems will be emphasized. The use of insecticides and other alternatives will be discussed. Methods to prevent insect problems and reducing insecticide use will be examined.

SEED DEPLOYMENT STRATEGIES

(Editors Note: A lunch-time discusion, tossing around the question: — 'Who should determine where the seed, *people like us produce*, is planted?' reminded me of the following article. It's worth reading)

Tree breeders strive to exploit genetic variation to increase commercial production. The fruits of their labor — populations of open-pollinated families, varieties, inbred lines, or clones — are unfortunately less diverse than the wild populations from which they are derived. Loss of genetic diversity in breeding populations is a concern of many tree breeders, pathologists, and entomologists. In their view, genetic diversity is the primary natural mechanism for protecting populations from catastrophic losses due to unexpected biotic and abiotic events.

Although few would argue the need for highly diverse breeding populations, considerable debate surrounds the amount of genetic diversity needed within and among commercial plantations. The debate centers on the idea that foresters, in deploying genetically improved planting stock, can choose among alternative strategies. Each strategy offers advantages and disadvantages.

Assessing risks, costs, and benefits is difficult, as is deciding on an optimum strategy that offers a proper balance. Despite difficulties, deployment decisions cannot be avoided, and it is clearly in the interests of forest managers to take an active part.

For example, it is common practice in many seed orchards to mix seed from different open-pollinated families into one bulk collection. In this mixture, each family is represented in proportion to that family's relative seed production in the orchard that year — not on the basis of fiber-yield capacity or any other trait of interest to the forest manager. Once the seed is mixed, the deployment 'strategy' is decided, and the entire forestry operation.

Suppose the seed were collected and maintained separately by family and sown separately in the nursery. Seed-collecting costs would probably be higher, but the forest manager could take an active part in developing and executing seed deployment. The strategy would be based not on matters of convenience or expediency but rather on careful consideration of the costs, risks, and benefits of alternatives.

What are the alternatives? Mixed stand strategies deploy mechanical mixtures of two or more genetic groups in the same stand. Pure-stand strategies deploy genetic groups separately by stand. Within each of these categories, many subdivisions are possible. To assess the relative risk of alternatives, managers must address the amount of genetic diversity to be deployed in time and space, and the effectiveness of that diversity in protecting stands from damaging events.

Clearly, genetic uniformity of any kind deployed rotation after rotation over wide areas should be avoided. For example, deployment of a single clone in large stands over wide areas would appear to offer an unacceptable risk. How does this strategy compare to an equal-part mixture of, say, ten clones deployed in the same way? Or to the same ten clones deployed in a mosaic of small pure stands?

A continuum of risk and benefit stretches from large, pure stands of clonal material, to mosaics of smaller pure stands, to intimate mixtures of heterozygous, unrelated individuals. By varying the timing and spatial patterns of genetic groups, almost any desired pattern of genetic diversity could be achieved.

Risks aside, pure-stand strategies appear to offer management advantages over mixed-stand strategies. Different management regimes — including different planting densities, fertilizer applications, and thinning schedules — can be tailored to match the requirements of each genetic group. If a particular genetic group exhibited high early mortality in a pure stand, the stand could be replanted, but in a mixed stand, partial replanting would not be practical. Similarly, salvage operations that might be easy in pure stands, could be much more difficult — if not impractical — in mixed stands.

Mechanized harvesting and processing would probably be more efficient and easier to implement in pure stands. Pure stands also allow greater possibilities for feedback on the performance of individual genetic groups under commercial production, since the forester could easily observe the performance of each genetic group deployed in the operation, unobscured by the presence of other groups in the same stand.

Overall, pure stands probably offer greater yield potential than do mixed stands. However, mixtures offer advantages over pure stands under certain conditions. They might also produce more stable yields if planted over diverse environments, where the component types are specifically adapted to a narrow range.

Deployment decisions cannot be reduced to blanket recommendations to plant either pure or mixed stands. In one forestry operation, a mixing strategy may be appropriate, whereas in another, a pure-stand strategy or some combination of the two might be preferable. Deployment decisions are critical management decisions, and forest managers should have a say.

Warren L. Nance, Principal Plant Geneticist,
USDA Forest Service,
Southern Forest Experiment Station,
Gulfport. MS.
Published: 1986. Journal Forestry 82(2):50-52.

