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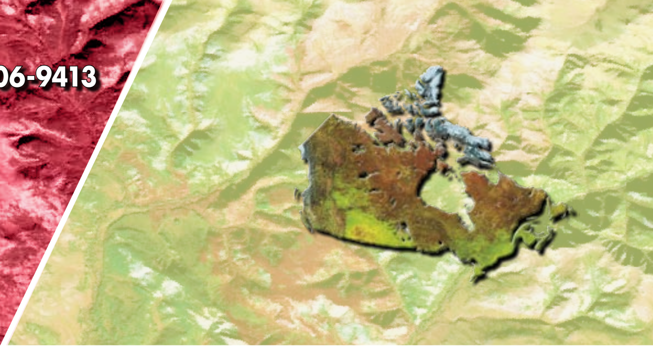
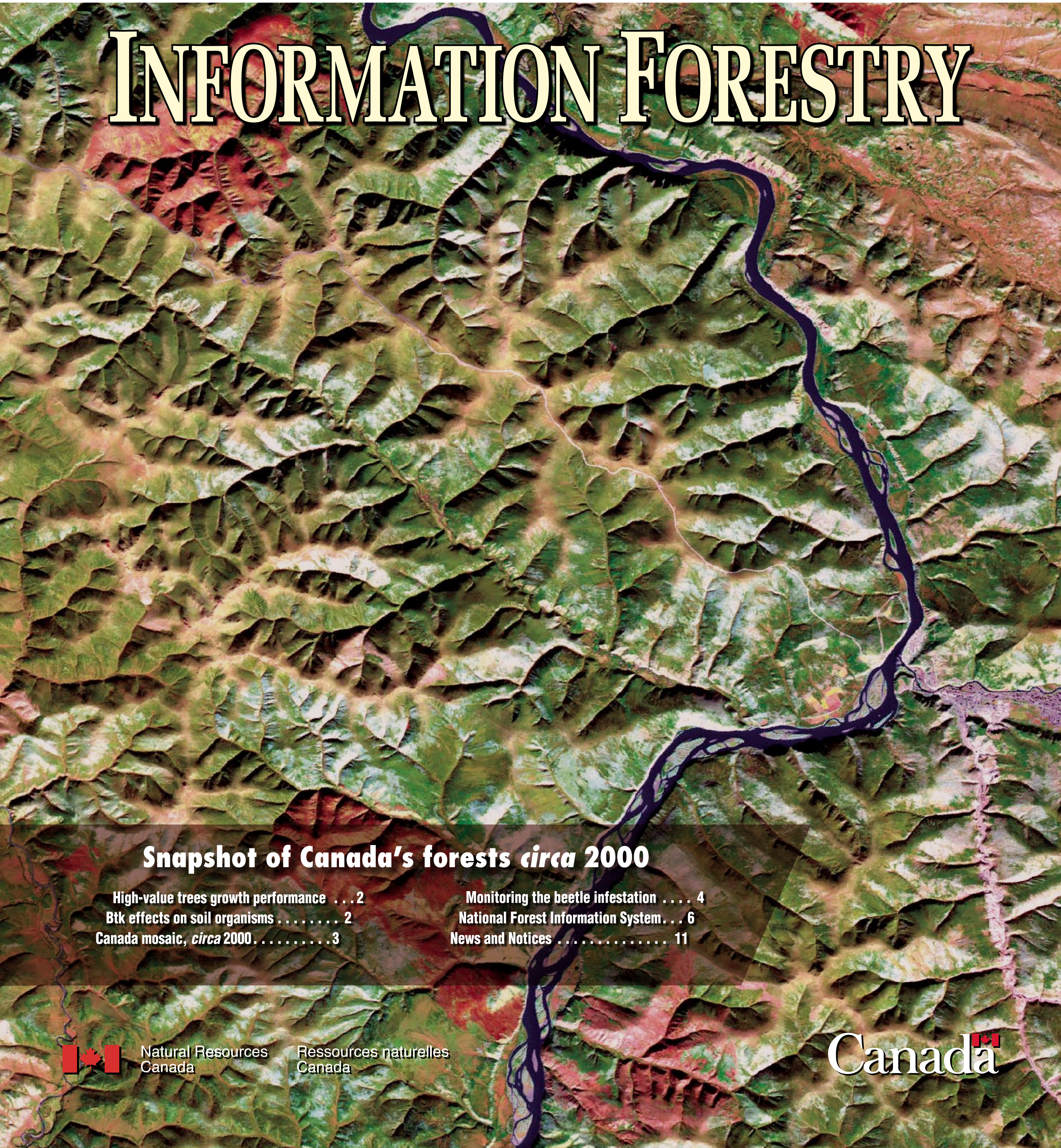


INFORMATION FORESTRY



Snapshot of Canada's forests *circa* 2000

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Natural Resources Canada
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Study examines bacterium's effect on soil micro-organisms

When using organisms to control pests, there is risk that the control agents may affect organisms other than the target insect. To address these concerns regarding the use of the bacterium *Bacillus thuringiensis* subsp. *kurstaki* (*Btk*) to control the common conifer defoliator, western spruce budworm (*Choristoneura occidentalis*), in British Columbia, Natural Resources Canada scientists and university collaborators recently tested the natural pesticide's effects on non-target soil organisms.

The researchers sprayed three 50-hectare plots of budworm-infested Douglas-fir forest with *Btk* near Merritt, British Columbia, and measured the bacterium's effects on populations of mites and collembola—tiny, wingless insects known as springtails—by comparing populations of these organisms in the treated areas against populations of the same two groups at nearby, similar but unsprayed sites. Mites and collembola are the most abundant, diverse soil arthropods; together with other soil invertebrates, they are vital for decomposition, nutrient cycling and soil formation.

"We looked really hard and we could not find any effect on numbers, diversity, distribution or feeding," says Royal Roads University scientist Jan Addison, who led the study. "We also looked specifically at collembola species known to feed on bacteria, and couldn't find any effects there either."

