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INFORMATION FORESTRY

Science and Technology Research at the Canadian Forest Service • Pacific Forestry Centre

Protecting trade and forests: success stories from forest-health research and programs

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Data analyses yield large-scale land-cover fragmentation

New national datasets of Canada's forests have enabled Natural Resources Canada researchers to determine forest harvesting affects specific forest-age classes at a landscape scale.

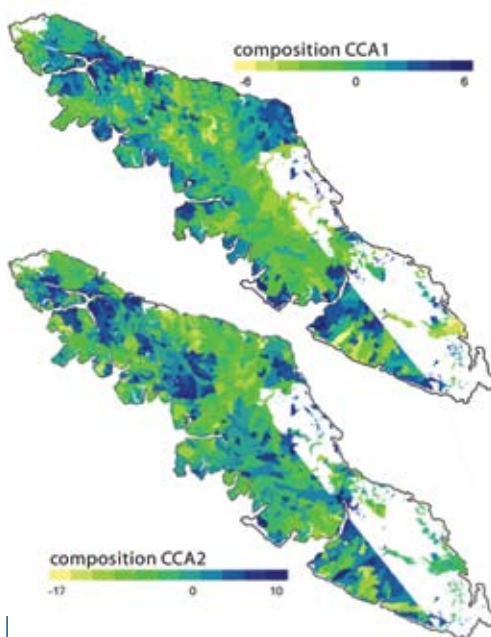
The little information known about these effects pertains mostly to structure of forest aging at small, patch scales, says Meg Andrew, study co-author and post-doctoral fellow at the Pacific Forestry Centre.

"The strength of this study is that it was conducted over all of Vancouver Island, which covers well over 1,200 watersheds and 32,000 square kilometres," she says. "It completely characterizes the island and delivers detailed, baseline information about the composition and pattern of forested land cover present."

Sources, this page

"Forest fragmentation, structure, and age characteristics as a legacy of forest management" (DOI: 10.1016/j.foreco.2009.07.041) was recently published in *Forest Ecology and Management*, and is available via the Canadian Forest Service online bookstore.

Visit CAFGRIS at <https://cfsnet.nfis.org/cafgris/index.html>. User registration is required.



By combining forest inventory and satellite-derived data to relate forest-age structure to land-cover composition, forest fragmentation and spatial variables, Andrew and colleagues were able to summarize forest patterns for all watersheds, and compare patterns

of forest-dominated and less-forested watersheds.

The scientists used datasets of Canadian forest composition and pattern, including Natural Resources Canada's Earth Observation for Sustainable Development of Forests (EOSD) land-cover and fragmentation datasets, to characterize watersheds over space and time.

The results add to our understanding of forest succession, and can be used by forest and land managers to plan forest management activities to include multiple values, says Canadian Forest Service Research Scientist **Mike Wulder** (mike.wulder@nrcan.gc.ca). "By incorporating the wide-area fragmentation information with forest inventory data, forest managers have an otherwise unavailable source of information to support decision making and planning related to biodiversity, habitat, and hydrological concerns, for example."

The Landsat satellite-derived EOSD datasets represent land cover for circa year 2000. They and a fragmentation dataset are now available for all of Canada's forested ecosystems—some 600 million hectares. —R.P.

CAFGRIS supports conservation of native tree species

Conserving Canada's native tree species became a bit easier with the recent launch of the Canadian Forest Genetic Resource Information System (CAFGRIS). The web-based central-registry system allows provinces, territories, municipalities and other jurisdictions to share and access information about these species.

"This is the first tool to allow natural resource practitioners to plan and manage for genetic conservation strategies that is not limited to jurisdictional boundaries," says Natural Resources Canada Tree Seed Researcher **Tannis Beardmore** (tannis.beardmore@nrcan.gc.ca).

About 126 native tree species grow in Canada's forests. Many face threats from changing climate, pests and harvesting practices that ignore silvicultural requirements of non-commercial

species. However, obtaining a Canada-wide perspective on how individual species tolerate those risks has always been difficult: jurisdictions use different databases and collect information using different inventory standards, scales and even accuracy. The size and diversity of the country's forests add to the challenge.

"CAFGRIS allows natural resource managers to process information on cumulative species impact caused by a particular insect infestation, for example," says National Forest Information System (NFIS) Manager **Brian Low** (brian.low@nrcan.gc.ca), of the Canadian Forest Service. "They can now also report on current status within a geographic area and will soon be able to provide scenarios of prediction models of conservation needs."

A 2003 survey to identify native tree species at potential risk provided the initial information to populate the system. The data can be integrated with information on protected areas, conservation efforts and disturbances.

The Canadian Forest Service launched the CAFGRIS in December. The technologies that enable the services, hardware, software and authentication systems linking the databases and filter spatial information into a standard format are provided by NFIS. The National Forest Information System is a web-based information superhighway managed by the Canadian Forest Service out of the Pacific Forestry Centre and developed in collaboration with the provinces and territories for the Canadian Council of Forest Ministers and GeoConnections.

—D.H. & M.K.

