

Forestry

INFORMATION

Canadian Forestry Service
Pacific Forest Research Centre
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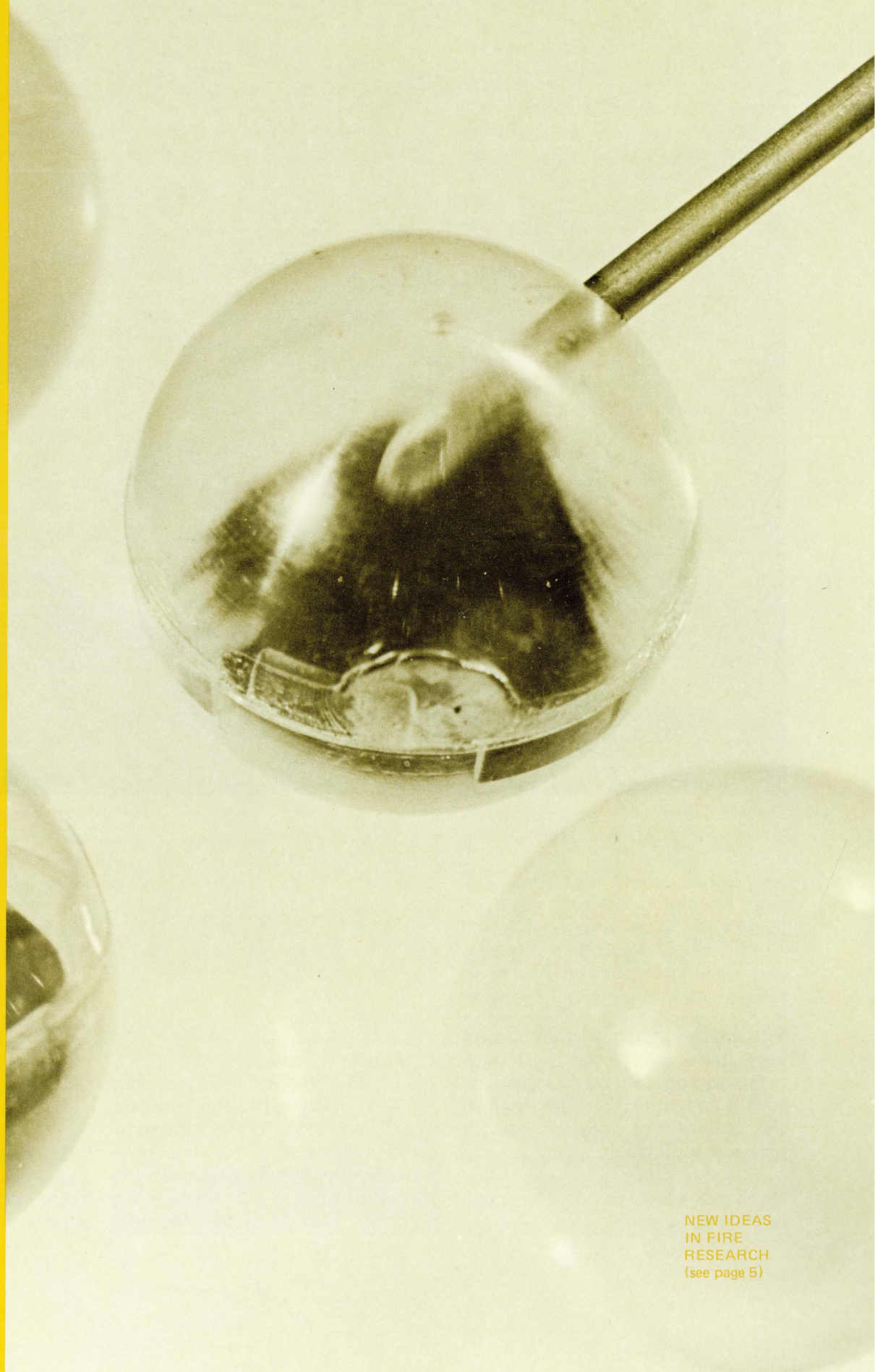


Environment
Canada

Environnement
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Forestry
Service

Service
des Forêts



NEW IDEAS
IN FIRE
RESEARCH
(see page 5)



FIRE RESEARCH AND DEVELOPMENT

PACIFIC FOREST
RESEARCH CENTRE

Fire studies at the Victoria Centre have been concerned with five major sectors, although in reality, each blends into the other both in the conduct of research and in practical application.

Much has been learned but much remains to be done.



Prescribed Fire

Work in this area has dealt with the problem of efficient and effective ignition of cut-over areas with recent involvement in the ignition of uncut areas for improvement of range for domestic animals and/or wildlife,

and the possibility of the equipment being used for backfiring or burning out to control wildfires.

