

branch lines



FACULTY OF FORESTRY
UNIVERSITY OF BRITISH COLUMBIA

Volume 15 No. 3 December, 2004

Where have all the flowers gone?

Emily Gonzales is determined to find out

Talking with Emily Gonzales, Ph.D. candidate in the Faculty of Forestry's Centre for Applied Conservation Research, about her experiences as a graduate student is as enjoyable as it is informative. She leans forward earnestly as she discusses the impacts of her research in Garry Oak ecosystems, recounts the organizations and individuals with whom she collaborates, and fondly describes the system she simply refers to as "Garry".

"My mission is to let members of the public know who Garry is. I tell them that she's complex, that ... to work with her we have to understand that she is dynamic, that she is going to change through time, and that she has needs and issues. So we talk about some of those issues like herbivory, like exotic {invasions}, and fragmentation; ...the key factors influencing the loss of ecosystem."

Emily's research questions are ambitious; she strives to determine which factors are contributing to the decline of one of Canada's most endangered ecosystems, as well as how best to protect and restore what is left. Emily is studying the effects of exotic plants and large herbivores, including native deer and exotic goats and sheep, on native plant communities in the Gulf Islands of BC. The islands form a series of natural laboratories, with varying degrees of human impact, exotic plants, and herbivores, which allows the comparison and quantification of these impacts.

"I have a fabulous project that involves visiting different Gulf islands, and comparing the vegetation ... {I} try to understand what leads to the plant community composition there". She is also running two experiments on islands with different complements of herbivores; Gabriola Island has deer, Saturna Island has goats



Countless hours of counting plants... A plot such as this one on Gabriola Island could take as long as 10 hours.

and deer, and Salt Spring Island has sheep and deer.

Emily, and her research advisor, Dr. Peter Arcese, collaborate with the Gulf Islands National Park Reserve, Parks Canada, the Garry Oak Ecosystem Recovery Team, various community groups on the island, and a handful of other academics who have ventured into this field of study. She describes her role in the process as "... providing answers to critical questions, and that's not really being done by anybody else at this stage". Her work complements the conservation efforts of local organizations removing invasive plants such as Scotch broom, purchasing properties and

changing policies to protect different areas. *“This ecosystem is so tied up with where people live that it’s very important to get the local people involved in protecting the community, in protecting the ecosystems, for {there} to be a partnering with the community level organizations. So I’ve been doing talks and workshops on the different islands and getting to know the folks that live where I work.”*

Emily has been involved in community and science since completing her Bachelor’s degree at Simon Fraser University, when she ran a non-profit organization called “Science ALIVE”. Even while working on her Masters degree at the University of Guelph, she contributed to British Columbia conservation efforts by studying the spread of the eastern grey squirrel on the

west coast, and its effects on native Douglas squirrels. Upon graduating, she worked as the Public Programs Coordinator with the Stanley Park Ecology Society. When she decided to return to academia, the support and enthusiasm of Dr. Arcese attracted Emily to UBC’s Faculty of Forestry. The multi-faceted nature of her work motivates her to continue. *“I really enjoy the work I do; to try to understand what is going on and then to tell people about it – which is incredibly important – it is really fun for me”.*

This article was written by M.Sc. student Yona Sipos-Randor following a series of interviews with selected students, faculty members and alumni during the summer.

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New enzymes for biotechnology

Our Canadian forests can provide a source of novel industrial enzymes

At UBC’s Faculty of Forestry, we use the term ‘Forest Enzymology’ to describe an emerging field focused on the study of enzymes secreted by forest microorganisms and their application to biotechnology. Enzymes are proteins produced by living organisms which serve as highly specific catalysts in all biological processes. Enzymes are already used as environmentally-friendly agents in a wide range of applications in the detergent, food, textile, leather, and pulp and paper industries. Generally, industrial enzymes make production processes more efficient and ‘greener’ by reducing chemical inputs and producing cleaner outputs.

The past decade has witnessed a huge expansion of activities aimed at improving the properties of known enzymes and the identification of novel enzymes for industry. Already, several industrial enzymes have been developed from microorganisms found in forests. Forest fungi are attractive sources because they produce and secrete a diverse range of enzymes in large quantities. Canadian forests support a wide biodiversity providing a largely untapped source of potential industrial enzymes.

