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PACIFIC FOREST RESEARCH CENTRE

VICTORIA, B.C.

INFORMATION Forestry

Hon. Jeanne Sauve, Minister

Environment Canada / Environnement Canada

Forestry Service / Service des Forêts

CONTAINERS

The following material has been extracted from papers presented at the August meeting of the North American Containerized Forest Seedling Symposium in Denver, Colorado.

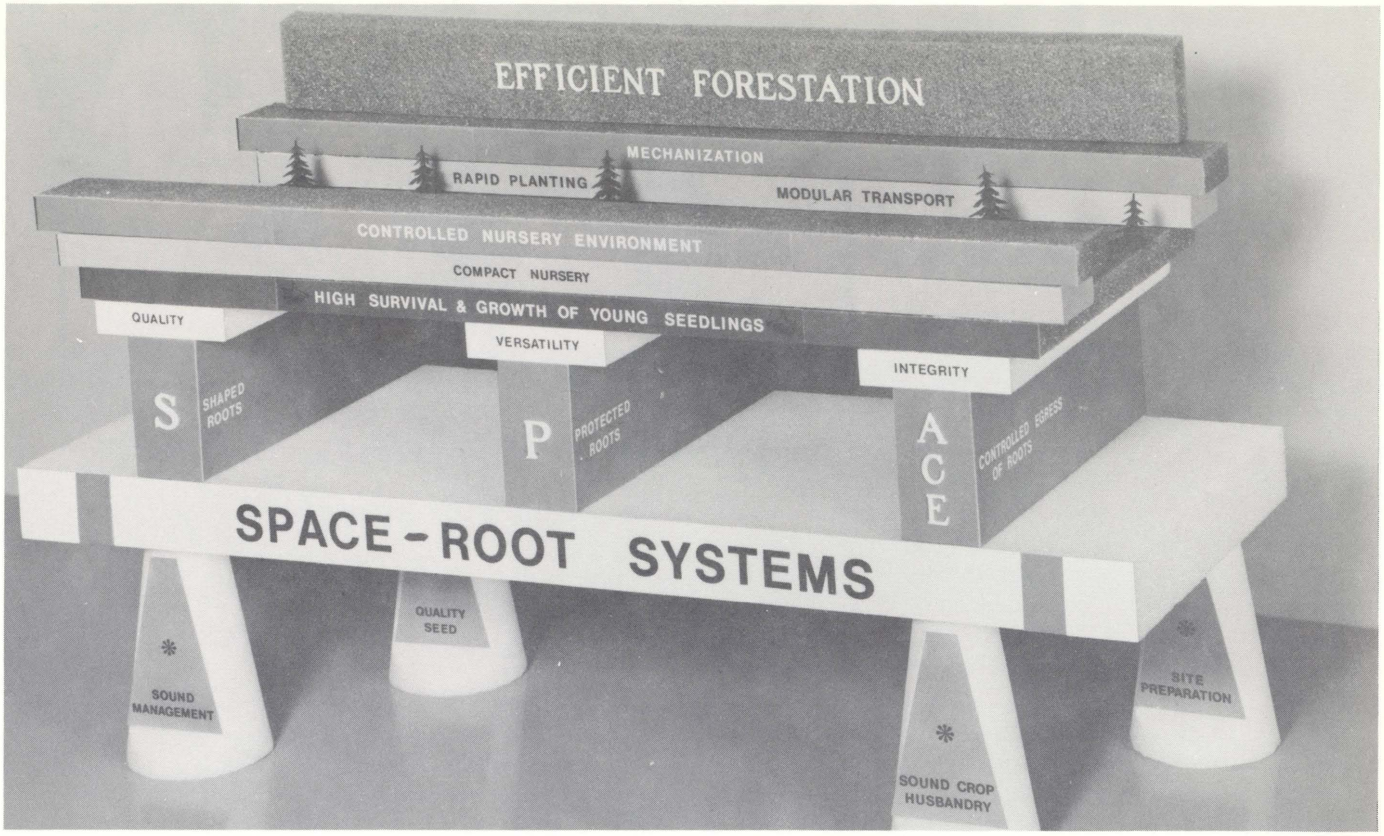
FISH CONTAINERS?