OPTIMIZATION OF ENVIRONMENTAL REGIMES FOR FLOWERING IN AN INDOOR BREEDING HALL FOR BLACK SPRUCE, WHITE SPRUCE AND JACK PINE

The effects of temperature and shade in combination with GA4/7 application on flowering of black spruce, white spruce and jack pine were evaluated in the J.D. Irving Ltd. breeding hall at Sussex Tree Nursery in 1989 and 1990. The breeding hall is partitioned into two halves so that two different temperature regimes can be maintained. During the 1989 experiment, 50% shading was maintained for a portion of each half of the hall. Four ramets from twenty clones for each species were used; one ramet per combination of temperature regime, with or without shading in the 1989 experiment and two ramets per temperature regime in 1990 (shading not included in 1990). Eight applications of GA4/7 were made to all trees as a foliar spray to wet the foliage. It was applied at a rate of 500 mg/L of solution which also contained 5% ethanol and 0.2% (active ingredient) Aromox C-12/W. The first application was made shortly after budbreak and continued weekly.

Temperatures in both halves of the breeding hall were maintained at the same levels until shoot elongation was approximately 80% complete. Minimum temperatures were kept above +5C and vents opened at +15C. After

Figure 1: **Effects of Shade and Temperature on Female Flowering**

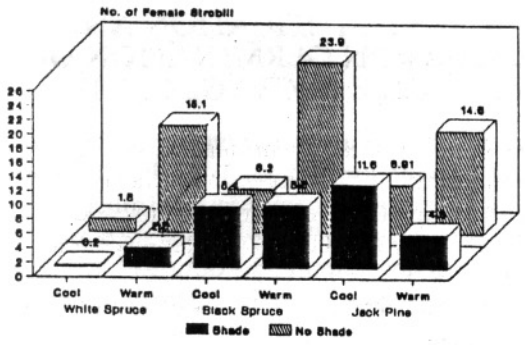


Figure 2: **Effects of Shade and Temperature on Male Flowering**

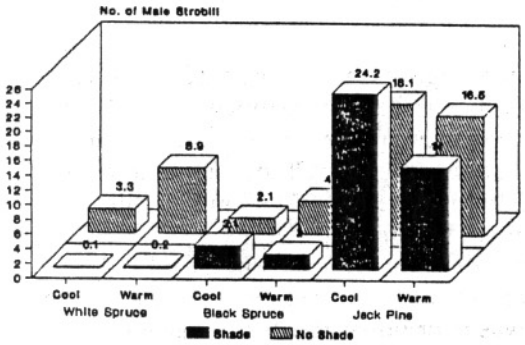


Figure 3: **Effects of Cool & Warm Temperatures in Late Stages of Shoot Elongation on Female Flowering in 1989 and 1990**

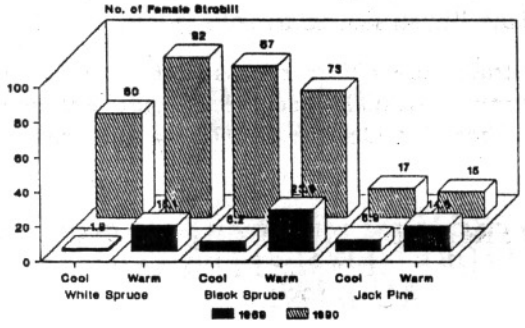
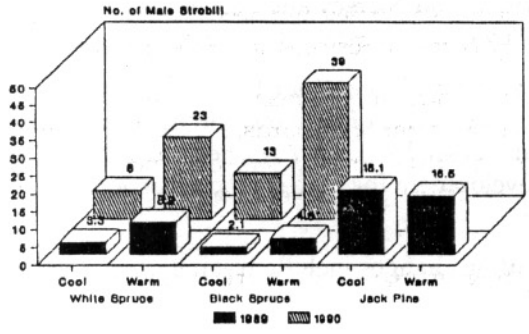


Figure 4: **Effects of Cool & Warm Temperatures in Late Stages of Shoot Elongation on Male Flowering in 1989 and 1990**



shoot elongation was 80% complete, the vents opened at +25C in the 'cool' treatment and +32C in the 'warm' treatment. In addition, night temperatures were maintained above +15C in the 'warm' treatment. Temperatures were maintained at these levels until the trees had completed growth and become dormant. For the shade treatment, a 50% shade curtain was drawn over that portion of the hall beginning early in the growing season.

