timberlines

Forestry Canada, Northwest Region

Third Quarter 1991

Where will we find a forest scene such as this 100 years from now? Please see the articles on climate change on pages 4-6.

In this issue

Forestry Canada Forêts Canada

Canada

Hands from across the Pacific help natives plant trees

It wasn't New Zealand, and it certainly wasn't dancing. But the Kahurangi Maori dance group was in the right place at the right time—tree planting time on the Sarcee Nation Indian Reserve (located just west of Calgary, Alberta) on June 1 and 2, 1991.

And, just by chance, a group of Boy Scouts happened to be holding a jamboree on the Sarcee land. Being in the tree planting business themselves on occasion, they offered to lend a hand. About 40 Scouts joined in the planting bee with the 15 Maoris and 40 natives.

The unexpected collaboration came about as 40 Sarcee Band members faced the daunting task of planting 13 000 lodgepole pine seedlings on clear-cuts on their land. That was their role in a Forestry Canada and Statistics Canada tree planting project to honor the 1991 national census (see the article on this page). With all the extra help, the seedlings were planted during a weekend instead of the anticipated 10 days.

Kahurangi, an internationally acclaimed Maori dance group whose name means cloak from heaven, was taking a break from performing and was visiting the Sarcee Reserve that weekend.

Coincidentally, one of the dancers had been a general bushman in the past, planting radiata pine for New Zealand Forest Products, and others in the group have planted trees for a living as well. When he and the other dancers saw what needed to be done, they pitched right in, helping to train and supervise the weekend tree planters.

"The Maoris were good, very good," commented Forestry Canada Development Officer John Mrklas,

J. Mirklas

Natives carefully plant a tree seedling.

who worked with the Sarcee Band to arrange the tree planting effort. He was impressed with the professionalism of the impromptu tree planters, as was Tom Mazurek, a Silvacom Ltd. forester who had been hired by Forestry Canada to train the Sarcee natives in tree planting.

The dance group, on the other hand, commented on how nicely grown the seedlings were. The trees were purchased from the Alberta Forest Service's Pine Ridge Forest Tree Nursery near Smoky Lake.

—J. Samoil

Making amends: StatsCan replaces trees

Although the endless questions of the 1991 Census may be quickly fading from your memory, the spirit of the Census lives on in 50 000 pine and spruce seedlings planted this spring on three Alberta Indian reserves.

Statistics Canada

Proudly displaying the plaque commemorating the 1991 Census Day tree planting are (left to right) Sarcee Chief Roy Whitney, Minister of Forestry Frank Oberle, and Assistant Chief Statistician Bruce Petrie.

The seedlings are symbolic of the trees harvested to produce the Census forms and of the thousands of census takers who knocked on doors on June 4, 1991. Statistics Canada and Forestry Canada's Northwest Region cooperated in this initiative to recognize the significance of Census Day, the importance of Canada's forests, and the cultural diversity of this country.

At a commemorative tree planting and plaque unveiling held on May 6 on the Sarcee Nation Indian Reserve near Calgary, federal Forestry Minister Frank Oberle commented that projects such as this remind Canadians that we are truly a forest nation. Also participating in the planting ceremony were Sarcee Chief Roy Whitney and Statistics Canada Assistant Chief Statistician Bruce Petrie.

The 50 000 seedlings were planted during June on the Sarcee Nation Reserve (13 000 lodgepole pine) and the Beaver Lake and Heart Lake reserves near Lac La Biche (18 500 white spruce each).

Forestry Canada paid the labor costs for the trees to be planted and made the arrangements for obtaining the trees from the Alberta Forest Service's Pine Ridge Forest Tree Nursery, while Statistics Canada paid for the seedlings.

—J. Samoil

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Spruce budworm study changes control strategy

What a difference a week can make! In the business of insect control, timing is everything, especially when you are dealing with controlling spruce budworm on white spruce in Alberta.

Mention spruce budworm to people, and the scene many envision is a vast panorama of the denuded balsam fir forests of eastern Canada. In western Canada, spruce budworm infestations are a problem in the isolated white spruce stands that characterize much of the region's boreal forest.