Unearthing underground tree–fungus relationships

In forest regeneration, what goes on underground is as important as what happens above the soil. According to a recent study by Natural Resources Canada scientists, leaving more green trees behind when harvesting stands leads to faster recovery of the underground biodiversity necessary to the health of regenerating forests.

“Single retained trees provide potentially viable ectomycorrhizae refugia, or areas from which these important fungi can recolonize harvested areas,” says Canadian Forest Service Forest Soil Biologist **Renata Outerbridge** (renata.outerbridge@nrcan.gc.ca), one of the researchers involved in a multi-year series of studies on ectomycorrhizae in British Columbia’s coastal forests. “The overall trend in the data was for a positive effect on fungus diversity by increasing the number of green trees retained.”

Ectomycorrhizae are fungi that grow in symbiotic relationship on the surfaces of plant roots. They help tree roots absorb nutrients from the soil, provide protection from drought, and some even protect trees from pathogens. Increased understanding of the best conditions for recolonizing reforested areas by these fungi is critical to developing best practices for second-growth and later-generation forests.

In one study, Outerbridge and her colleagues, Research Scientist **Tony Trofymow** (tony.trofymow@nrcan.gc.ca) and technician **Antoine Lalumiere** (antoine.lalumiere@nrcan.gc.ca), measured the impact of retained green trees, as a function of their number and distance, on diversity of ectomycorrhizal fungi on Douglas-fir seedling roots.

In a related study, they compared diversity found in old-growth or mature forests with that in adjacent stands five to 57 years old, and determined how quickly the fungi might recolonize a harvested area.

The researchers found significant reductions in species richness and proportion of root colonization in the regenerating five-year-old stands with increasing distance from reference stands. The reduction was smaller for transitions from reference stands to saplings, and insignificant in transitions to young or mature forest. Gentle slopes, small cutblock size, and immediate replanting with suitable hosts—all present in this study—favour ectomycorrhizae recolonization.

Full recovery of ectomycorrhiza diversity generally occurred within about 55 years. However, with ‘diversity’ defined as number of species and number of colonized root tips, Outerbridge says, “The community structure in all the harvested sites differed from that in old-growth forests.”

To understand the significance of the difference, more research is required to determine the functionality of the ectomycorrhiza species involved. Scientists do not yet understand which species are most involved in particular functions, or under which conditions. Many species that persisted in the cutover areas are common types, perhaps well suited to withstanding site disturbances

Research is also needed to better understand the role of ectomycorrhizae in forest system resilience to large-scale disturbances or repeated harvesting events, Outerbridge says.

“In a perfectly natural environment, unaffected by industrial activities, millions of years of adaptation have created a very unique biodiversity,” she says. “Time and again, by the old-growth stage, the trees along with their fungal and plant communities have experienced many different events and conditions.” The result is a forest ecosystem that has a collective ability to respond to a wide spectrum of adversities.

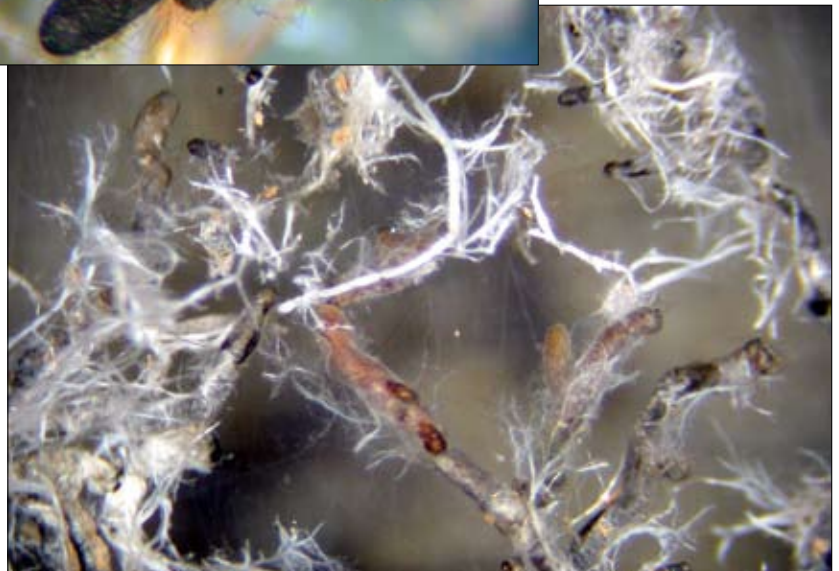
—K.H.

Sources

Visit the Canadian Forest Service online bookstore to order or download a copy of *Re-establishment of ectomycorrhizae from refugia bordering regenerating Douglas-fir stands on Vancouver Island, BC-X 418* (in press), “Forest management and maintenance of ectomycorrhizae: A case study of green tree retention in south-coastal British Columbia,” and “Diversity of ectomycorrhizae on experimentally planted Douglas-fir seedlings in variable retention forestry sites on southern Vancouver Island”.



Effects of harvesting on diversity and abundance of ectomycorrhizae (photos) may produce downstream effects on stand regeneration.



Battling beetle infestation effects reduces risk of wildfire

More information on the First Nations–forestry component of the federal Mountain Pine Beetle Program is available at mpb.cfs.nrcan.gc.ca/control/reserve_e.html

People in First Nations communities across British Columbia are working, with financial assistance from a federal funding program, to clear the flammable aftermath of the mountain pine beetle.