Female and male flowering was evaluated in the spring of 1990 and 1991. Results of the 1989 trial including shade and temperature are shown in Figures 1 and 2 while results for the two temperature regimes for both years are shown in Figures 3 and 4. Elevated temperatures in later stages of shoot elongation significantly promoted female flowering in white and black spruce. Female flowering was consistently better in both years for white spruce. For black spruce, this was only demonstrated in the first year results. The hall temperature regime did not consistently affect male flowering at a statistically significant level; however in both years, for both species, average male flowering was greatest in the warmest half of the hall. In contrast with the spruces, jack pine flowering was not sensitive to the temperature regimes tested.

Shade was detrimental in both female and male flowering for white spruce and female flowering for black spruce at statistically significant levels. In jack pine, shade had a statistically significant effect for males only; however male flowering in the poorest treatment was still more than ample for tree breeding purposes.

Note: Summary prepared by Greg Adams, J.D. Irving Ltd. which was extracted from a paper by G. Adams and M.S. Greenwood, In Proc.: IUFRO meeting on Mass Production Technology for Genetically Improved Fast Growing Forest Tree Species, Bordeaux, France, Sept. 14-18, 1992.

PRE-SEEDED SHELTER CONE SEEDING

FERIC, in cooperation with Spencer-Lemaire Industries Ltd. of Edmonton, began developing and testing an improved seeding technique in 1992. The current absence of a tool which can place a precise number of undamaged seeds into a shelter cone in the field prompted the design of a system whereby seeds can be attached to the cones in more controlled conditions and subsequently be released by rainfall in the field. Thus, the field operations will be more efficient, and plantation success more assured. Total costs of using such a system are expected to be less than the existing systems.

Funding for this project has been solicited from Industry, Science and Technology Canada. Other partners assisting in evaluating the concept are Boise Cascade Canada Ltd., Canadian Pacific Forest Products Ltd., Forestry Canada, and the Ontario Ministry of Natural Resources.

Contact Steve Dominy, Eastern Division, FERIC, 143 Place Frontenac, Point-Claire Québec H9R 4Z7, Tel (514)694-1140.

SHALLOW SOIL REGENERATION

Kenora Ont.

Boise Cascade Canada Ltd. in Kenora, Ontario, initiated a comparative trial in 1992 on regenerating shallow soils. The trial will provide a side-by-side comparison of different types of planting stock and a shelter seeding system:

- mini-plugs versus Cerkon shelter;
- mini-plugs versus Jiffy pot seedlings;
- Jiffy pots versus Spencer-Lemaire plugs.

Sample plots will be established within the plantation to compare the seedlings performance over a three-year period. Planting operations are planned to start in early June.

For further information, please contact Les Gordon, Boise Cascade Canada Ltd., P.O. Box 5000, Kenora, Ont., Ph. (807)467-3068.

Red Rock, Ont.

Mini-plugs consist of a 'rubber soil' peat/polymer mix approximately 4 cm long and 1 cm in diameter. Originally designed for a mechanized transplanting system for lettuce production in California (Castle & Cook), mini-plugs have been converted to a tree seedling transplanting system. Seedlings are grown in the greenhouse for 10-12 weeks to a target height of 4 cm before being transplanted in the nursery field for bare-root production.

Domtar in Red Rock, Ont., saw mini-plugs as a potential regeneration option on shallow, coarse-textured ablation till deposits found on the Nipigon Lake Forest, and initiated an outplanting trial in 1988. To date, the outplanting trial has involved the planting of 134 300 mini-plugs over a four-year period. The outplanting trial has shown some encouraging results. In general, mini-plugs height growth and survival equal that of conventional container stock.

The mini-plug regeneration alternative on shallow soil provides considerable economic advantages over conventional planting stock, with approximate cost savings of $125/thousand (i.e. $250/ha) being realized in in stock production alone. Once the planting method becomes operational, additional savings in the planting and delivery costs are also anticipated.

In 1992, Domtar Inc. planted 100 000 mini-plugs. Three types of short-handled dibbles of 12-18" (conventional wooden handle, L-shaped handle, and rubberized vertical handle), developed in conjunction with a local machine shop (Woodlands Welding), were also tested.

For further information, please contact Rob Booth, Domtar Forest Products Inc., P.O. Box 480, Red Rock, Ont., P0T 2P0, Tel. (807)886-2211.