Abundance and diversity of species of collembola declined in samples taken three weeks after spraying in both sprayed plots *and* control plots—perhaps reflecting the summer drought occurring at that time. Mite abundance, however, appeared unaffected by *Btk* or time of sampling. Similarly, the spray seemed to have little effect on the abundance of collembola known to feed on bacteria or on the proportion of bacteria in the diet of these collembola.

"This is the first study done on the effects of *Btk* on soil microorganisms in British Columbia," says Canadian Forest Service Research Scientist Imre Otvos, who organized the tests as part of a larger research project. "Previously, we could only extrapolate from work done elsewhere. This completes another part of the picture of what we know about the use of this bacterium in insect control and its safety."

Collembola—tiny, wingless insects known as springtails— and mites are members of the community of organisms responsible for decomposition, nutrient cycling and soil formation. Spraying forest sites with biological-control *Btk* bacteria seemed to have little effect on numbers, diversity, distribution or feeding of either collembola or mites.

Naturally occurring in soil, *Btk* has been used as a biological alternative to chemical pesticides in forestry and agriculture for decades. It degrades quickly when exposed to sunlight, and is used to control caterpillar pests with alkaline guts—including western spruce budworm—that must ingest the bacterium for the toxin to be activated.

Testing Mother Nature's limits

Mother Nature dictates which trees thrive, and where, by placing environmental constraints on survival and growth, but initial results from a recent Canadian Forest Service study suggest some retention of old-growth forest structure may mitigate environmental constraints enough to push the range boundaries of some highly valued tree species.

The Montane Alternative Silvicultural Systems (MASS) project site, where the study took place, is located at about 750-metres elevation in eastern Vancouver Island's Coastal Western Hemlock montane ecozone. "If you go *down* 100 metres in elevation from the site, Douglas-fir grows like mad; if you go *up* 100 metres, Douglas-fir doesn't grow at all," says Tree Physiologist and study leader Alan Mitchell. "We wanted to see if variable retention might change environmental conditions on the site enough to allow lower-elevation and high-value alternative species to do well further up in the transition zone."

Ten years after planting 1,800 seedlings of highly valued western redcedar, yellow-cedar and Douglas-fir in a combination of shelterwood, patch-cut, green-tree and conventional clearcut systems, Mitchell and his colleagues found that yellow-cedar performance survival and growth was the most promising—particularly in green-tree and patch-cut systems where some original overstorey was retained. Yellow-cedar had contributed less than two percent to the species mix on the site before harvesting in 1994.

Redcedar, on the other hand, showed little response to overstorey retention. Douglas-fir, a low-elevation species, survived poorly on the site, but those seedlings that did survive grew well—outgrowing even yellow-cedar, a higher-elevation species, in the clearcut and shelterwood areas.

Mitchell says he has recently noticed that yellow-cedar growth on the site has accelerated substantially since results were measured in 2004. This observation is not part of the 10-year assessment, but Mitchell stresses that it emphasizes the fundamental nature of silvicultural research: "Ten years is nothing in the life of these species. What happens during the *next* 10, 15, 25 years will tell."

However, this initial assessment suggests that use of retention silviculture may well reduce environmental constraints for regeneration of sought-after species such as yellow-cedar on high-elevation sites.

Earth-observation mosaic shows Canada's 10-year changes

Canadians can now download an image mosaic of Canada's forests *circa* 2000, produced by Natural Resources Canada from hundreds of Landsat images. Although the mosaic is a striking visual on its own, the actual digital information used to create it indicates where Canada's landscapes are changing.

The Canadian Forest Service, in partnership with the Canadian Space Agency, produced the mosaic as part of the Earth Observation for Sustainable Development of Forests (EOSD) program. In 2003, the department released a satellite mosaic of Canada circa 1990.

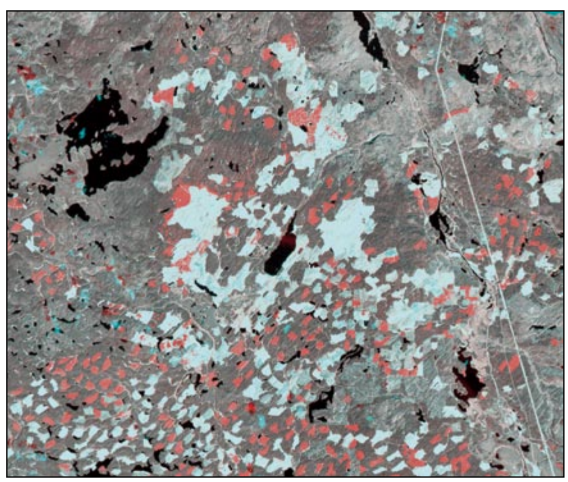
"By comparing the two mosaics, you can get a sense of where change in Canada's forests may have occurred during those 10 years," says EOSD Remote Sensing Data & Product Coordinator Morgan Cranny. "Then, if you examine the raw data that made up the mosaics, you can determine what kind of change actually happened."

The raw data consist of more than 450 overlapping Landsat image scenes provided by the North American Space Agency (NASA). Study of changes in Canada's land cover furthers understanding of how natural and human-made disturbances affect the landscape, and provides information to researchers, forest inventory specialists, and decision and policy makers.

"Space-based Earth-observation technologies allow us to create a variety of products integral to monitoring Canada's forests," says Canadian Forest Service Forest Information Director Jeff Dechka (**jdechka@pfc.cfs.nrcan.gc.ca**). Natural Resources Canada uses these technologies to create products for forest inventory, forest carbon accounting, fire disturbance, and monitoring sustainable development, and works with the provinces and territories to develop land-cover maps of the forested area of Canada.

The EOSD team has recently completed the groundwork for another such product, in addition to the *circa* 2000 mosaic: they have classified land cover in satellite imagery covering all of the forested regions of Canada. More than 600 digital map tiles containing information on 22 land-cover classes, including nine forest classes, are scheduled for release in 2007. The tiles will be scaled at 1:250,000 and synchronized with the National Topographic Survey mapping system, so that every point within an image corresponds to an actual location on the ground.