The wave of beetles has left red and grey tree skeletons tottering over homes and hillsides. As the pines die and dry out, First Nations communities are threatened by hazardous trees falling over or fuelling wildfire. In response, the Federal Government created the First Nations Element under the Federal Mountain Pine Beetle Program, a set of programs to reduce the post-beetle threat to public safety in First Nations communities within the beetle-infestation zone.

One component financially assists with removal of hazardous trees and a second with the removal of forest fuels. Under the forest fuel component, all projects start with professionally prepared Forest Fuels plans, which are designed to adhere to the national FireSmart program. Strategies include clearing and removing ladder fuel—the brush and low branches that let fires race up trees and turn a ground fire into a fast-spreading crown fire; thinning trees, whether by removing hazard trees within 100 metres of homes and buildings or spacing them to slow any crown fire; making firebreaks; and planting new seedlings.

From First Nation reserve lands located near the outbreak's epicentre to those at its edge, during the past three years, Bands have used Program funding to make their communities safer.

Pine forests of the Cheslatta First Nation, northeast of Tweedsmuir Provincial Park, were killed early in the outbreak.

"It's like 10 billion matchsticks scattered around your place," says Mike Robertson, Cheslatta's senior policy advisor. "One little spark would strike up the whole community."

Using \$265,000 in Program funds, Cheslatta crews hauled dead pine, vegetation, and debris from their land. Clearing the forest does more than make people safer, Robertson says: it lightens

the psychological heaviness of seeing their environment and livelihood destroyed. It also helps the community by keeping members close by, as recent downturns in the forest sector and the economy have forced some residents to find work off-reserve at the Alberta tar sands or on ships thousands of kilometres away. These First Nations Element programs provide employment close to home.

"This program has been a lifesaver," says Robertson.

For the Cayoose Creek Band, a few hundred kilometres to the southeast of the Cheslatta First Nation, beetle havoc has just crested. Michelle Edwards, the Band's Natural Resource Coordinator, estimates four-fifths of their pine is dead. With \$265,000 in Program funding, the Band has removed and burned hazard trees and cleared forest fuel around the community of homes.

Edwards is pleased with the actions taken under the Program: "We're always talking about this being our land and we should take care of it," she says. "Now, we are getting funding assistance to do it."

At least half the pines in the Nlaka'pamux Nation Tribal Council's northern and central forests are affected. "We don't need beetles to add to our forest fire risk," says Tawnya Durant, the Council's Registered Professional Forester. "It's already dry and windy here, and now this bug is turning our trees into kindling."

The Tribal Council has helped several bands address their fire risk, including Lytton First Nation. Lytton's lands stretch along the banks of the Fraser River from Hope to Cache Creek. Ponderosa



Federal Mountain Pine Beetle Program funding enabled beetle-affected First Nations in British Columbia to make their communities FireSmart.

Photo courtesy of Nlaka'pamux Nation Tribal Council

in communities and builds skills among First Nations

and lodgepole pine cover the hills. Now that the beetle has swept through, hundreds of dead trees threaten residents' safety.

"I look out the window and all I can see is red," says Lytton Band Economic Development Manager Bernadine Paul. The Federal Mountain Pine Beetle Program provided \$99,000 through the Tribal Council to Lytton First Nation to remove hazard trees. Lytton crews hauled beetle-killed trees from around residences and community structures, using a horse logger where conventional hauling would wreck the landscaping. Durant estimates 50 homes are now safer.

In addition, the Federal Mountain Pine Beetle Program has provided \$200,000 to the Lytton First Nation to remove beetle-killed pines near Lytton's homes and schools. Some of the First Nation's crew earned their green ticket in the process, adds Paul, which certifies them to fall trees around hydro lines.

In the dry Kamloops valley, where the South and North Thompson rivers meet, the Kamloops Indian Band's response to the mountain pine beetle in their reserve land was swift. Using their own resources and federal funds, Band members salvaged dead pine for pulp within months of the outbreak. Still the attack progressed. The copious rotting pine and a small fire prompted a revision of their approach from timber salvage to community safety. The Band assessed hazards and developed fuel mitigation treatments for areas where the community and the forest meet.

"The consultant hired to develop our fuel management plan said our work is some of the best he's ever seen," says Jim McGrath, the Band's Registered Professional Forester.

This past year, they focused on Paul Lake, home to Paul Lake Provincial Park and to about 200 Band residents. In 2008–09, Kamloops Band crew members worked full-time from October through the winter. Despite the snow, by mid-February of 2009, they had felled all the hazard trees within 100 metres of homes and from nearby power lines.

With \$197,000 in federal beetle funds over three years, the Band opened the forest canopy, reduced forest fuel levels, felled danger trees, pruned living trees, hauled underbrush and debris on the forest floor, and removed vegetation to make a firebreak. "The area looks better and the fire threat to our communities is reduced," McGrath says.



The crew's reputation has landed them work on a Crown land project for ecosystem restoration, he adds, and they have helped other First Nations manage their own beetle-related challenges.

Further south, the Penticton Indian Band is responding to the post-beetle fire threat.