(Source of the above three items: Silviculture Operations Group, FERIC. Silvicultural Operations Newsletter Vol 5(1), Spring 1992.)

EFFECTS OF STRATIFICATION AND TEMPERATURE ON GERMINATION OF WHITE SPRUCE (*PICEA GLAUCA*)

Temperature is a critical factor influencing conifer seed viability and germination success. With the assistance of FRDA funding, a prototype computer-controlled temperature gradient systme (TGS) was designed and constructed for use in determining the optimal temperatures for seed germination. In the first application of the TGS, this paper reports on the effects of temperature and stratification on germination of white spruce (*Picea glauca*). These results are part of systematic surveys planned for all major B.C. conifers to investigate the effects of temperature and other factors on seed germination.

Seeds from a single high quality source of white spruce received 4 stratification treatments (0, 3, 6, and 12 weeks), then were incubated under 16°C, 24°C, and 32°C constant temperature regimes. Of the 3 temperatures tested, seeds germinated best at 24°C, and at this temperature, there were no differences between 0, 3, and 6 weeks' stratification. At the sub-optimal 16°C, 3 to 6 weeks' stratification was required for best performance. Germination was poor under the 32°C constant temperature regime for all stratification treatments. Although these test results give some indication of germination temperature requirements, recommendations regarding optimal temperatures for white spruce cannot be made until additional seed sources have been tested.

Abstract, Forest Nursery Association of British Columbia, Annual General Meeting, Penticton, September 28 to October 1, 1992. By C.L. Leadem

ARTICLES FROM BC MINISTRY OF FOREST SILVICULTURE NEWSLETTER VOL, 5(2), AUG. 1992.

Restructuring and Staff Changes

Effective April 1, 1992 the Nursery and Seed Sections of the BC Forests Silviculture Branch were reorganized to more effectively deliver services. Nursery and Seed Extension Services and Nursey and Seed Operations have been replaced by Nursery Services and Seed Services.

Seed Services, under Jinji Konishi, handles a) seed planning; b) management of orchards, orchard pests, and the Seed Centre; c) seed extension services; and d) equipment development for both seed production and nurseries.

Recent staffing changes include Brian Barber (Seed

Orchard Projects Officer), Berken Feddersen (Seed Planning Officer), Robb Bennett (Seed Orchard Pest Management Officer), and Dave Reid (Coastal Zone Seed Production Officer). Nils Sjoberg (Equipment Development Officer) retired this summer. At the Seed Centre Rob Bowden-Green has been seconded (for about 8 months effective 1 April 1992) to serve as chairman of the SPAR project (see below), Heather Rooke is serving as Acting Manager, and David Kolotelo is the new Cone and Seed Improvement Officer.

Seed Planning and Registry System (SPAR)

SPAR is a new system being introduced by the BC Ministry of Forests, Silviculture Branch to replace the ten-year-old Tree Seed Register (TSR — registry and inventory of tree seed) and Sowing Request (SR — orders for tree seedlings) systems.

Major changes in the new system consist of:
- on-line access for planning and submitting requests (seedlings or cone and seed services);
- inclusion of unregistered seed and cutting lots.

Benefits to SPAR users are:
- on-line access at district, region and branch levels;
- reduction in manual workload:
  — ability to search for suitable seedlots,
  — seed transfer guidelines application automation;
- ability to designate a portion of any seedlot as 'reserved' for the exclusive use of the owner;
- ability to enter requests for seedlings at any time during the year (and for future years), cuttings, and cone and seed services.

Under SPAR, inventory and ordering functions will be combined and expanded to an extent that was not possible with TSR and SR. Also SPAR will have the potential to link with other silvicultural information systems.

Phase I (cone collection planning and seed inventory) has been in operational use since early July. Phase II (sowing requests) became available in September.

Questions or comments on SPAR can be directed to **Rob Bowden-Green.**

Ladybird Beetles at CPFP Nootka Seed Orchard

Cathy Cook, Barb Newberry, and Debbie MacLeod released predaceous ladybird beetles (Coleoptera, Coccinellidae) of the species *Hippodamia convergens* (obtained from Westgro Sales) this year in trials against Green Spruce Aphid (GSA — *Elatobium abietinum*). A total of approximately 175,000 beetles were released over three dates (March 24, April 10, April 28) this spring. Roughly 1,500 to 2,000 beetles were placed in a small area cleared of duff at the base of each of a number of randomly selected spruce trees and sprayed with a 1:1 flat Coca Cola/water solution to discourage flight and stimulate egg production (recommendation of Jim Matteoni, Westgro Sales). Eggs, pupae, and empty pupal skins of ladybird beetles have subsequently been observed. Identification of new adults to confirm the establishment of the released species is pending. If *Hippodamia convergens* successfully establishes itself in the spruce orchard at Nootka the next step will be to see if it can exert some level of control over the GSA during the late winter when the latter is most active.