To download a copy of the 2000 or 1990 Canada mosaics, visit the EOSD web site: **eosd.cfs.nrcan.gc.ca/resources/mosaic/2000_e.html** for jpeg, tif and full-resolution images.



Comparison of 1990 (top) and 2000 (middle) Earth-observation map data shows recent harvest activity (red) in forests (bottom) near Prince George, British Columbia. Regenerating forests appear light blue/grey; areas with little or no change appear grey.

The 2000 land-cover map mosaic of Canada takes up 90 gigabytes of computer memory, but compression technology has reduced the file to 2.9 gigabytes. This gigantic file can be downloaded free of charge.

From the cover:

A *circa*-2000 satellite image of the landscape near Dawson City, Yukon, helps researchers determine recent fire activity in the territory. Fire is the primary cause of forest disturbance in the north.

Remote-sensing system prototype monitors beetle spread,

Chris Butson usually spends his time working with computers to analyze satellite and airborne imagery of western Canada's forests. However, for three weeks last August, he, other researchers from the Canadian Forest Service, and University of British Columbia Masters student Sam Coggins traded hardware for hard hats, and headed out into forests along the Alberta–British Columbia border north of Jasper National Park. There, they set up more than 30 field plots and collected data on individual trees.

"We were doing ground-truthing surveys to validate high-resolution imagery," says the monitoring analyst. "We had air photos of the sites that had been taken in mid-July, and we had to determine which crowns in the photos belonged to which trees in the forest. I'd circle the trees on the photos that I could identify and we'd get information on those trees from on the ground: diameter, height, crown dimensions, GPS [global positioning system] location and if beetles were attacking it. We had to do this for as many of the trees as we could find that were in the photos."

The region in which the field plots are located is at the eastern front of western Canada's current mountain pine beetle epidemic. The information collected supports two related studies funded by Natural Resources Canada: to develop modeling tools to identify, monitor and assess response to mountain pine beetle populations across forest landscapes over time, and to implement such tools in operational forest management.

Such tools or approaches are part of a suite of infestation-monitoring systems being developed under the direction of Natural Resources Canada that will help governments and forest managers in Alberta and British Columbia determine the spread and magnitude of the current mountain pine beetle infestation, says Canadian Forest Service beetle research Chief Implementation Officer Dave Harrison (**daharris@pfc.cfs.nrcan.gc.ca**).

"A reliable monitoring system is key to increasing our ability to respond to changes in local and regional mountain pine beetle population levels in those forests," he says, "It's also key to reducing the threat of mountain pine beetle to the boreal forest." The beetle's preferred host is lodgepole pine, but studies show it would thrive in jack pine, a key species within Canada's country-wide boreal forest. If the beetle becomes established in jack pine and winters continue to be moderate, beetle populations may continue to expand eastward and northward.

Harrison says the monitoring system will help direct and measure effectiveness of future mitigation measures. "Currently, the way this is done is often expensive, inconsistent, and not terribly effective. The new approach will help forest managers to reliably pinpoint brewing trouble spots and deal with them quickly. And they would also be able to see if their efforts were worthwhile."

As well, the system will test, for the first time, existing mountain pine beetle susceptibility, population dynamics and dispersion models—models on which researchers and forest managers are basing management decisions during the current beetle infestation. It could also be used to monitor other major infestations by other insects, large-scale, long-term drought or disease, or climate change across forest regions.

The prototype

"We're looking at the forward edge of the infestation where some areas are infested, some aren't, and some may become infested in the next year or so," says University of British Columbia Canada Chair in Remote Sensing Nicholas Coops, who leads the development project. "This monitoring system counts and looks at individual tree crowns through time to determine changes in levels of infestation."

The prototype the University of British Columbia research team is building will be the first integrated,

Chris Butson verifies which trees are inside the boundaries of one plot established in the study area, while Field Assistant Alyson Watt flags the trees within the plot, from which data were collected as part of the ground-truthing surveys.

measures mitigation effectiveness, and protects forests

large-scale forest-monitoring system to systematically extract red-attack tree crowns from different spatial- and scale-level data sources—including aerial photography from fixed-wing aircraft and helicopter-GPS, and satellite imagery—and compare these predictions to aerial-based maps and field data collected at the same locations. By using a three-year series of images, the researchers are developing methods to determine and track progress, if any, of beetle populations across the study area.

"We're combining these data sources to work out how good we are at seeing individual tree crowns," says Coops, "as well as to determine how accurate our classification of red attack is. We're also dealing with all the issues associated with using satellite imagery through time—different effects from sun angle, from background exposure, from clouds. Part of the project involves figuring out how to standardized these images to give a consistent result through time."

The system will capture damage caused by mountain pine beetle infestations, and will facilitate detection of future changes in beetle population levels in the monitored areas—information that is critical for determining infestation status, long-term impact on forest structure, and effectiveness of mitigation measures, and for developing an early-warning system to indicate changes in mountain pine beetle populations before they outbreak into major infestations.

Operational application

Canadian Forest Service researchers are developing methodologies that would ensure the monitoring system can be implemented at the operational level. It could then be used to monitor mountain pine beetle in other areas of western Canada, including Alberta, the Rocky Mountain national and provincial parks, the boreal–lodgepole pine forest interface, and other high-value newly infested or at-risk areas.