Evaluating the probable intensity and rate of spread of the fire is of major concern in achieving the objectives of a prescribed burn.



Wildfire Prediction

Research has centered on the development and improvement of the fire danger rating system so that intuitive judgements can be replaced by decisions based on objectively collected weather data and systematic organization of past experience.



Ecological Effects

Although foresters and fire researchers believe that well conceived and executed fires can be beneficial in the reforestation of cutover lands, the data necessary to confirm or refute these beliefs are not available. Several years ago PFRC recognized this need and set up a program of study to secure the information necessary to answer these questions.



Wildfire behaviour

Research in this area is traditionally done through the instrumentation and burning of representative areas to study ignition probability, spread rate, and crowning, and to calculate the difficulty of control under particular sets of circumstances. An understandable reluctance to provide areas for burning to collect the required data has led to the development and use of an airborne infrared imagery system in the hope that data can be collected from free-burning wildfires.

Efforts are continuing to assemble the information necessary to build wildfire behaviour data bases which can then be integrated with the fire weather index to develop more precise guidelines.

Development of Computer Models, Operational Research Procedures and Methods are a part of our plans in this area of fire research.



Equipment Development

Many facets of fire research are intricately interwoven and the development of equipment to perform necessary functions in the ignition of prescribed fires or the gathering of meteorological data for use in research or operations has been an important function. Three major pieces of equipment have been developed either independently or in cooperation with the B.C.F.S.:

...the flying drip torch, particularly suited for ignition of clearcut areas

...the AID dispenser developed for ignition under tree canopies for a variety of prescribed and wildfire applications.

...a portable weather station capable of recording digitized information for immediate realtime use or for long term monitoring.

In addition to undertaking specific research projects in these areas, the fire group provides a continuing consultative service to the B.C. Forest Service, Yukon Lands and Forest Service, the forest industry and educational institutions.

Researchers feel that some problems have been solved. There are now guidelines which assist operational people in the decisions which must be made with regard to the burning of slash. There are tentative guides to the kind of fire behaviour which can be expected in certain broad fuel classes. There are methods of determining from weather observations the probability of fires occurring. There is equipment which will assist in ignition of fires for silvicultural purposes or fire control and in the acquisition of data necessary for fire prediction. ●

Why Fire Research ?

The Canadian Forestry Service policy of maintaining a viable fire research team at the Pacific Forest Research Centre is based on meeting the continual demands from resource managers for more comprehensive information on fire and its effect on the forest environment.

The forest fire research and development program at PFRC is primarily designed to fulfill the needs of British Columbia and the Yukon, although researchers are actively involved in national programs such as the fire danger rating system, the fire weather forecasts and participation in the Canadian committee in forest fire control.

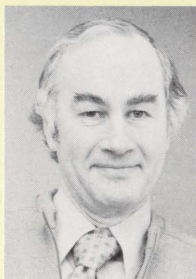
Close cooperation is maintained with the B.C. Forest Service and other elements of the provincial government, the Yukon Land and Forest Service, and industrial companies. These agencies have the responsibility for forest fire control or wish to use fire as a tool for modification of forest stands.

Multi-agency committees, such as the B.C. Fire Weather Advisory and Coordinating Group composed of CFS, BCFS and YL&FS, and the Atmospheric Environment Service are essential for the efficient operation of many of the programs.

Long Range-Plan

Forest fire management in British Columbia has reached the stage where we must assess our progress and develop plans for the future. Through the initiative of Bob Sutton, forester-in-charge of planning and research for the protection division BCFS, researchers at PFRC are participating in the development of a long-range plan for fire management in the province.