The basic principles of container grown seedlings are by no means new. Around the 13th century, Aztecs used the carcass of a fish as a container for growing seedlings. Fundamentally, the fish illustrates a number of principles sought in the design of an ideal seedling container. Its form is maintained by an endoskeleton, yet its outer wall can be penetrated by roots and is shaped for easy implanting. The substance of a fish's body provides a ready-made, slow-release fertilizer during the nursery phase and after outplanting. Roots are channelled toward a simple fundamental orifice. The only drawback is the odour which may limit the availability of nurserymen and planters.

B.C. PLAYS MAJOR ROLE.

The Denver Symposium showed that representatives from British Columbia, particularly the Canadian Forestry Service, the B.C. Forest Service, and The University of British Columbia, played a major role in the development of the container concept. Eleven of the 75 major papers were presented by delegates from British Columbia.

Jim Kinghorn, a forester with the Pacific Forest Research Centre, Victoria, one of two keynote speakers, outlined the principles and concepts in container planting. He emphasized that we must not assume that container seedlings will solve problems where all



Building blocks of forestation system. The composite structure may lead ultimately to maximum mechanization from seed to planted seedling.

else has failed. "Container techniques are no more than the extension of the principles governing bare-root and direct seeding forestation methods. Every forestation method must be judged on its capability of reaching a satisfactory balance between biological success and costs", he said. He added that **minimal cost at any crop survival rate is just as senseless as biological success at any price**. Compromise is the key word.

To illustrate his analogy that an effective forestation system must have a firm foundation, Kinghorn described the four basic foundation pillars:

— Good seed.
— Sound crop husbandry.
— Sound management
— Adequate site preparation.

Do not look for a simple solution in containers if the basic pillars are lacking or weak. Do not expect containers to offer an economical solution if seedling stock prescriptions are based on experience of seedlings with naked roots.

Other points he made include:

Tree planting . . . . One of the last strongholds of intensive human toil that has not yielded to extensive mechanization.

Roots . . . . Enough worldwide examples of container plantation failures to warrant serious concern about the long-term effects that root aberrations may impart. The objective should be to grow a root form that has the least risk of altering in any way the root structure.

Container design . . . . If present designs do not continue to yield thrifty stable trees, there are still many design options open.

Plugs . . . . Shaping of roots for subsequent automatic handling and to ensure that roots can egress without impediment, lends versatility to forestation without assuming serious risks.

Container Planting Systems . . . . Not one container concept today can justifiably claim superiority over every other system. However, several container systems show that small container grown seedlings can be planted twice as fast as conventional bare root stock. None of the container systems used is satisfactory if viability and vigor of the plant is subserviated to economic and mechanical considerations.

B.C. REVIEW

Alf Bamford, forester in charge of nurseries and seed production for the B.C. Forest Service, paid tribute to **Jack Walters** of the University of British Columbia for the early promotion of the container concept in B.C. He said that the excellent progress to date can be attributed to the spirit of cooperation between the Pacific Forest Research Centre and the Reforestation Division, and to all those connected with developing the system.

He said that the first containerized planting (bullets) in British Columbia was carried out in 1957, but it was not until 1961 that the new era in reforestation commenced.

Since then, extensive exploratory research and testing has been undertaken to demonstrate the potential of the **Walter's bullet**, **the Pelton mudpack**, and **BC/CFS styroblock plug**, in addition to continuing with the traditional bare root system. **Bamford** reported that although great advancements have been made, experimentation and development projects require further testing.

Among the problems that continue to plague the container program in British Columbia is low-temperature root damage to coastal species when carrying seedlings over the winter.

Latest innovations include the re-design of the styroblock for more efficient use of space. An intermediate size cavity has been introduced which should be advantageous for shallow rooted species such as spruce and western hemlock. Also, the use of shelter houses will allow earlier sowing, provide extractible plugs earlier, and provide protection for stock that must be overwintered.

Bamford said the Forest Service today has container facilities with an annual production capacity of 17 million 'plug' seedlings to supplement bare root production. Other Forest Service objectives included halving the cost of planting as compared to the conventional bare root mattock method.

ENGINEERING THE STYROBLOCK

The Styroblock System for growing container seedlings is emerging as an effective technique — biologically, physically, and economically, for both nursery production and field planting, stated **Nels Sjoberg** of the Reforestation Division, British Columbia Forest Service, Victoria.

Although the system is far from complete, the styroblock has not only provided a satisfactory medium for growth in the nursery but also a means of economical crop establishment.

Although additional experimentation and testing is still required, particularly to advance mechanical planting, reforestation costs have been reduced.

Sjoberg emphasized the importance of achieving a satisfactory balance between biologically acceptable results, and mechanization of production and field planting.