Forest Enzymology is a new venture for our Biotechnology and Biomaterials research cluster, but it has already achieved success. We have recently demonstrated the existence of a new class of fungal enzymes involved in hydrolysis of wood cellulose and hemicellulose. These enzymes seem to act more efficiently because of a reduced tendency to interact non-productively with lignin. They are of considerable interest in bioconversion processes that produce simple sugars from woody biomass for fermentation to fuel-grade ethanol. In other studies, we have isolated fungal strains responsible for sapstain, an increasing problem associated with the growing Mountain Pine Beetle infestations in BC and Alberta. These fungi are also seen as



A three-dimensional structural homology model of a weak-lignin binding cellulase from *Penicillium* sp. (center). Model developed by Dr. Alex Berlin

Photos of Whistler, BC (left), Faculty of Forestry, UBC (right)
Design by Vera Maximenko

promising sources of novel industrial enzymes.

Our Forest Enzymology group is headed by Drs. Jack Saddler and Colette Breuil, and combines the expertise of microbiologists and biochemists with state-of-the-art analytical facilities. Currently, we are expanding our efforts to include collaboration with leading biotechnological groups worldwide.

For further information, please contact Dr. Jack Saddler at 604-822-2467, jack.saddler@ubc.ca or Dr. Alex Berlin at 604-822-5936, alberlin@interchange.ubc.ca

Holistic housing

“Initial results indicate that one third of Canadians have reported illnesses from materials in home construction”

Residential construction is a key driver of many economies and consequently a major user of the world’s natural resources. Buildings account for one-sixth of the world’s fresh water withdrawals, one-quarter of its wood harvest and two-fifths of its material and energy flows. As populations in developed countries age, more and more time is being spent at home and the impact of the home environment on human and environmental health is becoming increasingly understood. Holistic housing represents a burgeoning area of inquiry which recognizes and addresses these health issues.

Drs. David Cohen, Rob Kozak and a team of graduate students from the Department of Wood Science are exploring the concept of holistic housing based on a framework adapted from sustainable development. This framework (see figure) attempts to balance the trade-offs between concerns for the environment, societal and cultural constraints, and human well-being (including economics). While holistic housing is complicated by the fact that these trade-offs and interactions can vary both temporally (years, decades and centuries) and spatially (local, regional and global), it is a relatively simple notion to grasp. We must strike a balance between our health and well-being with the demand that we place on our natural capital. To date, the research being conducted at UBC has focused on perceptions of health and the role that natural materials – like wood – can play.

Two graduate student research projects (M.Sc.) are already complete: Wellington Spetic has surveyed Canadians about indoor environmental quality (IEQ) and Jennifer Rice has explored how peoples’ psychological well-being is impacted by the interior finish of a home. Two further projects (Ph.D.) are ongoing: Pavlos Alexiadis is exploring how culture and psychological characteristics can impact on public perceptions of holistic housing. Surveys are currently underway in Japan and the project will be extended to Europe in 2005. David Fell is examining how and why the presence of natural materials in human environments can provide health benefits to, and communicate social cues about, inhabitants. Three psychological experiments are currently being designed and will be administered in 2005/06.

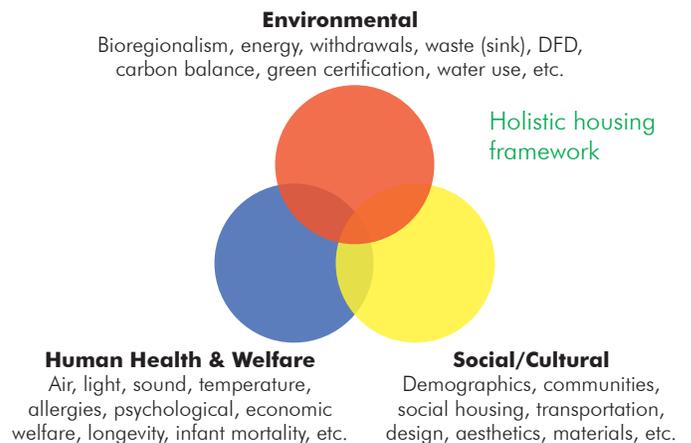
Some of the results to date should be of interest to those involved in the home-building supply chain (including wood producers). For instance, findings from the IEQ study (Spetic) suggest that almost one-third of Canadians believe that they have, or have had, illnesses caused by materials or substances in their homes. Over half of them would be willing to pay a price premium for better indoor environmental quality and they rank energy



