branchlines

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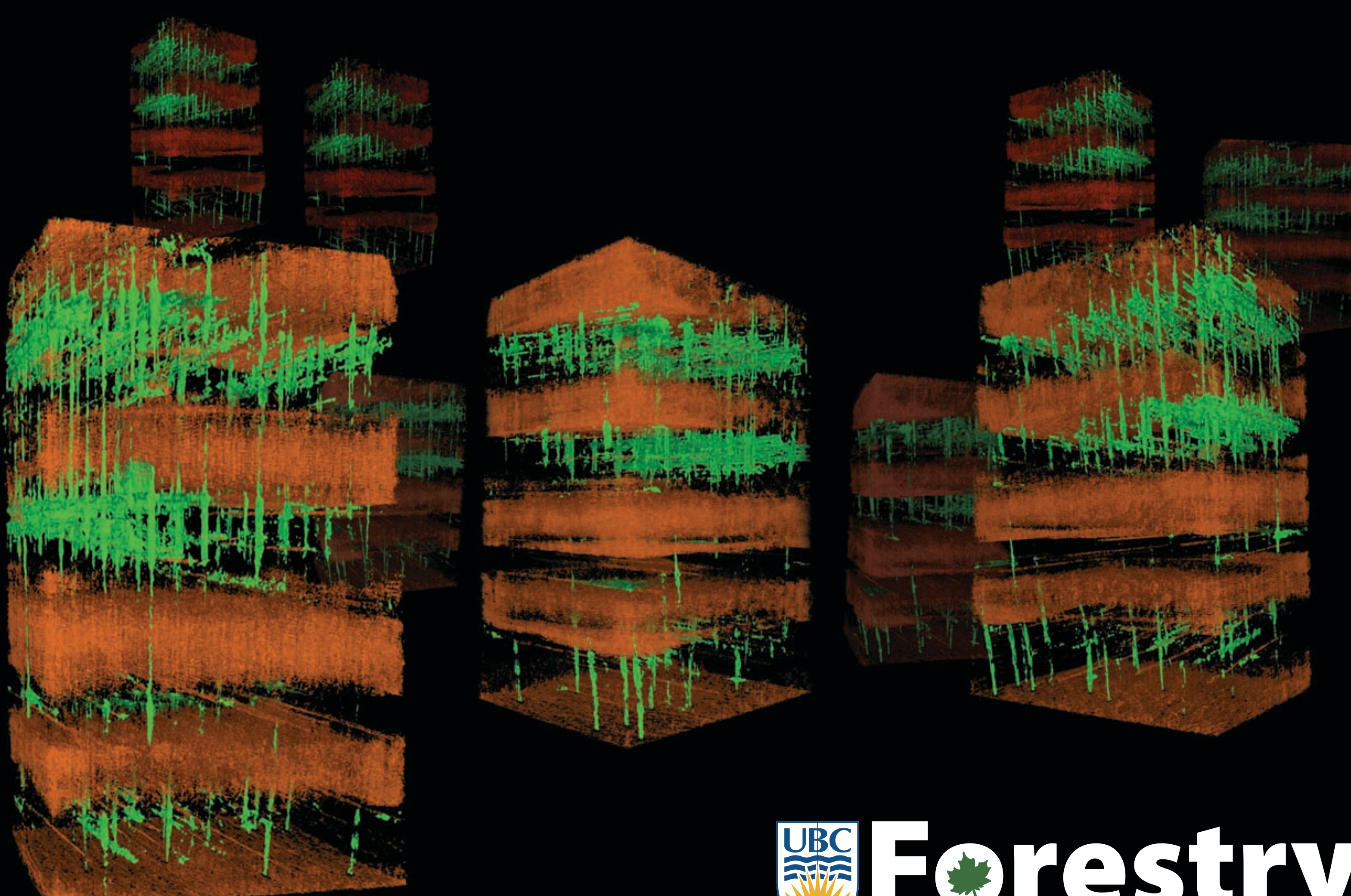


UBC Forestry
University of British Columbia

dean'smessage

In this issue of BranchLines, we focus on one of the areas in which the Faculty of Forestry has been identified as outstanding – innovation in wood science and wood products processing. We sometimes forget that the products from our forests are sustainable when harvested appropriately, and provide an important alternative to products such as oil and steel. Optimizing the use of such products is critical, and our Faculty is playing a major role in ensuring that this happens.

The cover story deals with the use and application of highly sophisticated imaging by Dr Phil Evans and his team. It is striking that such techniques have found their way into forestry applications so quickly. Their potential is clear, as is the increased use of the types of high-tech equipment that Phil describes. Another article deals with the complexity of developing biofuels from cellulose. These articles emphasize the changing nature and increasing sophistication of wood science.

The increased use of forest biomass could be a problem for the maintenance of that part of biodiversity dependent on coarse woody debris, and this conundrum is examined in the article by Dr Tom Sullivan. He argues for a balance – something that we hear a lot about in forestry, as it is the ability to find a balance between competing demands that may be one of the most characteristic outcomes of a forestry education. This is evident in several of the articles presented in this issue of BranchLines: such as the derivation of an appropriate balance between central and local control of community forests, described by Dr Reem Hajjar. It is also apparent in the article on REDD+ by Dr Hosny El-Lakany, which examines the need to balance afforestation with the better management of our existing forests if we are to fully utilize the carbon sequestering potential of the world's forests.

The articles dealing with wood emphasize the value of partnerships with some of our neighboring institutions on campus, particularly FPInnovations. Such partnerships must be of benefit to the British Columbian and Canadian forest sectors, but they do not occur as frequently as they should. This could reduce the advantages held by the forest sector in the province and in Canada, and developing a mutually beneficial solution will be a priority in the coming year. With so much world-class forest sector research being undertaken in the region, it is time for us to capitalize on some of the synergies that could be gained from closer cooperation.

The Faculty's outreach activities remain an important component of what we do. In this issue, a recently completed project in South Africa is described. Working with Stellenbosch University and Nelson Mandela Metropolitan University, the Faculty's Centre for Advanced Wood Processing was able to develop a training program to provide the skilled people needed to re-invigorate small- and medium-sized furniture manufacturers in South Africa. It is particularly pleasing that the capacity that we helped create is now being mobilized to train further people in other parts of southern Africa.

John L Innes
Professor and Dean
Forest Renewal BC Chair, Forest Management

forestrynews

Climate change conference in China

In August 2011, several members of the faculty travelled to Yichun in northern China to attend the international conference on 'Response of Forests and Adaptation Management to Climate Change'. The Faculty was one of the co-sponsors of the meeting, reflecting not only the expertise that we have in this area but also our increasing interest in climate change research in China. A keynote presentation was given by Dean John Innes, and individual papers were presented by Stephen Sheppard, Harry Nelson, Tongli Wang, Guangyu Wang and Ken Day. David Spittlehouse from the BC Ministry of Forests, Lands and Natural Resource Operations also presented a paper.

Much of the work that we are doing on climate change adaptation in British Columbia is applicable to China, and we are using this link to strengthen our connections with climate change researchers in institutions such as the Chinese Academy of Forestry. For example, Tongli Wang was able to explain how modeling techniques being used in British Columbia and Western North America could be extended to China. Ken Day was one of the few forest managers present (in a conference about adaptation management!) and told delegates how the Alex Fraser Research Forest is adapting its management practices to meet the challenges present by climate change.

After the conference, the delegates had an opportunity to see Tangwanghe National Park, the first national park approved in China. The forest is dominated by a diverse range of species including Korean pine (*Pinus koraiensis*), Manchurian fir (*Abies nephrolepis*), Jezo Spruce (*Picea jezoensis*), Dahurian larch (*Larix gmelinii*). Asian white birch (*Betula platyphylla*) and Amur chokecherry (*Prunus maackii*).

Mixed coniferous and broadleaved forest in Tangwanghe National Park

Research cooperation agreement signed with the China Green Carbon Foundation

As one of the world's largest and fastest-growing economies, China has the ability to influence strongly the future development of greenhouse gas emissions. The China Green Carbon Foundation is the first nationwide, non-profit, public funding foundation dedicated to combating climate change by increasing carbon sinks in China. It is doing so by taking donations from individuals and companies and using the money to establish forests which have the primary goal of sequestering carbon.

Signing the research agreement with the China Green Carbon Foundation

It has set up the Chinese Academy of Carbon Sequestration, which is based at the Wenzhou Vocational and Technical College in Wenzhou, Zhejiang Province, and this will be the main partner for UBC Forestry. The cooperation agreement covers both research and training, and we expect that a number of individuals will come to the Faculty to learn more about forest-based carbon sequestration options.