GROWING PERFORMANCE

Comparing field survival and growth of bullet, bullet-plug and styro-plug seedlings with bare root planting stock, **Jim Arnott**, a forester with the PFRC, Canadian Forestry Service, Victoria, reported that plug seedlings for most species were superior. Survival of container-grown seedlings, however, falls when seedlings are planted in progressively harsher growing conditions.

Results of a 5-year study of CFS and BCFS bullets and bullet-plugs, as compared to bare root seedlings, indicated that the container itself was detrimental to seedling survival.

Arnott reported that drought is the most important single cause of container-grown seedling mortality in the field, accounting for most seedling deaths over the first 3 years after planting.

On a biological comparative basis, he said that plugs from both bullets and the styroblock were superior for hemlock, white spruce and lodgepole pine. Field performance of bare root and styroplug Douglas-fir seedlings were equal.

In explaining the superiority of styroplug seedlings over other systems, **Arnott** stated that the improvement did not derive solely from differences in container configuration or cavity volume, but was also the result of improvements in container cultural practices over the past 4 years.

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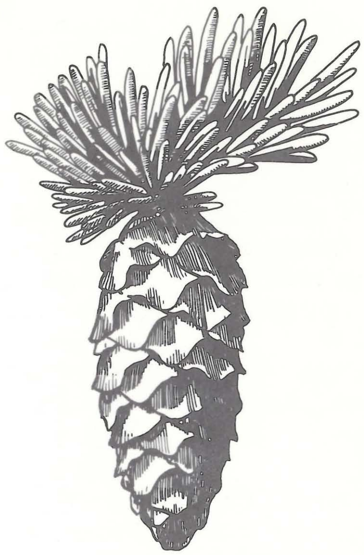
People & Things

Putting It All Together

Provincial and Federal Forest Services collaborate.

The British Columbia Forest Service and the Canadian Forestry Service (Pacific Forest Research Centre Victoria) have formed a joint task force to prepare a series of guidelines on cone and seed production, collection and processing for forest operations staff and the interested public.

The basic objective of the guidelines is to prevent a shortage of conifer seed from interfering with the B.C. Forest Service's goal of producing 150 million seedlings by 1980.



Sitka spruce

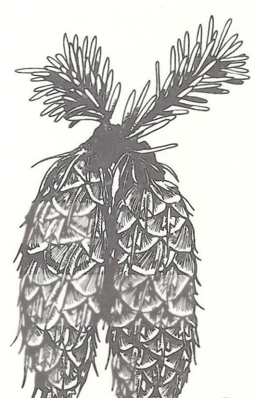
The following two reports, first in a series, have just been released.

CONE PICKERS MANUAL is a 14-page leaflet intended for use by prospective cone pickers. It describes the why, when, where and how aspects of collecting cones in the forest tree seed zones of B.C. Well illustrated, the booklet includes general information as well as safety tips, pay, and what the well-dressed cone picker should wear.

GUIDELINES TO COLLECTING CONES OF B.C. CONIFERS is an interim report designed for training field and laboratory personnel in the procedures and techniques of collecting cones. It is the forerunner of a detailed publication which will be available prior to the 1975 field season. Major species of cones and distribution zones are illustrated.

Both publications were prepared by a task force subcommittee made up of **David Wallinger** and **Jenji Konishi,** of the Reforestation Division, B.C. Forest Service, and **Drs. Robert Dobbs** and **George Edwards,** of the Pacific Forest Research Centre, Canadian Forestry Service, Victoria.

For additional information and copies of the Cone Pickers Manual write to: Forester i/c, Reforestation Division, B.C. Forest Service, Legislative Buildings, Victoria, B.C. V8V 1X5. Because of the interim nature of the other report, distribution is being restricted. •



Douglas-fir

New Publications

7. BC-X-97 Infection and Development of Dwarf Mistletoes on Plantation-Grown Trees in British Columbia. By: R.B. Smith.
8. BC-X-99 Saltspring Island. A Landscape Analysis. By: H.E. Hirvonen, J.P. Senyk & E.T. Oswald. (Map, "Landscape Associations of Saltspring Island" is included with the above report.)
9. BC-X-100 Soil and Foliar Nutrient Relationships for Douglas fir on Three Different Sites. By: B.D. Webber.
10. BC-X-101 Aerial Spraying Operations Against Blackheaded Budworm on Vancouver Island, 1973. Edited By: J.R. Carrow.
11. BC-X-102 The 25-Year Storm and Culvert Size — A Critical Appraisal. By: E.D. Hetherington.
12. Technical Report No. 1 Management of Lodgepole Pine to Reduce Losses From Mountain Pine Beetle. By: L. Safranyik, D.M. Shrimpton, and H.S. Whitney.
13. FPL No. 29 Some Insects Encountered In and Near The Home. By: D.H. Ruppel & E.C. Pass.
14. An Introduction to Christmas Tree Growing In Canada. By: W.M. Stiell & Chas. R. Stanton.

