Branch lines

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Collaborating with China
Forestry higher education

CHINA'S CULTURAL REVOLUTION (1967 to 1976) devastated higher education more than any other sector of the country. The enrollment of postsecondary students dropped from 675,000 to 50,000 during this period and the decline in educational quality was profound. Since this time, Chinese higher education has undergone a series of reforms that have brought great improvement. The number of undergraduate and graduate students in China has been growing at approximately 30% per year since 1999.

China's university education followed the Soviet model and was originally classified by industry and region. Forestry is a typical example. Forestry universities were divided into Northeast, Northwest, Southwest, Central South, as well as Beijing, Nanjing, Fujian and Zhejiang Forestry Colleges. These Universities have now evolved into eight comprehensive universities that still carry the forestry name. Several agricultural universities also have forestry colleges and forestry-related programs. In 2008, close to 200,000 students were enrolled in forestry-related programs at Chinese universities. *Continued on page 18*

Complementing trade relationships between China and Canada

CHINA'S HIGH DEMAND for wood and Canada's rich supply of forests have led to considerable increases in cooperation between the two countries. China has emerged as Canada's third largest trading partner, now surpassing Japan. Imports from China have grown six fold in the past decade and exports have quadrupled. A major driver for these exports has been the expansion of China's forest sector, which is now the world's largest importer of logs and fiber and a massive exporter of furniture and finished wood products to Europe and North America.

China requires wood and is competing for logs around the world. This presents significant opportunities for Canadian wood exporters. Supported by the Canadian International Council, Dr Guangyu Wang has examined the development of China's forestry sector and the related opportunities for Canada. This research was part of his postdoctoral research under the supervision of Dr John Innes in the UBC Faculty of Forestry. Guangyu emphasizes the great potential for Canadian wood products in China and suggests that the two forestry sectors can build a bilateral trade relationship which is complementary rather than competitive.

Opportunities for Canada

There are many challenges for China's forestry sector but there are also many opportunities for Canada.

- China's demand for wood for domestic use and export-oriented manufacturing is expected to grow for the next 20 years.

- China has tried all possible means to increase domestic wood supply and at the same time has sourced wood from all over the world. Its programs to reforest and establish fast-growing plantations will, if successful, help to decrease its import needs. However, in the short-term, it is very likely that China will need to import its raw material to maintain growth in its wood industry.
- Internal domestic issues such as forest logging bans, energy deficits, food security, land availability, environmental problems and social issues limit China's ability to increase its domestic production of raw materials in the short term. With so many of China's import sources restricting logging, China will not be able to meet demand from these traditional sources.
- An increase in domestic environmental awareness together with international efforts will force China to turn to well-managed forest nations, such as Canada for wood supplies.

Canada should take advantage of these opportunities in China through improving the competitiveness of its forest industry and cooperating with the Chinese forest sector. Forest management and forest certification are not only needed to improve management at the level of the forest and to improve land stewardship, but also as a mechanism for Canada to show that it is acting responsibly in global environmental protection. China is a signatory country to the Montreal Process, as is Canada. Currently, the Chinese government is promoting a forest stewardship program to protect the environment. Promoting certified wood will encourage China to import wood from Canada while reducing imports from Russia and Southeast Asia, much of which has been illegally logged. However, this certification could increase general barriers to the exports of Chinese forest products when such rules are used.

Supported by the BC Innovation Council and the Ministry of Science and Technology, the UBC Sustainable Forest Management Lab is working with the State Forestry Administration of China to develop the Chinese National Sustainable Forest Management System and the National Forest Certification Standard. This project incorporates the research required to help China develop both an internationally recognized means of implementing sustainable forest management and a market-based mechanism for ensuring that management achieves internationally accepted standards. The success of the project will help China reduce illegal wood procurement and will enhance the BC forest industry's access to the Chinese forest products market.

Most of Canada's marketing efforts have aimed to convince Chinese wood consumers to build American-style housing. However, because of the many differences between China and Canada, construction projects have not been developed as quickly as expected. In the future, greater emphasis should be placed on understanding how wood is used in construction in China, and products should be designed that will meet these demands.

In 2007, several agreements were reached between the Canadian federal government, the BC and Quebec governments and the Chinese Ministry of Science and Technology which aimed to promote the joint development of potential commercialized research projects in Canada and China. For example, the Canada-China Science and Technology Joint Initiatives and the BC-China Innovation and Commercialization Strategic Development have developed a useful platform for Canada and China to cooperate over their respective forestry sectors. Such steps need to be encouraged and moved into concrete action.