One of the first studies that will be conducted will look into aviation emissions and how these can be efficiently offset through forestry projects in Zhejiang, a project that will involve Harry Nelson from the department of Forest Resources Management. The project will be the catalyst for an international workshop co-organized by UBC Forestry and the Academy dealing with forest carbon property rights, carbon policy development and carbon trading.

Forest stand consisting of hybrid Eucalyptus *grandis x urophylla* established by the China Green Carbon Foundation on abandoned agricultural land

Double-take in Melbourne Airport

Poster in Melbourne Airport featuring alumnus Zoe Ryan

A poster in the departure hall of Melbourne Airport is not exactly where one would expect to see a picture of one of our alumni. However, Zoe Ryan (née Harkin), is currently being featured in a forestry promotion effort by Forest and Wood Products Australia Ltd Zoe, working with Gary Bull in the Department of Forest Resources Management, wrote a thesis on the establishment of a market for forest carbon in Canada. Described in the poster as a 'forest carbon specialist', she is clearly putting the knowledge she gained at UBC to good use.

UBC Forestry students in Finland

The International Forestry Students Association (IFSA) held its annual meeting in Helsinki, Finland, in August. UBC Forestry students attended for the first time, with Katie Gibson representing the Forestry Undergraduate Society and Maria Fernanda Tomaselli representing the Forestry Graduate Students Association. They joined approximately 130 forestry students from more than 27 countries. Both participants were very active, and Katie was appointed to be the IFSA Liaison Officer with the Commonwealth Forestry Association, whereas Maria was appointed IFSA Liaison Officer with the UN FAO. Richard Schuster (FGSA), who was unable to be there, was appointed as the new Web Commissioner and the Regional Representative of North America. A partnership with the Forestry Students Association of the Department of Environmental Science and Forest Resources in Chungnam National University, Republic of Korea was established, with the idea being to maintain contact between students, exchange information and experiences, and to learn from each other. After the main meeting Katie and Maria stayed on to receive special training in communication, project management, time management, and motivation, among other topics. This took place in Lapland, providing both students with a chance to see the forests of a very different part of the world. We are actively encouraging our students to play a bigger role in the International Forestry Students Association, and are pleased to see them doing so.

Finnish Forest Research Institute, Joensuu

Joint course development with the University of Melbourne

The Library Building of the Department of Forest and Ecosystem Science at the University of Melbourne's Creswick campus

With the help of a grant from the UBC Teaching and Learning Enhancement Fund, we have been developing an online course in cooperation with the Department of Forest and Ecosystem Science at the University of Melbourne. The course is designed to inspire undergraduate students to move into forestry and is utilizing a range of new on-line teaching technologies. The course aims to examine world forestry within the context of a range of social, environmental, historical, economic and conservation issues. In addition, it uses the opportunities presented by web-based technologies to capitalize on our improving knowledge of the different ways in which people learn. When completed, it is our intention that students from different parts of the world will be able to take the course together, sharing experiences and knowledge of different types of forests and the communities that they support. The ultimate aim is to demonstrate to potential students the range of activities covered by today's forestry and the many different career options open to graduates from forestry programs.

Towards a greener REDD

A commentary by Hosny El-Lakany

IN THE PAST decade, major resources have been committed to finding ways of reducing emissions of greenhouse gases (GHGs) from deforestation and forest degradation in developing countries. REDD (Reducing Emissions from Deforestation and Forest Degradation) is currently being discussed under the United Nations Framework Convention on Climate Change as a possible financial mechanism for reducing GHG emissions from developing country forests in the post-2012 climate change regime. Recently, the term REDD+ (also 'REDD-plus') has been coined to indicate that "…forest conservation, the sustainable management of forests, and the enhancement of carbon stocks" should be included in any future REDD mechanism.

While the debates on REDD+ continue, many countries have been adding to their net forest area, usually with little fanfare or outside funding. According to the Global Forest Resource Assessment (Food and Agriculture Organization, 2010), 78 countries each with more than 200,000 hectares of forests, increased or maintained their forest area over the period 1990-2010. These forest-adding countries (FACs) now contain more than half the world's remaining forest area.

A recent paper (see end of this article) provides an assessment of why and how some countries have moved from being net forest-losing countries (FLCs) to becoming FACs, looking in depth at five countries (China, Republic of Korea, Vietnam, India, and Chile) that did so in fairly recent times.

In addition to reducing deforestation, most FACs are implementing measures that we think should be included in REDD+. For example, they are managing more of their production forests on a sustainable basis, establishing major areas of protection forest and forest biodiversity preserves and, crucially, designing and implementing major programs of afforestation, reforestation and restoration of degraded lands (ARRDL).

"...the imposition of domestic logging bans, the control of illegal logging and the expansion of protected areas have caused a dwindling of local wood supplies..."

To this end, many of the FACs have undertaken major forest-tenure reforms to help encourage the grassroots sustainable management of and investment in forests. These reforms, as highlighted in the case studies, attest to the need to consider the potential role that tenure reform plays in making a large-scale impact on reducing deforestation and supporting productive ARRDL activities that expand livelihood opportunities for forest dwellers. In particular the forest transitions of India, Vietnam, Chile and China carry lessons, both positive and cautionary, on how tenure systems incentivize forest protection and growth and community development. While the incentives for growing trees differ from those for avoiding their future loss, just and clear land and resource tenure systems are of great concern for REDD as well as ARRDL, as reflected in the REDD proposal agreed to in Cancun.

An important component of ARRDL is production plantations. It is no coincidence that the FACs were responsible for 85 percent of the 86 million ha of forest plantation area added globally in the period 1990–2010 (from a total of 178 million ha in 1990 to 264 million ha in 2010). Plantation-grown wood is already important economically, accounting for more than one third of the industrial round-wood consumed in 2000. Planted forest is still growing in all regions (by almost 5 million ha per year globally in the period 2005–10). In 2010 planted forests accounted for only 7 percent of the global forest area (about 2 percent of land use), but had the potential to produce two thirds of the 1.8 billion cubic meters of the global industrial round-wood demand, with an anticipated increase to 80 percent by 2030. However, when considering net forest cover statistics, it is crucial to bear in mind that high plantation growth can conceal significant depletions of native forest— in some cases, native forest may even be cleared to make way for new plantations.

In the case-study countries, another significant change has been the liberalization of wood imports, which has provided easier access through global markets to raw materials, in several cases to feed expanding wood products export businesses. In many FACs, the imposition of domestic logging bans, the control of illegal logging and the expansion of protected areas have caused a dwindling of local wood supplies, even as wood demand has increased. Since local planted forests were not at a stage where they could meet the increased demand, there has been a rapid increase in wood imports in the FACs. There is a risk that FACs are exporting deforestation and especially forest degradation, leading to international leakage of emissions avoided at home.

The authors of this paper use the acronym ARRDL in this paper for convenience and to make a clear distinction between REDD and REDD+. The '+' in REDD+ has not been defined or agreed upon operationally in international debates beyond the following: "the role of conservation, sustainable management of forests and enhancement of forest carbon stocks in developing countries". If it transpires that, ultimately, REDD+ includes all ARRDL activities as major components, so be it – there is no vested interest in seeing ARRDL separated from REDD in negotiations. The authors argue in this paper, however, that major ARRDL activities, including those carried out through agroforestry, are a necessary complement to REDD and should get equal billing. This same need to look at REDD in a broader context becomes particularly clear when considering how to confront leakage and additionality issues, as others have stressed.

Many of the lessons from FACs only emerge when one looks at the situations in FACs and FLCs in a much broader, holistic, and global context than is often the case in REDD discussions, which tend to have a more narrow country-level or project-level focus. In deriving lessons, it is necessary to consider, among other things, the implications of the dynamics of interacting global wood supply and demand, and the implications for leakage in REDD programs. This includes the risk of exporting deforestation and forest degradation from FACs and the role of illegal logging and global wood trade; the desirability, in a 'green' economy, of using more rather than less wood as a renewable raw material that can substitute for energy-intensive, non-renewable raw materials; changing global market and production trends for non-forest commodities such as beef, soy beans, and palm oil that are responsible for much of the deforestation taking place globally; changing trends in the productivity of major agricultural crops and their implications for forest clearing. The demand for agricultural crops is expected to increase steadily in the next decades because of growth in both population and income. Between 1980 and 2000, more than 55 percent of new agricultural land in the tropics came at the expense of intact forests and another 28 percent came at the expense of disturbed forests. At the same time, breakthroughs in biotechnology have resulted in increased agricultural and forestry productivity, and may significantly lessen pressures on forests.

In examining the history of the FACs in a broad and dynamic global context, our assessment leads to comprehensive conclusions that link ARRDL and REDD as necessary complements in both FACs and FLCs.