If you wish to receive copies of any of these publications, please complete form on back page. •

Today's forestry research will uncover even better ideas for tomorrow.

Promoting Forestry

The Canadian Forestry Service has undertaken several new projects aimed at increasing Canadian awareness of the forest environment and our relationship to it. A public information program was launched at the Service's Petawawa Forest Experiment Station near Chalk River, with the provision of an interpretive centre and the development of a nature trail. Also among the new 'awareness' programs is an extensive series of forestry fact sheets. Subjects include:

- — A Natural Finish for Wood Siding (1)
- — Careers in Forestry (2)
- — Dutch Elm Disease (3)
- — Forestry and the Environment (4)
- — Planting Shade Trees (5)
- — Spruce Budworm (6)

Copies may be obtained by completing form on back page. •

Contract Research

The impact of timber harvesting on the physical and chemical properties of forest soils in coastal southwestern part of British Columbia is one of 50 research contracts let over the past 3 years by the Pacific Forest Research Centre, CFS, Victoria. With a value in excess of $450,000 these contracts are awarded to undertake research that produces immediate results to urgent problems. The majority of contracts were developed to further some phase of PFRC research.

Among the contracts awarded recently are:

- — Critical review of literature on the effects of HERBICIDES on wood production and other forest values.
- — Study and review of SOCIO-ECONOMIC USE OF FOREST LAND IN URBAN AND PERIURBAN AREAS.
- — Description, interpretation and mapping of the natural VEGETATION OF THE GREATER VANCOUVER REGIONAL DISTRICT.
- — Opportunity cost for environmental quality maintenance in FOREST ROAD DESIGN.
- — Production of an ECOTOUR MAP for a portion of the Trans-Canada highway in B.C.
- — Investigation of the feasibility of measuring forest wildfire through application of infrared imagery using AIRBORNE THERMOVISION EQUIPMENT.
- — Production of a publication on the development of BUDS IN WESTERN HEMLOCK.

Further information on the results of contracts let by the Pacific Forest Research Centre may be obtained by contacting the Centre. In most cases only library loans may be made to obtain copies of final reports. •

Managing Bark Beetles

In widespread outbreaks, spruce beetles have periodically ravaged vast spruce forests from Alaska to the southwest United States. In British Columbia alone, they destroyed extensive areas of spruce in the central interior and southern mountains in the Kootenays. Between 1962 and 1964, they killed more than 500 million cubic feet of mature and over-mature spruce, in the Prince George and Prince Rupert Forest Districts. **These recurring attacks have had a serious detrimental effect on the long-term management of interior forests.**

where found

The spruce beetle reproduces in great numbers, usually in windthrown spruce trees in mature stands, in forest edges along streams and edges of clearcut. Under present forest management practices, strips of timber are usually left along stream edges to protect fish habitat and provide a game corridor. If climatic conditions are favorable to the beetles and unfavorable to the spruce, the beetles may attack the standing trees, resulting in the destruction of timber reserves and forcing changes in management plans.

To combat the insect and develop guidelines for forest management purposes, the Canadian Forestry Service has embarked on a number of significant research studies.

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This Information Forestry Newsletter is designed to keep you continuously informed on the work undertaken on your behalf by the staff of the Pacific Forest Research Centre, Canadian Forestry Service, Victoria, B.C.

DR. JOHN A. CHAPMAN
1919 - 1974

John A. Chapman, an internationally known scientist with the Canadian Forestry Service, died October 28 in Victoria General Hospital after a lengthy battle with leukemia. He had only just retired after 21 years with the Pacific Forest Research Centre, Victoria.

A specialist in insect physiology, Dr. Chapman conducted, among other things, experiments involving the use of alternative sex attractants to manipulate insect populations. His studies helped clarify the confusing situation as to what factors led beetles to attack certain logs. His work on ambrosia beetles enabled the forest industry to produce a timetable for felling timber to avoid attacks by beetles.

