Timberlines

NORTHERN FORESTRY CENTRE
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Countdown to Climate Change

"Canada's Atmospheric Environment Service predicts that by the year 2030, we may have effectively doubled pre-industrial levels of carbon dioxide (CO2) in the earth's atmosphere if present trends continue." At a recent information seminar on the greenhouse effect and forestry held at the Northern Forestry Centre, Dr. Mike Apps quickly built a case for what he believes to be the inevitability of climatic change. Dr. Apps' presentation was followed by those of two other senior research scientists at the Centre, Steve Zoltai and Dr. Teja Singh.

This seminar was held to acquaint Northern Forestry Centre staff with current thinking on the intensified greenhouse effect and climatic change. Information sharing is an initial plank of a Forestry Canada strategy to deal with climatic change being prepared by Mr. Zoltai, Dr. Doug Pollard and Dr. Paul Addison (the latter two with Forestry Canada's Pacific Forestry Centre and Forest Science Directorate in Ottawa, respectively). The draft strategy identifies the major impacts on forest ecosystems that can be anticipated due to climatic change; proposes the relevance of current Forestry Canada research programs be examined in light of this change, and offers suggestions as to future direction of departmental programs.

A doubling of carbon dioxide will likely result in an average global temperature increase of between 1.5°C and 4.5°C by 2050.

Dr. Apps stressed that, to a certain degree, the greenhouse effect is necessary to make the earth habitable. Carbon dioxide in the atmosphere acts as a natural blanket to hold in some of the sun's heat. The amount of CO_2 in the earth's atmosphere has maintained an intricate heat balance for over 600 million years, a balance controlled by a large number of natural cycles. The earth, when cold, boosts CO_2 production through changes in these cycles; when warm, it curtails such production while increasing storage of carbon dioxide. This natural thermostat works on a geologic time scale, with thousands of years of response time. The problem, says Dr. Apps, is that through man's actions such as burning fossil fuels and deforestation "we're plugging in an electric blanket—but we're not cold. What's worse, we're not yet taking effective steps to reduce CO_2 production—it's like losing the thermostat after setting it on high." Even if worldwide brakes were to be applied now to CO_2 emissions, said Dr. Apps, the accelerated greenhouse effect would continue for 50 to 100 years.

Scientists studying climate change generally agree that a doubling of carbon dioxide will likely result in an average global temperature increase of between 1.5° and 4.5° C by 2050. However, temperature increases could be even higher (by twice as much or more) in northern and southern latitudes. That projection has

Continued on page 3...

Voracious Armada Expected to Return

At its worst late last spring, homeowners in four Edmonton-area counties battled wriggling hordes of forest tent caterpillars blackening the sides of their houses like scenes from a grade-B horror movie. Unfortunately, the caterpillar infestation outlook for those counties in particular, and for other areas in Alberta and Saskatchewan this spring (see map) is just as bad.

Public concern in Alberta over methods to control these pests has led to formation of the Alberta Forest Tent Caterpillar Technical Committee. Jim Emond, Senior Forest Insect and Disease Survey Technician and Howard Gates, Forest Insect and Disease Survey Ranger, represent the Northern Forestry Centre on the committee. Other participating agencies include Alberta Environment, Alberta Agriculture, Agriculture Canada, county fieldmen, horticulturalists and the City of Edmonton.