Fire Staff



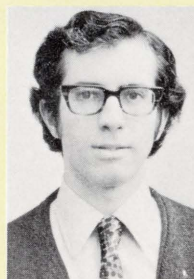
Cliff Brown
Program Manager



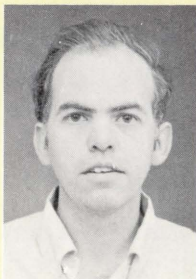
John Muraro



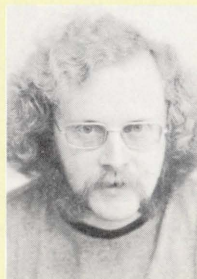
Dick Silversides



Bruce Lawson



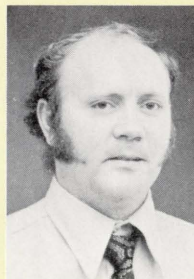
Bob Russell



Glen Robertson



Bill Cave



Gary Lait

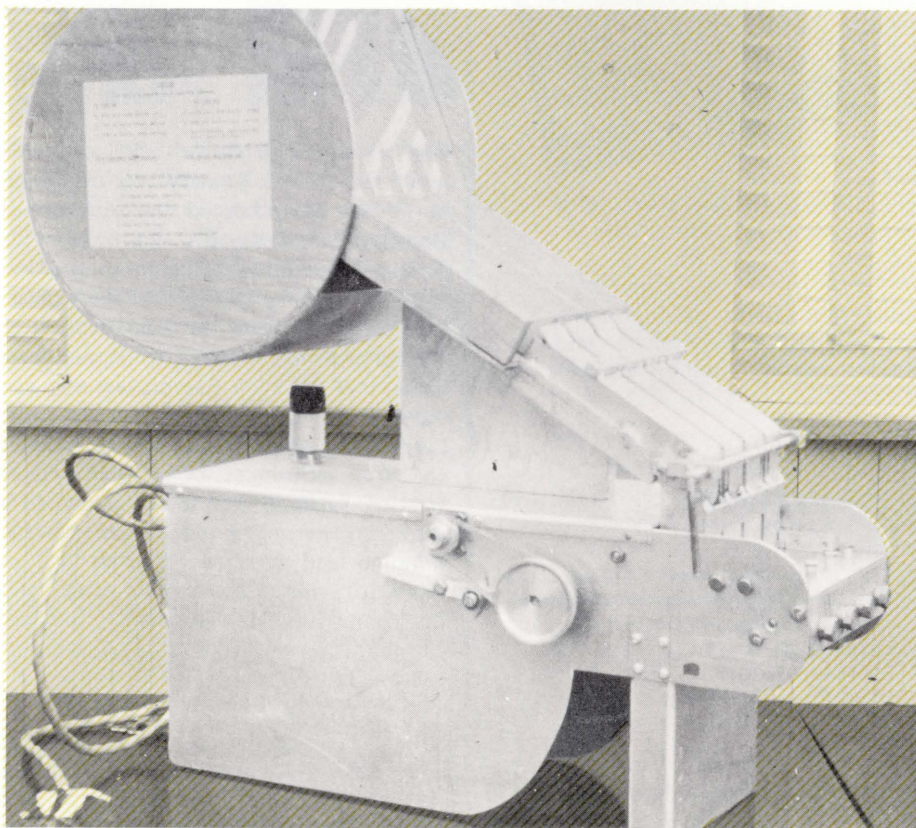
If you want to ignite a large area in a fast and safe manner, using a small crew, the new aerial ignition device (AID) may be your answer. John Muraro and Gary Lait, of the PFRC fire research group, have perfected the technique reported in the November 1974 issue of the Infor Forestry Newsletter.

The dispenser is a portable machine designed to be attached to the inside of a helicopter, rather than to the outside as was the old model.

The new machine is capable of dispensing 1¼ inch diameter polystyrene balls (¾ the size of a ping pong ball) at the rate of up to 240 per minute, depending on the ignition requirement.

One improved feature of the new unit is the use of the 'ball' incendiary capsule, which replaces the plastic medicine bottle-type container. (The ball capsule is the brainchild of the Alberta Forest Service.) The ball is sealed after being charged with potassium permanganate. The balls are commercially available, loaded, sealed and packaged in 1000 lots, from Premo Engineering

New Fire AID



AID fire dispenser

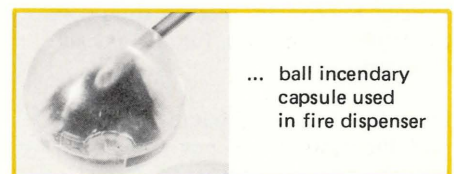
in Victoria, B.C. They are easier to load into the machine and quicker to release over the prescribed fire area. By using a hopper to hold the balls, rather than the pre-loaded

magazines used in the earlier model, the carrying capacity of the helicopter is greatly increased, resulting in a continuous operation and reducing helicopter time.

The principle of ignition is the same in the new unit, but the technique behind the feeding chambers and the ignition needles is more sophisticated.

To date, 5 units have been produced, of which two have been used in the Yukon Territory, and one in Ontario, for wildfire suppression by backfiring from natural fire barriers in some of the more remote fire areas. Aerial ignition, using incendiaries, has also been used for large-scale rangeland and wildlife habitat improvement in British Columbia. Fire researchers indicate that the new AID has increased the efficiency of the large-scale aerial ignition concept and more widespread use will be made of it in the future.