M.H. Drinkwater, Director of the Victoria Centre considered Chapman's work to have a strong influence on the development of overall forest research, not only in North America, but in other parts of the world where bark beetles pose a problem.

Dr. Chapman was also involved in many aspects of community life, including a number of natural history groups. He was associated with the National Science Foundation and the American Association for the Advancement of Science; he was a member of the Biological Council of Canada and served as President of the Entomological Society of British Columbia.

75 Years

The Canadian Forestry Service Marks Its 75th Anniversary

1899 — The eve of the Twentieth Century. The year men sported derby hats and wore handle-bar mustaches, while women were still required to have their hemlines touch the floor. The age of horses and bicycles and when fallers used crosscuts and springboards

Also in 1899 the federal government authorized the appointment of Elihu Stewart as Chief Inspector of Timber and Forestry. An act which resulted in federal involvement in forestry activities.

75th Anniversary of the Canadian Forestry Service

75e anniversaire du Service canadien des forets

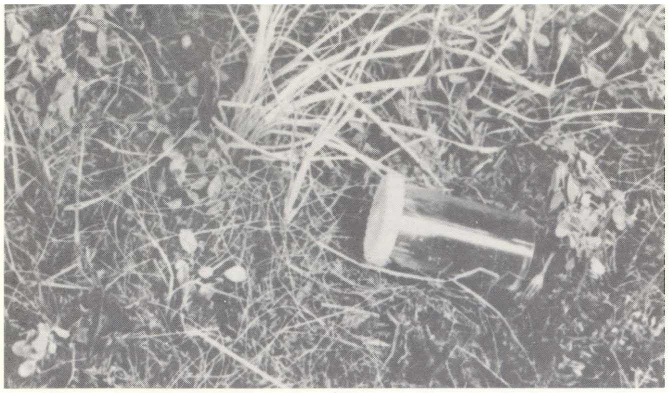
Today the **Canadian Forestry Service**, within the federal Department of the Environment, conducts both operational and research work in Canada and is the principal coordinator of Canada's involvement in international forestry matters. The Service operates six Forest Research Centres from Vancouver Island to Newfoundland and Institutes dealing with special areas of concern within forestry.

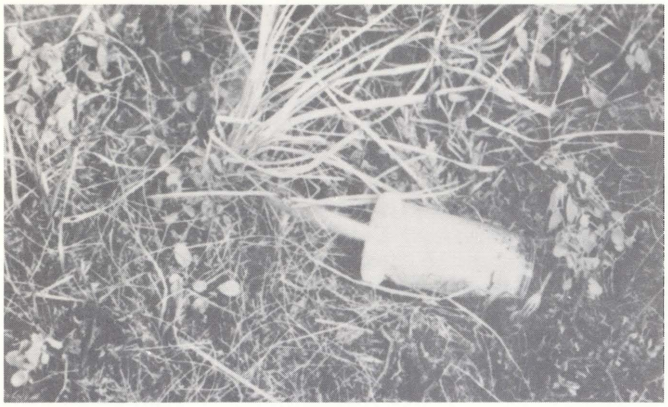
Today, the Canadian Forestry Service, employing nearly 500 research specialists, works continuously to promote effective management and use of Canada's forest resources, compatible with concern for the environment.

Profile

Joining the staff of the Pacific Forest Research Centre, Victoria, is **Dr. Terry G. Honer**, formerly chief of the forest productivity program with the Forest Management Institute, Ottawa. Dr. Honer is the new Program Manager in charge of Forest Resources Research and a member of the Centre's Management Committee. He replaces Mr. Bryan Armitage.

Dr. Honer's past work has been in forest productivity studies concerning dimensional and growth relationship of individual trees and stands. He has worked in standards for forest management and description, growth simulation surveys of productivity and operational inventory practices.