Dr Hosny El-Lakany is an Adjunct Professor in the Department of Forest Resources Management and Director of International Forestry at UBC's Faculty of Forestry. He is also one of the authors of the report "The Greener Side of REDD+ Lessons for REDD+ from Countries where Forest Area is Increasing". He can be reached at hosny.ellakany@ubc.ca. The report, published earlier this year by the Rights and Resources Initiative, can be viewed at www.rightsandresources.org

Economic development in Africa through wood products manufacturing

Contemporary furniture manufactured in South Africa

IN THE LATE 1990s post-apartheid South Africa was well on its way to reintegrating into the global economy. Investments had been made in a variety of industries, including both the well-established primary wood processing sector and the emerging value-added wood products sector. The potential for small to medium sized companies to participate in the furniture industry, being well-suited to small-scale production with relatively low capital barriers for start-up, was seen as a way to alleviate poverty and provide employment throughout the country. However, when IKEA pulled its manufacturing contracts out of the country, causing significant job losses at small and mid-sized companies, they cited a lack of quality and cost-competitiveness, and an inability to solve these problems due to the lack of appropriate training opportunities for its workforce.

The government of South Africa knew it needed help developing its secondary wood products industry, and started looking for appropriate models for new industry and university education programs. The UBC Faculty of Forestry's Department of Wood Science and Centre for Advanced Wood Processing (CAWP) were identified as ideal partners for such a project, due to their specialist role in serving the value-added industry and the strong industry support and connections that they enjoy. In response to a request from the Canadian industry, the Department of Wood Science had launched the Wood Products Processing Bachelor's degree in 1996 and established CAWP the same year, so they had been through a similar process of change to that now facing the South Africans. Close engagement with industry was seen as an important characteristic of an educational program designed to help expand and transform the furniture industry in South Africa.

A million dollar commitment from CIDA (Canadian International Development Agency) allowed Iain MacDonald from CAWP and Phil Evans from the Department of Wood Science to lead a team from UBC and Emily Carr that helped South African colleagues to redevelop the Wood Products Science degree at Stellenbosch University (near Cape Town) and to contribute to a new National Diploma in Wood Technology at Nelson Mandela Metropolitan University (NMMU), located in the Western Cape Province. The new courses were focused on modern manufacturing methods and materials and included discussion of industrial engineering principles, machinery, software, tooling and technologies used in industry. Stellenbosch and NMMU faced serious challenges in the development of these new programs, not the least of which were that they had no relevant, in-house experience in these subjects, no text books upon which to base their classes, and great challenges in finding and hiring new staff to teach these classes.


Modern furniture factory in South Africa

Between 2004 and 2010 staff and faculty from UBC visited the partner institutions to plan and develop course material, exchange knowledge, and create a selection of sophisticated e-learning courses. Extensive visits to South African wood processing factories were made to gather and incorporate local case study examples to maximize the local relevance of the courses. Large numbers of photos, technical drawings, video footage, animated simulations and plant layout diagrams were included in the e-learning courses, which were on topics as diverse as industrial wood finishing, sawmilling, furniture design and wood composites. While some instructors initially used the e-learning courses much like electronic textbooks and continued to hold face-to-face classes on campus, a number of courses are now offered exclusively online to both undergraduate students and industry distance learners.

Industry support for the new programs has been extensive and has taken the form of scholarships and bursaries, equipment donations, co-op placements for students and, perhaps most importantly, encouragement for their current managers and technicians to enrol in the programs and distance learning courses. Educating the current and future workforce at the same time, and using the same tools to do so, has created lasting bonds between the different groups of students and a foundation that will help to sustain the close links with industry over the long term.


Sawmill supplying solid wood to the South African furniture industry

Symbolising the government's confidence in the new program at Stellenbosch, the Department of Trade and Industry established a Furniture Centre of Excellence at the university in 2010, cementing its new role as a hub for wood technology education at national and international levels. Requests to create similar programs in Ghana and Morocco have been received, with talks under way for Stellenbosch to play a key role in the capacity-building work that it was the recipient of just a few short years ago. The opportunity to work with SU and NMMU has been an incredibly rich learning experience for faculty, staff and students, and has strengthened UBC's own undergraduate and industry outreach programs. As Stellenbosch now steps up to take a lead role in the development of sustainable value-added manufacturing education in Africa, the UBC team looks forward to our continuing involvement in what has become a thoroughly fulfilling partnership.

For further information contact Iain Macdonald, Managing Director of the Centre for Advanced Wood Processing, at iain.macdonald@ubc.ca

A Brazilian's journey with biofuels


Sugar cane in Brazil

FOR ENVIRONMENTAL, POLITICAL and social reasons as well as the high price of gasoline, our current use of fossil fuels for transportation is not sustainable. The world needs renewable alternatives to oil-derived liquid transportation fuels. Biofuels such as ethanol, which can be fermented from sugars extracted from renewable biomass, are of increasing interest as alternative sources of transportation fuels.

Countries such as Brazil have already greatly reduced their dependence on fossil fuels and have shown that sugarcane derived fuels can be economically, environmentally and socially much more beneficial than fossil fuels, despite some claims that ethanol production can be linked to deforestation in the Amazon. Brazil was a pioneer in the development of biofuels and their move from hydrocarbon to carbohydrate based transportation fuels was catalyzed in the late 1970s by the "Oil Crisis" and oil embargo that led to sky-high fuel prices and massive trade deficits for Brazil (a country highly dependent on imported oil). Much of Brazil has a tropical climate that typically allows the fast, sustainable growth of sugarcane, which provides the sugars for fermenting to fuel grade ethanol. Brazil was already the world's biggest producer and exporter of sugar and the growth of the ethanol sector allowed local producers to diversify their markets and deal with the huge swings in profitability of the world's sugar markets. Car manufacturers in Brazil have become pioneers in the development of flex-fuel vehicles that can run on mixtures of gasoline and ethanol from 100% gasoline though to blends of 15/85% gasoline/ethanol. Even though Brazil is rapidly becoming self sufficient in the exploitation of its oil resources, ethanol is the predominant fuel used in domestic cars. Neat (100%) gasoline is no longer sold in the country and 80% gasoline is the maximum gas content allowed for transportation fuels.

> **"...trees can grow in a wide range of climatic conditions and if used sustainably, could provide the basis for many countries to be self sufficient in the production of transportation fuels."**

Back in Canada, starch crops, such as corn and wheat grown in Ontario and the Prairies, are the source of sugars used to make ethanol and help to meet the ethanol blending mandate for gasoline sold in this country. However, for a range of social, environmental and economic reasons there is an increasing desire to turn to second generation ethanol that uses sugars found in the cellulose/hemicellulose fractions of biomass such as wood residues, wheat straw, corn stover, and beetle-killed lodgepole pine.

One of the significant challenges with biomass-derived-ethanol is that Nature designed the glucose polymers in starch to serve as a source of energy readily broken down by enzymes (that is why we can easily digest potatoes, pasta, etc). In contrast, cellulosic biomass from feedstock is not easily broken down. Although both starch and cellulose are made from polymers of glucose, the alpha-bond that links glucose molecules together in starch results in a less structured material that is easily broken down (if you boil a potato long enough it will eventually dissolve). The beta-linkage found in cellulose results in a much closer alignment of the polymer, making it much more recalcitrant and very difficult to break down (you can boil a wood chip or cotton strip all you want, but it will not dissolve). Indeed, cellulose's primary function is to give plants physical strength, making lignocellulosic biomass strong and durable. Thus, in contrast to the relatively easy process of using the simple sugars extracted from sugarcane, or breaking down the starch found in corn or wheat, for biofuels, the "liberation" of sugars found in cellulose is a much more complex and expensive process.

However, despite the physical strength and toughness of wood, certain microorganisms (particularly fungi) are able to produce a battery of enzymes and many other compounds (yet to be characterized) that enable them to access and convert cellulosic biomass to simple sugars such as glucose. By using the enzymes from these microorganisms we can extract the energy stored in plant biomass and use the released sugars as an alternative source to food crops such as corn and wheat for biofuels.

Dead trees take a long time to decompose and although microbial enzymes have a tremendous ability to release sugar molecules from cellulosic biomass, these enzymes do not break down cellulose fast enough to be used for biofuel production on a commercial scale. This challenge has been the focus of research led by Dr Jack Saddler's Forest Products Biotechnology and Bioenergy Group at UBC. Researchers in this group are looking at ways to cost-effectively (and socially and ecologically) harness the energy stored in wood and forest residues. The work pioneered by this group involves an initial treatment at high temperatures and pressures to allow the disruption and fractionation of the cellulosic biomass matrix, generating a cellulose fraction that is more susceptible to the action of cellulase enzymes.