Designed by PFRC fire personnel, the AID dispenser is being built under contract by C. Quentin Wilson of Fulford Harbour, B.C. ●

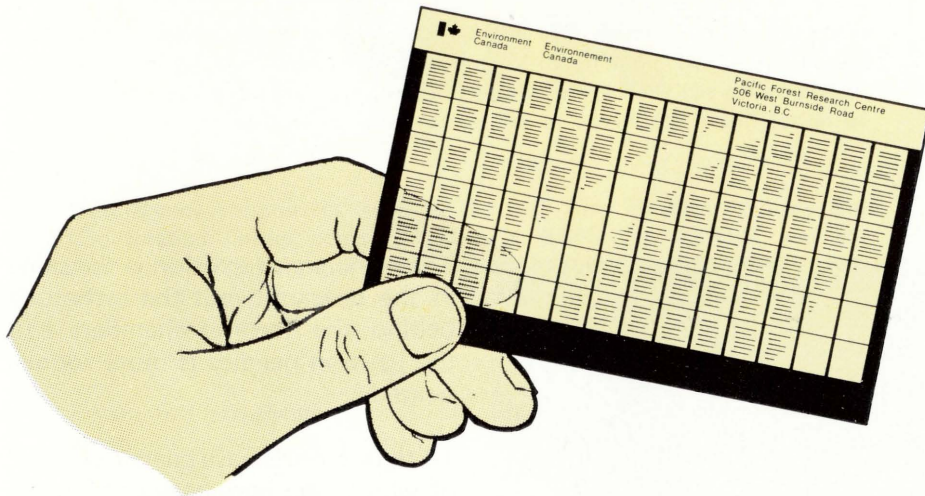


... ball incendiary capsule used in fire dispenser

Something New

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

Micro Publishing



What is microfiche?

To those of us that are finding it difficult to meet the increased cost of printing, microfiche is a new, versatile, economic method of publishing detailed reference information. Information that is sometimes too costly to print in the standard format. It is a technique where material is photographically recorded on a 4" x 6" slide. The standard slide holds ninety-six 8½" x 11" pages of type, photographs or graphs.

Accepted universally, the system reduces printing costs, lowers mailing or distribution costs, and makes substantial savings in filing or storage space.

Special microfiche readers should be available in libraries frequented by foresters.

Mike Drinkwater, Director of PFRC, said the system will not completely replace the information report

series, but will be used primarily for making bibliographies and similar detailed studies available to clients.

NEW PUBLICATIONS AVAILABLE IN MICROFICHE ONLY:

- (1) BC-X-121 The Striped Ambrosia Beetle: An Annotated Bibliography. (By: W.W. Nijholt)

(This report provides a comprehensive background for the study of the insect, as well as easy access to information of practical use to the forester.)

- (2) BC-X-129 Influences of Fertilization on Forest Production and the Forest Environment. By M. Bell, W.F. Hubbard & J.M. Beckett

- (3) BC-X-130 Influences of Thinning on Forest Production and the Forest Environment. By M. Bell, W.F. Hubbard & J.M. Beckett

People



JOINS BCFS

Paul Brett, well known B.C. forester and head of the forestry services group at PFRC, has accepted the position of Coordinator of the B.C. Forest Service Forest Productivity program--a position formerly held by Denis Glew. Paul joined the CFS in 1966 as coordinator of federal-provincial forestry agreements. Since that time he has played a major role in the Centre's research program, particularly with the development of the container techniques for improving reforestation systems, as project leader of a study to investigate the effects of tree thinning and fertilization trials and as Head of the Centre's Forestry and Environmental Development Services Group.

Mike Drinkwater, Director of PFRC in expressing his thanks to Paul for his efforts over the past 9 years, said "...thank you for your most energetic and effective contribution to the PFRC research and service operations, and particularly in the area of program management. You have had a real and lasting impact on forest and environmental research and its application in the region and across the country."

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.

VISITS CHINA



Ross Macdonald, Deputy Director of the Pacific Forest Research Centre, Victoria, spent three weeks in China recently as part of a scientific and technological exchange program. China has been doing extensive breeding of parasites as a means of controlling forest pests and Macdonald's visit was primarily concerned with extending our search for candidate bio-control material that can be used in Canada. Besides an interest in forest protection the program includes the exchange of tree seed for tree breeding programs.

CONTRACTS OF INTEREST Let by Environment Canada

- ... Conditioning and treatment of 200 samples of western hemlock and amabilis fir poles will be undertaken by Domtar Chemicals Ltd. of Vancouver, B.C. in a study to test the treatability and strength of western Canadian poles. The Western Forest Products Laboratory, CFS, Vancouver, is supervising the contract.
- ... A feasibility study of the aerial rake concept for harvesting cones from coniferous trees will be undertaken by McLean Tool Manufacturing Ltd., Burnaby, B.C. The Forest Management Institute, CFS, Ottawa is supervising the contract.