Furthermore, what works in the east is not suitable here, a Forestry Canada research team has discovered. As a result of its recommendations, the Alberta Forest Service (AFS) is changing its spruce budworm control strategy from foliage protection to population suppression, says Jan Volney, Project Leader, Insect and Disease Management Systems and Surveys, at the Northern Forestry Centre.

An unexpected benefit of the study is that Forestry Canada has gained valuable information on statistically robust sampling and monitoring techniques for assessing budworm impact on white spruce stands.

Hawk Hills blocks sprayed

In the summer of 1990 Forestry Canada was invited to carry out a research study in conjunction with operational trials the AFS was planning for the Hawk Hills area in northern Alberta. Two formulations of *Bt (Bacillus thuringiensis)* were sprayed on June 7, 1990, on two blocks of white spruce.

The study results showed clearly that in Alberta reducing the budworm population levels was a more effective strategy than trying to reduce damage to the foliage in the year of treatment. "We want to be able to knock the populations of budworm down to a level where natural enemies can then control them," said Dr. Volney.

In eastern Canada the fourth instar stage of budworm development is targeted for spraying of balsam fir. This study, however, found that in northern Alberta it is not until the insect is in the sixth instar that the spruce shoots on which they feed start to expand, Dr. Volney explained. Exactly why there is such a difference in the budworm's development will be studied further by a doctoral candidate working with Forestry Canada and the Department of Entomology at the University of Alberta.

J. Volney

Sampling methods for the spruce budworm research project sometimes called for a different perspective.

If spraying is done too early in the season when the spruce bud cap is still on the developing shoot, the foliage that the insects eat will not be exposed to the spray. In 1990 at Hawk Hills this occurred between June 1 and 8. A better time for spraying is a week later when shoot elongation occurs and the bud cap is lost.

Population control targeted

Although the spraying was only marginally effective at reducing budworm populations, the researchers noticed that the number of budworm eggs in the sprayed blocks were lower than expected. As a result, this year the study at Hawk Hills sprayed small, isolated populations of budworm with two treatments of a stronger experimental dose of *Bt*.

"We wanted to demonstrate that you can suppress populations. Then you can start quibbling about the technique," said Dr. Volney. This strategy aims to knock down the population for the year following application. The initial results look very good, he says.

One offshoot of this study has been establishment of permanent sample plots that will be used to assess the effect of budworm defoliation on forest productivity. A benefit-cost analysis can then balance the value of the lost wood and economic activity against the costs of spraying.

H. Cerezke

Spruce budworms leave behind dead needles and silken threads on white spruce.

Working with Dr. Volney on the spruce budworm study were Forestry Canada employees Herb Cerezke, Andu Yohannes, and Peter Amirault and student Mike Doll in addition to six AFS employees. Art Robinson and Kees van Frankenhuyzen of Forestry Canada's Forest Pest Management Institute in Sault Ste. Marie, Ontario, also assisted in the study.

—J. Samoil

Forestry Canada launches a major program to study

Everybody talks about it. Finally, Forestry Canada is doing something about it—determining the effects of climate change, that is.

Scientists agree that the concentration of carbon dioxide and other gases in the air will likely double within the next 100 years, resulting in a global warming of the atmosphere of 1-4°C. They do not, however, know what the end result of that warming will be.

Because the polar regions are expected to warm by 7-10°C, the potential effects on Canada's boreal forest could be tremendous.

The boreal forest is a significant feature across the whole of Canada.

"Our region is near the bull's-eye of the climate change effect," points out Mike Apps, a Forestry Canada, Northwest Region, scientist who is also team leader for Forestry Canada's national climate change program. Regionally, Steve Zoltai is leader of the Northwest Region's Canadian Forests and Climate Change project that was created earlier in 1991.

Forestry Canada's climate change initiative, part of the Government of Canada's Green Plan announced in December 1990, is designed to collect the scientific information needed to make, at the very least, an educated guess about what could happen. "Will our forests be part of the problem or part of the solution?" wonders Dr. Apps.

The southern part of the Northwest Region (Alberta, Saskatchewan, Manitoba, and the Northwest Territories) may experience significant drought, and this has Dr. Apps concerned. He notes that "The northern part will be warmer, but the soils and seed dispersal may limit the expansion of forests into that area."