Efforts already being made through the China-Canadian Forestry Education Exchange Platform should be fully supported. Together with Chinese and Canadian partners, UBC's Faculty of Forestry is hosting a forestry education symposium in May of this year as a follow up to the symposium held in Beijing in 2008 (see article on front page). These symposia provide excellent platforms for Chinese forestry universities and western universities to explore future synergies and collaborations in the area of forestry education.

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Opportunities for sustainable forest management and forest certification in China

CHINA'S FOREST sector has received much international attention over the past decade as it has pursued opportunities for sustainable forest management (SFM) and forest certification. It is difficult to predict how China will proceed with SFM and how this will affect China's forests and forest sector.

Juan Chen, a doctoral student in UBC's Sustainable Forest Management Laboratory, is looking at China's opportunities for sustainable forest management, specifically how and to what extent Chinese wood products manufacturers would adopt forest certification. Juan hopes to identify the means to China's adoption of certification, as well as the impacts of SFM on the livelihoods of those living in forest-dependant regions.

Juan's research involves small-scale forest farmers, forestry property markets, wood products manufacturers, and customers. All of these are stakeholder groups in the timber supply chain. She selected Yong'an, in Fujian province and Tonggu, in Jiangxi province as case study sites. These sites were selected because they were the first to be chosen by China's State Forestry Administration as pilot studies for forest tenure reforms and other forest-related policies. Furthermore, these two sites are being used as models that can be extended to other forest-dependant regions.

Forest tenure reforms have resulted in forest land, once collectively owned, being returned to individual farmers. Although the area that each farmer has been given is quite small at less than 2 ha per person, the change allows forest farmers to operate and manage the forests independently. Individual farmers can cut and sell the timber within specified limits or they can decide to leave the trees on the land.

Forestry property markets, established as the supporting measure to better achieve the goals of forest tenure reform, provide a one-stop service to forest farmers and realize the functions associated with forest tenure reform. For instance, market officials are trained to assist forest farmers with forestry property mortgages, forestry assets auctioning and bidding, providing transparent information and facilitating timber trading. In addition, they also invite experts (professionals and professors from academic institutions and universities) to give training programs on new technologies to forest farmers. Through these efforts, two major problems facing forest tenure reforms, the availability of

Yong'an Element Market, Fujian province.

Bamboo forest in Dacao village, Tonggu county, Jiangxi province.

capital and technological capacity, have been greatly improved.

Wood products manufacturers play a significant role in the promotion of SFM and certification. They purchase timber from the forest farmers and also produce wood products and sell them to the retailers and end consumers. Customer requests are the major incentive for wood products manufacturers to adopt SFM and certification. The influence of the customers depends largely on their purchasing power and the premiums they will be willing to spend on certified wood products.

As a Chinese national, and in cooperation with the State Forestry Administration, Juan has been able to undertake this research 'on the ground' through interviews and field trips over the past two years. In the summer of 2008, she interviewed managers of wood products companies producing furniture, wood doors, wood flooring and various engineered wood products. In the summer of 2009, she interviewed forest farmers in Yong'an and Tonggu who had obtained small parcels of forest land through the forest tenure reform process. Juan also interviewed governmental officials who were working with the forestry property markets in Yong'an and Tonggu.

The goal of this research is to enhance the understanding of sustainable forest management and forest certification within the four stakeholder groups involved in the supply chain. Results to date are providing valuable information for government professionals and the forest industry in China.

Juan Chen's research is supported by the Social Sciences and Humanities Research Council of Canada, the BC Innovation Council and the China State Forestry Administration through the China Ministry of Science and Technology. She can be reached at candice10933@yahoo.ca

Forest in Sangxi village, Yong'an city, Fujian province.

An emission trading program for China?

AS HUMAN BEINGS, we rely on the atmospheric environment as a valuable resource for our daily needs. Destruction of this environment is usually an irreversible process. Attempting to restore an already damaged atmospheric environment is much more costly than preventing atmospheric pollution in the first place.

As has been the case with the industrialization of western countries, Asia's social and economic development has created an awareness of new problems of environmental pollution and ecological degradation. Data collected by the National Aeronautics and Space Administration indicate that particulates transported in the air from East Asia to North America represent about 15% of the total particulate production in North America. Since 2000, trans-boundary efforts in pollution abatement have been aimed at more countries in Asia. Such efforts have been concentrated in South Asia where a thick and dense layer of brownish haze (known as Asian smog) has enveloped the region and extended towards East Asia. There is concern that this band of pollution will extend beyond Asia to Europe and America.