Michelle Schmidt and Robb Bennett

A New Wooly Aphid in the Okanagan

Adelges lariciatus, a wooly aphid new to the area, has turned up in western larch (*Larix occidentalis*) at the Kalamalka Seed Orchard. The larch there are just beginning to produce cone crops and the aphids are showing up in considerable numbers under the scales of many of the cones. As with many other species of adelgid aphids, this one has a two host life cycle with spruce (*Picea*) being the primary host (upon which galls are formed). The proximity of the larch orchards to the spruces at Kalamalka makes for an ideal situation for a population build-up of *A. lariciatus*.

A full life cycle takes two years and six generations to complete with one year on larch and one on spruce. There is variability and overlap of generations such that in natural populations all stages can be found at any one time. For those that might be interested the basic life cycle of *A. lariciatus* follows (condensed from "The life history and morphology of *Adelges lariciatus*" by M.E.P. Cumming in Canadian Entomologist, 1968, vol. 100(2), p 113-126):

1. *Fundatrices* (stem mothers) are wingless parthenogenetic females. They overwinter as nymphs on spruce, feeding in spring on the underside of twigs immediately below new buds. Their progeny are *gallicolae migrantes*.

2. *Gallicolae migrantes* develop in galls over the summer on spruce twigs. The galls are variable in form but usually sort of pineapple-like and not totally surrounding twigs or extending to tips (i.e. twigs can grow beyond galls). Adults are winged parthenogenetic females which fly to larch in late summer, settle on needles, and begin feeding and secreting a small amount of wax.

3. *Sistentes* are the progeny of the *g.m.*'s. They overwinter on larch as 1st instar nymphs usually on older bud scales. Sistentes develop into wingless parthenogenetic females the following spring and produce *progredientes* and *sexuparae*.

4. *Progredientes* remain on larch through the summer feeding on new cones if present or on leaf buds. Adults are wingless parthenogenetic females. Their progeny (*neosistentes*) remain feeding on cones. The fate of the *neosistentes* is uncertain.

5. *Sexuparae* also remain on larch but mature into winged parthenogenetic females while feeding on cones or buds. They fly to spruce in late summer and begin to produce *sexuales*.

6. *Sexuales* mature in the autumn into small wingless males and females (got to get some sex in there somewhere) which mate and produce the overwintering *fundatrices*.

Cones are being sampled at regular intervals to monitor the aphids and watch for signs of damage. Any seed damage will be assessed at cone harvest. At the time of this writing (mid-July), within the larch cones sistentes and their young offspring are present in variable numbers and are found mostly at the edges of the seeds. In severely infested cones the populations spill out onto the surface of the cones at the scale margins. No winged forms (sexuparae) have been noticed developing in the cones yet.

Thanks are extended to Bob Duncan at the Pacific Forestry Centre for identifying this insect.

Robb Bennett

ONTARIO SEED ORCHARD PEST SURVEY

A seed orchard survey was initiated in 1990 to gather baseline data on pest problems associated with seed orchards in northern Ontario and continued in 1991. The results of the 1991 field survey are listed below.

Insects: — The spruce budworm (*Choristoneura fumiferana*) was the most prevalent insect pest and was present in all the white and black spruce orchards. The proportion of trees infested varied from 1 to 100% and average defoliation ranged from <1 to 39%. The heaviest infestation was in a white spruce seed orchard.

The yellowheaded spruce sawfly (*Pikonema alaskensis*) was found in four black and two white spruce orchards. The incidence of attack ranged from 6 to 12% and defoliation of infested trees varied from 4 to 20%.

The white pine weevil (*Pissodes strobi*) was found in five black spruce, four jack pine, three white spruce and one white pine orchard. The incidence of leader attack ranged from 0.7 to 19.7%. Similar leader damage was caused by the eastern pine shoot border (*Eucosma gloriola*) which attacked jack pine. The incidence of leader attack was 1.3 to 14.0%.

