Timberlines

FORESTRY CANADA
NORTHWEST REGION
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Forestry Canada Encourages Sustainable Development

With the passage of legislation last December, the Canadian Forestry Service became Forestry Canada, a new federal department. One of the cornerstones of Forestry Canada's new mandate is the commitment to sustainable development of the country's forest resources. Work is underway to coordinate and develop federal forest resource policies, promote sustainable development in the forest industry, and help Canada compete in international markets.

A fourth goal reaffirms the scientific and developmental role Forestry Canada has traditionally played in the country's forest sector, that of researching new tools and processes to improve forest management. In the Northwest Region, the Northern Forestry Centre will continue working with its traditional client base of provincial and territorial forest management agencies, the forest industry, research organizations and other federal departments. Research and development projects underway at the Centre dovetail with broader departmental objectives. For example, the Centre's lead role in assembling silviculture statistics supports the objective of a national forest database.

A Regional Strategic Plan is being prepared to guide the Northern Forestry Centre and Forestry Canada's District Offices in this region over the next 5-10 years. All staff members are regularly informed as this plan takes shape. Consideration is being given to five key new thrusts: mixedwood/aspen decision support systems, environmental and multiple-use concerns, a technology development unit, an aspen innovation centre, and climate change.

NORTHERN FORESTRY CENTRE
20 TWENTIETH ANNIVERSARY
"People and forests ... growing resources."

1990 marks the Northern Forestry Centre's 20th Anniversary. We view our achievements with pride, and look ahead to a challenging and changing role within our region. We bring to the task a legacy of world-class forestry research and development, together with highly-skilled and committed people. ♣

Research Proposal TARGETS Climate Change

With major petroleum companies declaring that "lead is dead" at Canadian gas pumps, it appears the public's call for cleaner air is being heeded to some degree. Despite the benefits of eliminating lead from gasoline at the retail level, scientists agree burning of fossil fuels remains a serious problem, contributing to the world-wide greenhouse effect.

Global warming is predicted to be most pronounced at high latitudes, placing Canada's northern boreal and mixedwood forest ecosystems at risk. A group of scientists called the Climate Change Action Group has put together a wide-ranging proposal to study the effects of climate change on our forests. This group is headed by Steve Zoltai, a research scientist with the Northern Forestry Centre.

To investigate climate change is a daunting task: where do you start? Members of the Climate Change Action Group hope to begin by sifting through pertinent studies and climate change models already developed, keeping what's useful and potentially useful. From there, research would get underway via a number of interconnected studies. One such study, for example, would help to determine silvicultural strategies and timber supplies under various climatic scenarios. Another study would follow a different tack by looking at what happened in the past, through examining boreal peatlands that underwent climate change. A third study would explore the effects of climate change at the forest-tundra boundary (it's expected that with a warmer climate, trees would extend their range into the tundra).

These studies are just a small sample of the work that's planned. Related research (but separate from the work of the Climate Change Action Group) into Canada's "carbon budget" is already underway. Dr. Mike Apps of the Northern Forestry Centre is overseeing this work, which is partially-funded through ENFOR (ENergy from the FORest). A private consultant is examining the amounts of carbon that forests and forest products take from and release into the atmosphere respectively. The intent is to calculate the current net balance of atmospheric carbon traceable to Canada's forest sector.

Northern Forestry Centre colleagues of Mr. Zoltai involved in the Climate

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July 26th, 1989. Adrenalin surging, Kelvin Hirsch fired new information into his PC, trying to gauge where the volatile infernos raging across Manitoba's northern forests would go next. For Mr. Hirsch, a fire research officer with Forestry Canada's Manitoba District Office, the only certainty was uncertainty. When he had used the Canadian Forest Fire Behavior Prediction (FBP) System to forecast fire behavior in the spring, it had performed like a pro. But now, what was going on?

What was going on was a record-setting fire season in Manitoba. At its height, 24,000 people were evacuated and the province declared a state of emergency. When the flames finally died, 2 million hectares (more than 5 million acres) of forest lay in charred silence.