Hidden decay in a wall can seriously impact indoor air quality efficiency and indoor air quality (IAQ) as the two most important indoor environmental characteristics within a house. Findings from the psychological study (Rice) indicate that people have a strong preference for rooms which bring nature indoors, either through the use of natural materials or with windows overlooking natural vistas. Notably, it was shown that the use of wood and other natural materials in the finishing of rooms can improve the psychological well-being and emotional states of residents.

In short, there is potential to market “healthy houses” to certain segments of society, and the wood products industry – primary and value-added producers alike – should take note. While the concept of holistic housing is still in its infancy, it is continually evolving as we gain a better understanding of the health impacts (real or perceived) that home environments can have on inhabitants. Much of this work has been supported by Akira Yamaguchi, a homebuilder and the founder of Fuyo Soken and Kinoshiro Taisetsu based in Hokkaido, Japan.

For more information, contact David Cohen at 604-822-6716, david.cohen@ubc.ca, or Robert Kozak at 604-822-2402, rob.kozak@ubc.ca



Research Forests address urban wildfire issues

Following the tinder dry fire season of 2003, the Alex Fraser Research Forest (AFRF) has been finding opportunities to team up with local government, Ministry of Forests staff, forest companies, and other businesses to increase awareness about forest fire risk and address urban-rural interface issues.

The first initiative took place in November 2003, when the Research Forest and the Dean's office coordinated a public lecture on fires and the urban interface at the Forest Sciences Centre. This lecture was attended by about 100 people, and received television news coverage. In March 2004 the lecture was repeated (by request) for Fire Chiefs from the GVRD, and included a field trip to the Malcolm Knapp Research Forest.

The Alex Fraser Research Forest and the Forest Capital committee of Williams Lake organized a public information meeting during National Forestry Week in May 2004. The presentation, "Wildfire: Not In My Back Yard!", focussed on what property owners could do to protect themselves from wildfire. It also addressed some implications of the Filmon Report to communities and rural areas; the ecological role of wildfire in forest and range lands, first-hand experiences in fighting fires in August 2003, and the "FireSmart" program for protecting homes, land and livestock. The session was attended by the Mayor and Council of Williams Lake, and received local radio and newspaper coverage.

The momentum generated by bringing all of these people and agencies together led to the development and delivery of a workshop: "Developing a Framework for Managing Wildfire Hazard in the Urban-Rural Interface of the Cariboo-Chilcotin," June 18, 2004. Thirty-four people participated, representing

local communities, provincial agencies, forest companies, fire departments, ranchers, woodlot owners, and consultants.

Following this workshop, a steering committee was charged with creating an action plan for the Williams Lake area. The process is being facilitated by the Fraser Basin Council, with representation from the AFRF, industry, local government, and provincial ministries. Its objective is to develop an interface fire risk and hazard map and to propose a set of treatments to reduce the hazard. Treatments being considered span the spectrum, from building codes to fuel-reduction treatments in the forest. It is already clear that this cooperative effort will increase communications, and reduce hazard from wildfire at the wildland/urban interface.

For further information contact Ken Day, manager AFRF at ken.day@ubc.ca or 250-392-2207



McClure Fire encircles homes at the urban-rural interface, 2003

BC Forum on Forest Economics and Policy to hold symposium on 27 January

The BC Forum was created earlier this year to stimulate international research and dialogue to promote a highly competitive, sustainable, and respected forest sector. The Forum will hold its first symposium on 27 January 2005 in Vancouver in partnership with the Forest Products Association of Canada (FPAC).

The theme of the event is "Besieged by global change: Defining the future role of BC's forest sector." The keynote talk will be given by Don Roberts, Managing Director for CIBC World Markets. Don will portray the global changes in lumber production underway, and offer strategies being followed by sector leaders in other regions. FPAC CEO Avrim Lazar will offer his insights into how Canada's forest sector can succeed in an increasingly competitive marketplace. UBC Professor of Forest Products Marketing David Cohen will talk about how changing

markets and consumer demand are producing new opportunities for Canadian companies.