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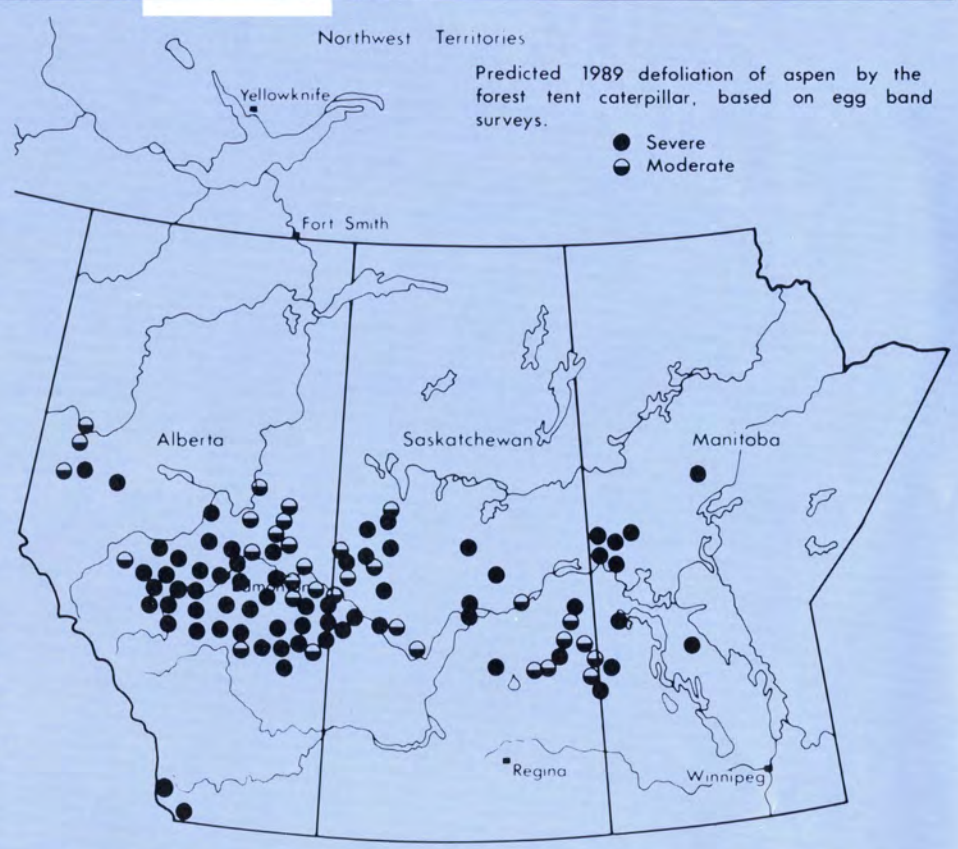

Predicted 1989 defoliation of aspen by the forest tent caterpillar, based on egg band surveys.

● Severe
◒ Moderate

Forest tent caterpillar nest.

Committee members are anticipating requests by Edmonton-area counties to hold public meetings, likely in March or April. They will be prepared to answer questions about the biology and life cycle of the forest tent caterpillar, indicate the expected severity of the anticipated outbreak and to advise on control methods. Alberta regulations currently allow aerial spraying of only the biological pesticide Bacillus thuringiensis (Bt) over residential areas, including acreages. Certain chemicals such as Malathion and Dylox are approved for ground application only. Those interested in having the committee make a presentation are asked to contact the Pesticide Chemicals Branch of Alberta Environment.

Spruce budworm is expected to cause the other major trouble in the region this year, particularly in the Footner Lake and Grande Prairie Forests of western and northern Alberta, and in the Hudson Bay area of east-central Saskatchewan. The Saskatchewan government already has a salvage harvesting program operating in that valuable timber-producing region, expected to continue this year. In Alberta, attention is focused on a 700-hectare strip of spruce forest along the Peace River north of Eaglesham in the Grande Prairie Forest. Bordering farmland, the Alberta Forest Service sees this area offering an opportunity for small-scale timber harvesting, in addition to some recreation and wildlife management possibilities.

In cooperation with Northern Forestry Centre staff, sample plots were established last fall, foliage specimens taken and an aerial survey of the area completed. Dr. Herb Cerezke, a research scientist with the Northern Forestry Centre, says data gathered from the sample plots point to high populations of spruce budworm in the area this summer. The Alberta Forest Service will be examining options aimed at best managing that stretch of timber.

The most positive information on insect conditions this year relates to jack pine budworm and mountain pine beetle. Budworm populations have collapsed across the region, with only slight damage anticipated from this pest in some areas. Mountain pine beetle populations in the foothills of southwestern Alberta, and in the Cypress Hills of southeastern Alberta and southwestern Saskatchewan are also generally low, but will be monitored this year.

for Peat's Sake

Collapsing permafrost peatland on Horn Plateau, about 165 kilometres northeast of Fort Simpson, N.W.T.

Wetlands occupy a unique position in Canada's ecological makeup. These transitional terrains harbor singular, distinctive flora and fauna while acting as vast freshwater reservoirs. Their diverse characters are revealed in their names—ribbed fen, slope bog, salt marsh, treed swamp and muskeg (a word of Algonquian origin)—to name a few. They also, as noted in the foreword to Wetlands of Canada, have mystical qualities with power to stir the imagination. Who, upon hearing of discoveries of human bodies centuries old preserved in peat, does not pause to think of things metaphysical?