Fire

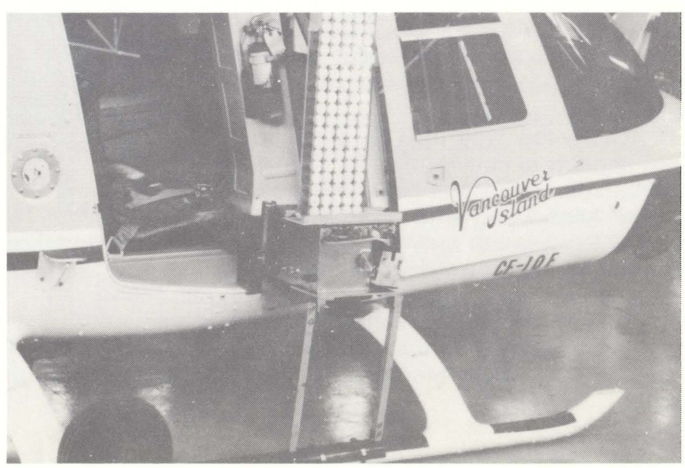
Where and When You Want It

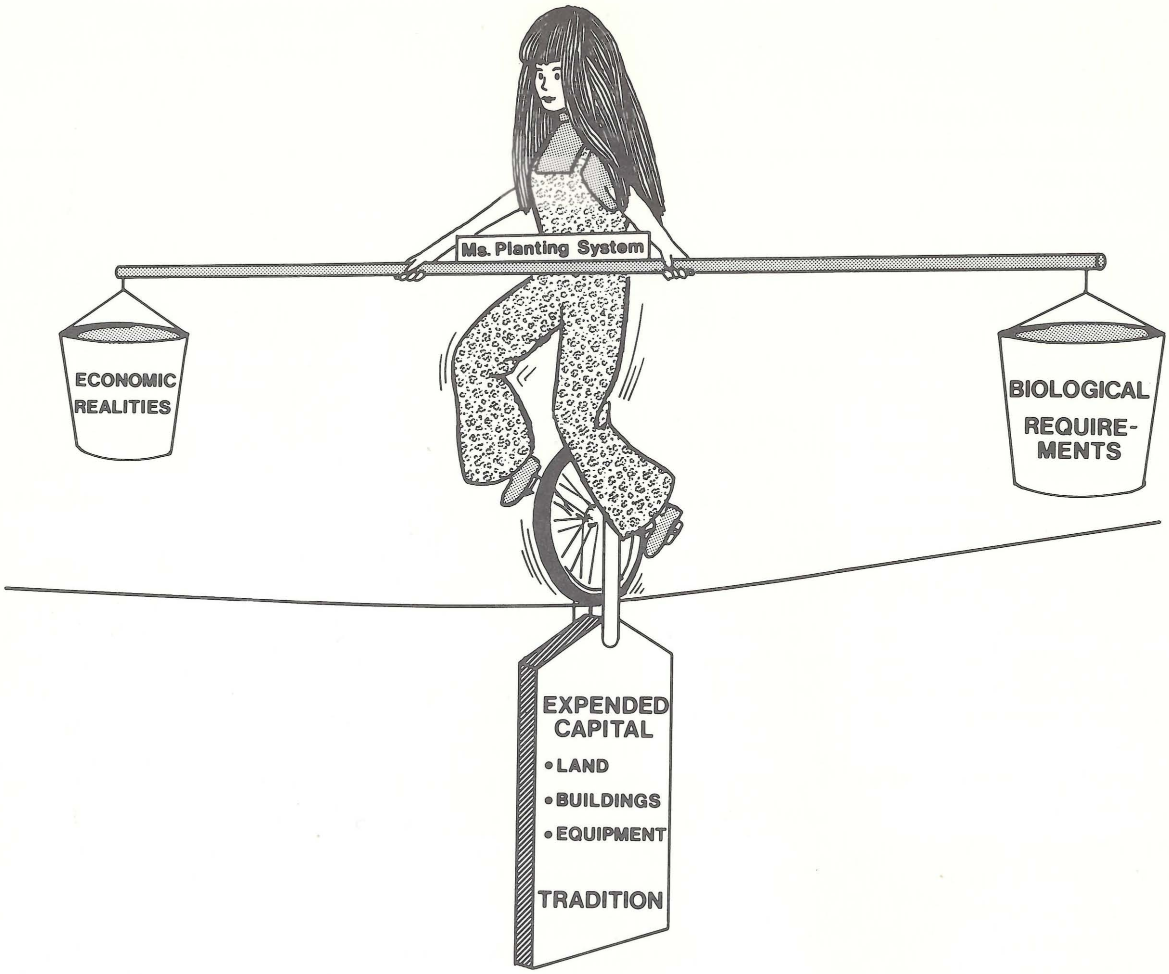
A safe new approach in igniting prescribed fires has been perfected by **John Muraro** and **Gary Lait** of the fire research group, Pacific Forest Research Centre, Victoria.