As the largest of all developing countries, China has experienced a dramatic increase in energy demands and pollutant emissions. This is partly due to the fact that coal is the primary source of energy for China, something that is not expected to change in the foreseeable future. The country is not meeting its established objectives on air pollution abatement and the current administrative mechanisms are not providing adequate solutions for sulphur dioxide or acid rain problems. In response to this, the Chinese government is looking for more effective ways to balance economic growth and pollution control. One such mechanism for China could be an emission trading program aimed at adjusting and improving air pollutant control mechanisms. Such a system has played a significant and effective role in sulphur dioxide and acid rain control in the US.

Shijun You is a graduate student with Dr John Innes in the Sustainable Forest Management Lab at UBC's Faculty of Forestry. He is researching the feasibility of introducing an emission trading system to China. Based on the successful experience of the US trading program and the analysis of a series of emission trading pilot projects in China, Shijun has recommended a design and implementation plan for an Emission trading program for China.

For further information on Shijun You's research, contact sjyou9@hotmail.com

Net primary productivity and climate change in China's subtropical forests

NET PRIMARY Productivity (NPP), represents vegetation's net carbon uptake from the atmosphere and is an important index in evaluating carbon storage and carbon cycling in forest ecosystems. Interest in quantifying net carbon stored and sequestrated in forests has been increasing as a direct result of the greenhouse gas reduction targets set by the Kyoto Protocol. However, NPP is spatio-temporal, differing at different scales (e.g. individual tree, stand level, landscape scales and regional scales). Many factors such as climate (e.g. precipitation, temperature), disturbances (e.g. fire) and management practices (e.g. harvesting, thinning, fertilizing) can cause variations in NPP. An understanding of the impacts of climate change and management practices on carbon uptakes in forests will help us to achieve a better balance between carbon management objectives and other forest management goals.

The subtropical forest ecosystems in southeast China play an important role in the national carbon budget since they account for around 30% of total forest area in China. To date, few studies have been conducted to investigate the potential impacts of climate change and management practices on forest NPP and carbon balance of forest ecosystem at multi-scales. Dagangshan Mountain Forest Ecosystem Research Station (which belongs to the Chinese Forest Ecosystem Research Network and the China National Ecosystem Observation and Research Network) is located in Fenyi County, Jiangxi Province in southeastern China. This area includes typical subtropical forests and is providing a suitable location for doctoral student Lianzhen Xu to study the responses of NPP to climate change and forest management practices in the subtropical forests of China.

Lianzhen would like to answer the following questions: (1) what is the productivity of current subtropical forests in China? (2) to what extent does climate change affect forest NPP? (3) how do management practices influence forest NPP? (4) what is the response of NPP to the changing climate with management practices? To answer these questions, both empirical measurements and process models will be required to quantify the amount of NPP in forests at the process, stand, landscape and regional levels. Lianzhen will evaluate and calibrate several process models using ground-measured data and forest inventory data. She will calibrate models to represent NPP from stand level to regional scales. A unique feature of her study is the integration of NPP with climate change and adapted forest management to achieve an integrated approach to adaptive forest management.

The results of this research will help to improve understanding of carbon cycling processes in the subtropical forests in China and will complement studies being done by the China-FLUX Network and Carbon Cycle and Driving Mechanisms in Chinese Terrestrial Ecosystem. The results, which will be incorporated in to the best management practices for the State Forestry Administration and in to revisions of the National China Forest Management Standard, will have important political, scientific and practical significance for China.

Lianzhen Xu is a doctoral student in the Sustainable Forest Management Laboratory at UBC's department of Forest Resources Management. Her work is supported by the State Forestry Administration of China.

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Atmospheric pollution and forest management in China's forests

CHINA'S RAPID economic growth has created pressures on its forest sector to provide increasing supplies of wood products. However, increasing economic demands are also increasing atmospheric pollution. Sustaining forest growth is critical for ensuring future timber supplies and other environmental services, such as carbon sequestration. A significant productivity decline has already been detected in several Chinese forests. Overexploitation and pollution highlight the critical need to assess the causes of this decline and the need to determine practical management solutions for long-term sustainability. This, together with the increasing demand on wood products, is causing China to place forest growth recovery and carbon management as one of its highest priorities.