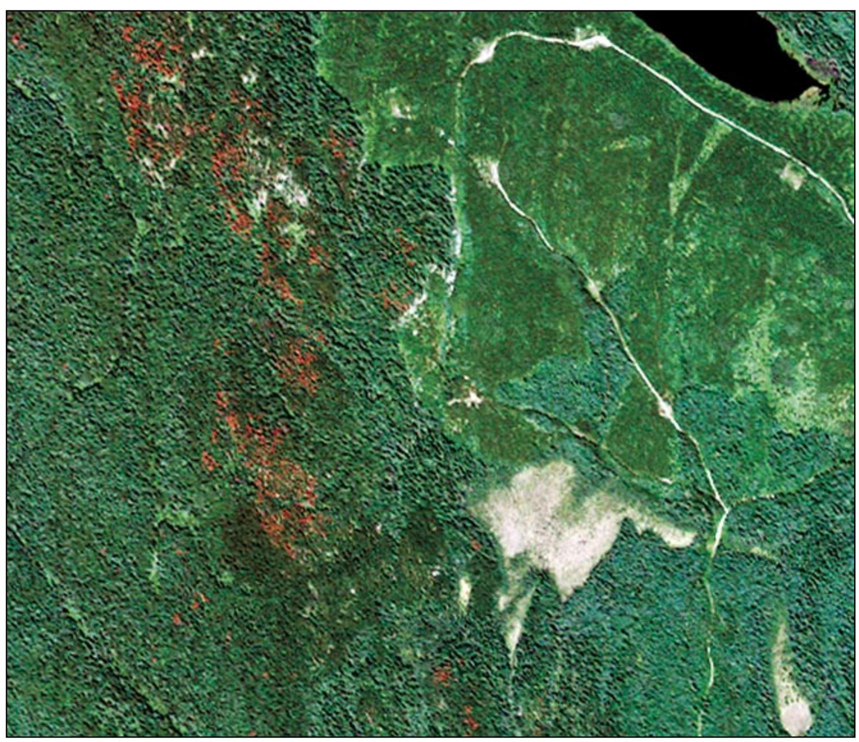
Because the system must be as cost effective as possible, it must be able to extrapolate stand-level survey information to landscape-level monitoring using satellite imagery, which is usually less expensive than other imagery, and is significantly less expensive than field surveys.

"We know it's possible to use satellite data to monitor these populations on the landscape," says Canadian Forest Service Research Scientist Mike Wulder, implementation project leader. "What we've done with the mountain pine beetle infestation is really see a case for monitoring. You want to be able to use some of these highly detailed satellite-data sources, and lay them out in such a way that you can monitor tree crowns through time in a way that is meaningful over the larger area."

By comparing field data with results from running high-resolution imagery through software that segments regions in an image based on spectral and spatial properties, researchers should be able to determine how the signals differ, says Butson. "If you have green attack one year, and red attack the next year, the situation on the ground is probably getting worse; if the ratio of red to green in the imagery is higher in the second year, that indicates the infestation is worsening. That's really what we're working on: the rate of increase or decrease in the infestation over time."

Relationships of imagery values at each scale must be determined, validated and plotted against each other and against field data in a stepped approach. The end result will be a stable, verified system that provides information on the current state of the infestation in the study area, that could be used to plan harvest schedules and mitigation activities, and ultimately reduce the infestation.

"The system is a tool in the first line of defense," says Coops. "It doesn't replace field surveys and the detailed information they collect about stands, but it could be used to help direct crews to areas where their time would be best spent, and inform them where they should put their plots or do their surveys. It provides a solid, informed basis for that kind of work, rather than just randomly surveying or establishing plots across the landscape."



Researchers set up 30 field plots in the study area along the front of the current mountain pine beetle infestation.

National system facilitates access to consistent forest

NFIS is an information highway that allows partners and users to discover, integrate and display current, accurate, and consistent information on Canada's forests, by enabling access to many different holdings of data on Canada's forests.

Its primary purpose is to facilitate reporting on the status and management of Canada's forests, in accordance with provincial, national and international agreements.

Intended users include governments, agencies, industry and the public.

Canada's forests, which cover more than 400 million hectares and stretch from coast to coast, are managed by the provinces, the territories, private owners and the federal government. Each of these gathers information about its respective forests in different ways, and stores that information in different locations, in different formats, and for different purposes.

As people who work with forest inventories can attest, these differences make integration of the information into overviews of the entire country's forests complicated and difficult. Gathering consistent information from across the country is extremely laborious, and the reliability of reports derived from that information is open to challenge. Nevertheless, Canada is required to report on the status and management of its forests for the UN Food and Agriculture Organization's Forest Resource Assessment, the Montreal Process on Criteria and Indicators for the Conservation and Sustainable Management of Temperate and Boreal Forests, the State of Canada's Forests, and other national and international agreements it has signed.

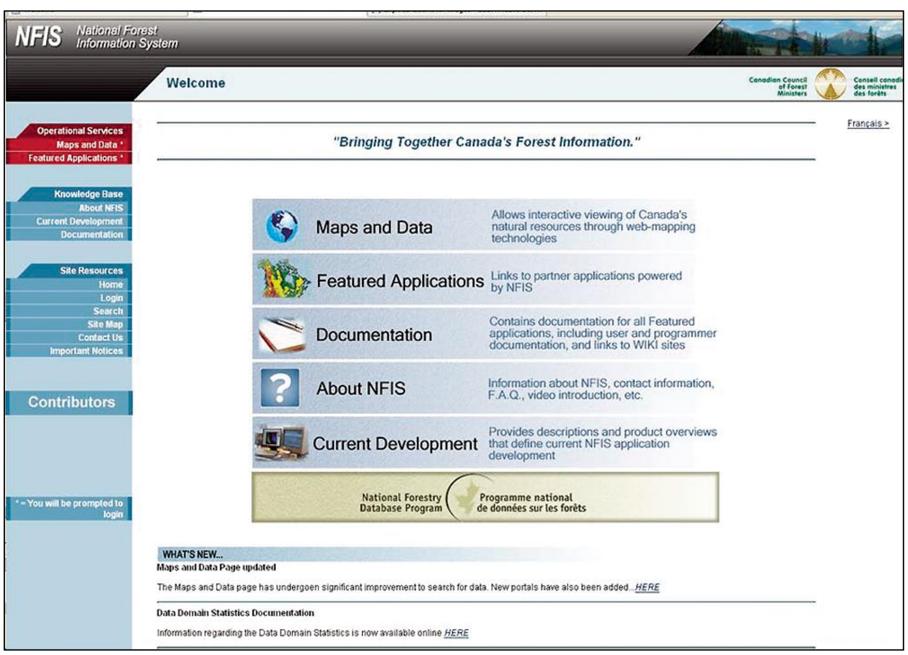
But now, a cutting-edge, web-based information system recently developed by Natural Resources Canada, Canadian Forest Service makes those tasks much easier and more reliably consistent. The **National Forest Information System** (NFIS) makes forest management information available to all Canadians, governments, agencies and industry. It enables access to information holdings that the provinces, territories and other jurisdictions make available about forests and their management in Canada. Access happens via servers distributed across the country, thereby ensuring that the most up-to-date and accurate information about the country's forests that is available can be used for integration, analysis and reporting.