Dr Valdeir Arantes was attracted to join this research group in 2008. Valdeir is from São Paulo state in Brazil, an area considered to be the world's epicentre of biofuels research. As a doctoral student at the University of São Paulo (Brazil) his research focused on the biochemical and chemical characterization of a naturally unique degradative mechanism in wood decay fungi, a background that has led him to be a valuable member of the UBC research group.

After recovering from the initial shock of a Canadian winter, Valdeir focused his research on developing empirical models that could better measure enzyme performance – a key step in unraveling the factors known to slow the enzymatic breakdown process under industry-relevant conditions. Valdeir is now researching the catalytic and non-catalytic proteins that can act as co-factors/enhancers to change plant structure and boost enzyme performance by exposing the cellulose chains buried within the biomass matrix. In this way, the release of sugars from biomass such as mountain pine beetle killed trees could become a faster and more efficient part of the biomass-to-biofuel process.

It is unlikely that cellulosic biomass derived sugars will ever be able to compete with the cost of producing sugar from sugarcane, even though very few countries have the climate to support sugarcane's sustainable growth. On the other hand, trees can grow in a wide range of climatic conditions and if used sustainably, could provide the basis for many countries to be self sufficient in the production of transportation fuels.

For further information contact Dr Valdeir Arantes at varantes@forestry.ubc.ca or Dr Jack Saddler, at jack.saddler@ubc.ca. Both Valdeir and Jack are members of the Department of Wood Science.

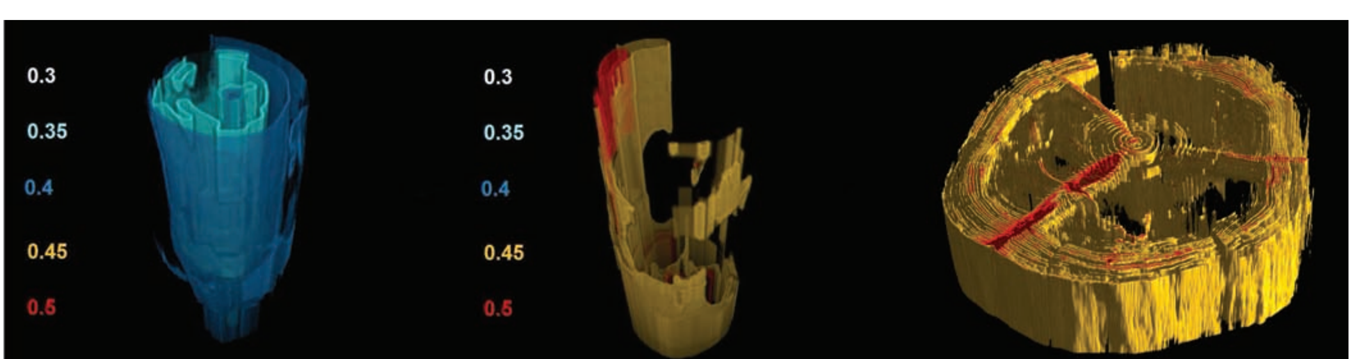

Wood chips in BC

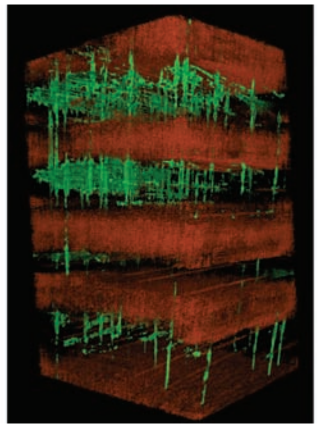
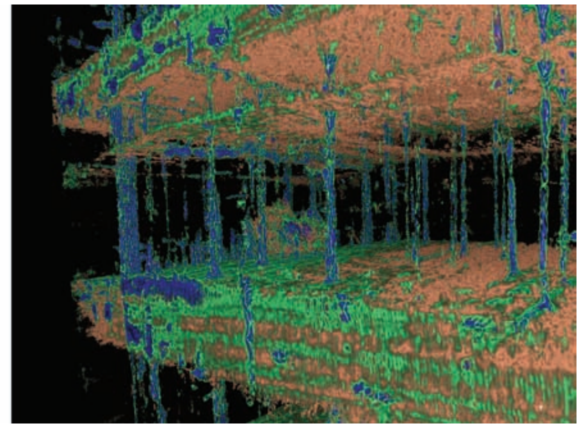
3-D X-ray images of wood

MOST PEOPLE ARE familiar with the use of X-ray imaging to diagnose bone fractures. X-ray images reveal differences in the density of the body. Denser objects in the body such as bone absorb more radiation and therefore appear darker, while fractures (voids) absorb little radiation and appear white. X-ray imaging is only one of a suite of diagnostic techniques that use X-rays for diagnosis of hard and soft tissue diseases. A far more sophisticated technique is that of computed tomography (CT). Medical CT has the potential to detect subtle differences in tissue composition, and provides numerous 2-D slices of the body, which can be combined to create 3-dimensional images of target tissues or organs (tomos = section or slice in Greek). The power of CT to reveal subtle differences in material composition had led to its use in many other fields, for example, detecting cracks in helicopter rotor blades and turbines blades of jet engines. CT has also been used in forestry to help detect variations in wood density in trees and to identify pockets of decay in power poles. Kim Henze, a Master's student with Dr Phil Evans in UBC's Department of Wood Science, used the industrial CT system at FP-Innovations in Vancouver to image five-metre long logs from western hemlock trees grown in Malcolm Knapp Forest. She detected great asymmetry in the density of stem wood, radially (pith to bark), longitudinally (with tree height) and circumferentially. Lower density (0.35 to 0.4 g/cm^3) wood (blue in the image on the left below) was more common in the inner and upper parts of the stem. Pockets of dense (0.5 g/cm^3) 'compression wood' (red in the central image below) were distinguished in the outer parts of stems. Dense wood near the pith and the outer parts of stems were connected by denser branch wood, giving the stem the appearance of a spoked wheel (right-hand image below). This arrangement of the denser (stronger) wood in hemlock stems could be an efficient way for trees to transfer stresses within the stem and, hence, for the western hemlock trees to cope with external forces (wind and snow loads) that they are subjected to.

More recently, Phil has been using another CT technology, X-ray micro-CT (µ-CT), to probe the micro-structure of wood and wood composites. The basic principles are similar to those that underpin medical and industrial CT. However, µ-CT achieves far greater levels of resolution, of the order of microns, thanks to the development of brilliant X-ray sources and high resolution CCD cameras. The simultaneous development of powerful computational techniques for image interpretation, three-dimensional visualisation and structural characterisation using CT data is providing a powerful stimulus for research on the structure and behaviour of complex natural materials such as bone and wood. Phil is working collaboratively with scientists at The Australian National University (ANU), Department of Applied Mathematics (where he is a Visiting Fellow) and also The ANU's Supercomputing Facility. Their research is currently focussed in two areas: (1) Distribution of preservative in wood treated with newly developed micronised wood preservatives; and (2) Distribution of adhesives in wood composites.

Research on micronised wood preservatives began in 2007 shortly after the commercialisation of these preservatives in the USA. Micronised preservatives are aqueous emulsions of small, nano and micron-sized basic copper carbonate (plus an additional organic biocide). These preservatives have rapidly captured a large (75% +) share of the market for wood preservatives in the USA, although they are not available in Canada. In 2008, Phil and colleagues at the Forestry and Forest Products Research Institute in Japan published a note in the journal Nature Nanotechnology (Vol 3 (10):577) pointing out that the treatment of wood with micronised wood preservatives is one of the World's largest applications of 'Nanotechnology'. Since then the group has taken a close look at how the preservative is distributed in wood, as this is a key factor affecting the performance of wood preservatives. Research in Japan has used electron microscopy, while the research in Vancouver has used X-ray µ-CT.