It's estimated that 14% of Canada, over a million and a quarter square kilometres, is defined as wetlands.

Continued on page 8...

Countdown to Climate Change

Continued from page 1.

Evaporated prairie sloughs such as the one pictured here are predicted to become more common if climate warming continues.

profound implications for Canada, and for the country's forests, Steve Zoltai told seminar participants. "Under the doubled carbon dioxide scenario, the country's ecoclimatic zones would shift—transitional grassland up to 700 kilometres into the boreal forest, boreal into the subarctic and subarctic invading the arctic. It will be difficult for any kind of vegetation to reach an equilibrium."

In what are presently the lower reaches of the boreal zone, Mr. Zoltai said temperature increase is projected to bring with it dry summers, more frequent and intense forest fires, and more severe insect and disease infestations. The changing ecology of the zone would result in a low survival rate for some conifer species with a corresponding increase in the growth of grasses and herbaceous plants. The outlook for the northerly ranges of the boreal zone appears to be generally more favorable, although insects now south of the zone may expand their range north. A longer, warmer growing season would encourage faster growth, provided there is no depletion of soil moisture. Present species would likely survive, preserving the current species mix with perhaps a slight increase in hardwoods. Forests on the east slopes of the Rocky Mountains are forecast to survive at the higher elevations. Projections indicate, however, that some young softwood trees now growing in the southern two-thirds of the prairie provinces may not survive long enough to become merchantable in today's terms. "We must account for climatic change as forest research, management and development programs are planned," said Mr. Zoltai. "Only the timing and rate of this change are in doubt."

Dr. Singh addressed the impact of climatic change on the managed forest ecosystem as a whole. He outlined how rising temperature is likely to alter, for example, growing season, regeneration, wood densities and qualities, and snow accumulation and melt patterns. To be taken into account, too, are the effects of changing climate on wildlife and recreational values of the forest. Dr. Singh suggested short-term studies, in the form of bioeconomic models, are needed now to provide guidance in making the most of any beneficial impacts while minimizing adverse effects associated with climatic change. Because any shifts in land use (from forestry to agriculture, for example) will result in shifts in human populations, Dr. Singh noted long-term projections are also necessary to deal with the corresponding policy and planning implications.

The information seminar was a successful, thought-provoking opener to a subject that is receiving considerable attention throughout Forestry Canada. A follow-up seminar is planned.

REJUVENATING AN E

To the Cree, they were known as the "The Thunder Breeding Hills", the home and fountainhead of storms. The Cypress Hills of southeastern Alberta and southwestern Saskatchewan are a geological remnant that partially escaped glaciation 15,000 years ago. Rising almost 600 metres above the surrounding plains, they are the highest point of land between Labrador and the Rocky Mountains. With ecosystems ranging from mixed-grass prairie to montane, the Hills shelter over 250 wildlife species including lynx and the trumpeter swan. Fort Walsh National Historic Park attests to the tumultuous human history of the area, the most notorious incident being the Cypress Hills Massacre in the spring of 1873.

Today, the portion of the Cypress Hills in Saskatchewan set aside as Cypress Hills Provincial Park performs a vital tourism role (there is also a provincial park of the same name on the Alberta side of the Cypress Hills). The park comprises

Lodgepole pine stands have placed a characteristic stamp on the park.

three distinct areas known as the east, centre and west blocks. Campgrounds and recreational areas are concentrated in the centre block, with natural and historic attractions found in the west block. The east block remains largely undeveloped. Although white spruce stands are present, it is lodgepole pines that dominate. These pines have placed a characteristic stamp on the park as it is the only place in Saskatchewan where this species naturally occurs. These stands are now uniformly over a century old and an unwelcome tenant, the mountain pine beetle, has found them to its liking. If left entirely to natural succession, without the assistance of fire to regenerate the lodgepole pine, these aging trees would become further victims of insects, disease and decay. This process would eventually culminate in establishment of a predominantly white spruce forest ecosystem.

Partly because of the desire to maintain the lodgepole character of the montane areas of the park, the Cypress Hills Management Plan was prepared by a consultant in 1985. (The plan deals with several additional aspects of land management, including grasslands use, that will not be covered here). Several staff members of Forestry Canada's Prince Albert and Edmonton offices have been assisting Saskatchewan Parks, Recreation and Culture (SPRC) personnel to carry out some of the plan's recommendations.