NFIS complies with international standards, such as those of the Open Geospatial Consortium, as well as adheres to the Canadian Geospatial Data Infrastructure standards and principles. It consists of a distributed network of servers, Web services and applications that allow access to forest information held by independent agencies. It also provides Web tools, ranging from simple portrayal to sophisticated analysis, to users around the world. Its business practices include open sourcing its software—the Government of Canada maintains its intellectual property rights—which increases transparency of the system and of any reports generated by the system.

Together, says NFIS Project Manager Robin Quenet (**rquenet@pfc.cfs.nrcan.gc.ca**), these attributes address many of the needs initially identified by the Canadian Council of Forest Ministers, which in 2000 mandated the development of the system. The system allows provincial and territorial partners to link databases to the system with minimal modification on their part, provides security, and controls access through different servers across the country that provide the links to the system. "When we designed NFIS, we tried to build it as a foundation for services that we or NFIS users develop."

"It's an infrastructure, much like a highway system," says Canadian Forest Service NFIS Geospatial Scientist Brian Low (**blow@pfc.cfs.nrcan.gc.ca**). "We've built the highway system and the service stations; our partners and users are adding vehicles in the form of data and applications that can be transported around the whole system in different ways."

NFIS now supports and makes available National Forest Inventory services, the Forest Health Database service, the Carbon Budget Model of the Canadian Forest Service download service, and serves provinces and territories via regionally distributed nodes. More than 50 NFIS-based applications are now available or are being developed for the technology, including the Canadian Wildland Fire Information System or the Conservation Areas Reporting and Tracking System. As partners and users become familiar with the technology and its capabilities, the number of services will grow.



By enabling access to data holdings that the provinces, territories and other jurisdictions make available about forests and their management in Canada, the National Forest Information System facilitates the gathering, integration and reporting of consistent forest information from across the country.

data across Canada

Access to Forest Data

"Contributing forestry- and forest lands-related geospatial information through a centralized system is helpful for those interested in learning about Manitoba's forests and their sustainability," says Manitoba Conservation Forest Inventory and Resource Analysis Manager Greg Carlson. Because of the Manitoba Land Initiative, a multi-departmental information system that harmonizes, integrates and shares the province's digital lands-related information via the internet and web-based systems, Manitoba is becoming positioned to link its forest information into NFIS. According to Carlson and colleagues Kip Tyler and Al Dakin, Manitoba, which chairs the Canadian Council of Forest Ministers in 2007, is poised to begin increasing links to NFIS in the near future.

The forest resource inventory along with protected area's data also continues to be updated for NFIS purposes, say Dakin, Warehouse Coordinator, and Tyler, Program Manager for Manitoba Conservation's Information Technology Services section.

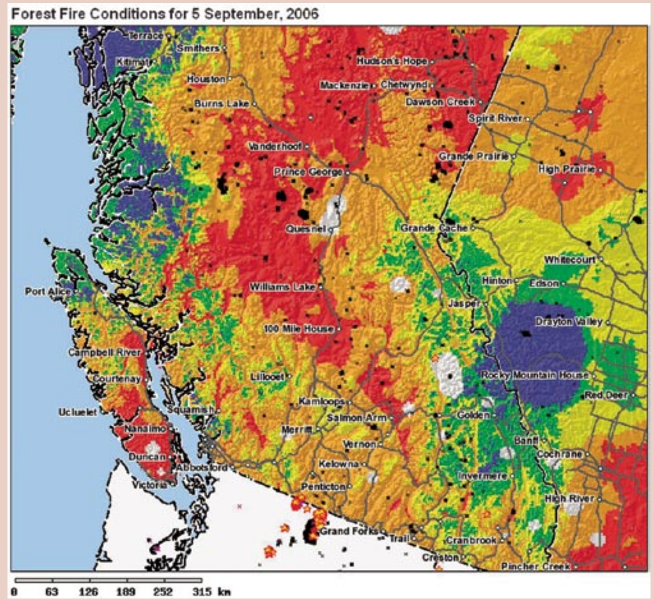
Provinces and territories are key partners in NFIS: they are the owners and custodians of much of the forest information that NFIS users access. Although some issues regarding data sharing, source recognition and governance ensuring data maintenance are still being worked out, jurisdictions are making more and more information available on the system.

In order to accommodate variation among datasets, Low says NFIS automatically filters the spatial information into a standard format that is less detailed than provincial inventories, but still meets reporting requirements. "There were two approaches to dealing with the differences," says Low. "The provinces could adopt the same business practices or the same way of storing data—which would have been difficult and expensive—or, they could continue to do their business as is, and we could develop a layer on top that maps the databases on the fly to national schema."

The schema are selected in consultation with the jurisdictions. As well, before any analyses or reports are published from NFIS, the provinces and territories are given opportunity to review and approve their data as it appears therein to ensure accuracy and consistency.

Fern Gruszka, Ecosystem Information Manager for Saskatchewan Environment, has worked with forest inventories for many years throughout her career. According to her, NFIS "has the potential for being the perfect solution to rolling things up

Fire information system links to NFIS capabilities



The Canadian Wildland Fire Information System integrates information and generate maps of forest fires and forest fire danger across the country or across regions. It has been linked to CFSNet to take advantage of NFIS technology.