Dr. Apps sees a double challenge for Forestry Canada's scientists. First, they must determine how forests might respond to climate change. Decisions would have to be made regarding, for example, what trees to plant now for the future timber supply and what resources should be allocated to fire fighting if the incidence of fire increases.

Secondly, the scientists must examine the role of the changing forest ecosystem and resource management in mitigating or exacerbating the changing environment. What potential do we have to change that?

Coordinated effort the key

Forestry Canada's climate change initiative is a coordinated research effort that makes use of the talents of scientists at all eight Forestry Canada establishments. The Northwest Region is providing the scientific leadership for this national program.

The challenge for the program is to generate scientific data or best estimates regarding the consequences of a changing climate and to formulate strategies to enable the forestry community to take advantage of opportunities that might arise and to prepare for any potential detrimental impacts.

The climate change research falls into three categories: integrating studies, filling knowledge gaps, and miscellaneous projects. In addition, there will be administration activities and coordination with related international studies.

the effects of climate change

Integrating studies will pull together existing climate change research data and try to place it in a predictive framework within a national and international policy context. The single study in this category is one headed by Dr. Apps to further develop a model for assessing the carbon budget of Canadian forests and forest activities under alternative scenarios of climate change and resource management. His principal collaborator is Vancouver consultant Dr. Werner Kurz, but the study is a large team effort that draws in industry, government, and university expertise.

Knowledge gap studies have been selected to provide a coordinated effort in field research by having people from different parts of Canada working in different disciplines on a case study in the Northwest Region. All of these studies will take place along a line extending from the BOREAS transect, a line in the boreal forest between Prince Albert National Park in Saskatchewan and Nelson House, Manitoba (see the accompanying article on the BOREAS program).

The result will be hard data for a gradient of changing ecological and climatic conditions, from aspen parkland in the south to tundra in the north.

Miscellaneous studies will investigate specific forest disturbances related to cli- mate change and will take place in eastern Canada. Examples are studies on dieback of hardwoods, stress indicators, and insect dynamics models.

Northwest Region's role

In addition to the carbon budget study by Dr. Apps that was mentioned earlier, the Northwest Region is responsible for a number of other climate change studies.

The dynamics of peat production and decay will be studied by Mr. Zoltai as he considers the trade-off of carbon sequestering versus production of methane and carbondioxide.

One study will examine photosynthesis, evapotranspiration, and carbon synthe- sis in relation to changes in forest productivity from the northern edge of the prairie grasslands through the boreal forest and to the arctic tundra in

Continued on page 6

BOREAS: measuring the winds of change

BOREAS, the Greek god of the north wind, would likely be awestruck by the scope and intent of his namesake international study. During 1994, after 4 years of planning, several hundred Canadian and American researchers associated with the BOReal Ecosystem Atmospheric Study will descend on two sites in Manitoba and Saskatchewan to collect data on the boreal forest by land, by air, and from space.

BOREAS is a challenging, cooperative effort between Canada and the United States that focuses on the impact of climate change on the boreal forest, which accounts for nearly one-third of the forested land of the world.

Although containing less species diversity than the tropical forests, the boreal forest (because of its size) could play a significant role in regulating climate changes. These changes in the boreal forest could have severe consequences for the many developed nations that rely on it for economic, social, and esthetic purposes.

Predicting the future role of the boreal forest first requires a sound understanding of how the forest responds to changing conditions, from the leaf level to the whole forest level. It is hoped that BOREAS will provide some of that basic knowledge.

Forestry Canada is a significant participant in BOREAS. The Northwest Region's Mike Apps, who is team leader for Forestry Canada's national climate change program, is on the study's Science Steering Committee, as is Don Leckie, Project Leader, Digital Remote Sensing, at the Petawawa National Forestry Institute in Chalk River, Ontario.

The climate change initiative of the Government of Canada's Green Plan is expected to provide funds for a number of studies coordinated with the BOREAS research activities, support for preparation of the EARP (Environmental Assessment and Review Process) sub- mission, and a field officer to help coordinate BOREAS activities in Canada over the next 5 years.

Major field effort in 1994

The major field effort will take place in 1994 when the study's two 20 X 20 km sites at Prince Albert National Park in Saskatchewan and Nelson House, Manitoba, will be the focus of intensive information gathering.