Other insects which were encountered in the survey but did not cause appreciable damage were the spruce coneworm (*Dioryctria reniculelloides*), spruce shootworms (*Zeiraphera* spp.), sawyer beetles (*Monochamus* spp.), jack pine tip beetle (*Conophthorus banksianae*), pine needle scale (*Chionaspis pinifoliae*) and pine spittlebug (*Aphrophora cribrata*).

Diseases: — Few diseases were encountered in the 1991 survey. *Armillaria* root rot, the most serious disease found, was present in five black spruce and two jack pine orchards. Although the infection rate was in the 2% range, the disease is having a serious impact by annually killing this proportion of the crop trees.

The spruce needle rusts (*Chrysomyxa ledi* and *C. ledicola*) were found in three black and one white spruce orchard. This is a reduction in incidence from 1990. Foliar damage in the infected trees was in the 2% range.

White pine blister rust was found on 1.3% of the trees in a white pine orchard. A needle rust (*Coleosporium asterum* [Dietel] Sydow) was recorded on 12% of the trees in a jack pine orchard and a needle cast (*Davisomycella ampla* [J. Davis] Darker) was observed on 24% of the trees in another jack pine orchard. Diplodia tip blight (*Diplodia* sp.) occurred on 2% of the trees in one black spruce orchard while spruce broom rust (*Chrysomyxa arctostaphyli* Dietel) affected 2% of another.

Abiotic problems encountered during the survey included frost damage, which caused low levels of foliar damage in two black spruce orchards, and wind damage, which destroyed or severely injured 10% of the trees in a black spruce orchard.

(Information extracted from Forestry Canada, Forest Insect and Disease Survey Bulletin for Ontario Spring 1992.)

SEED ORGANIZATIONS

How many organizations are you aware of that have a sincere interest in seed yet do not operate within the confines of some level of government or are part of an industrial complex? I have been associated with two such organizations.

One is the Canadian Organic Growers Association who in 1984 initiated a 'Heritage Seed Program'. This program is dedicated to searching out and preserving heirloom and endangered varieties of food crops. Its members are backyard gardeners, farmers, horticulturalists and interested individuals. The heart of the Program is a network of growers who practice the proper techniques to keep the varieties pure, gather and store the seed and make it available to other members for free. You can learn more about this program by contacting: — Heritage Seed Program, RR#3, Uxbridge, Ontario, L0C 1K0.

The other organization is the Society of Ontario Nut Growers (SONG), formed in 1972. They encourage the exchange of nut and bean bearing, tree and shrub seed and nursery stock amongst their membership. The Eastern Chapter, with which I am most familiar, is assisting local conservation authorities in establishing nut groves and encouraging the use of nut and bean bearing species in fence rows and landscaping. You can learn more about this organization by contacting Eastern Chapter SONG, 980 Connaught Ave., Ottawa, Ontario, K2B 5M9.

I am interested in learning about similar organizations with a particular interest in seed. If you are

aware of one, please write me a note describing it.

Hugh Schooley
Forestry Canada
P.O. Box 2000, Chalk River, Ontario, K0J 1J0

HAVE YOU SEEN THE MARCH 1992 ISSUE OF CROSS TALK?

This issue (#2) of the Ontario Ministry of Natural Resources' 'communication link for tree breeders' has 5 articles of interest to 'seed people'. They are:

- Preliminary work on 'high density' seed orchard establishment and management at Kalamalka seed orchards; by Chris Walsh, Seed Orchard Manager, Kalamalka Seed Orchards, B.C.
- Supplemental mass pollination in a young black spruce seedling seed orchard; by Greg Adams, Tree Improvement Forester, J.D. Irving Ltd., Sussex Tree Nursery, N.B.
- Mulching trial — Raymore black spruce seedling seed orchard; by Chris Attack, Orchard Manager, Ontario Tree Improvement Council, South Porcupine, Ont.
- Seed orchard GIS project; by Kevin Casselman et al., Fast Growing Forests Group, Brockville, Ont.
- The art and science of breeding tamarack; by Kathleen Tosh, Tree Improvement Unit, Dept. Natural Resources and Energy, N.B.

If you are interested in receiving this (free) Newsletter you should contact the Editor, Cross Talk, Fast Growing Forests Group, Ontario Ministry of Natural Resources, P.O. Box 605, Brockville, Ontario, K6V 5Y8. Ph. (613)342-8524; Fax (613)342-7544. They will put you on the mailing list (and accept your article for the publication).