At any time, on any day, anyone can check the status of wildfires and wildfire conditions affecting Canada's forests. The Canadian Wildland Fire Information System is an interactive, web-based system designed to integrate information and generate maps of forest fires and forest fire danger across the country. It automatically accesses observed and forecast weather data and uses a geographic information system to transform the data into probable fire danger and fire behavior maps, which are disseminated through the web. The system's database incorporates underlying terrain, fuel, and elevation maps, as well as satellite information from various sources. An interactive web map server has recently been added to allow users to select various layers of information and zoom into a region of interest.

Although it has been available through the web for a decade, the system is now also linked to CFSNet in order to take advantage of NFIS technology.

"We've just started on the path towards open-geographic information system standards and data sharing," says Fire Research Spatial Analyst John Little (**John.Little@nrcan.gc.ca**). "NFIS is a leader in that field, and we wanted to use those capabilities for the Canadian Wildland Fire Information System. By linking to CFSNet, users will have better access to our data, and we will be able to draw in data from other information holdings linked to NFIS."

CFSNet and its underlying NFIS distributed-network and data-sharing framework permits the wildland fire information system group at the Northern Forestry Centre to more easily develop new tools for the system. Some areas that could draw on CFSNet capabilities include development of national smoke models and tracking tools, and increasingly efficient data collection for the Large Fire Database, which is a collection of spatial and point fire data from multiple agencies across the country.

"We wanted the data we produce and hold within the system to be shared among other users, and to have the system become better known among the fire management and research communities," says Fire Research Officer Richard Carr (**rcarr@nrcan.gc.ca**). "Plus it helps to foster collaboration, new products and research."

nationally, whatever the data. It is the current tool for that kind of exercise, and has made the process much easier for the provincial folks."

CFSNet helps federal forest scientists to make research data available to the provinces, territories and the public.

It enables access by researchers to provincial and territorial forest-information holdings.

It allows scientists to integrate their research with that of other scientists.

It archives and records data used in federal forest research.

It allows the public to access federal forest research information.

Access to Forest Research

In 2004, the NFIS project team deployed a data-sharing highway across the Canadian Forest Service. Using NFIS technology, services, hardware, software and authentication systems, CFSNet enables federal forest scientists and program leaders to make research results and information available among research centres and to the provinces, territories and the public.

"It allows our partners access to research that can be used to assist them in their management and reporting duties," says Low. "Similarly, it provides scientists with access to provincial information to undertake their science."

To date, 23 applications that allow integration of multi-jurisdictional research information have been ported onto CFSNet, or are being developed to run on the network.

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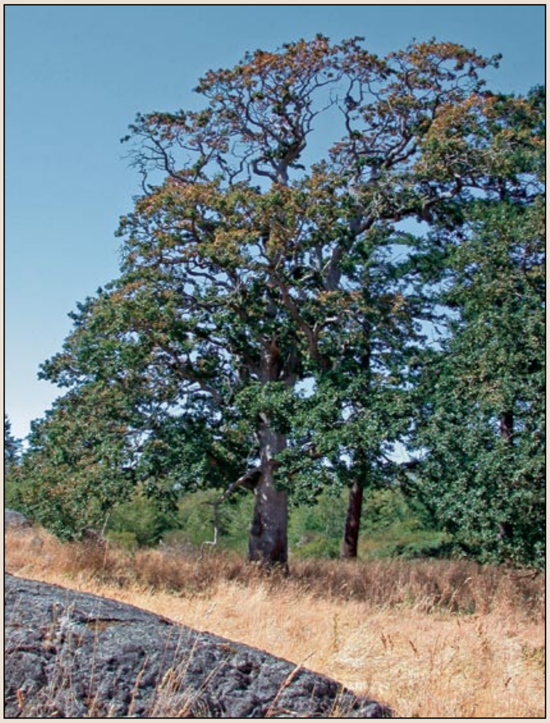
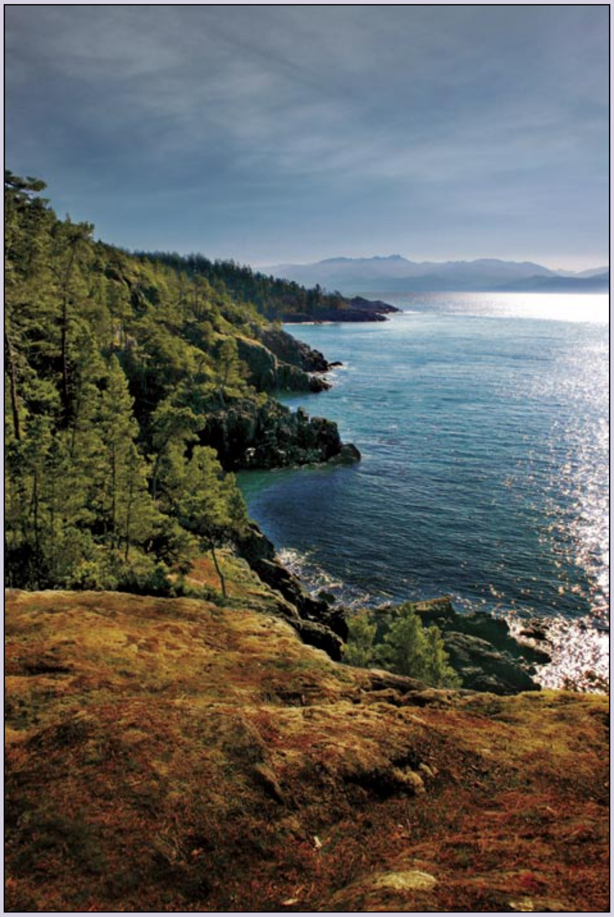


Reporting and tracking system uses NFIS technology to access information



Canada's commitments to report to the international community on the status of its protected areas include the World Commission on Protected Areas, the United Nations Convention on Biological Diversity and the Montreal Process Criteria and Indicators for Sustainable Development. To facilitate the process, the Canadian Council of Forest Ministers (CCFM), through NFIS, has developed a web-based application to enable standardized reporting and mapping for all public Canadian conservation or protected areas. The application supports initiatives such as the CCFM Criteria and Indicators of Sustainable Forest Management reporting, the Canadian Council on Ecological Areas Protected Areas Reporting and Tracking System (PARTS), the CCFM Boreal Initiative, biodiversity reporting and others.