The presentations are followed by an in-depth panel discussion moderated by Vancouver Sun columnist and Voice of BC host Vaughn Palmer. The panelists, key representatives of sector stakeholder groups, will present a vision for the future. Questioning will bring out how they see their vision being compromised.

"The purpose of the Forum is to involve forest sector stakeholders in achieving a vision for the future, explains Forum Director Thomas Maness. "We are looking 20 years out, beyond the realm of most corporate and governmental planning exercises. Achieving change involves building a shared vision."

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The forest's hidden half

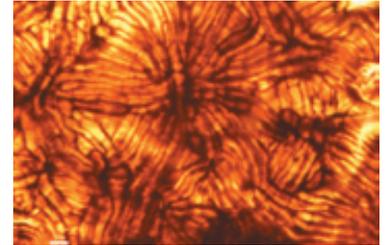
Forestry's newest research cluster suggests that the key to understanding forest ecosystems lies beneath our feet

Soil is recognized by many as our most precious non-renewable resource, and soil protection is fundamental for sustainable forest management. Innumerable soil organisms perform several critical ecosystem processes, and the half of the forest that we cannot see is the most diverse and complex part of the ecosystem. Soil ecology is one of the last major frontiers to improve our understanding of forest ecosystems, and is the focus of the newly established Belowground Ecosystem Group in Forest Sciences at UBC.

The group currently comprises five faculty members (Chris Chanway, Sue Grayston, Maja Krzic, Cindy Prescott, Suzanne Simard), thirteen graduate students, two support staff and two post-doctoral researchers at UBC. Through research collaborations and bi-weekly videoconferences, the group extends to UBC-Okanagan in Kelowna. Group members' expertise extends across many disciplines including forest ecology, silviculture, soil science and microbiology. The research cluster pools its intellectual resources and also shares its laboratories and technical team. There is not a single lab in the group with only one professor's name on the door, recognizing that single researchers can only see a tiny piece of the puzzle that is the belowground ecosystem.

Sue Grayston, a group member and Canada Research Chair, is an expert in determining the role of bacteria and fungi in nutrient transformations. Sue is spearheading a project involving scientists and graduate students from four BC universities and the BC Ministry of Forests, in collaboration with International Forest Products, to examine the role of soil microbes and fauna in forest ecosystem functioning. The team will determine how patterns of retaining live-trees on harvested slopes might maintain key nutrient cycling processes and better preserve ecosystems. The first portion of the project has just begun; investigating the diversity and functioning of belowground organisms, including worms, mites, nematodes, fungi, and bacteria that are responsible for organic matter, nitrogen, and phosphorus turnover. After harvesting, the team will determine the maximum distance from each live-tree patch at which these organisms and processes are maintained. *"In the end, we hope to return to Interfor and make a concrete recommendation for successful use of live-tree retention to retain belowground biodiversity and function. Current recommendations for soil protection are limited to retention of coarse woody debris and limitation of soil scalping. This research could lead to improvements in regulations with green tree retention being included as a means of preserving soil 'health', and will directly contribute to recommendations on the size and dispersion of green tree 'islands' to be used by forest managers"*says Grayston.

A close-up of *Cenococcum* sp. an important genera of mycorrhizal fungi living on conifer roots (Photo courtesy Francois Teste, a Ph.D. student in the Belowground Ecosystem Group)



The Belowground Ecosystem Group also provides unique opportunities for graduate students. Jason Barker, a new Ph.D. student from Oregon, has begun a project supervised by group members Suzanne Simard at UBC and Melanie Jones and Dan Durall at UBC Okanagan investigating the importance of mycorrhizae in forest regeneration following the devastating 2003 fires in interior BC. Mycorrhizae are fungi that live on the fine roots of trees and generally improve the plant's ability to acquire nutrients and water. Barker thinks that colonization of regenerating seedlings by these fungi may be critical for seedling survival. He suspects that the severity of a particular burn alters the community composition of mycorrhizal fungi and that these changes affect the speed and success of forest regeneration. Study in the Belowground Ecosystem Group allows for exposure to a breadth of disciplines and techniques to better approach environmental issues. Says Barker, *"The fire research project is an exciting opportunity to conduct an interdisciplinary study that incorporates techniques ranging from molecular identification to stable isotopes to provide an understanding of the role that mycorrhizae play in conifer regeneration and nutrient cycling."*

This article was written by Dr. Nathan Basiliko, a post-doctoral research associate in Forest Sciences at UBC based on interviews with members of the Belowground Ecosystem Group.