UPCOMING MEETINGS

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

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

Genetic Conservation and Production of Tropical Tree Seed.

International Symposium sponsered by the ASEAN-CANADA Forest Tree Seed Project, June 15-19, 1993 in Chiang Mai, Thailand. Deadline for papers and posters Dec. 31, 1992; full text of papers required by May 15, 1993. Themes include

- genetic diversity and conservation;
- flowering and pollination biology;
- causes and effects of genetic erosion;
- strategies for genetic conservation;
- impact of forest management and development policies on genetic conservation;
- alternative propagation techniques;
- management of seed production areas and seed orchards;
- socioeconomic significance of genetic conservation.

Contact: Symposium Secretariat, ASEAN-Canada Forest Tree Seed Centre, Muak-lek, Saraburi 18180, Thailand. Tel: (036)341-305, Fax: (036)341-859.

Twenty-second Southern Forest Tree Improvement Conference

Organized by the USDA Forest Service, The Intstitute of Paper Science and Technology, and the Georgia Forestry Commission. Will be held June 14-17, 1993, in the Holiday Inn Buckhead, Atlanta, Georgia.

Theme: Forest genetics in a changing world, with papers on the following topics: seed orchard management; biotechnology; hardwood tree improvement; vegetative propagation; pest management; and breeding, progeny testing, seed movement and biodiversity.

For information contact Mr. James L. McConnell, Chair, SFTIC Committee, 1720 Peachtree Road NW, Suite 816N, Atlanta, GA 30367.

Canadian Tree Improvement Association 1993 Meeting

The 24th meeting of the CTIA/ACAA will be held in Fredericton, New Brunswick, Canada August 17-19, 1993. The main theme of the symposium is "The Future Forests — Options and Economics". We are now in the process of putting together an exciting program for you. At the present time we have confirmation from several distinctive speakers (J.P. vanBuijtenen - Texas A & M University, H. Roulund - Denmark, R.J. Weir - N.C. University) who promise to make this a very stimulating meeting for everyone involved.

Some of the sessions featured are economic implications of advanced generation breeding, new seed orchard technology for greater gain and potential applications of biotechnology.

In addition to the main symposium, several workshops are planned, including "Advanced Generation Breeding", "Forest Genetics and Climate Change" and "Seed Testing and Processing". Tours of Tree Improvement facilities and seed orchards in New Brunswick are also being finalized. There will be a session for contributed papers, as well as posters.

Please inform your colleagues about our meeting. More information will soon appear in various Forestry

Journals. Registration forms and a call for papers/posters will be mailed to our members. Other interested persons can obtain registration forms by sending a request to: Kathy Tosh, Chair CTIA, Dept. Natural Resources and Energy, Provincial Forest Nursery, RR #6, Fredericton, NB Canada E3B 4X7, Tel(506-453-9101) Fax (506-453-1741).

RECENT PUBLICATIONS

El-Kassaby, Y.A.; Edwards, D.G.W.; Taylor, D.W. 1992. Genetic control of germination parameters in Douglas-fir and its importance for domestication. Silvae Genet. 41:48-54.

Gordon, A.G.; Gosling, P.; Wang, B.S.P. eds. 1991. Tree and shrub seed handbook. International Seed Testing Association, Zurich, Switzerland.

Harrison, D.L.S.; Owens, J.N. 1992. Gibberellin A 4/7 enhanced cone production in *Tsuga heterophylla*: the influence of gibberellin A 4/7 on seed and pollen cone production. International J. Plant Sci. 153(2):171-177.

Niembro-Rocas, A. 1992. Formato descriptivo para la caracterizacion morfologica de semillas de leguminosas de importancia agroforestal (A descriptive format for morphological seed characteristics of legumes). Semina 2(1):1-23.

Niembro-Rocas, A. 1992. Metodos para determinar la viabilidad y el vigor de las semillas forestales (Methods for determining viability and vigour of forest seeds). Semina 3(1):1-16.

Niembro-Rocas, A.; Medina, M.T.Y. 1992. Morfologia de les semillas de *Inga jinicuil* Schlecht (Internal and external morphological features of *Inga jinicuil* seeds). Semina 1(1):1-4.

We thank Petawawa National Forestry Institute for their assistance in the preparation of this issue of the Newsbulletin.