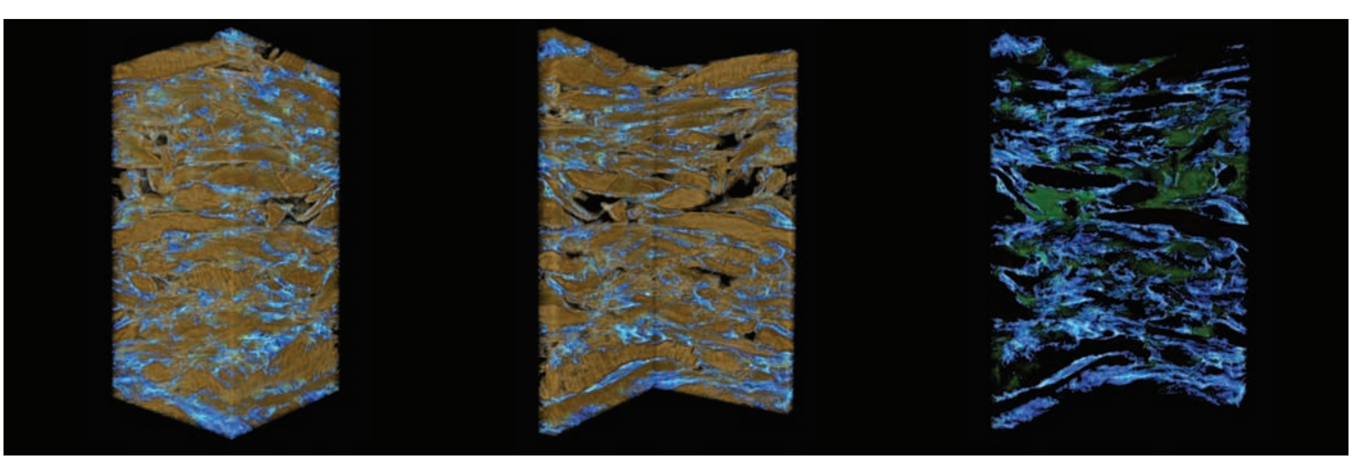



The advantage of X-ray µ-CT for this kind of research is that it is possible to easily visualise in 3-D the distribution of the denser copper carbonate particles in the wood's microstructure, and even in tissues within the wood that have different densities. The photographs above show (from left to right) a sample of treated pine wood that was imaged using X-ray µ-CT, distribution of copper carbonate (green) in the higher density summer wood, and the distribution of copper carbonate (green and blue) within the lower density spring wood. The photographs show that the copper is concentrated in ray tissues running from top to bottom, and longitudinal resin canals that run at right angles to the rays. Phil has produced stunning animations to show the circumferential variation of the copper in the treated wood, and some of the images from these animations are shown on the front cover of this issue of Branchlines.

Seeing the microstructure of wood in three dimensions is thrilling, but X-ray µ-CT offers much more. For example, the data generated from X-ray µ-CT, which routinely consists of 2048^3 (8 billion!) data points (voxels), can be used to quantify the relative spatial distributions of the different components within a material, ie wood, copper and air in the photographs above. Phil and colleagues in Australia took this approach when using X-ray µ-CT to explore the distribution of adhesive in a wood composite (Int J Adhesion and Adhesives 2010 30:754-762). The photographs below show the wood composite particleboard. The block on the left below is a piece of particleboard with the wood coloured brown and the adhesive blue. The next two images show the centre of the composite (central image below), and (below right) the adhesive skeleton (blue) and voids (green). It is apparent from these images that the adhesive is preferentially aligned in planes running horizontally within the composite. Two different computational techniques (maximal sphere modelling and chord length analysis) were used to confirm such anisotropic distribution of adhesive in the composite. The insights from this work have led to ideas for improving the properties of wood composites or lowering the costs of manufacturing them.

Data generated from X-ray µ-CT can also be used to calculate a range of structural and mechanical properties of materials. Work is already being done on this in other fields, for example, to calculate bone strength from images of bones from people with osteoporosis, or to link the physical properties (permeability, strength etc) of different materials, including oil-bearing rocks, coal, and industrial foams, to their complex microstructures. The full capacity of X-ray µ-CT to perform such virtual (numerical) experiments on wood has yet to be explored, but is of great interest to Phil's research group who hope to be able to report on their progress in this area in the future.

Dr Phil Evans is the British Columbia Leadership Chair in Advanced Forest Products Manufacturing Technology and a member of the Department of Wood Science at UBC. For further information contact Phil at phil.evans@ubc.ca Additional X-ray µ-CT images can be viewed at http://anusf.anu.edu.au/Vizlab/drishti/gallery.shtml



Power to the people: Community forestry in Brazil and Mexico

Manually skidding logs of pau mulato (*Calycophyllum spruceanum*) in Amapá, Brazil

IN THE PAST few decades, community forestry has been promoted as a way to enhance the conservation and sustainable use of forests, consolidate rights over traditional lands and resources, and reduce rural poverty. Indeed, increased decentralization of forest governance has been a noticeable global trend since the 1980s and 1990s, particularly in developing countries. Case studies from around the world show that community forestry can deliver many economic, socio-cultural and ecological benefits to local communities, and several examples of profitable community forest enterprises have appeared, particularly in Mexico and Central America.

However, global results have been mixed, as many initiatives have failed to deliver their promised expectations. Many community enterprises have collapsed once external support systems are withdrawn. Promises of empowering communities by placing in their hands the means for their own economic development have led to disappointing outcomes, as the transfer of management responsibility of forests to them has only been partial. Implementation of community forestry as a conservation and/or development intervention has remained an exercise delivered from the top down, rather than the bottom-up approach that had originally been one of the central reasons for promoting such initiatives.

For her PhD research in the Department of Forest Resources Management, Reem Hajjar wanted to provide further insights on the community forestry experience, from the perspective of the community member or local forest user. Reem wanted to hear what the local forest users had to say about which aspects of forestry were important to them and their community. She also wanted to know what was constricting their ability to manage the forest and/or run a forest-related enterprise. Using this local perspective, she set out to answer the questions, why are community forestry initiatives still struggling in many places and what can be done to improve their chances of success? Her goal was to suggest a path forward for community forests based on local forest users' needs and wants, in order to harmonize interventions with the original intention of empowering communities

"Communities continue to face a number of challenges to forest management, and this research produced a roadmap of sorts for tackling them."

Reem spent several months in forest-dependent communities in the Yucatán peninsula of Mexico and the eastern Brazilian Amazon. Mexico is seen as having the most advanced community forestry sector in Latin America, and has been promoted as a global model for sustainable landscapes. Meanwhile, community forestry in Brazil, which came about from an exogenous push mostly from NGOs trying to promote more sustainable forest practices in the Amazon, has a comparatively short history, with mixed results to date. The contrasting experiences in these two regions provided insights into how community goals differ between established models of community forestry (the Mexican cases) and less established models (the Brazilian cases).

Choosing three community forest models in each region as case studies, Reem visited with community members, conducted interviews with forest users and learned about local governance, management practices and local needs. Specifically, she wanted to assess the amount of decision-making power communities have over their forest resources. She also wanted to identify what sort of challenges they face in managing these resources, and ascertain local perspectives on and goals for forest management practices.

Findings suggest that, in both countries, the government has retained significant amounts of control over forest resources through heavy regulation of extraction of wood and, in some cases, non-wood forest products. However, the sampled communities have high decision-making power over use of forest products for subsistence purposes, and are gaining more control over day-to-day decisions for the commercialization of forest products, including timber. Importantly, benefits from forest management are now for the most part fully reaching the community. This is quite a difference from the position a few decades ago in both Brazil and Mexico, where communities had few rights over forest resources, and received little in terms of benefits from forest companies operating in their areas. Yet, as has been the case in several community forests around the world, benefit distribution remains unequal within the studied communities.

Communities continue to face a number of challenges to forest management, and this research produced a roadmap of sorts for tackling them. In the development phase of the forestry initiative, root challenges include clarifying land ownership, organizing for collective action, acquiring technical knowledge to comply with stringent management norms, and raising adequate financial capital. These challenges need to be


Harvesting açai palm fruit (*Euterpe oleracea*), an important non-timber forest product for forest-dependent communities in Amapá, Brazil


Reem Hajjar (left) conducting interviews with local forest users in Pará, Brazil

overcome prior to obtaining legal management permission, an overly technical and expensive procedure and a major hurdle for communities. With the legal permission in hand, further challenges to operationalization are presented, including deterring illegal loggers, maintaining necessary infrastructure, obtaining necessary managerial skills and accessing markets.

Communities often struggle to overcome these challenges and can often only do so with the help of an NGO or external institution. However, as is often the case, these external actors will dominate decision-making with little input from the communities, and will implement projects that replicate industrial-scale forestry models, rather than integrate traditional community practices. The final part of this research sought to identify goals for forest management that are more meaningful to communities, processes to reach those goals that are locally acceptable, and practices that are locally appropriate. Reem's work stresses the point that forestry interventions that are overly focused on timber production need to be harmonized with other livelihood strategies, particularly agricultural practices. The diversity of goals expressed by the different case study communities underlines the fact that site-specific models of intervention will be needed to take into account the variety of contexts and community desires. These results counter the conventional way of introducing community forestry in many places.

Policymakers still have to decide what amount of decentralization of forest governance is appropriate for their jurisdiction, given possible benefits that can be had with more local control, and possible drawbacks. But without the community member playing an essential role in the design, strategic planning, and everyday activities, community forestry will have failed to achieve at least one of its goals: empowering the local forest user.