Chinese fir, one of China's major timber species, is experiencing substantial losses of standing timber volume. This species accounts for close to 80% of China's plantations. However, by the third rotation standing wood volume can decline by almost 50%. Many hypothesized factors (nutrient removal, short rotations, slash burning etc.) and their contribution to yield decline have not been evaluated in a broader ecosystem context. Recently, the UBC Forest Ecosystem Simulation Management Group (led by Dr Hamish Kimmins) made a key contribution to understanding this issue by using the model FORECAST at different levels of complexity.

Chinese graduate students (left: Qi Guang; right top: Xin Zanhong; right bottom: Jie Chengyue) learning how to use the FORECAST model.

In addition, increasing levels of atmospheric N deposition and acid rain are likely affecting the ecosystem processes in those forests and could have important implications for long-term forest management. With growth decline, other ecological attributes including carbon sequestration, wildlife habitat, biodiversity and watershed functions are all negatively affected. The ramifications of this issue on both regional economy and environmental protection are extensive, given that China continues to rely on this species for timber supply.

China is implementing several large-scale reforestation programs. Information on the effects of different management strategies on long-term productivity and carbon sequestration are urgently needed to guide implementation of these programs. Dr Adam Wei, from UBC Okanagan, in collaboration with our team and Dr Jiang Hong from Zhejiang Forestry University (ZFU), initiated a project under the BC and China Innovation and Commercialization Strategic Development Program in 2008. This project will allow the determination of the best forest management strategies to sustain forest productivity and improve other ecological variables. The forest ecosystem model, FORECAST, developed and improved over 30 years by our team, is particularly suitable for this project. Our specific objectives for this project are:

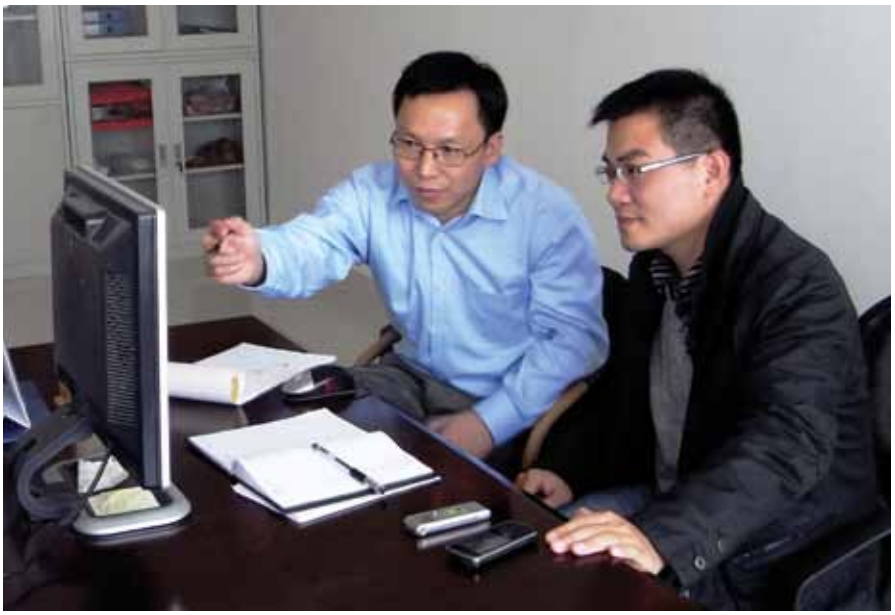
- To apply FORECAST to several key Chinese forests to determine the best forest management strategies for sustainable forest productivity and promotion of greater carbon sequestration.

- To test and improve FORECAST in new ecological conditions, which will help BC and Canada to more accurately assess forest productivity sustainability and forest carbon budgets and credits in BC forest ecosystems.

- To increase scientific collaboration between Chinese and Canadian institutions and transfer BC technology to China.

- To support accurate carbon accounting to meet the needs of carbon trading in the Chinese forestry sector.

- To promote commercial opportunities for BC technology in China (software development, consulting services, etc.).



Adam Wei (in blue shirt) discussing some aspects of the project.

The project is under way, and we have already facilitated the organization of the International Workshop on Simulation of Ecosystem Productivity, C-N Cycling and Multi-objective Forest Management at ZFU with more than 40 researchers from China and Canada. In 2009, Dr Juan Blanco visited Zhejiang Forestry University to train graduate students in the use of ecosystem-level models in the analysis of sustainable forest management. The next steps are to facilitate the visit of several Chinese graduate students to the Faculty of Forestry at UBC and to transfer the results to the Chinese forest managers.