The method, involving a portable machine, has been used successfully on a number of experimental burns. The machine is capable of dispensing 2-ounce incendiary capsules at a rate of up to 90 a minute. Capsules containing potassium permanganate are fed into the unit from pre-loaded racks that have a capacity of 100 capsules. When the machine is activated, two rotating plates carry the capsules past a plunger, which injects ethylene glycol, and out of the base of the machine. The liquid chemical bursts into flame in 16 or more seconds depending on permanganate grain size and air temperature.

Designed for attachment on the door and skid outside a helicopter, the unit can be used at most elevations; however, 300 feet was considered to be the most effective. It was originally intended for use this summer in the Peace River area of British Columbia.

Although the basic principle of ignition, using the two chemicals, is similar to that used in Australia, this development provides an economical method of distributing the capsule uniformly over a prescribed burn area. The new unit is also smaller and more portable.





Miss Planting System – achieving the ultimate by balancing economic realities with biological principles. The underwire counterbalance is an asset to stability during development but may prove to be a liability if it continues to support a system that is no longer in bio-economic equilibrium.

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GREEN THUMBING

The paper on growing season production of western conifers by **Evert Van Eerden**, a forester with the PFRC, Canadian Forestry Service, Victoria, described seedling production on experimental and semi-operational production of seedlings in Walters' bullets and the BC/CFS styroblock. He reported that there is still much to be learned about growing media, mineral nutrition, growth rhythm, dormancy and frost-hardiness. He said that the success of container seedlings in British Columbia is heavily dependent on improvement of seed quality or development techniques that will circumvent the adverse effects of low seed viability. Although shelterhouses will provide protection, development of techniques for inducing frost-hardiness to permit greater flexibility in shipping and planting of container stock is urgent.

Among other papers presented were:

— *Mineral Nutrition of Container Grown Seedlings* by H. Brix an R. van den Driessche.

— *Sowing Rules for Container Nurseries*, by A.H. Vyse and J.D Rudd.

— *Development of High Capacity Precision Seeding, Loading, anc Handling Equipment for Container Nurseries*, by Erling O. Nyborg and George Shikaze.

— *Engineering for Injection Planting*, by John Walters.

— *Root Growth of Container Grown Stock After Planting*, by Evert Van Eerden and James T. Arnott.

— *The Cost of Raising and Planting Containerized Trees in Canada*, by D.E. Ketcheson and A.H. Vyse.

Copies of all these papers are available from the respective authors •

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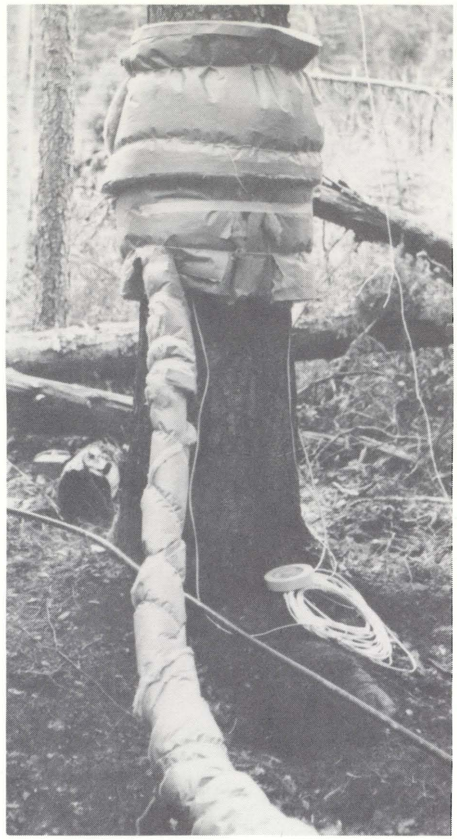
joint effort

In cooperation with the B.C. Forest Service, and industry, the Pacific Forest Research Centre, Victoria, has established a camp at Hixon, B.C. that serves as the field base for six research scientists and a technical support staff. The camp operates on a 5-month basis during the height of beetle activity, May to September. Although the project is presently confined mainly to the Prince George Forest District, investigations of the spruce beetle will be applicable to other areas of British Columbia and the Yukon Territories. As a result of a recent reorganization of the Canadian Forestry Service, the Yukon Territories became part of the region serviced by the Pacific Forest Research Centre.

goal

David Dyer, project supervisor for the past 2 years, and **Les Safranyik**, the new supervisor, report that the initial goal is to produce forest management guidelines that will reduce losses from spruce beetles in old-growth spruce forests in the Interior. The investigation is concerned as much with the physiological condition of the trees as with the habits of the insect. By knowing the role that windfalls and slash play in providing breeding grounds for the beetle and by studying its reproductive requirements, researchers will be better able to forecast outbreaks and manipulate insect populations.