Dr Reem Hajjar continues to work with forest-dependent communities as a post-doctoral fellow at UBC's Faculty of Forestry, and is also teaching an undergraduate course on community forestry at the Faculty in the fall 2011 semester. She can be reached at reem.hajjar@gmail.com

The Spirit Bear: A swirl of scientific, management and ethical issues


Photo: Wayne McCrory, Valhalla Wilderness Society

THE KERMODE BEAR, popularly termed the "Spirit Bear", is a rare white-phase black bear that lives in the rainforests of the north coast of British Columbia. Revered by the native Kitasoo and Tsimshian people, it was initially thought to be a distinct species. It is now deemed a subspecies, *Ursus americanus kermodei*, within which the black-phase predominates. On certain islands off the coast of BC, the frequency of Spirit Bears can be upwards of 30%, but the total number of Spirit Bears is in the low hundreds. The dramatic coat colour difference has captivated the interest of environmentalists, eco-tourists, and of course the First Nations. The August 2011 issue of National Geographic features the Spirit Bear on the cover, with a striking assemblage of pictures inside. The Spirit Bear represents the "Great Bear Rainforest", a keystone species of ecosystem function. Here, we examine some of the developments in our understanding of this bear and some of the recent challenges faced in its management.

In a BranchLines article 10 years ago, Dr Kermit Ritland of UBC's Forest Sciences Department, reported on a study supporting suspicions that the white colour was due to a single recessive gene. Kermit discoverd that a single nucleotide polymorphism at the gene "Mc1r" showed complete correlation with white coat colour when in the recessive condition. Mc1r functions near the end of a pathway that controls the production of the pigment melanin. Mc1r variants have been shown to cause conspicuous colour variants in many mammal species, most notably the Labrador retriever, where a deletion near the Spirit variant causes the yellow coat colour. Also, the extinct mammoth was shown to have a Mc1r variant just 3 amino acids away from the Spirit allele and Neanderthals have a variant just 9 amino acids away (maybe they all had red or blonde hair). In humans, over 30 variant alleles have been identified that correlate with skin and hair colour. The Spirit Bear variant has not been found in any other mammal, placing untold value on the uniqueness of this bear.

Adaptive significance of the white coat

The white coat of the polar bear is thought to confer an advantage in hunting because it provides camouflage in the Arctic ice and snow. However, the Spirit Bear is forest-adapted, lives in the temperate rain forest, and hibernates during the winter. Also for much of the year, the Spirit Bear mainly forages on green herbage and berries and is not an obligate predator like the polar bear. The native Tsimshian people did not hunt the Spirit Bear because of a taboo, and in BC, there is a governmental ban on hunting the Spirit Bear. The prevalence of this rare conspicuous polymorphism cannot be explained by human interference or polar bear adaptations.

Two years ago, researchers identified a potential selective agent: the white phase is camouflage against the cloudy sky when the bear pursues fish during the late summer and fall salmon runs. Through natural observations, they found that the white morph had significantly higher salmon capture efficiency than black forms during daylight. In addition, experiments with a human white-cloaked model showed that salmon were half as evasive to white vs black cloaks. Chemical assays also show Spirit Bears have more marine nutrients than sympatric black bears.

Management issues in the face of logging

As with any bear population, logging and road-building will result in loss of den trees, critical food sources, and cover for safety from poachers. With regard to the Spirit Bear, logging the steep, wet slopes can cause landslides and erosion, which could destroy salmon habitat. On February 7, 2006, the BC government announced creation of 10 Spirit Bear habitat conservancies totaling 212,415 hectares. This was a major victory for BC conservationist groups, particularly the Valhalla Wilderness Society, who got 80% of their original proposal.

What comes around goes around. While much of the prime range of the Spirit Bear was preserved, adjacent areas also need management. In 2007, a proposal was made to selectively log portions of the Green River watershed, on the mainland but across from the islands of the Spirit Bear. While Green River is almost all black phase bear, logging can increase production of food plants, resulting in increased population size and migration. Princess Royal Island, with the highest frequency of Spirit Bears in BC, is separated by a narrow channel which bears can easily cross. Increased migration of homozygous black bears can "swamp" the frequency of the white bear due to its recessive condition.

To envisage the genetic consequences of this, we predicted that the increase of population due to logging was about one bear per home range, and that the increase in migration was that one of four migrants will go to Princess Royal Island (for the report, see www.corporate.gov.bc.ca/bcspiritbear/downloads/KermodeScientificPanelReport.pdf). For the population of ca 500 bears on Princess Royal Island, one additional homozygous black-phase bear immigrating every generation would cause an expected 10% reduction of the white gene frequency after 52 generations or 520 years (in population genetics, we solve for n in the equation $(499/500)^n = 0.90$). Previous studies using molecular data indicated that historical levels of gene flow, based upon Wright's F_{st}, is about two per generation, so that migration is increased by about 50% by the new logging practice. What does the 520 year prediction mean, particularly if conservation budgets span only a few years? More generally, while the Spirit Bear is truly unique, should a novel single nucleotide polymorphism of conspicuous effect be worth our efforts to maintain it? The answer resides in our cultural and aesthetic values.

The timber wars subside, but will the tanker wars begin?

The article immediately following the August 2011 National Geographic cover story unexpectedly brought up issues about Enbridge's "Northern Gateway Pipelines Project", a $5.5 billion proposal to construct oil pipelines running from Alberta to Kitimat, just a few kilometers from Spirit Bear populations. The article, entitled "Pipeline Through Paradise", takes readers to Hartley Bay, where Gitga'at First Nations people talk about leaks from the sunken Queen of the North ferry and pipeline fears. Environmental groups might be delighted that worldwide attention will be drawn to the risks of piping oil across mountains then shipping it across the narrow waters of BC's northern coast. Readers may not have thought about this risk, but one thing is for sure, black oil will not look good on a white coat.

The future of Spirit Bear research

What further information would help understand the evolutionary factors that may have contributed to the Spirit polymorphism? The localized distribution of the Spirit mutation suggests this mutation successfully increased only once, perhaps from either Gribbell Island or Princess Royal Island where the frequencies are the highest. Detailed DNA sequencing of the region around the Mc1r gene can give an estimate of the age and strength of selection for the white phase allele. This will test the hypothesis that the white allele is of recent origin and due to a single mutational event.

What further information will help guide the management of the Spirit Bear? A database for the numbers and distribution of Spirit Bears needs to be established. It is much more efficient to estimate gene frequency via genetic assays than by counting numbers of white vs black bears, because white genes can be counted in heterozygous black bears. This involves systematic sampling of bear hairs (for DNA) and genetic analysis of resulting bear DNA to portray the geographical distribution of this Mc1r variant and its change through time. Also, current approaches that monitor bear populations in the Queen Charlotte Islands can be extended to the range of the Spirit Bear.

For further information contact Dr Kermit Ritland, Department of Forest Sciences, at kermit.ritland@ubc.ca

Bioenergy or biodiversity? Woody debris structures and forest mammals


Red-backed vole

COARSE WOODY DEBRIS on the floor of coniferous, deciduous, and mixed-wood forests supports many important functions such as wildlife habitat, reserves of nutrients and water, as well as microsites and substrates for seedlings and fungi. These attributes play major roles in ecosystem function and are essential to the maintenance of forest biodiversity and long-term productivity. Wood residues may accumulate as a result of forest harvesting, or disturbance from wildfire and insect outbreaks such as the mountain pine beetle outbreak in BC. Within the North American and European forestry sectors, such residues may be viewed as biomass "feedstocks" for bioenergy production to help reduce our dependence on fossil fuels. Bioethanol from lignocelluloses does not impinge on food production chains and could reduce our dependence on petroleum-based energy sources and their consequent release of greenhouse gases. However, biomass removals of woody debris may have potential impacts on forest biodiversity and ecosystem function. It is this role in disturbance regimes, and our utilitarian outlook, that has generated a definition of woody debris as "wood waste," particularly the residue (slash) occurring after conventional and salvage harvesting of forests.

On the forest floor, communities of small mammals may serve as ecological indicators of significant change in forest structure and function. These terrestrial mammals are widespread across temperate and boreal forest ecosystems and have a variety of functions, including prey for many predators, distribution of beneficial mycorrhizal fungi, as well as consumers of plants, plant products, and invertebrates. The southern red-backed vole (*Myodes gapperi*) typically disappears after clearcut harvesting, and is an important indicator species of "old forest conditions". The presence of red-backed vole populations at mature or old-growth "forest" levels of abundance would suggest that networks of food sources and predators are also present as components of biodiversity.