"We have 45,000 acres, and three-quarters of it is forested," says Greg Gabriel, the Band Administrator. "Our main residential area is adjacent to the City of Penticton, so we're trying to minimize the fire hazard for both communities."

Crews have applied \$223,000 to reducing fuel levels, spacing dominant trees, pruning trees, and clearing ladder fuel. Over three years, they have treated areas around their communities; at least 100 homes are safer.

"It's a better feeling knowing there's not as much hazard," says Gabriel.

Through the Federal Mountain Pine Beetle Program's First Nations Element, funding has addressed diverse needs in managing beetle-related problems across First Nations communities. By hiring band members to apply FireSmart guidelines to their land, the communities have secured hundreds of homes, while providing employment and training for First Nations throughout the province. —K.Z.

Lytton First Nations members chip beetle-killed wood removed to protect the band's reserve lands from wildfire.

Photo courtesy of Lytton First Nation

Commodity-based invasive forest pest-risk review prote

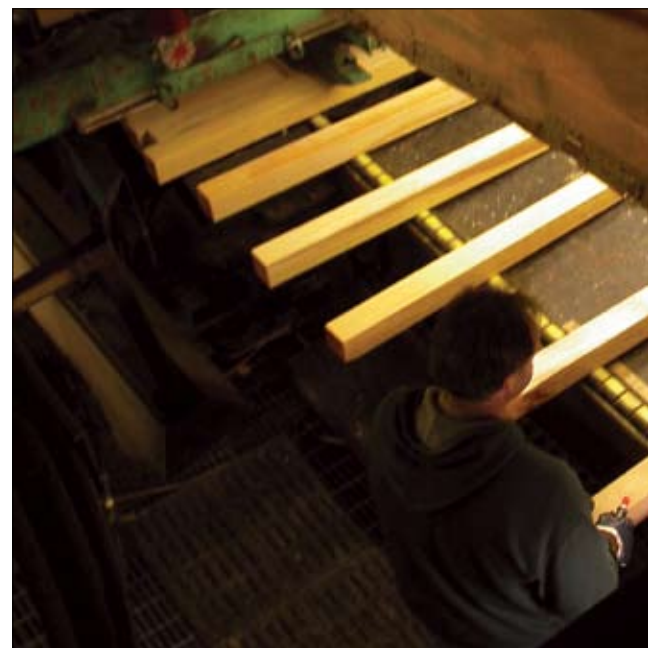
World trade in forest products is a multi-billion dollar industry. In 2007, about 324 million cubic metres of wood products with phytosanitary risks were exported around the world, worth \$USD 52.8 billion. This represents a 61 percent increase in quantity and 83 percent increase in value since 1992.

Every year, trade increases.

"As global trade has expanded, diversity of forest products and horticultural commodities traded and number of trading partners involved have increased," says Natural Resources Canada Research Biologist **Isabel Leal** (isabel.leal@nrcan.gc.ca). "Potential for spread of invasive pests with devastating consequences for the forests of recipient countries has expanded in parallel."

Scientists within the Canadian Forest Service, the Canadian Food Inspection Agency, industry, and other agencies work to identify and monitor non-native pests that threaten the wellbeing of Canada's forests or its ability to trade with other countries. The researchers develop detection methods and tools, assist with monitoring, and provide scientific advice for control of pests and

Visually grading lumber is one of the measures employed by mills and plant-health officials to detect pathogens that may pose a risk to forests and to trade in wood products.



treatment of high-risk products being imported or exported by Canada (see articles, this and following pages).

Research contributes to international understanding of

Every month, a puzzling pathogen that threatens the nursery industry and urban and forest environments becomes slightly less mysterious, thanks in part to efforts by an international team of researchers.

Natural Resources Canada Research Scientist **Simon Shamoun** and colleagues from government agencies and universities across Canada and the U.S. are studying *Phytophthora ramorum*, a water mould that causes many diseases, including sudden oak death and ramorum blight. The laboratories form part of a worldwide network of scientists and plant-health officials working to uncover information about *P. ramorum*.

"*Phytophthora ramorum* is an emerging pathogen of concern around the world," Shamoun (simon.shamoun@nrcan.gc.ca) says. "It is a complex pathosystem that has the potential to seriously damage specific forest and landscape environments."

Latin *phytophthora* means "plant destroyer." Closely related to the potato-blight pathogen and the Port Orford cedar

pathogen, *P. ramorum* has ravaged live-oak and tanoak forests in California and rhododendron ecosystems in Europe.

Although the pathogen has not been detected in Canada's wildlands nor outside of nurseries here, stringent quarantine restrictions are enforced throughout the country on movement of host plants from infested areas and on pathogen handling in laboratories. For instance, when plant-health inspectors found *P. ramorum* on shrubs for sale at four Lower Mainland and southern Vancouver Island nurseries in 2003, 2004 and 2005, they recalled and destroyed high-risk plants, quarantined the nurseries, and placed gardens where infected shrubs had been planted under observation. Any nursery that tests positive for *P. ramorum* is quarantined until the pathogen is eradicated.