New Publications

SILVICULTURE

- CONTAINER PRODUCTION OF WESTERN HEMLOCK IN BRITISH COLUMBIA. - J.T. Arnott. Tree Planters' Notes, 1975.
- FIELD PERFORMANCE OF CONTAINER-GROWN AND BAREROOT TREES IN COASTAL BRITISH COLUMBIA. - J.T. Arnott. Can. J. of For. Res. 1975.
- ROOTING OF CUTTINGS FROM MATURE DOUGLAS FIR. - H. Brix. N.Z. Jour. of For. Sci.
- PROCUREMENT AND PROCESSING OF CONIFER SEED. An Annotated Bibliography with Special Reference to British Columbia. British Columbia Forest Service/Canadian Forestry Service Joint Rept. No. 2, April, 1975. Contract No. OSS4-0247.
- HOW CONTAINERS AFFECT TUBED SEEDLINGS 5 YEARS AFTER PLANTING. - G. Fisque and J.T. Arnott. 1975. Tree Planters' Notes.

PROTECTION

- STEM CANKERS OF YOUNG DOUGLAS FIRS ASSOCIATED WITH LARVAL FEEDING GALLERIES OF LASPEYRESIA PSEUDOTSUGAE. - A. Funk. Eur. J. For. Path. 1975.
- AN INTERPRETATION OF THE INTERACTION BETWEEN LODGEPOLE PINE, THE MOUNTAIN PINE BEETLE AND ITS ASSOCIATED BLUE STAIN FUNGI IN WESTERN CANADA. Reprinted from Management of Lodgepole Pine Ecosystems Symposium Proceedings edited by David M. Baumgartner. Pub. by Wash. State Univ., Coop. Ext. Serv. - L. Safranyik, D.M. Shrimpton, and H.S. Whitney. 1975.
- DAMPING-OFF IN BRITISH COLUMBIA FOREST NURSERIES. Control Trials with Fungicides Applied to Different Quality Seeds. - Jack R. Sutherland, W. Lock & L.J. Sluggett. 1975. PFRC Rept. BC-X-125.

LAND USE

- THE HIGHLAND LANDSCAPE. An Ecological Evaluation of Land Suitability for Urban Development in the Southern Portion of the Highland District, Capital Region of British Columbia. - S. Eis & E.T. Oswald. PFRC Rept. BC-X-119.

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

Something New

Impact of Harvesting on Forest Environments and Resources—a bibliography containing 1595 fully indexed references. CFS Technical Report No. 3.

This bibliography is designed to facilitate retrieval of information by researchers and managers on the influence of harvesting and related practices on forest ecosystems and on forest land values. It was compiled following intensive searches through government and university libraries. Insofar as limited compilation time allowed, it includes all available published and unpublished

literature from some of the earliest forest research up to December 31, 1972.

The manuscript for this bibliography was prepared by BIOCON Research Ltd., Victoria, B.C. under contract with the Pacific Forest Research Centre, Victoria. Available by mail from Information Canada bookshops. B.C. regional bookshop is located at 800 Granville Street, Vancouver, B.C.

Price: Canada \$6.75
Other countries. \$8.10

New Joint Report

"Guidelines to Collecting Cones of B.C. Conifers"

R.C. Dobbs
D.G.W. Edwards
J. Konishi
D. Wallinger
-- 1976.



Douglas fir

Produced as a cooperative project by the Canadian Forestry Service and the B.C. Forest Service under the auspices of the Joint Cone and Seed Guidelines Committee. (It replaces the Interim Guideline distributed in 1974.)

Useful to foresters and forest technicians over a wide geographical area, the 'guideline' is concerned with the cone collection operation from the determination of seed requirements, to the delivery of cones to a seed extraction plant. Much of the information is general; some of it is specific to one or more species. The 'guideline' is organized in two parts. **Part I** is a survey of the cone collection operation; major sections concern biological background, planning and pre-organization of the cone collection operation, and cone collection and handling methods. **Part II** provides specific information and recommendations for collecting cones of important conifers. The 'guidelines' is well illustrated with 8 colour plates and numerous line drawings.

Copies of the report are available from the Reforestation Division, B.C. Forest Service, Parliament Buildings, Victoria, B.C. V8V 1X5 or Pacific Forest Research Centre, 506 West Burnside Road, Victoria, B.C. V8Z 1M5.

Metric Conversion ~ Fire

The Canadian Forest Fire Weather Index Tables will convert to metric in 1976. This conversion follows the lead of the weather office into the metric system of measuring and reporting weather statistics.

The index Tables designed to rate fire danger have been in use in all provinces and territories of Canada since being developed by the Canadian Forestry Service in 1970.