Selective logging and small clearcuts have been gradually removing some of the mature lodgepole pine throughout the park while maintaining its aesthetic appeal. Replanting has also begun. At the request of Bruce Walter, a forester with SPRC, Alex Gardner and Derek Sidders of Forestry Canada's Saskatchewan District Office have been involved in site preparation and planting trials. Last summer Mr. Sidders, Renewal and Intensive Management Specialist, coordinated a contract in the west block that included planting over 100,000 lodgepole pine seedlings on 38 hectares, and site preparation of a further 55 hectares. An additional 100,000 seedlings are targeted for planting annually over the next four years. In the meantime Mr. Gardner, Research and Extension Coordinator, had been monitoring the growth of container and bareroot lodgepole pine seedlings. These seedlings were planted on four test sites last spring. Their progress will be monitored over the next few years to determine the site preparation/planting stock combination that will yield the best results for additional replanting.

Pictured here is local contractor planting lodgepole pine seedlings on prepared sites in Cypress Hills Provincial Park.

The long-term goal is a renewed

COLOGICAL TREASURE

lodgepole pine forest comprising a healthy mix of different-aged stands that will substantially reduce the risk of mountain pine beetle infestation. The larvae of this small beetle feed on the inner bark of pines, eventually killing them. Extensive damage from mountain pine beetle occurred from 1980-83 and has been declining since then, but populations rose slightly last year. It is largely through aerial surveys and pheromone baits set throughout the park that the trouble areas have been located. "The beetles are attracted to the pheromone-baited trees. The baits contain a synthetic formulation of two of the chemicals secreted by the insect, as well as an attractive component produced by the tree," says Dr. Herb Cerezke, a research scientist with the Northern Forestry Centre. "By counting the numbers of baited trees attacked, as well as the numbers of individual attacks on baited and nearby trees, we can estimate general population levels and track these from one year to the next for population trends." Now that phased, selective logging is underway in the park, the favored lodging of these beetles is diminishing.

Fire can perform an important cleansing and renewal function in a forest, particularly in pine stands where the intense heat opens up the cones to release seed. Fire is also a critical management issue in a park such as Cypress Hills where people and property are involved. The area is at particular risk not only because of the mature lodgepole pine forest cover, but also because the Hills lie within one of the three most severe fire weather zones in Canada. An extensive review of fire operations in the park therefore evolved out of the Cypress Hills Management Plan.

Bill De Groot, a Fire Technology Transfer Specialist with Forestry Canada's Saskatchewan District Office, coordinated this review. Mr. De Groot offered some alternatives and additions to current procedures for fire detection and initial attack (the first response to a fire). At the same time, however, he gave top marks to the way in which the initial attack crew is presently set up and organized.

Regarding protection of people and property, Mr. De Groot and park staff agreed a public information program would be valuable. Informed homeowners in forested areas in Colorado, for instance, have been able to effectively protect their properties from fire by installing sprinkler systems that wet down building exteriors. An audiovisual presentation describing the role of fire in the Cypress Hills is being produced, the first step in a fire prevention and protection information program for the park.

Fire is a critical management issue in a park such as Cypress Hills where people and property are involved.

Finally, Mr. De Groot viewed construction of fireguards in the core recreation area as essential to strengthened fire protection in Cypress Hills Provincial Park. Working with park staff, he designed a system of primary and secondary fireguards. This plan makes good use of natural fuel breaks, such as Lone Pine Creek, and man-made breaks in the park where trees have already been removed in selectively designed strips to lessen the fire hazard.

Cypress Hills Provincial Park is an ecologically complex network of past uses and future expectations, part of a geological and historical landmark on the Great Canadian Plains. The efforts noted above highlight some of the contributions of Forestry Canada to a wide range of management initiatives aimed at keeping the park a balanced, harmonious whole.

Taking Care of Business

Say a site preparation contractor has taken out a loan to buy a Timberjack 550 skidder for $130,000. With this equipment he could work year round if he wanted to; for instance, by preparing planting sites in the summer and skidding trees during the winter harvest (dragging them from cutting sites in the bush to a "landing" where they are delimbed and may be cut into "tree lengths" or "logs"). Although this typical owner-operator doesn't have to pay a lot in salaries, there's that large capital investment that must be paid off. A tree planting contractor on the other hand, with a crew of 10 to 20, faces different expenses—a high overhead contributed to by salaries, camp costs and transportation charges. Each of these silvicultural contractors faces a continual challenge to keep things "in the black".