Insulated coils containing chilled antifreeze controls flow of sap during tests to determine ability of the tree to resist invasion of blue stain fungi introduced by bark beetles.

attractants

The beetles produce a natural attractant odor which allows them to aggregate at trees or logs suitable for brood development. Alternative synthetic attractants are being tested by David Dyer to induce beetles to attack stands planned for immediate harvesting or other healthy trees which can resist the attacks and prevent any brood development.

Les Safranyik, also an entomologist, is investigating the effects of forest management practices, climatic and food factors, and natural enemies on year-to-year changes in beetle numbers. This work is necessary to improve our ability of forecasting beetle hazard to spruce stands and to evaluate various beetle management strategies.

Because some stands are more resistant to attack than others, **Malcolm Shrimpton**, a tree physiologist, is studying the biochemistry of mature spruce trees to determine cutting priorities for the more susceptible stands.

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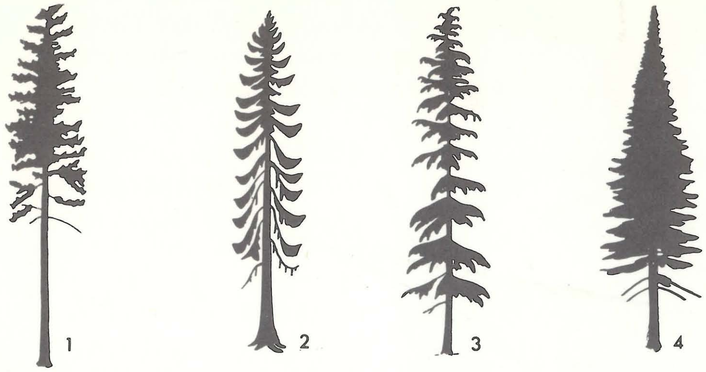
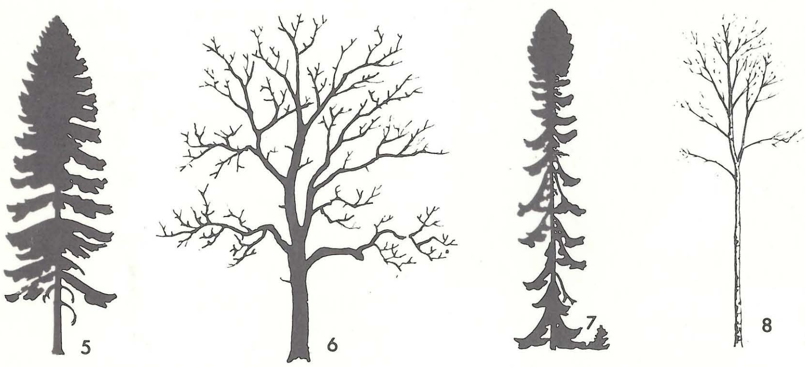


Can You Identify These Canadian Trees?



About 140 tree species grow in Canada. To enable Canadians to know more about trees and their value to the nation, the Canadian Forestry Service has issued two pamphlets — A FOREST NATION and EIGHT FOREST REGIONS. Both carry a map showing species and regions.

1. Douglas-fir
2. Western Red Cedar
3. Western Hemlock
4. Balsam fir
5. White Spruce
6. Oak
7. Black Spruce
8. White Birch

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Stewart Whitney, a plant disease specialist, is investigating the role of blue-stain fungi associated with bark beetles in their nutrition and in tree mortality. The fungi, introduced by the beetles, may kill the trees that are unable to resist.

To determine the optimum breeding habitats of the insect, **Tara Sahota**, an insect physiologist, is studying the synthesis of proteins required for egg production of beetles under a variety of host conditions. He will also attempt to discover synthetic chemicals that will interfere with their reproductive functions.

Because trees felled by wind, play a major role in providing breeding grounds for the spruce beetle and drought reduces tree resistance, meteorologist **Jack Turner** is studying climatic situations which may forecast forest hazard.

The project should produce within the next 3 years, data that will assist resource managers to plan composite management for reducing beetle loss, while encouraging multiple use of the forest land in the central interior. •

Copies of all reports and publications mentioned in the Newsletter may be obtained by contacting the Information Services office at the PFRC.

To obtain copies of publications listed please circle the appropriate number, affix postage and return to address on reverse.

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