Metric weather observations only will appear in the new metric edition of the index tables being published early in 1976. Temperature will be measured to the nearest half a Celsius degree, precipitation to the nearest tenth millimetre, and wind speed to the nearest kilometre per hour.

Conversion Table

Because all forest fire weather stations will not be equipped with metric weather instruments by the 1976 fire season, a supplementary set of metric conversion tables will be provided. Conversion of weather observations to metric will have to be done before the indices are calculated and before the weather observations are recorded, transmitted or stored.

Further details may be obtained from the Fire Research Group of the Pacific Forest Research Centre or the Protection Division, B.C. Forest Service, Victoria, B.C.



Workshops Work!

Special workshops on the mountain pine beetle and its devastating effect on stands of mature lodgepole pine were held recently at six key locations throughout British Columbia.

Chief participants in the project were Drs. Les Safranyik, Malcolm Shrimpton, and Stuart Whitney of the Pacific Forest Research Centre, Victoria, and representatives of the B.C. Forest Service.

The one-day workshops provided a forum where social and economic losses caused by the mountain pine beetle could be described and evaluated and where practical control measures, developed by PFRC scientists to prevent further losses, could be discussed.

Environmental Concern

More than 350 resource managers, biologists, technicians, ecologists and

representatives from environmental groups, attended the sessions which were held in **Smithers, Williams Lake, Kelowna, Fairmont, Vancouver and Victoria**. Demonstrations in active infestations were a part of the four interior workshops, as was a public exhibit showing the interaction of beetles and fungi with the trees.

The workshop at Kelowna was exceptionally important to representatives of environmental groups and resource agencies, because of the social significance of infestations in the Okanagan watersheds.

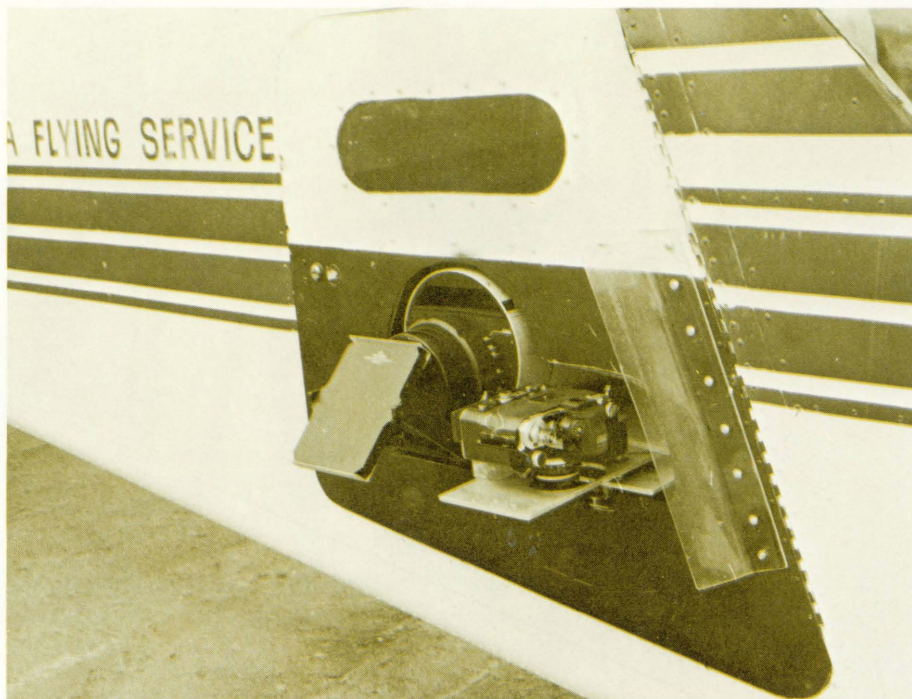
Control is a problem

Following an extensive research study that produced guidelines that will assist resource managers in coping with continuing infestations, the PFRC scientists reported that it is impractical to attempt to control the insect with

presently available insecticides. More intensive detection and damage appraisal practices, salvage and sanitation logging and other silviculture practices are the most practical methods to reduce losses. Understanding the biology of the insect and its interaction with the stand has enabled foresters to forecast the risk of outbreaks and probable stand depletion, and to institute management practices to prevent future large scale losses.

Losses to continue

Foresters estimate that the beetle has destroyed more than 26 million cubic feet of mature pine stands in British Columbia during the past 20 years. Infestations are reported in all forest districts, but Prince Rupert, Cariboo, Kamloops and Nelson Districts were the hardest hit, having more than 35,000 acres of mature lodgepole pine forests destroyed in 1975.