The number of private contractors is small, but has been steadily growing over the past decade as the province has shifted responsibility for forest renewal on leased lands to the industry leaseholders.

A large part of that challenge is in bidding successfully for the work. In Manitoba, for example, most tree planting and site preparation contracts arise from two sources: the provincial government and two forest companies, Abitibi-Price Inc. and Manfor Ltd. The number of private contractors in the province is small, but has been steadily growing over the past decade as the province has shifted responsibility for forest renewal on leased lands to the industry leaseholders. The Canada-Manitoba Forest Renewal Agreement has opened up even more opportunities for private contractors, again through government and industry-sponsored projects. Since 1984, an additional 8 million seedlings have been planted yearly under Agreement reforestation programs, for a total of about 12-13 million annually. This planting initiative has prompted the need for added site preparation, planting and stand tending work.

While silvicultural contractors generally have excellent product and technical knowledge, many have no formal training in the "business side of business", preparation of bids being one example. Based on the results of a survey sent to silvicultural contractors throughout Manitoba last summer, a 2-day course sponsored by the Canada-Manitoba Forest Renewal Agreement went ahead in December to provide this kind of information.

The course, held in Winnipeg, was taught by Herb Bax, a professional forester with KBM Forestry Consultants Inc. in Thunder Bay. Participants were given useful definitions and formulas to help them calculate such things as their own fixed and operating costs and equipment depreciation. It was pointed out that interest, insurance and taxes must be considered. Fuel costs. Labor costs. Tires. Travel time. Productive hours. Downtime. All the financial vagaries of doing business must somehow be estimated or accounted for. Obligations under federal and provincial legislation concerning, for example, workplace safety and health must also be respected. And the course underscored the importance of requesting a written evaluation of the work performed—signed by both contractor and client.

Joe De Franceschi, a Forest Economist at the Northern Forestry Centre, pinpointed the need for a silvicultural contractors course, initiated the survey and hired the consultant. Mr. De Franceschi says the number (about 20) and mix of participants helped to make the course highly interactive and constructive. "Having buyers and sellers together—government and industry people, and contractors—aired everyone's points of view, particularly constraints. The practical exercises really brought that out," says Mr. De Franceschi. "The consultant's own contracting experience was also valuable because course participants could personally relate to many of Mr. Bax's examples." For the contractors, many of whom work in relative isolation for much of the year, getting together to compare notes was valuable in itself.

Government Supports Private Research

Take a walk through a lodgepole or jack pine forest, and sooner or later you'll likely see a pine with clumps of woody material on the trunk or branches. These clumps are called galls, symptomatic of western gall rust. Over the years, some operators of Christmas tree plantations and provincial tree nurseries across the prairies have seen their expectations wither with their trees because of this disease. Some forest industries are also concerned that their pine plantations are being affected by the rust.

Pioneering research done by Dr. Yasu Hiratsuka of the Northern Forestry Centre has shown how the disease invades trees and the mechanisms by which infection progresses. A University of Alberta researcher is now preparing to build on that knowledge foundation by exploring the potential of a certain compound to control western gall rust. Dr. Peter Blenis, an Assistant Professor with the University's Faculty of Agriculture and Forestry, plans to investigate the use of maltol to inhibit the infection of trees and to curb advancement of the disease. Maltol is a naturally-occuring substance that some conifers produce themselves in small amounts. When applied to the soil it is taken up by the tree, providing long-lasting and thorough resistance. Although it's clear that maltol inhibits western gall rust, it's not known exactly how this is accomplished. Dr. Blenis intends to show how and why maltol works, a first step toward devising preventative strategies.

Gall formed on young pine by western gall rust.

Although it's clear that maltol inhibits western gall rust, it's not known exactly how this is accomplished.

Dr. Blenis' work is being sponsored by the Unsolicited Proposals Program administered by Supply and Services Canada. This program was set up specifically to sponsor research projects initiated by private sector individuals and agencies that directly further the goals of federal government departments. Project initiators must show they have the backing of a federal department (including a specified commitment of seed money), that the proposal has scientific merit and is technically feasible, and that it is unique. Uniqueness can mean either that the proposal offers a new and unique idea, or that the proponent has a unique capability to take on the work.