In many forestry jurisdictions, post-harvest woody debris is either burned on-site to reduce a perceived fire hazard, or is targeted for use as a source of bioenergy. However, some important questions need to be addressed. Could strategic management of this debris maintain abundance and diversity of forest mammals on clearcuts by providing habitat and connectivity across openings? Furthermore, what are the economic implications of woody debris removal for the expanding bioenergy market?

In an attempt to address these questions, Dr Tom Sullivan, a member of the Department of Forest Sciences at UBC, initiated a cooperative venture between the Faculty of Forestry, the Okanagan Innovative Forestry Society, BC Forest Science Program, and three forest products companies (Gorman Bros Lumber Ltd, Tolko Industries Ltd, and Federated Co-operatives Ltd) in the southern interior of BC. In association with PhD student Pontus Lindgren, and two research associates, a study was begun on the influence of large piles and windrows of woody debris on clearcut sites, compared with a dispersed treatment of debris. The researchers looked at the population dynamics (abundance, reproduction, and survival) of red-backed voles and the relative abundance of a variety of mammalian carnivores on these sites. In a related study, PhD students Justin Bull (Department of Wood Science) and Catalin Ristea (Department of Forest Resources Management) looked at the trade-offs in values and functions between the apparently competing uses of bioenergy versus biodiversity.

Initial results of this integrated research project indicate that constructed piles and windrows of woody debris do maintain habitat for red-backed voles, and presumably some components of biodiversity, on clearcuts. This result is novel in that red-backed voles were maintained for three years post-harvest in woody debris habitats on clearcuts at levels of abundance comparable to those of mature forest. Continued monitoring is required to determine long-term responses to these habitat structures. Red-backed vole movements between forest patches and windrows, as well as the minimum amount of debris required in piles or windrows to maintain voles on clearcuts, are currently being investigated.

Mammalian carnivores were also enhanced by the retention of large piles of woody debris, but the response was species-specific. Coyotes (*Canis latrans*) and weasels (*Mustela* spp) were the two most common carnivores encountered at piles and windrows during winter track counts. The strongest results were recorded where debris structures were at least 2 m in height and 5 m in width or diameter. These structures need to be created at the time of forest harvesting to minimize cost and provide sufficient volume of woody material for at least 300 m^3/ha, with at least one windrow or a series of piles connecting patches of mature forest and riparian areas. Conservation implications include creation of habitat for small mammals and their predators, as well as other potential components of biodiversity, on conventional clearcuts and very large (>100 ha) salvage openings.

Woody debris from harvested sites can be used for bioenergy production, but this depends on the interplay between volume, transportation distance, plant capacity, and electricity price. These variables define the economic value of woody debris and we feel this is an indirect expression of the value of biodiversity. The response of policy makers will reflect how we prioritize the challenge of managing biodiversity as we develop new sources of renewable energy. Harvested sites with low debris volumes at remote locations that feed a small-capacity facility, for example, offer little economic benefit. Retaining debris under these circumstances has a low opportunity cost, and provides the biodiversity benefits already discussed. In contrast, harvest sites close to large-capacity facilities present ideal circumstances for removing debris for energy. This suggests that there is no clear answer for whether removal or retention is preferable. Since burning of post-harvest woody debris is a common practice, retention would also reduce short-term emissions. Sometimes the energy benefit of removal (and the impact this removal has on offsetting fossil fuel use) will result in site-treatments that do not benefit biodiversity. At other times, the economic benefits of woody debris removal are minor, and managing for biodiversity is both cost effective and likely beneficial. Initial results from this research (Bioenergy or biodiversity? Woody debris structures and maintenance of red-backed voles on clearcuts) have been accepted for publication in the journal Biomass & Bioenergy.

The fate of down wood from harvesting operations remains unclear as biomass removals for energy production continue to grow. Presumably integration of bioenergy and biodiversity objectives is achievable, if not on each site, then according to a mosaic of sites managed for both purposes.

For further information contact Dr Tom Sullivan, Department of Forest Sciences, at tom.sullivan@ubc.ca or visit http://appliedmammal.com


Chipping of debris for biomass


Debris piles at harvested site

Can a forest power itself? Biomass energy for Loon Lake

ENERGY COSTS ARE quickly becoming a limiting factor to doing business in remote areas. Propane and diesel generated electricity costs have risen at 5% annually over the past ten years. At the same time, there have been improvements in the technology behind small scale bioenergy systems that can produce both heat and power for remote communities.

UBC's Malcolm Knapp Research Forest in Maple Ridge operates the Loon Lake Research and Education Centre as a facility that relies on propane for the majority of its heating and hot water needs. This could be an ideal location to test and demonstrate options for small scale heat and power generation using biomass systems. Most certainly, the Forest has ready access to biomass that is currently treated as a waste by-product of milling operations on site. The question is whether or not this source of bioenergy offers a workable solution that could replace the current dependency on propane.

With the help of grants from MITACS and the BC Bioenergy Network, an investigative team began a study this spring to determining the costs and feasibility of bioenergy heat and power for the Loon Lake facility. The team included Harry Nelson (UBC Faculty of Forestry), Hadi Dowlatabadi (UBC Institute for Resources, Environment and Sustainability) and Brihas Sarathy (Green Erg Technologies). Graduate students from Forestry (Phil Grace) and Civil Engineering (Sonya Wilson and Mohammed Masnadi) were also involved in the project.

The key questions for the evaluation were:

- Is the sawmill residue from the Research Forest suitable to use as a feedstock for heat and power generation?
- What are the logistics and economics of processing, transporting and storing the feedstock?
- What side effects from biomass combustion would impact the Research Forest and the Loon Lake facilities?
- What are the technological options for small scale heat and power systems that would be suitable for Loon Lake?
- How would the cost of biomass energy generated from waste wood on the Research Forest compare with alternative biomass energy sources, other green energy sources, and traditional fossil fuels such as propane and natural gas?

The analysis was complicated by a number of factors influencing the feasibility of wood waste biomass. For example, moisture content of raw sawmill waste was measured at levels up to 70% - a level beyond the tolerance of any small scale system. Drying the fuel would create extra cost and fire hazard in an area with a history of arson fires. Also, access to the Loon Lake site during the winter season is complicated by snow packs of 2 metres or more on steep forest roads. Despite these potential complications, the study's final results indicate that a biomass system for heating, powered by residues from the Research Forest sawmill, could be feasible for the Loon Lake facility. The baseline cost of energy obtained by operating the system with purchased wood pellets would be $6.50 per Gigajoule compared to propane at $33, carbon neutral natural gas at $9.25, and electricity at $18.30. However, the cost of processing and drying wood residues from the Research Forest sawmill could not compete with the lower cost alternative of purchased wood pellets. The cost of installation of a biomass district heating system at Loon Lake was estimated at $300-500,000. A life cycle cost analysis comparing this alternative to the current propane heating system produced a 30 year savings of $1.6 million for the installation of the biomass system.

Given this information, the Loon Lake facility will likely be converted to either biomass or natural gas over the next two years. The final decision will be based primarily on availability of funding for capital expenditures.

For further information contact Paul Lawson, Director of the UBC Research Forests, at paul.lawson@ubc.ca

Loon Lake Student Centre

alumninews

Reunions and events

Will your class be celebrating a milestone reunion in 2012? Contact Jenna McCann at 604.822.8787 for assistance with planning or to find out if a reunion organizer has already stepped forward for your year.

Mark your calendars for the following events:

- September 24 – Homecoming Game – UBC Thunderbirds vs Manitoba Bisons
- October 26 – UBC Dialogues: Richmond (Complementary medicine: Can we have faith in health alternatives?)
- November 23 – Fall Graduation Ceremony and Reception

More information on each of these events and all the services available to Forestry alumni can be found at www.forestry.ubc.ca/alum

Alumni in action

One of the common questions raised by alumni is 'What happened to my classmates after graduation?' Similarly, our students wonder 'What can I do with my degree?' To answer both of these questions, this column features stories from our alumni, highlighting the various career paths our graduates have followed.

Heather Coleman
BSF 2002, PhD 2008

What year did you graduate and from which program?

I received a BSF in Forest Resources Management in 2002 then returned to complete my PhD in the Faculty in 2008.

Where did you grow up?

On a dairy farm near Redwater, Alberta.

Why did you choose UBC Forestry?

I started at UBC intending to go into commerce in my second year. Growing up on the prairies I didn't really know that forestry could be a career option – I had spent four summers prior to starting at UBC tree planting and doing other silviculture work, but didn't really understand the planning and research that guided these sorts of activities. I have to admit that being on the other end of campus was not half as fun as what forestry seemed to be, and the courses that I was taking weren't really interesting me. I heard a lot about the dendrology course from forestry students I knew and started to realize that forestry could be an option and that there was a lot more to it than the field work aspect, which I enjoyed, but couldn't imagine doing forever. I finished my year in Arts and then transferred into Forestry for the next fall.