Mr. Hirsch is still conducting his own post-mortem of the experience. The FBP System, developed by Forestry Canada, is designed to predict fire behavior under a variety of weather and fuel conditions; however, the situation in Manitoba last summer was unique. Tinder-dry vegetation was all that remained after two years of parched skies and light snow cover. Water and soil moisture levels had plummeted. Scorching temperatures in the 30-35°C range, coupled with relative humidities of 20-30%, set the stage for the major player, lightning.

In stark contrast to what was happening in Manitoba, a research team near Timmins, Ontario was waiting for conditions favoring fire—a prescribed burn, to be exact. Such burns are routinely used in northern Ontario to prepare logged areas for planting. Concern has arisen, however, over the method used to set such burns (a helicopter with a driptorch sets fires in a large spiral pattern), as intense, erratic fire behavior has resulted. A major Canada-U.S. study is now examining the behavior of such fires, and their smoke formation and dispersal. Obtaining data on smoke behavior is also important to researchers studying climate change, as forest fires release enormous amounts of carbon dioxide through smoke into the atmosphere.

Chuck Ogilvie, a fire research technician, represents the Northern Forestry Centre on this study team. Staff from Forestry Canada's Great Lakes Forestry Centre, Environment Canada's Atmospheric Environment Service, Ontario Ministry of the Environment, Ontario Ministry of Natural Resources, the United States Forest Service, North American Space Administration (NASA), and the U.S.'s National Oceanic and Atmospheric Administration are also cooperators.

With northern Manitoba ablaze next door, the Ontario team was biding its time. Mr. Ogilvie got a phone call. Would he be interested in testing his infrared camera and digital imaging system (AIDMAS) in Manitoba?

The system Mr. Ogilvie has assembled includes a high-resolution infrared camera in a pod slung on the belly of a Bell 206B helicopter. Images are recorded on 3/4" videotape and fed through a Compuheat VIPS 300 Analyzer where they are digitized. These digitized images are then recorded onto 1/2" VHS tape. All this in real time as the helicopter hovers up to 3200 metres in the air—with the equipment on board. Calculations of the distances fires travel, their areas and intensities can either be done on the spot, or later on a PC.

Mr. Ogilvie says the AIDMAS test run in Manitoba was invaluable. When it came to using the system in Ontario, much of the fine-tuning had been done and the Ontario fieldwork was a success.

Winter is the time when researchers like Mr. Hirsch and Mr. Ogilvie review their data, refine their computer programs and plan for the next field season. It's also a good time to share research findings and products. Last December, a national workshop on the FBP System was hosted in Winnipeg by Forestry Canada's national Fire Danger Group. Mr. Hirsch together with Bill De Groot, a fire research officer with Forestry Canada's Saskatchewan District Office, led some of the workshop sessions.

Representatives of fire management agencies from across Canada attended the workshop, held as a "sneak preview" of the first full edition of the FBP System before its formal release. The interim version released in 1984 has been well-accepted, proving its worth in controlling fires. With the first full edition in hand, fire management agencies can incorporate it into their planning for the upcoming fire season. The first full edition of the FBP System will be formally released in 1991.

Some may call the results of last summer's fires in Manitoba "devastation". Mr. Hirsch views them as a natural, if unique, event. They have provided him and the members of the Fire Danger Group with the opportunity to adjust and further refine the FBP System before its formal release. "The FBP System is based on actual fire observations, but very little data exist for the severe conditions we encountered last summer," notes Mr. Hirsch. "I'm planning to talk to some of the field people who were out there, to verify the information that was reported to me. Their observations should help us to strengthen the FBP System's data base at the extreme end of the scale."

Improved Growth PerpHormance Sought

"House calls" to forest industries throughout the Northern Forestry Centre's region are a regular part of Dr. Ivor Edwards' job. Dr. Edwards, a research scientist, and Joe Van Dyk, a nursery management technician, have been working lately with staff at Weldwood of Canada Ltd. in Hinton, Alberta. The company has been thwarted in three attempts at replanting one of its cutblocks. Many of the white spruce seedlings have died and survivors have been doing poorly.