Hot Spotting

An infrared scanner so sensitive that it can detect a lighted cigarette from 1000 feet away was used successfully to locate 'hot spots' on wildfires in the Kamloops Forest District in 1975.

Bruce Lawson, Glen Robertson and Bill Cave of the PFRC fire research group, tested the system on the 'Litch' fire, an escaped prescribed fire near Kamloops. When the fire was considered under control, the crew 'flew' the fire from an altitude of 1300 feet



above ground in a fixed wing aircraft. Using the AGA infrared sensory equipment, they detected three hot spots that were smokeless and not visible to the ground crew. Radio communication with scanner operator enabled the suppression crew to locate and extinguish the hot spots.

AGA Thermo-Vision

This new detection technique is a spin-off from the fire mapping project utilizing the AGA THERMO-VISION 680 system. The AGA system is sensitive to the middle infrared wavelength band, displaying temperatures in steps from -30°C to $+2000^{\circ}\text{C}$. The scanner is attached to a television-like screen or monitor. Thermal images (hot spots) appear as white flashes. Images can be recorded on demand by the operator using a 35mm camera and colour slide film.

Some difficulties

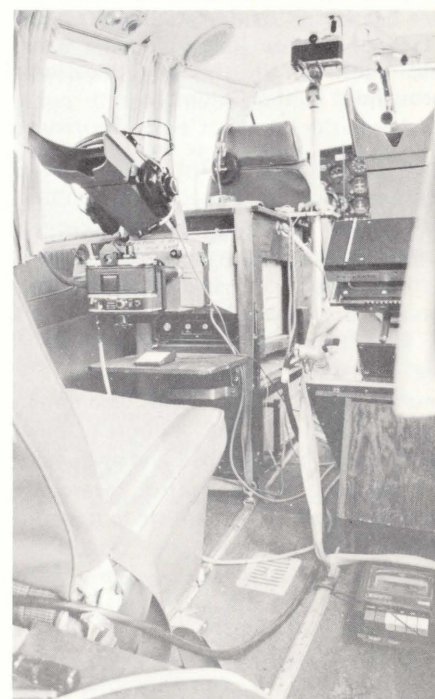
The AGA equipment was also used on the 'Duff' fire that occurred in an open pine stand near Kamloops. Flying at

3000 feet above ground, a hot spot was detected on the upwind side of the fire. The information was relayed to the ground crew but difficulties in recognizing ground reference points took the suppression crew more than one hour to locate the spot. The spot was 25 feet from a heavy needle-twig litter area which could have caused serious problems in terms of later rapid fire spread if the hot spot had gone undetected for any further length of time. As the scanner operator sees only thermal images and is usually travelling at an air speed of 100 miles per hour, it is difficult to lead the ground crew to a particular hot spot. This problem may be overcome by using a helicopter that can hover directly over the spot.

Successful tests were made in a variety of fuels ranging from light-canopied stands to heavily logged areas.

The AGA system has exceptional potential as a detection aid in landing and hangover fires according to fire researchers. The high cost of escaped landing fires warrant additional detection efforts prior to snow melt and drying spring weather.

Further cost effectiveness studies using the AGA system are planned for the 1976 fire season. ●



Some Bull In Fire Research

A bull's presence in a burned over aspen-invaded, grazing area is one indication that aerial ignition systems can be a useful management tool in lighting large prescribed fires designed to rehabilitate rangelands for game habitat or domestic livestock use.

One of the research projects undertaken by PFRC fire researchers was a cooperative prescribed burn on open rangeland in the Peace River District. In conjunction with the B.C. Forest Service and the

local cattlemen's association, 7,000 acres of rangeland 50 miles west of Fort St. John was lit-up, using an aerial incendiary device. The primary objective was to burn off an accumulation of dead grass and kill aspen suckers that were preventing access to grazing animals.



Two weeks after the burn, the area was green with new grass that benefitted from the released nutrients and increased soil temperatures below the blackened surface. The fire had removed 80 per cent of the dead grass and killed most

aspen stems up to two inches in diameter without causing damage to the mineral soil.

Researchers report that preliminary results are very encouraging but that repeated burning will be necessary to completely remove the aspen stems.

The use of the aerial ignition device enabled crews to lay a fire line completely around the area in a very short period. More than 10,000 plastic capsules, containing potassium permanganate and injected with ethylene glycol, were dropped, 90 per minute, from a helicopter flying at a height of 300 feet.