The application uses NFIS technology to access and bring together up-to-date information on protected areas from databases held and maintained by the provinces, territories and other jurisdictions. It adopts standard definitions of protected area characteristics, which enables accurate integration of data from across the country.

"Projects such as this are causing the various agencies across the country to work together in the development of a common data model," says Resource Data Manager George Bahr, of Saskatchewan Environment, which provides various information on the province's protected areas. "This sounds as if it would be an easy thing; it is not an easy thing. But is very much needed."

In order for intelligent or common reporting to occur, contributors need to speak the same language, says Bahr. "It's very difficult for different jurisdictions with different objectives, different motivations and different legislation to be able to report in a consistent way. But if there's a common data model, you start getting the consistency so that the numbers really start meaning something."

The Conservation Areas Reporting and Tracking system uses NFIS technology to access and gather up-to-date information from databases held and maintained by various jurisdictions on Canada's protected areas, including East Sooke Regional Park, on southern Vancouver Island. Photo: © 2006 iStockphoto.com/Jason van der Valk.

Tracking trees at risk

Forest ecosystems in Canada contain approximately 124 native tree species and face a variety of threats including changes in land use, environmental change, invasive alien species and harvesting practices that ignore silvicultural requirements of non-commercial species. Given the size of these forests and their diversity, obtaining a Canadian perspective on how individual tree species are tolerating these various threats is challenging.

And all of these species, says Canadian Forest Service Research Scientist and Tree Seed Physiologist Tannis Beardmore, are important genetic resources, about which researchers, policy makers, resource managers and the public need reliable and up-to-date information.

"The conservation of forest genetic diversity is a prime objective of both the National Forest Strategy and the Canadian Biodiversity Strategy," says Beardmore (**tbeardmo@nrcan-rncan.gc.ca**). "Ecosystem health and stability depends on these resources, which permit adaptation to changing environment conditions, such as changes in air quality, climate change and invasive species."

As part of the Canadian Forest Genetic Resources Conservation Program, Beardmore is developing a web-based system that will allow information about Canada's native tree species to be shared and accessed via CFSNet. This data could then be integrated with information on protected areas, in situ conservation efforts, as well as information on insect infestations, fires and other disturbances that put these genetic resources at risk.

"CFSNet provides visibility, as well as access and integration of current and authoritative information with regards to trees of concern and to all native tree species," says Beardmore. "The kind and depth of information we have on native tree species is so variable across the country, we're hoping the system will provide an authentic national perspective, so at least we would know where we're starting from where these resources are concerned."

To date, a prototype of the system, called the Canadian Forest Genetic Resource Information System, has been launched; a fully operational system should be available to resource managers and researchers by 2009.

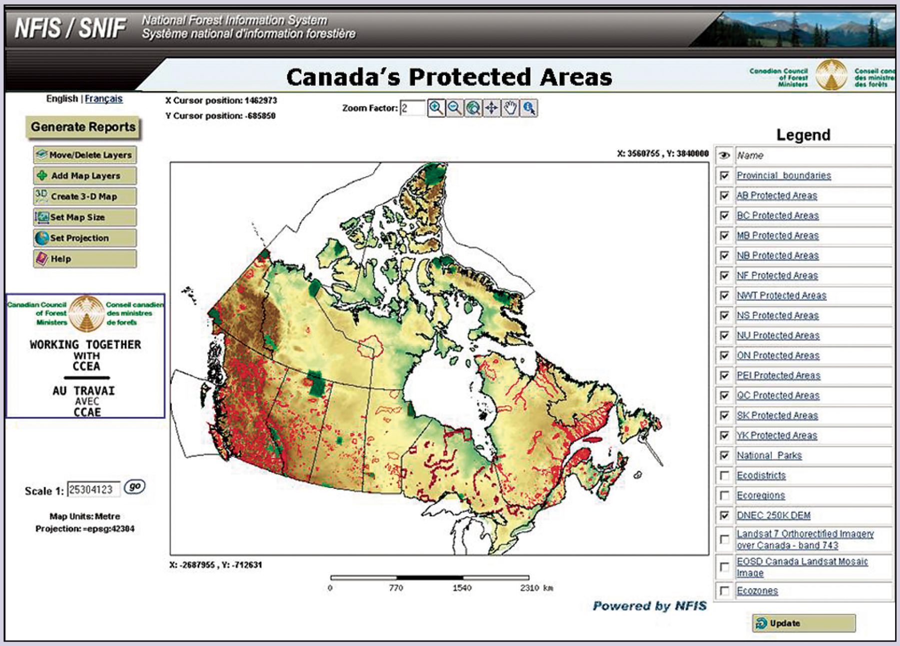
about protected areas across Canada

Without a system like NFIS, and cooperation between the CCFM and the Council on Ecological Areas, generating a broad view of protected areas would be tedious and time consuming. One would have to search many data sources: provincial government ministries, federal departments, non-government agencies—some with databases, others without; some with current data, others without.

"This is truly a national initiative," says NFIS Research Manager Robin Quenet. The NFIS team provides technical support and advice to the project's partners, and has developed the system's reporting software. "We work in partnership with all of the jurisdictions, every one of which is contributing in some fashion—data, support, direction, and so on."

"We are developing content," says Bahr, "and NFIS is one of the many delivery systems that can access that content and roll it up on a national scale."

Analysts, policy-makers, industry, researchers, or the public can use the system to query data and create reports, graphs, tables, and maps as provinces, territories and other owners of protected areas make information available. The reporting software compiles information in numerous ways, including protected areas by region, number, size, date of creation, and designation by World Conservation Union standards, and can even graph change through time. As applications are developed and launched on the system, users can then assemble, analyse and interpret the information to answer specific questions, such as whether certain activities are prohibited on specific parcels of land, or to determine status of wildlife species or trees species at risk.



The reporting software compiles information in numerous ways, including by protected areas by region, number, size, date of creation, and designation by World Conservation Union standards.