High soil alkalinity (high pH) was diagnosed as the problem. Not only that, the soil has a high buffering capacity that resists attempts to lower the pH. Dr. Edwards and Mr. Van Dyk initially determined that this buffering capacity could be neutralized by adding an acidifying agent to the soil; one of three strategies now being investigated is aimed at finding an inexpensive way of doing this. A second strategy would be to plant seedlings grown from seed collected from conifer species growing elsewhere in the province that have adapted to alkaline soil. White spruce would be the preferred species, but because of site considerations, Douglas-fir would also be tried. Third, Dr. Edwards is scanning scientific literature to identify species of mycorrhizae that would thrive under alkaline soil conditions. Mycorrhizae are helpful fungi that attach themselves to plant roots, helping them to take up nutrients from the soil. The next step would be to introduce such fungi into the soil at the cutblock site.

It's hoped that results from one or all of these avenues will enable Weldwood to successfully restock what had once been a forested site. ♣

TRY before you BUY

Industry and government forest managers are always on the lookout for accurate, inexpensive methods to map harvested areas (cutovers). It's a tall order, for low costs and precise results rarely go hand-in-hand. In pursuit of such a rare find, Ron Hall, a researcher at the Northern Forestry Centre, has compared the effectiveness and relative costs of various remote sensors in recording the sizes of cutovers. Working closely with Mr. Hall were Bob Dams of Intera Technologies, Dr. Frank Ahern of the Canada Centre for Remote Sensing, and Dean Patterson, a remote sensing technician formerly with the Northern Forestry Centre. The project was initiated at the request of the Alberta Forest Service.

Portions (wavebands) of the electromagnetic spectrum are continually being bounced back from our world in the form of light or heat. Each of the remote sensing devices tested was designed to home in on and digitally capture different, specific wavebands. In addition, each device produces images of different spatial resolution; i.e. for any defined area, some devices will produce clear, detailed images while others produce less well-defined images. When the captured information is interpreted, mapped and compared, the shortcomings and strengths of each device in producing pictures of Earth's surface become apparent.

The evaluation got underway with a study of imagery data from the LANDSAT satellite. LANDSAT carries two remote sensing devices known as the Thematic Mapper (TM) and the Multispectral Scanner (MSS). Next, images obtained from the SPOT Satellite Panchromatic Linear Array (PLA) and Multispectral Linear Array (MLA) were examined. The SPOT Satellite was launched by France. Finally, the STAR-1 X-Band RADAR sensor owned and operated by Intera Technologies was evaluated; this information was obtained from aircraft.

The SPOT PLA was found to be the most accurate in recording cutover sizes relative to their actual areas (91% accuracy rate); LANDSAT MSS was the least accurate (86.9%). Mr. Hall found that the accuracy of all the devices increased as the size of the cutovers increased. Similarly, when comparing the depiction of cutover boundaries with the actual boundaries, SPOT PLA was found to be the most accurate (within 24.0 metres); LANDSAT MSS the least accurate (within 38.3 metres).

And what about costs? Using LANDSAT TM data was found to be one-twelfth as expensive as obtaining forestry information from conventional aerial photographs, the method currently used the most by provincial and territorial forest management agencies. SPOT, which came out on top in terms of accuracy, was about one-fifth as expensive as using aerial photographs.

The ideal for forest management agencies would be to update provincial or territorial forest inventories every year. The evaluation of the remote sensing devices done by Mr. Hall and his colleagues provides a valuable reference for choosing the method, or combination of methods that would give the best value for the annual inventory dollar. ♣

Northern Forestry Centre Welcomes ...

Mario Aguilar, Molecular Geneticist. Dr. Aguilar was formerly with the Universidad Nacional de La Plata in La Plata, Argentina.
Kathy Earl, Records Clerk. Ms. Earl was previously with Veterans Affairs in Edmonton, Alberta.
Brenda Laishley, Scientific Editor. Ms. Laishley comes to us from Weldwood of Canada Ltd. in Hinton, Alberta.
Bill White, Forestry Development Economist. Dr. White joins us from Forestry Canada's Pacific Forestry Centre in Victoria, British Columbia.