The Northern Forestry Centre has endorsed Dr. Blenis' proposal to investigate maltol, and has contributed $4,000 through the Canada-Alberta Forest Resource Development agreement toward this two-year investigation. The balance of financial sponsorship has been committed by Supply and Services Canada through the Unsolicited Proposals Program.

More information about the Unsolicited Proposals Program is available from any office of Supply and Services Canada.

THIRD INTERNATIONAL IUFRO "RUSTS OF PINE" WORKING PARTY CONFERENCE

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Banff Centre, Banff, Alberta

Papers to be presented on such topics as resistance testing and screening methods, hazard rating and impact assessment, management and control, and research collaboration and networking. Conference also to include poster sessions and ½-day field trip.

Sponsored by the International Union of Forestry Research Organizations (IUFRO) and Forestry Canada.

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for Peat's Sake

Continued from page 3.

On a more factual plane, it's estimated that 14% of Canada, over a million and a quarter square kilometres, is defined as wetlands. Their importance as wildlife habitat and their role in freshwater movement and distribution have long been recognized by the scientific community but, until recently, no comprehensive book existed that uniformly described wetlands throughout Canada. With the publication last September of Wetlands of Canada, an information resource was created for many different audiences. The text, complemented by 135 photos and 92 illustrations, was written by a number of authors working in concert as the National Wetlands Working Group. This group is part of the larger Canada Committee on Ecological Land Classification.

Steve Zoltai, a senior research scientist with the Northern Forestry Centre, co-authored the book's chapters dealing with the wetlands of the arctic, subarctic and boreal regions. In the arctic and subarctic the phenomenon of permafrost partially melting and buckling the terrain creates arresting landscapes—and headaches for engineers involved in commercial or residential construction. Wetlands of Canada also describes wetlands of the prairies, of the temperate areas of Ontario and Quebec, and those of Pacific and Atlantic Canada, in addition to the salt marshes that are found countrywide. Each chapter positions the particular wetlands within their total environment, discusses their dynamics, their ecological values, and any ongoing development and/or conservation activities. Near the end of the book is The Canadian Wetland Classification System, also a first of its kind in providing a framework for uniformly classifying the diversity of wetlands found throughout Canada.

Wetlands of Canada is published by Polyscience Publications Inc., 555 Legendre E., Suite 24, Montreal, Quebec, H2M 1G2.

NOTE:

The dates in the Autumn 1988 issue of Timberlines concerning the Forest Modeling Symposium should have read March 13–15, 1989.

New Publications

Cerezke, H.F.; Emond, F.J. 1989. Forest insect and disease conditions in Alberta, Saskatchewan, Manitoba, and the Northwest Territories in 1987. For. Can., North. For. Cent., Edmonton, Alberta. Inf. Rep. NOR-X-300.

Emond, F.J.; Cerezke, H.F. 1989. Forest insect and disease conditions in Alberta, Saskatchewan, Manitoba, and the Northwest Territories in 1988 and predictions for 1989. For. Can., North. For. Cent., Edmonton, Alberta. Inf. Rep. NOR-X-303.

Kuhnke, D.H. 1989. Silviculture statistics for Canada: an 11-year summary. For. Can., North. For. Cent., Edmonton, Alberta. Inf. Rep. NOR-X-301E.

Kuhnke, D.H. 1989. Statistiques sylvicoles canadiennes: resume couvrant une periode de 11 ans. For. Can., Cent. for. Nord., Edmonton, Alberta. Rapp. inf. NOR-X-301F.

Kuhnke, D.H. 1989. Silviculture in Canada/La sylviculture au Canada. For. Can., North. For. Cent., Edmonton, Alberta. Brochure.

Ogilvie, C.J.; Young, R.W. Daedalus line scanner trials in Alberta, 1985 and 1986. For. Can., North. For. Cent., Edmonton, Alberta. Inf. Rep. NOR-X-298.

Yang, R.C. 1989. Growth response of white spruce to release from trembling aspen. For. Can., North. For. Cent., Edmonton, Alberta. Inf. Rep. NOR-X-302.

The NORTHERN FORESTRY CENTRE, located in Edmonton, Alberta is the western and northern regional establishment of Forestry Canada. The Northern Forestry Centre coordinates all federal forestry research and development activities throughout Alberta, Saskatchewan, Manitoba and the Northwest Territories.

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