Scientists have been quick to recognize the research potential of the technology. For instance, it facilitates access to specialized data that otherwise might require field surveys or questionnaires sent to provincial inventory staff. According to Canadian Forest Service Research Scientist Tannis Beardmore (**tbeardmo@nrcan-rncan.gc.ca**), of the Atlantic Forestry Centre and coordinator of the Canadian Forest Genetic Resource Information System, "The component of the technology which is integral to what we want to do is its ability to provide current and authoritative information based on the most up-to-date data within inventories and other sources across Canada. This would be extremely laborious without NFIS technology."

It also allows integration of data across applications. Even though a project may be designed to address a specific area of research, scientists with projects linked to CFSNet can access and share data and information with other CFSNet projects. For instance, Beardmore's system draws information from the Canadian Wildland Fire Information System, from the Conservation Areas Reporting and Tracking System, and from the Forest Health Database. This capability adds another dimension to the research, encourages interconnectivity among projects, and enables scientists to examine research questions in a much broader way.

Assessing needs

Beginning in 2007, the NFIS project team is assessing the content, service and functionality needs of those using and those not yet using NFIS and CFSNet to increase capacity.

"A lot of people are unaware of the potential of this technology," says Low. "We're sort of NFIS promoters: we go and tell people what we're doing and how we can help them. We provide advice and assistance—help them explore the possibilities and how NFIS could help them meet their business requirements."

"This is a shared resource," says Quenet. "The provinces, territories and private owners of forests should feel they can use it to publish their data and to integrate and synthesize data from across the country."

GeoConnections, a cross-Canada program whose goal is to evolve and expand the Canadian Geospatial Data Infrastructure, and a major sponsor of NFIS, is providing funds for the needs assessment.

Information about NFIS can be found at **nfis.org/index_e.shtml;** information about CFSNet is available under the site's Maps and Data option. Registration may be required to access some of the information holdings and applications.

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Events

ExpoFor 2007
Association of BC Forest Professionals
Feb. 21–23, 2007
Harrison Hot Springs, BC
Information: **www.abcfp.ca/practice_development/continuing_education/forestry_conference/ExpoFor_Home.asp**

5th AGM of the Fluxnet-Canada
Research Network
March 9–11, 2007
Ottawa, Ontario
www.fluxnet-canada.ca

Council of Forest Industries (COFI) AGM
April 1–13, 2007
Prince George, BC
Information: **www.cofi.org**

Climate Change Impacts on Boreal Forest Disturbance Regimes
6th International Conference on Disturbance Dynamics in Boreal Forests
May 30–June 2, 2007
Fairbanks, Alaska
Information: **www.icddbf.uaf.edu**

People

Assignments

Raoul Wiart is working on assignment as Director, West, of the Canadian Wood Fibre Centre, a Natural Resources Canada, Canadian Forest Service initiative to work with industry, provinces and non-governmental forest research agencies to conduct and coordinate research that focuses on increasing the competitiveness of Canada's forest sector. Prior to this assignment, Wiart was Director of Programs, Planning and Operations at the Pacific Forestry Centre. Ten research staff from the centre join Wiart under the auspices of the Canadian Wood Fibre Centre: Forest Ecophysiology Technician **Tom Bown**, Root Disease Research Scientist **Mike Cruickshank**, Silviculture Research Technician **Graeme Goodmanson**, Technician **Antoine Lalumière**, Forest Pathology Technician **Dominique Lejour**, Tree Physiologist **Al Mitchell**, Silviculture Technician **John Vallentgoed**, Research Economist **William Wagner**, Research Silviculturalist **Roger Whitehead**, and Forest Research Biologist **Ross Koppenaal**.

Accolades

Natural Resources Canada, Canadian Forest Service Research Technician **Laura Byrne** received a 2006 Saanich Environmental Award for her work with other federal agencies to protect at-risk plant species on federally owned lands on south Vancouver Island. Under a memorandum of understanding with the Department of National Defense, she helped the National Research Council develop a management plan and implement a Garry oak ecosystem recovery strategy for Observatory Hill, an 85-hectare property nine kilometres north of Victoria, in the municipality of Saanich.

Memorials

Terry Honer, former Canadian Forest Service scientist, program director, and Pacific Forestry Centre director general, passed away November 18. Honer worked at both the Forest Management Institute in Ottawa and the Pacific Forestry Centre, and when Canada converted to metric units from imperial measurements, he was instrumental in converting the forestry sector to metric, having served as Chairman of the committee for 17 years. Honer also played a key role in committing Pacific Forestry Centre funds to research with remote sensing technologies, and obtained Department of Supply and Services (now Public Works) funding for a company named OVAAC8 to develop a digital-image-analysis system for remotely sensed data. After a number of name changes and other transformations, this company became present-day PCI.

In retirement, Honer took up painting and writing. One of his paintings appears on the cover of his book, *Without Fear or Favour: culling & scaling timber in Canada 1762-1992*, which continued his work in documenting the history of the forest service and of forestry in Canada. He recently published *Iron Tools and Logging Practices of the Ottawa River Shantyman.*

Former Plant Ecologist **Ed Oswald** passed away on December 1. Oswald worked at the Pacific Forestry Centre from 1970 until his retirement in the mid-1990s, and had also spent three years at the Canadian Forest Service lab in Winnipeg before the lab closed. Throughout his career at Victoria, he provided ecological data from various locations throughout British Columbia to research studies; his greatest contribution and the work period he enjoyed most, however, was the time he spent in Yukon Territory, which culminated in a publication in the ecological land-classification field. Oswald served on a number of national and regional committees and represented the Canadian Forest Service in the Mackenzie Valley Pipeline Hearings.

Next Issue

Shedding light on ectomycorrhizal fungi

&

Effects of mountain pine beetle on forest hydrology

New from the bookstore

Bioenergy options for woody feedstock: are trees killed by mountain pine beetle in British Columbia a viable bioenergy resource? 2006. Stennes, B.; McBeath, A. Information Report BC-X-405E.

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