Simultaneous ground-based measurements, tower-based observations, and aircraft and satellite imagery will be used to improve understanding of the biological and physical processes and states that govern the exchanges of energy, water, heat, carbon, and trace gasses between the boreal forest and the atmosphere. The study will also develop remote sensing techniques to expand the understanding from local to regional scales.

Three main field campaigns will be conducted during the growing season, with a possible fourth in the late winter. Simulation models of ecosystem productivity and carbon cycling will be used to interpret the observations.

Data analysis and monitoring will continue during 1994-96.

The knowledge gap studies being conducted as part of Forestry Canada's climate change initiative are all taking place on a transect that runs through the two BOREAS sites and will produce more information on the boreal ecosystem dynamics over time and space.

Cooperating with Forestry Canada on the study are Energy, Mines and Resources Canada's Canadian Centre for Remote Sensing, Environment Canada's Atmospheric Environment Service, Agriculture Canada, the Royal Society of Canada as part of the Canadian Global Change Program, and the U.S. National Aeronautics and Space Administration.

—I. Samoil

A primer of Canadian climate change programs

Forestry Canada's climate change initiative under the Green Plan joins a number of other research programs concerned with climate change and forests. Here are some of the major activities the Northwest Region is involved in.

BOREAS: The BOReal Ecosystem Atmospheric Study (1990-96) is a Canada-United States joint project that focuses on the interactions between the boreal forest and the atmosphere. Its main experiment will take place in 1994 at two sites in the Northwest Region: Prince Albert National Park in Saskatchewan and Nelson House, Manitoba. (See the article on page 5.)

NBIOME: The Northern Biosphere Observation and Modelling Experiment is one of two Canadian projects that have been accepted in NASA's EOS (Earth Observing System) program. This 10-year multidisciplinary, interagency project attempts to link data bases from sources such as satellite remote sensing and biomass and soils inventories with models of organic matter dynamics and carbon sequestering in forests.

One of its major activities is to model the carbon dynamics across a transect through the grasslands, boreal forest, and tundra (including the BOREAS sites). Mike Apps of Forestry Canada's Northwest Region is on NBIOME's Science Steering Committee.

CBM: The Carbon Budget Model of the Canadian Forest Sector is a national research project being conducted jointly by Forestry Canada and ESSA Ltd. An assessment of the current carbon inventory of all Canadian forest ecosystems and the budget for reference year 1988 was completed in 1990. Future activities will address the impact of climate change and forest resource policy on the Canadian carbon budget. CBM and NBIOME activities are closely related, with Dr. Apps providing the coordinating link between them.

GEWEX: The Global Water and Energy Exchange Experiment is designed to provide a basic understanding of water yield from forested areas, with strong implications for climate change. It will likely include the BOREAS sites as part of its field sites.

Climate change

Continued from page 5

an attempt to determine how ecophysiological processes affect plant growth.

Another study will look at the changing competition between tree species in a changing environment, or which species will adapt best. This will be done using gap dynamic models, which are used for ecosystem simulation.

In addition, Dr. Apps and Mr. Zoltai are supervising a contract to compile an inventory of the soil carbon content of forest ecosystems across Canada.

There are a great many uncertainties as to both the timing and extent of climate change and the response of Canada's forests to such change. The Green Plan's climate change initiative is expected to be a significant step toward answering some of the basic science questions that are needed before proper management decisions can be taken.

—J. Samoil

How to plant a tree (X 40 000)

If you want to organize a community tree planting event for National Forest Week next year, start planning now, says Mike Newman, a renewal and intensive management specialist with Forestry Canada in Saskatchewan.

"It takes a good year to plan such an event—from concept to putting the first tree in the ground," he says.

That is sound advice from a forester who was the on-site coordinator of a two-day planting project involving over 800 children during the 1991 National Forest Week in early May.

The project first took shape last fall at the initiative of the POWER 99 FM radio station in Prince Albert. During the months that followed, local businesses, community groups, and government agencies caught on to the idea.

About a thousand people were involved—mostly kids in grades 5 and 6—and over 40 000 jack pine seedlings were planted to create a small forest on a site that had been recently harvested near the city.

Although planning was under way in October 1990, the first meeting could have been held even earlier, Mr. Newman says. Committees were formed to handle promotion, transportation, on-site management, and seedling supply.