What was your first job after graduation (related or not to your degree)?

I worked for a forestry consulting company for two summers during my degree, but my first job after graduating was working as a researcher in Shawn Mansfield's lab at UBC. During my third year

I started thinking about going to grad school and spoke with a number of professors about working in their labs. I had enjoyed the courses that Shawn taught and he had a PhD student position available and so I ended up working for him for the summer and then continuing in his lab for my PhD.

What are you doing now and how did you end up there?

I just started as an Assistant Professor in Biology at Syracuse University (SU) in Syracuse, NY. I finished my PhD in 2008 and then moved to Australia for three years to work at the Syngenta Centre for Sugarcane Biofuels Development at Queensland University of Technology. Since starting my PhD the goal had always been to find a faculty position. For the past eight years that is what I'd been working towards by doing a PhD and then taking a post-doctoral position. I've had a lot of great opportunities in the last few years, and I'm really excited about the new challenge here at SU.

Do you have any fond memories of your time at UBC?

I think the best memories for me from my time at UBC come from the field schools and anytime we were in the woods for a lab. UBC Forestry students are really fortunate to have access to Pacific Spirit Park and the research forests, but also to work and study in BC, one of the most beautiful places in the world in my opinion. Add to that the quality of the people in the Faculty of Forestry, both students and professors. How can you not have fond memories of working with great people in a beautiful environment?

If you weren't working where you are now what profession would you most like to try?

This is a tough question for me – I used to be able to think of a long list of things that I would like to do, but right now, I'm doing exactly what I want to be doing and I love it.

What is the toughest business or professional decision you've had to make?

Probably the toughest professional decisions have been the ones that have affected my personal life – things like staying in Vancouver to do a PhD while my partner worked in the Interior and moving overseas for jobs – once to Australia and now back again to North America. I'm fortunate to have a partner who also has a forestry degree and used his time working in forestry consulting to obtain project management experience and training and now has professional designation in that field as well and therefore has a relatively transferable career. However, it's never easy to leave a comfortable situation and a good job for the unknown, especially when you are living in Australia.

> **"UBC forestry students are really fortunate to have access to Pacific Spirit Park and the research forests, but also to work and study in BC"**

What do you aspire to 10 years from now?

Ten years ago I was almost finished my forestry degree and had no idea that I'd be sitting where I am now. So ten years from now, who knows! I love what I do and I love the life that I'm able to have because of what I do, with opportunities to travel and work with people from all over the world. I imagine I'll keep doing what I'm doing as long as it makes me happy and then I'll find the next challenge. In academia I feel that things can be as challenging as you want them to be, so I can't imagine getting bored anytime soon.

Do you have any advice for students considering enrolling in forestry?

A degree in forestry is a unique undergraduate degree. It's a degree that can lead to many different careers, and unless you continue in the forestry industry, it's going to be a degree that sets you apart from your co-workers, or the other applicants for a job. So you have the option of staying in the forestry industry and you have a degree from an excellent program, or you can use the transferable skills and knowledge that you have gained to move into and excel in many other fields as well. I know there are a lot of people that I went to university with that still work in forestry, but I know just as many that have moved on to other things and if they've had a similar experience to mine, they will say that their degree has helped set them apart and allowed them unique and exciting opportunities.

Interested in sharing your story? Send submissions with a photo to Jenna McCann at jenna.mccann@ubc.ca

Lost in the woods

The Faculty's Alumni Relations Office is trying to track down contact information – email or mailing addresses – for all our alumni. If you are in touch with anyone on our Lost in the Woods list, please ask them to get in touch with Jenna McCann at 604.822.8787 or jenna.mccann@ubc.ca. Visit www.forestry.ubc.ca/alum and click on the 'Lost in the Woods' page to find the list.

Are you moving? Don't forget to let us know where you're going so we can continue to update you on news and events.

Making a difference

Think back to your time as a Forestry student – a longer journey down memory lane for some! Did you have any idea what you would do with your degree out in the real world? Where would you go? Who could you connect with for your first summer job? And were all those lessons in statistics, forest policy, or hydrology really going to serve you well in future years?

Today's students have these same questions, but thanks to the recently introduced Mentoring Program, many have the opportunity to find out the answers before they leave UBC.

Greg Goldstone BSF 1984

One of our mentors, **Greg Goldstone**, an alumnus from the Class of 1984, shares how and why he became involved in the program and the difference he feels it has made in the lives of the Forestry students he has met.

Tell us a bit about yourself. What have you been up to since graduation?

Following graduation with a BSF in Forest Management I worked as a contractor primarily in silviculture and protection but also dabbled in logging and road building. I joined the Forest Service and worked in protection, silviculture, engineering, the Small Business Program, and now BC Timber Sales. For the past year I have been the Acting Woodlands Manager for the BCTS Strait of Georgia Business Area.

How did you hear about the Mentoring Program?

I was asked by Geoff Anderson (Co-op and Mentoring Program Coordinator) if I would be interested in joining the Mentoring Program. I have been involved in hiring Co-op summer students from UBC since 2005 and found that it requires coaching for the Co-op term but often continues as mentoring afterwards. So joining the Mentoring Program was a natural progression.

Why did you decide to join the program? How long have you been involved?

I was pleased to be asked to join the program because I have enjoyed the interaction with the students so much. I have been involved in the Forestry Mentoring Program for two years now but have been a mentor for about 15 years. I am still in regular touch with the first person I mentored.

What kind of students have you met? What were their interests?

Although the interests of the students vary and they have different backgrounds, all are very enthusiastic and very bright. Their interests have ranged through conservation ecology, international forestry, biology, land use planning, to forest engineering and road building.

> "I find that mentoring puts day to day pressures into perspective and I leave each conversation infected with the enthusiasm of the mentee."

How do you find the time to mentor the students? Is it a lengthy commitment each year?

It has not been difficult to make time for mentoring but communication has been a challenge at times since I live in Campbell River on Vancouver Island. I have been able to work around the distance challenge though by meeting the students face-to-face about once a month when I am in Vancouver for other reasons. The rest of the time communication is by telephone or email. It does not amount to a lot of time, perhaps three to five hours a month.

What have you gained from the experience?

It gives me a real lift to see what a difference a little help can make – things as simple as providing contacts, ideas on assignments, discussing how the forest industry works, or what current events could mean. It is very satisfying to be part of the transition of a junior student with a lot of questions, to a senior student with confidence and opinions on forestry topics, and then see them launch their career.

Would you recommend the program to others?

I definitely recommend the Mentoring Program to others. It really doesn't take a lot of time and is so beneficial to both the mentor and mentee. I find that mentoring puts day to day pressures into perspective and I leave each conversation infected with the enthusiasm of the mentee.

There you have it. A little of the mentor's time coupled with the immeasurable enthusiasm of our students combine each year to have a great impact on both the alumni and students involved in the program.

To learn more about our Mentoring Program, visit www.forestry.ubc.ca or contact Geoff Anderson (geoff.anderson@ubc.ca) or Jenna McCann (jenna.mccann@ubc.ca)

New appointment

On July 1, 2011, Dr Lori Daniels joined the Department of Forest Sciences as an Associate Professor in Forest Ecology. Lori comes to us from the UBC Geography, where she has been a faculty member since 2001. Lori received her PhD in Biogeography from the University of Colorado at Boulder and her Masters in Forest Ecology from the University of British Columbia. Her research and teaching interests focus on forest dynamics and the interactions among natural disturbances, climatic variation and human impacts. Much of her work involves dendrochronology, the use of tree rings to reconstruct historic forest processes. Lori looks forward to teaching in the forest sciences and conservation components of our undergraduate degree programs and to being involved in our growing research on the impacts of climate change on forests. She can be reached at lori.daniels@ubc.ca

2010 Annual Report now available

Our latest annual report, covering the period April 1, 2010 to March 31, 2011, is now accessible from our Faculty web site. To view the report, go to www.forestry.ubc.ca or scan the QR code, and follow the links under "Publications" and "Annual Report". If you would prefer to receive a printed copy in the mail, or would like to have email notification of when the electronic version of the report is available every year, please let us know.

Electronic versus paper newsletter?

Branchlines is currently mailed to over 4,000 forestry alumni, interested groups and individuals. We also post an electronic version of each issue on our Faculty website (go to www.forestry.ubc.ca and click on "Publications").

If you would prefer to stop receiving paper copies we can notify you by email when electronic versions are available online. To change your subscription from paper to electronic notification please send your request to Jamie at jamie.myers@ubc.ca

Branchlines now displays this QR (quick response) code which allows users to access current or back issues online by scanning the code via their cell phone (using a QR code reader application).

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