To find out more about the Belowground Ecosystem Group visit: www.forestry.ubc.ca/research/beg.htm or contact Sue Grayston at sue.grayston@ubc.ca or 604-822-5928



Members of the Green Tree Retention research team sampling soils at the STEMS Installation on Vancouver Island. (Photo courtesy of Sue Grayston.)

From L-R, Nathan Basiliko, PDF, UBC; Nora Berg, Technician, UBC; Jan Addison, Professor, Royal Roads University, Victoria)



Dean's diary

Today's economic map of the world is dominated by "clusters": critical masses – in one place – of unusual competitive success in particular fields¹. Cluster partners group together in order to take advantage of the increased

competitiveness and success of building on local sources of uniqueness and strength. Clusters are striking features of almost every economically advanced nation. Perhaps the world's best know examples are those of the Silicon Valley and Hollywood. Three global forest sector "innovation" clusters are emerging – North America, Europe and Eastern Asia. At the same time, the federal government's Innovation Strategy is looking for ways to support ground-breaking discoveries through research. One target is, by 2010, for Canada to rank among the top five countries in the world in terms of R&D performance. Another target is to develop at least ten internationally recognized technology clusters in various areas.

BC's forest sector R&D and marketing groups have the capability and infrastructure to become North America's Forest Sector Innovation Cluster. Together, these organizations could form a world-class grouping of scientific research endeavours focusing on achieving the strategic vision, and cover the entire value chain from "genetic codes to markets".

British Columbia has unique strengths, with not only a strong university-based forest R&D community but also three national institutes (Forintek, PAPRICAN and Feric) located in BC, very strong provincial R&D organizations, the largest Canadian Forest Service laboratory in the country located in Victoria, and many world class, integrated companies headquartered in Vancouver.

The Faculty of Forestry at UBC has a firmly established R&D infrastructure, intellectual resources and an excellent track record of achievements with research support at an all-time high. Much of our research involves cooperation with other faculties on campus, research institutes, government and non-government agencies and industry. This cooperation has led to the establishment of several Faculty research groups – the newest of these is featured in this issue of Branch Lines. The Belowground Ecosystem Group is

centered in the Faculty, but links scientists from several other units on campus and other institutions in BC. Belowground ecology is recognized as one of the most critical and rapidly expanding fields of ecology. This area is poorly understood, but vital to answer questions regarding impacts of climate change, carbon sequestration, biodiversity and sustainable management of forests and other ecosystems. You can read about the synergies that occur when different, but complementary, research disciplines are combined in the Belowground Ecology Group article on page 5.

Future Branch Lines will feature other research groups that are contributing to the "forest innovation cluster" which is in its nascent stages of development here in BC, with the goal of achieving a truly world class status. The days of the "lone scientist" pushing back the frontiers of science are long over. Team work and the synergies, insights and breakthroughs that occur through interdisciplinary cooperation are today's and the future's *modus operandi*. Further information on the Faculty's research groups can be found at www.forestry.ubc.ca/research/clusters.htm

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Jack Saddler

¹ Porter, M.E. (1998) Clusters and the new economics of competition. Harvard Business Review 76(6):77-90

New appointment

Dr. Tom Sullivan has joined the Forest Sciences department and the Agroecology Program in the Faculty of Agricultural Sciences, as a joint appointment. Tom is teaching courses in research methods, agroforestry, agroecology and biodiversity. His research interests include forest-wildlife interactions and conservation as well as managing for biodiversity and sustainability in agroecosystems. Tom was a member of the Faculty of Forestry from 1990 to 1997 and an independent research scientist from 1997-2003, before returning to UBC this year.



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Newsletter Production

Branch Lines is published by the Faculty of Forestry at the University of British Columbia three times each year.
ISSN 1181-9936.

www.forestry.ubc.ca

Editor: Susan B. Watts, Ph.D., R.P.F.

In-house typesetting, design and layout:

Jamie Myers and Susan B. Watts.

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