For future tree planting organizers he offers a few more tips. "If you involve students, talk to the schools early—maybe in August, because that's when they plan their programs."

"Get the media on side. POWER 99 provided lots of free air time, the equivalent of about $14 000 in advertising."

Mr. Newman also suggests that organizers pick a site that is easily accessible and arrange for public transit to eliminate traffic jams. Experienced supervisors should be on hand to help with planting. "In our case, Weyerhaeuser had 10 employees supervising the actual planting. It was also a good idea to get the kids working in groups of two and to limit their time on the site to 30 minutes."

Thanks to months of careful planning, the project was an enormous success. "The most rewarding thing was that everyone bent over backwards to make it work. We didn't even have to sell the project."

"And even though it poured buckets the second day, everyone seemed to have fun. You saw the kids climbing back on the bus, and they looked tired, but happy and satisfied."

—L. Worster

Infrared scanner gives forest fire fighters a boost

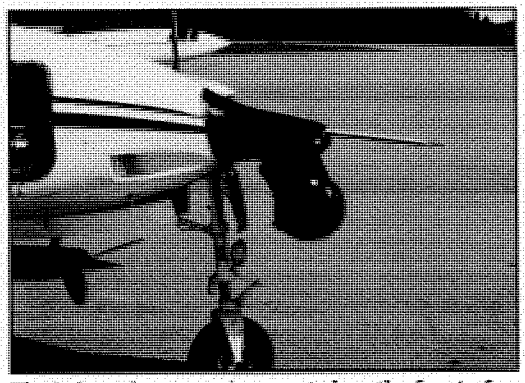
Time usually means money. In the business of fighting forest fires it can also mean saved lives and property. Alberta's Lac La Biche Forest is getting a big boost this year with the help of a high-technology scanner that "sees" the fire through the smoke.

The forward-looking infrared scanner was adopted on a trial basis this year by the province's air tanker group based at Lac La Biche at the urging of Forestry Canada fire research technician Chuck Ogilvie and air-attack supervisor Revie Lieskovsky of the Alberta Forest Service (AFS).

Mr. Ogilvie had seen the potential of infrared scanning in the mid-1980s after observing its use in a fire retardant evaluation study.

"You can see the fire intensity and exactly where the hot spot is," he explained. "It's a lot like giving a near-sighted person glasses. All of a sudden you can see things you always wanted to but couldn't."

In 1990 Mr. Ogilvie and Mr. Lieskovsky were able to persuade the AFS to use the forward-looking infrared scanner on a helicopter during a foam retardant study. That confirmed its potential for use on fixed-wing aircraft such as the Cessna 310 on which it is currently mounted. Mr. Ogilvie was involved in the installation and initial trials.



C. Ogilvie

The infrared scanner is mounted on the front of the plane.

The scanner, made by FLIR Systems in Oregon, responds to long light waves, which are heat generated. It is mounted on the bird-dog aircraft that flies over the fire ahead of two air tankers and helps them zero in on the spot to drop water, foam, or chemical fire retardant.

By showing the air attack officer a black-and-white video image of exactly where the drop was made, accuracy is greatly improved.

The result is a savings of money on retardant, time in the air, and area burned, points out Mr. Ogilvie. In addition, the scanner can be used at night.

Bob Young, fire detection coordinator with the AFS in Edmonton, is enthusiastic about the scanner. "It has not only met but exceeded initial expectations," he notes and predicts that "the present utilization is only the tip of the iceberg of the potential that lies ahead."

Forestry Canada through its forestry partnership agreements in Saskatchewan and Manitoba has contributed $23,000 to pay for 2 months of leasing costs for the $146,000 scanner system. Air Spray (1967) Ltd. in Red Deer, which has the contract to fly and maintain the fire fighting aircraft, made the mount and fitted the equipment. The AFS is picking up the remainder of the costs of this operational trial.

Although the cost of the scanner may seem high, it is easily put into perspective by the fact that it costs about $5,000 an hour for the air tanker group, which consists of three planes and their crews.

Recognition of the potential value of the forward-looking infrared scanner is just another in a series of accomplishments by Forestry Canada's Northwest Region in adaptation of infrared technology for forest fire fighting. In 1974 the fire group at the Northern Forestry Centre began using hand-held scanners, which have since been adopted by the AFS and other fire management agencies to detect hot spots and confirm that fires are out.