... and congratulates staff who have received permanent appointments ...
Mim Keryliuk, Storesperson.
Janet Sayko, Purchasing Clerk.
Peter Todd, Silviculture Specialist.

Research Proposal

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Change Action Group include Dr. Apps, Dr. Teja Singh, Dr. Jan Volney and Dr. Ian Corns. Representatives from Forestry Canada's Great Lakes Forestry Centre, the Alberta Research Council, Saskatchewan Research Council, University of Alberta, University of British Columbia and Boreal Institute for Northern Studies also form part of the group. Application has been made to Forestry Canada's Science and Technology Opportunity Fund for help in underwriting the project.

Initially, the methodologies and models that result from the Climate Change Action Group studies will have a west-central Canada focus. Eventually, they will be expanded to cover all of Canada. Reports will be made available, and workshops and symposiums are planned to share the knowledge gained through the studies. ♣

Study Reaches ELEMENTARY CONCLUSION

When there's a natural gas well blowout, it's news—sometimes international news—and the characteristic "rotten egg" smell of the hydrogen sulphide, or "sour" gas hangs heavily in the air. Such isolated events can be spectacular, and the sour gas spewing out inevitably arouses widespread public concern. But what of the long-term effects of sulphurous emissions created every day by a gas company's operations?

For Forestry Canada's air pollutants research scientists, the focus has naturally narrowed to studying the effects of sulphurous airborne pollutants on forest ecosystems. Over four years, Dr. Doug Maynard and his research team at the Northern Forestry Centre collaborated with Canterra Energy Ltd. (now Husky Oil) and Gulf Canada Resources Inc. at the companies' operations near Rocky Mountain House, Alberta. Test samples of soil, understorey vegetation and lodgepole pines near the gas plants taken at the start of the study were compared with similar samples four years later. Frank Radford, Senior Analytical Research Technician, and Yash Kalra, Analytical Services Chemist, assisted Dr. Maynard with the analyses.

Some unexpected findings resulted. Sulphurous air emissions from the gas plants were found to have little or no measurable effects on the forest. What was harming the forest ecosystem was airborne elemental, or solid sulphur produced when natural gas is extracted from sour gas. Approximately 98% of the sulphur can be removed and converted into a solid form. The study found that dust from solid sulphur being stored beside the plants was blowing into the nearby forest, causing site-specific damage as far as a kilometre away. When the research project first began, Dr. Maynard's team noted high sulphur content in the lodgepole pines themselves, and that the understorey vegetation had disappeared. Four years later those problems remained. In addition, pine needle loss and failure of buds to open were noted in some areas.

Over the course of the study, Dr. Maynard's team developed a new procedure to test soils for the presence of elemental sulphur. The procedure now forms part of Alberta Environment guidelines, acting as a barometer of sorts against which natural gas plants are to measure their effectiveness in minimizing sulphur dust dispersion.

Not all research equipment is high-tech. Here, a plastic food container with terry towel inside collects sulphur samples on the forest floor.

New Publications

Drouin, J.A. 1989. Herbicide efficacy trials in Alberta and Manitoba, 1980-85. For. Can., North. For. Cent., Edmonton, Alberta. Inf. Rep. NOR-X-306.

Edwards, I.E. 1989. Proceedings of the 1987 Federal-Provincial Nurserymen's Meeting, September 8-10, 1987, in Indian Head, Saskatchewan. For. Can., North. For. Cent., Edmonton, Alberta. Inf. Rep. NOR-X-307.

Ondro, W.J. 1989. Utilization and market potential of poplar in Alberta. For. Can., North. For. Cent., Edmonton, Alberta. Inf. Rep. NOR-X-305.

The NORTHERN FORESTRY CENTRE, located in Edmonton, Alberta is the Northwest 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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