Shamoun's team has developed genetic techniques to separate *P. ramorum* from other species and distinguish the organism's three clonal lineages. The scientists have compared lineage pathogenicity and are looking at the role of

cytoplasmic elements in pathogenicity. The researchers are also testing biological and chemical control products on *P. ramorum*.

"We must learn as quickly as possible as much as we can about *P. ramorum* and how to manage it," Shamoun says. "If it were to get established in Canada, it may affect nurseries' abilities to grow certain species and the trade in forest products and nursery stock."

Researchers from Laurentian Forestry Centre are testing susceptibility of plants native to Canada's eastern forest to the pathogen, and are studying possible genetic markers for the pathogen.

In a recent assessment, the Canadian Food Inspection Agency concluded that the pathogen is unlikely to affect Canada's wildlands to the same degree as in California, because the pathogen requires specific host and climate factors not present in Canada. However, the pathogen continues to be a concern to uninfested areas and would affect trade in nursery goods if it infested any area in Canada.

Protect forests and global trade in wood products



For instance, Leal and colleagues from the Canadian Forest Service, the Canadian Food Inspection Agency and FPIInnovations recently

evaluated the risks of forest pests being spread according to type of wood commodity. From logs to wood chips, they scrutinized how trade in various green or unprocessed wood products could introduce pests that threaten forest health. They also rate the effectiveness of treatments commonly used to eliminate live pest organisms associated with wood commodities—treatments such as fumigation or heat.

The resulting report, due this spring, has already been considered in the drafting of a new international standard that details plant-health measures appropriate for wood products in international trade. A group of plant-protection specialists from around the world is developing the standard under the International Plant Protection Convention. These experts, the Technical Panel on Forest Quarantine, rely on scientific information, such as that which Leal's group has provided.

"This report compiles research results and scientific information necessary for appropriate regulation of wood commodities moving in trade," Leal says.

Invasive non-native forest pests can cause great ecological, economic and social harm in affected countries or regions. For instance, these insects and diseases cost Canada's forest sector between \$7.7 billion and \$20.1 billion each year. The costs include lost or damaged timber and non-timber values and expenses for control and eradication.

Furthermore, nations whose exports spread invasive organisms incur additional costs, as trading partners may restrict or stop import of goods to prevent pest spread.

According World Trade Organization regulations, trade restrictions due to threats to forest health must be demonstrably supported by science.

"This review may provide useful scientific support of international standards-setting bodies tasked with establishing phytosanitary requirements in a fair, uniform and scientifically sound way," says Canadian Food Inspection Agency Forest Health Specialist Shane Sela, one of the report's co-authors. "And it supports discussions with our trading partners on the realities of the risks associated with trade in wood commodities, particularly in identifying appropriate measures for managing risks in Canadian wood exports."

—M.K.

On the cover



Lumber awaits inspection by forest-health officers at a Campbell River, British Columbia, mill.

problem pathogen

In addition to contributing to the study of *P. ramorum*, Canadian Forest Service scientists provide scientific advice on quarantine issues related to the pathogen.

"The value of Canadian Forest Service research and advice on quarantine issues is well recognized by partner agencies in Canada and across North America," says Natural Resources Canada Research Mycologist **Brenda Callan** (brenda.callan@nrcan.gc.ca), a member of Canada's Sudden Oak Death Task Force scientific advisory committee. "Scientific advice on *P. ramorum* is part of the expertise we offer." Callan works with colleagues in the provinces to analyse emerging science on the pathogen and provides technical expertise to the Canadian Food Inspection Agency (CFIA) in developing a relevant response to the pathogen. For example, she assisted the CFIA in developing the current *P. ramorum* risk assessment.

—M.K.

Sources, this page

Visit the Canadian Forest Service online bookstore to order or download a copy of *Phytosanitary risks associated with the global movement of wood products: a commodity-based approach*, BC-X 419 (in press), or for research on *Phytophthora ramorum* to which Canadian Forest Service researchers have contributed.

DNA screening identifies 31 non-native forest

Emerging DNA-screening technologies can play a vital role in detecting and identifying potentially problematic pest insects in Canadian forests. Natural Resources Canada, the University of British Columbia and other agencies recently used DNA screening to uncover 31 non-native moth species in Vancouver's Stanley Park.

Four of the non-native species were not known to be established in British Columbia; three of those four are new records for North America.

"These are phenomenal results, considering only 190 species were collected," says Natural Resources Canada Research Scientist **Lee Humble** (leland.humble@nrcan.gc.ca). "The DNA analyses helped us zero in on species identities."

Humble has been conducting surveys for alien insects in forested areas throughout British Columbia's lower mainland for 14 years. In 2007, in cooperation with the University of British Columbia Faculty of Forestry, the Metro Vancouver Parks Board and the Canadian Food Inspection Agency, he extended his research to include Stanley Park. Humble supplied light traps for the university-led insect inventory and developed protocols for collecting moths using light at sampling locations in the 400-hectare urban park. The survey was prompted by the 2006 wind storms that blew down swathes of Stanley Park's famous old-growth west coast forest.

Humble and Ph.D. candidate Jeremy deWaard used the survey to populate the DNA database of Canadian *Lepidoptera* for the Canadian Barcode of Life project, an initiative based at the University of Guelph, in Ontario. Like the universal product codes on supermarket goods, the analysed DNA segments serve as species-specific identification tags that eventually can be cross-referenced between the database and new field samples to detect and identify species, track their movement around the globe, and study evolution and biodiversity.