The most significant feature of the experiment was the use of the aerial ignition system for large scale rangeland and wildlife habitat improvement. Researchers believe the system will enable resource managers to carry out prescribed underburning over large areas with a small crew in a quick and efficient manner. The AID system is now available on a commercial basis. ●

Guides Help Fire Boss

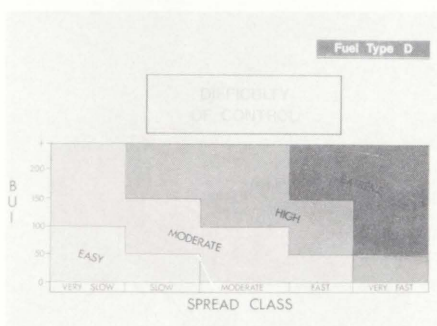
Preliminary forest fire behavior guides produced in 1975, will help fire managers predict fire potential in five generalized fuel types in British Columbia.

The PFRC fire research group developed the preliminary guides to supplement the fire danger rating information provided by the Canadian Forest Fire Weather Index System (CFFWIS).

The guides will form part of a B.C. Forest Service operational decision-

aid package being provided to fire managers in the province.

There has been a requirement to describe ease of ignition, relative rates of spread and relative difficulty of control



in various fuel types under a full range of fire weather conditions. The preliminary guides use the moisture codes and indices of the CFFWIS to rate ease of ignition as difficult, moderate to easy and very easy; rate of spread in six

classes from very slow through to extreme; and difficulty to control in four classes from easy through to extremely difficult. Four fuel types of standing timber and one type of slash situation are described by the guides.

Although the guides are preliminary they do provide planning help to the fire manager over and above what can be done with only the CFFWIS. More sophisticated guides will be provided in the near future.

By making the guidelines relative to benchmark fuel complexes and describing relative ease of ignition, spread rate and control difficulty, fire management planning can be better matched to site specific demands. Fire researchers emphasize that accurate and representative weather observations are the key to successful use of the fire behavior guides and the basic fire weather index system. ●

Bark beetles, spruce budworms, Douglas-fir tussock moths and black army cutworms are the major forest pests affecting B.C.'s timber stands, according to recent reports by the insect and disease survey section of the Pacific Forest Research Centre.

The 1975 surveys show that there is a severe outbreak of the mountain pine beetle in five of the six provincial forest districts. It is considered the single most serious pest problem in all but the Vancouver District, where the spruce budworm is forest enemy number one. In the Vancouver District where there is little lodgepole pine, the pine beetle has attacked white pine in the southern areas and some lodgepole pine stands in the relatively inaccessible areas of the Klinaklini River which flows into Knight Inlet.

All reports indicate that 'red trees', resulting from the 1975 attack, will be evident throughout the province in 1976.

Other bark beetles on the increase include the Douglas-fir bark beetle, reported in the Cariboo and Vancouver Districts. The spruce beetle, at low levels during recent years, is on the upswing, particularly in Engelmann spruce stands northwest of Kamloops. Windthrow and drought conditions in 1973 have contributed to the buildup of the spruce beetle.

Budworm

The western spruce budworm in the Vancouver district, is causing medium to heavy defoliation of Douglas fir in Lillooet River north of Pemberton, along the Fraser Canyon, and east of Hope, extending also into the north-western portions of the Kamloops Forest District and into Manning Park. This outbreak has been continuous in some areas since 1970, and even though Douglas fir usually recovers after repeated attacks, some tree mortality and top-killing is becoming apparent in a few stands which have sustained defoliation for six consecutive years.

Tussock moth



Tussock Moth

The Douglas-fir tussock moth is causing considerable tree mortality in the valley of the North Thompson River north of Kamloops, and in a large area south of Kamloops lake. However, direct control measures, coupled with an increase in a natural virus disease, have resulted in a reduction of egg masses, and populations are expected to be lower in several of the areas in 1976.

Army Cutworm

The black army cutworm, although still epidemic in four conifer plantations in the Golden, Revelstoke and Salmon Arm areas, is generally on the decline. Fall sampling of this insect indicates very high insect parasitism and predation by birds, pointing to lighter infestations in 1976.

The blackheaded budworm, a serious defoliator of western hemlock in the coastal regions for the past five to six years, virtually disappeared during 1975. It was restricted to a few stands on the Queen Charlotte Islands. High parasitism of looper eggs has contributed to the decline of the hemlock looper in Douglas fir in the interior.

Annual Survey

The B.C.-Yukon detection survey undertaken by specialists from the Pacific Forest Research Centre in Victoria is part of an annual nation-wide program. Technicians, working with B.C. Forest Service and forest industrial personnel, locate, define and forecast the distribution and intensity of outbreaks and the damage that may be expected.

Information is collected on the identity, biology, natural control parasites, and general ecological relationships of forest insects and disease.

In British Columbia, over 800 collections were made in 1975. Results of the survey assist resource managers in determining allowable cuts and implement salvage logging if required.

Pest Survey 1975



Black Army Cutworm