In the fall of 1991, the air attack aircraft will fly to Saskatchewan and Manitoba for demonstrations of the scanner's performance to provincial fire officials, again paid for by the two forestry partnership agreements.

—J. Samoil

Research proposals sought

Do you have a great idea for a forestry research proposal? If so, perhaps we can help you.

Forestry Canada's new forestry partnership agreements with both Manitoba and Saskatchewan offer opportunities for outside agencies to conduct research in a variety of areas. Educational institutions, research councils, and private industry are all invited to submit proposals.

The Canada-Manitoba Partnership Agreement in Forestry provides for a total of $8.5 million in provincial and federal funds for Program B, Applied research, marketing, and technology transfer. Funding is directed to the following subprograms: technology transfer; forestry research, development, and demonstration; integrated resource management and planning; and forest resource data.

The Canada-Saskatchewan Partnership Agreement in Forestry provides for $6.25 million in federal and provincial funds for Program B, Applied research, marketing, and technology transfer. This includes subprograms in technology transfer, applied forestry research, and forest products research and marketing.

Priority will be given to research into integrated forest resource management, tree and plantation improvement, forest protection systems for fire and insects and diseases, and environmental impacts of forestry practices.

If you have a great research idea, our district offices in Winnipeg and Prince Albert would like to hear from you. Contact Vic Begrand, District Manager in Prince Albert, and John McQueen, District Manager in Winnipeg, at the addresses on the back page of *Timberlines*.

—J. Samoil

Partnership agreement signed with Saskatchewan

More than 75 people attended a short ceremony in Prince Albert on June 5 to celebrate the new Canada-Saskatchewan Partnership Agreement in Forestry. Forestry Minister Frank Oberle and Saskatchewan Parks and Renewable Resources Minister Lorne Kopelchuk signed the $30-million agreement.

The new agreement is designed to strengthen Saskatchewan's forest economy. "The agreement builds upon cooperation with the provincial government and the forestry community," noted Mr. Oberle. Both ministers emphasized that the partnership is an opportunity to promote sustainable forestry development in the province.

J. Samoil

Looking pleased at having just signed the Canada-Saskatchewan Partnership Agreement in Forestry are Saskatchewan Parks and Renewable Resources Minister Lorne Kopelchuk (left) and Forestry Canada Minister Frank Oberle (right).

Cost of the agreement will be shared equally by the two governments. Funds will go toward four major programs: wood supply maintenance and enhancement; applied research, marketing, and technology transfer; integrated forest management, planning, and development; and public information and worker training.

The agreement builds on existing research and management programs, while supporting forestry development on private lands and Indian reserves. Funds will provide for an enhanced reforestation program, improvements in the province's data base, and research into forest watersheds and wildlife.

The partners will pay special attention to the issue of integrated forest management. Mr. Kopelchuk announced that as part of this goal, the province will produce, with public input, a long-term plan outlining forestry strategies over a full harvesting cycle.

The 5-year partnership agreement replaces the Forest Resource Development Agreement that expired in 1989. As some of the guests said, with the new agreement in place people are looking forward to what lies ahead for the forest sector in Saskatchewan.

—L. Worster

Staff Changes

The Northwest Region said farewell recently to a number of staff. Retiring after many years of distinguished contributions to forestry research were Regional Coordinator of Planning and Special Projects **John Powell**, Mixedwood Silviculture project leader **Lorne Brace**, climate change modeling scientist **Teja Singh**, vegetation-climate change interaction scientist **Bob Swanson**, insect and disease specialist **Peter Amirault**, insect and disease rangers **Gary Still** and **Craig Tidsbury**, and hydrology technician **Zdenek Fisera.**

Our gain was Ottawa's loss when **Dennis Dubé** (at one time leader of our Fire Management Research project) returned to Edmonton as Program Director, Forest Resources Research. We also welcome **Ron Bronstein**, Chief of the newly created Technology Development Unit. Forest geneticist **Jerry Klein** and tree improvement specialist **Paul Chapman** have moved from the Northern Forestry Centre to the Manitoba District Office.

New publications

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