"The Stanley Park experience highlights many advantages to using barcoding in biodiversity inventories," says deWaard, who helped develop DNA barcoding during his undergraduate and masters studies at Guelph.

DNA-barcode screening increased the accuracy of species identifications and decreased time required for a species' identification from days or weeks to hours. It also flagged specimens requiring further attention, thereby allowing trained taxonomists to focus on problematic identifications while non-specialists confirmed identities of the common, routine specimens.



"It allowed us to identify cryptic species, new species, species that don't belong here, and species for which only single specimens were collected," says deWaard.

Rapid and accurate

Rapid detection and identification of non-native invasive pests is key to preventing their establishment in new territories.

The repercussions of delay and misidentification recently surfaced in British Columbia's Vancouver Island and Lower Mainland. DNA sampling of moths in the Pacific Forestry Centre insect collection recently confirmed that *Gypsonoma aceriana*, a European shoot-boring pest of poplars, has been in the region for three decades—plenty of time for a pest to become established.

The specimens in question were collected in the early 1980s. A taxonomist examined and returned them, indicating a possible identification to genus level within the moth family *Tortricidae*. They were catalogued as such, and stored away.

"Insect identification can be extremely challenging," says Canadian Forest

Sources

"In the dark in a large urban park: DNA barcodes illuminate cryptic and introduced moth species" was published in *Biodiversity and Conservation*, and "Delayed recognition of the European poplar shoot borer, *Gypsonoma aceriana*... in Canada" is published in the December 2009 issue of *Journal of the Entomological Society of British Columbia*.

Both are available from the Canadian Forest Service online bookstore.

See *Information Forestry*, April 2009, for information on the Stanley Park insect inventory

pests at home in Vancouver's Stanley Park



Damage to the old-growth forests of Vancouver's renowned Stanley Park prompted a survey for insects, which were identified using DNA-barcode screening.

Photo: Spirit Wrestler Gallery, Vancouver © 2007 - flickr

"Right away we knew the family and had an indication of genus," deWaard says. "In a quick discussion with colleagues, we learned of one specimen that had been collected in Newfoundland in the 1970s that was also a member of *Prays*, so we pieced it together, looked at the literature and examined our single Stanley Park specimen. That's how we arrived at the i.d."

Prays fraxinella is one of the four survey identifications that represent new non-native moth records for British Columbia.

"The Stanley Park results demonstrate clearly how DNA screening can save time and resources, and provide reliable, accurate identification," says Humble. "As the technology becomes more accessible and cost-effective, we're going to see DNA screening become a regular part of the pest detection and monitoring toolkit." —M.K.

For instance, DNA analysis of one lone specimen collected in the park indicated the moth closely matched the genus *Prays* from Eurasia.

identification needed to prevent new pest problems

Service Research Scientist **Lee Humble**. "For instance, a taxonomist may know North American species and important pest species really well, but we're asking them to know this huge diversity from around the world—obscure species that have never turned up in North America before, that have never even been identified as problems before. Add to that, experienced taxonomists are retiring and few are being trained to take their places."

In 2001, when a U.S. colleague reported that *G. aceriana* had been detected throughout western Washington State, Humble added the pest to his list of non-native insects to watch for. In 2007, he and Ph.D. candidate Jeremy deWaard re-examined the Pacific Forestry Centre specimens, examining both DNA and morphology.

Their conclusions: the vaguely identified *Tortricidae* specimens sitting in

the Pacific Forestry Centre collection since 1981 were also *G. aceriana*.

Subsequent surveys for its larvae and adults indicate the moth is now established throughout southern Vancouver Island and the Lower Mainland.

"Because we didn't have enough information to positively identify this species 30 years ago, we lost those years and the pest is here for good," says deWaard. "This case demonstrates how much we're expecting from our taxonomy specialists, and how unrealistic those expectations may be."

It also demonstrates how DNA sampling can help taxonomists and plant-health officials pinpoint potential problem species at any life stage, so that risks can be assessed and control measures taken.

—M.K.



The difficulty of detecting and identifying non-native pest species led to the establishment of *Gypsonoma aceriana*, an Asian pest of poplars, in south-coastal British Columbia.

Technique protects trade by targeting live micro-pest

Sources

Visit the Canadian Forest Service online bookstore for "Application of a real-time PCR method for the detection of pine wood nematode, *Bursaphelenchus xylophilus*, in wood samples from lodgepole pine" and "First North American records for *Heterarthrus vagans*, a Palaearctic leafmining sawfly of alder" (in press with *The Canadian Entomologist*).

A new molecular diagnostics method developed by Natural Resources Canada to detect live pinewood nematode in wood caught the attention of forest health officials from around the world.

"Scientists from countries with forests infested by pinewood nematode expressed a great deal of interest, as did those who are developing phytosanitary treatments," says Canadian Forest Service Research Scientist **Eric Allen** (eric.allen@nrcan.gc.ca), who presented the method and its preliminary results at the 2009 International Symposium of Pine Wilt Disease in Nanjing.

Pinewood nematode is the microscopic roundworm that causes pine wilt disease. Native to North America, it rarely affects North American tree species, but has seriously damaged trees in Asia and Portugal. In 1993, Europe banned imports of untreated softwood from North America, significantly decreasing market access.

The new method, developed by Canadian Forest Service Molecular Biologist **Isabel Leal** (isabel.leal@nrcan.gc.ca) and colleagues, analyses samples for messenger-RNA (mRNA) associated with pinewood nematode heat-shock proteins. Unlike DNA, which can survive in dead tissues for years, mRNA degrades soon after an organism dies. Its absence indicates a lack of viable nematodes in a sample.

"It's important to have a method that differentiates between dead and live nematodes,



Pinewood nematode is a microscopic wormlike organism that causes pine wilt disease in susceptible softwood trees. Photo: USDA Forest Service, bugwood.org

because only live nematodes are a risk to forest health," Leal says.

Many major wood-importing regions, including China, Korea and Europe, require countries where pinewood nematode is found to heat treat all softwood commodities prior to export in accordance with international standards. Leal and colleagues' method will allow plant-health officials to test the effectiveness of treatments against the nematode.

The method will also protect trade by allowing exporters to demonstrate that their softwood lumber, chips, logs, prefabricated housing and wood packaging is free of living, dangerous nematodes. —M.K.

Trap and lure research uncovers new insect invader

A chance encounter by a Natural Resources Canada researcher this past summer during a routine survey for invasive beetles led to the first discovery of a non-native leaf-mining sawfly of birch or alder (family *Betulaceae*) establishing in North America in more than 25 years.

Next to one beetle trap, set up in the University of British Columbia's Malcolm Knapp Research Forest near Maple Ridge, Canadian Forest Service Research Scientist Lee Humble (leland.humble@nrcan.gc.ca) noticed a branch of a red alder tree with leaves containing leaf-mining sawfly cocoons.

"I knew right away something was wrong," he says. "The only leaf-mining sawfly that attacks alder in Canada

feeds in the leaves, then drops down and pupates in the soil."

Within 10 days, Humble initiated a roadside survey of alder throughout the Fraser Valley, north towards Whistler, and east and north of Hope, as well as around Victoria.

In an article now in press in *The Canadian Entomologist*, Humble confirms the presence of *Heterarthrus vagans* throughout the Fraser Valley and northward to the town of Squamish. To date, the damaging insect has not been found on Vancouver Island.

Heterarthrus vagans is widespread throughout Europe and eastern Asia. Adults lay eggs in alder leaves. When the eggs hatch, the flattened caterpillar-like larvae feed inside the

leaves. The mines they excavate then provide shelter to the larvae while they spin cocoons and pupate.

A deciduous North American tree, red alder is found throughout the Pacific Northwest. Other alder species live in other parts of North America.

Humble began surveying British Columbia's Lower Mainland and Vancouver Island for non-native beetles and moths 14 years ago to support his research. He is currently using the surveys in research with colleagues from the Atlantic, Great Lakes and Pacific forestry centres to improve traps and lures to detect and monitor wood-boring beetle populations. —M.K.

People

Arrivals

Kendrick Brown joins the Canadian Forest Service as a wildland fire research scientist. Brown reports to the Northern Forestry Centre in Edmonton, but will be based at the Pacific Forestry Centre. His background is in paleo-fires and the control of fire over vegetation dynamics, especially under climate change.

Departures

After 40 years, five months and 20 days, Research Scientist **Imre Otvos** retired from the Canadian Forest Service November 6. Otvos supervised a research program that studied ecologically sound biological control and integrated pest management methods using parasitoids, predators and pathogens for forest defoliators. He was also involved in the successful control of the non-native winter moth populations on Vancouver Island and the larch casebearer in the British Columbia interior using classical biocontrol techniques, and helped develop the management system for controlling Douglas-fir tussock moth.

Research Scientist **Jason Nault** retired from the Canadian Forest Service in December. Since 1992, Nault conducted experiments on interactions between tree chemistry and insect attack, and developed applications of reflectance chemistry for analysis of wood and woody debris. He was also responsible for maintaining and operating the organic chemistry lab collection of instruments. Before joining the Pacific Forestry Centre, he worked for Forintek Canada as a research scientist.

Accolades

Pacific Forestry Centre Research Scientists **Mike Wulder** and **David Goodenough**, Forest Inventory and Analysis Spatial Analyst **Joanne White**, Remote Sensing Analyst **Morgan Cranny**, and Forest Information Director **Jeff Dechka**, as well as Northern Forestry Centre Remote Sensing Inventory Specialist **Ron Hall** and Atlantic Forestry Centre Remote Sensing Scientist **Joan Luther**, won the *Canadian Journal of Remote Sensing* Award for Best Published Paper in 2008. The paper, "Monitoring Canada's forests. Part 1: Completion of the EOSD Land cover project," presents an overview of the national effort to map land cover in Canada's forested areas.

The Canadian Aeronautics and Space Institute's Canadian Remote Sensing Society presented its Gold Medal to Research Scientist **Don Leckie** at the Canadian Symposium on Remote Sensing held in Lethbridge, Alberta, this past June. The award recognizes Leckie's significant contributions to the field of remote sensing in Canada. The gold medal is the society's highest award.

The Swedish University of Agricultural Sciences, Faculty of Forest Sciences, recently awarded Research Scientist **Werner Kurz** an honorary doctorate for his research on effects of forest management and land-use change on boreal forest carbon budgets. The ceremony took place in Uppsala, Sweden, on October 3. Kurz presented a public lecture at the university on October 2, entitled Forests and Carbon: Feedback to Climate Change.

Events

Annual conference and general meeting

Association of BC Forest Professionals
April 8–9, 2010
Kelowna, BC
Info: www.expofor.ca

International Conference on the Efforts in Response to Forest-Related Natural Disasters

1st Forest Science Forum
April 12–14, 2010
Beijing, China
info: gfsf2010.org

23rd Annual Global Forest and Paper Industry Conference

PricewaterhouseCoopers
11 May 2010
Vancouver, BC
Info: www.pwcd.com/en_GX/gx/forest-paper-packaging/events/23d-fpp-conference/transformation-through-innovation

A tale of two cedars: western cedar and yellow-cedar international symposium

May 24–28, 2010
Victoria, BC
www.fs.fed.us/pnw/olympia/silv/CedarSymposium

4th International BioEnergy Conference and Exhibition

BC BioEnergy Network
June 8–10, 2010
Prince George, BC
info: www.bioenergyconference.org

Forest Landscapes and Global Change

New Frontiers in Management, Conservation and Restoration Landscape Ecology International Conference
IUFRO
September 21 to 27, 2010
Bragança, Portugal

New publications from Pacific Forestry Centre

Mountain Pine Beetle working papers

Characterization of the jack pine forests of Western Canada for susceptibility to infestation by mountain pine beetle. Shore, T.L.; Fall, A.; Burnett, C.; Riel, W.G. Natural Resources Canada, Canadian Forest Service, Pacific Forestry Centre. Mountain Pine Beetle Working Paper 2009-04.

Hydrologic effects of mountain pine beetle infestation and salvage-harvesting operations. Rex, J.; Dubé, S. Natural Resources Canada, Canadian Forest Service, Pacific Forestry Centre. Mountain Pine Beetle Working Paper 2009-05.

Assessment of post-beetle impacts on natural regeneration of lodgepole pine. Egger, K.N.; Arocena, J.; Green, S.; Kennedy, N.; Massicotte, H.; Tackaberry, L.; Scholefield, S. Natural Resources Canada, Canadian Forest Service, Pacific Forestry Centre. Mountain Pine Beetle Working Paper 2009-07.

Near infrared detection of decay in post-mountain pine beetle lumber. Stirling, R. Natural Resources Canada, Canadian Forest Service, Pacific Forestry Centre. Mountain Pine Beetle Working Paper 2009-08.

Impact of mountain pine beetle-attacked lodgepole pine logs on veneer processing. Wang, B.J.; Dai, C. Natural Resources Canada, Canadian Forest Service, Pacific Forestry Centre. Mountain Pine Beetle Working Paper 2009-12.

Effects of overstorey mortality on snow accumulation and ablation—Phase 2. Teti, P. Natural Resources Canada, Canadian Forest Service, Pacific Forestry Centre. Mountain Pine Beetle Working Paper 2009-15.

Novel aerial photography as an aid to sampling secondary structure in pine stands. Teti, P. Natural Resources Canada, Canadian Forest Service, Pacific Forestry Centre. Mountain Pine Beetle Working Paper 2009-16.

MPB-Biodiversity (MPBio): A GIS-based toolbox for exploring the ecological consequences of salvage logging - description and user's guide. Chan McLeod, A.; Moy, A. Natural Resources Canada, Canadian Forest Service, Pacific Forestry Centre. Mountain Pine Beetle Working Paper 2009-21.

Decision support tool for managing biodiversity and ecosystem resilience in mountain pine beetle-susceptible landscapes. Chan McLeod, A.; Vermier, P. Natural Resources Canada, Canadian Forest Service, Pacific Forestry Centre. Mountain Pine Beetle Working Paper 2009-23.

Other Publications

Environmental Science Advisory Committee: 2008/2009 Annual Report. Natural Resources Canada, Canadian Forest Service, Pacific Forestry Centre. Copublished by the Department of National Defense.

The State of Canada's Forests. Annual Report 2009. Natural Resources Canada, Canadian Forest Service, Ottawa.

L'État des forêts au Canada. Rapport annuel 2009. Ressources naturelles Canada, Service canadien des forêts, Ottawa.

2009 numbers from the Canadian Forest Service online bookstore

Publications downloaded, viewed or ordered via the Canadian Forest Service online bookstore in 2009 totalled almost 210,000.

About 80,000 publications were served out of the Pacific Forestry Centre.

Almost 30,000 downloads, views and orders were for publications produced under the Government of Canada's mountain pine beetle programs.

November 5 was the busiest day of the year: more than 26,000 visits were recorded.



Visit the Canadian Forest Service online bookstore to order or download Canadian Forest Service publications:

bookstore.cfs.nrcan.gc.ca

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