For further info about this project contact Adam Wei at adam.wei@ubc.ca or Juan Blanco at juan.blanco@ubc.ca or visit our website www.forestry.ubc.ca/ecomodels/

Plantation of Chinese fir in Zhejiang province (SE China).

From a global hydrocarbon economy to a carbohydrate based society in the Asia-Pacific

THE UBC FOREST PRODUCTS Biotechnology/ Bioenergy (FPB/Bioenergy) Group has been working on bioenergy/bioproducts research for the past 20 years. Many graduates from the group have gone on to be influential leaders in their own countries and, to date, the group's alumni Includes individuals from at least 25 countries who have worked on developing sustainable solutions to weaning off society's dependence on carbon intensive oil based products. Our group primarily focuses on conversion technologies for the production of lignocellulosic ethanol, a liquid biofuel that can be produced from many organic sources such as forestry or agricultural residues, pine-beetle affected wood, or any sustainably produced biomass.

One of the attractions of a carbohydrate based economy is that the basic resource, biomass, is much more democratically distributed than are fossil fuels such as coal, oil and natural gas, Countries such as China, India and Japan, who have limited access to hydrocarbons, are actively pursuing the "bioeconomy", as evidenced by their strong support of training, research and commercialization of technology and participation in fora such as the recent GLOBE 2010 conference held in Vancouver.

The international stature that the FPB/Bioenergy Group has developed over the past two decades has been greatly aided by the quality, industry and innovation that the international students and post docs have brought to the group here at UBC. The contribution that our international colleagues have made is evidenced by the stories of three of our graduate students from Asia/Pacific countries. Their work helps to show how UBC's commitment of "Place and Promise" will help us evolve from a finite and limited hydrocarbon economy to a much more sustainable carbohydrate based global society.

Linoj Kumar is a doctoral student from India who joined our FPB/Bioenergy Group in 2007 after working in the area of lignocellulosic bioethanol research in his home country. India has a population of over one billion, it is the world's largest democracy and is predicted to experience a 40% growth in its energy demands over the next decade. Although the country has experienced sustained and rapid economic expansion, India imports more than 80% of its crude oil needs. Thus, biofuels and the overall bioeconomy are increasingly important. Linoj's PhD focus is on pretreatment and post treatment conditions of lignocellulosic materials that will enhance overall ethanol production. His intention is to use his expertise to facilitate academic-industry partnerships between India and Canada and help advance lignocellulose based ethanol technologies towards a sustainable and carbon neutral word.

Jinguang Hu comes from Xi'an in northwest China. This part of China has abundant forestry and agricultural resources but residues are currently burned causing serious environmental problems. While completing his masters degree in China, Jinguang heard about research being conducted by UBC's FPB/Bioenergy Group and realized that joining this group would allow him to equip himself with the training needed to help solve the biomass residue problems in his home country. He won a highly prestigious China Scholarship Council award to support his PhD study in Canada. Jinguang arrived in Sep, 2009 and has since been working on the enzymatic hydrolysis of biomass. One of the aims of his research is to decrease enzyme dosages such that the cost of making sure and ethanol from biomass is reduced. After completing his studies, he plans to return to China and focus on bioenergy research that will utilize agricultural residues in X'ian.

Seiji Nakagame is a doctoral student from Japan. His home country imports about 96% of its energy needs. However, after the oil crisis in the 1970s, Japan realized

it had to reduce its dependence on fossil fuels. In 2002 the Japanese government launched a multifaceted project known as the Biomass Nippon Strategy. The goals of this strategy are to:

- reduce global warming
- create a recycling, reduce/reuse-oriented society
- foster new strategic industries
- reinvent the agriculture, forestry, and fishery sectors, and their associated rural communities.

After ten years of research with the Oji Paper Co., Ltd. (the biggest pulp and paper company in Japan), Seiji gained considerable expertise in pulp chemistry and microbiology. In 2007, he moved from Tokyo to Vancouver to pursue doctoral studies in the FPB/Bioenergy Group at UBC. Seiji's current research is focused on how lignin, one of the main components of lignocellulosic biomass, decreases the action of enzymes on biomass. His goal is to increase the effectiveness of the process so that more ethanol can be extracted from the biomass, thus making the process more efficient. When Seiji completes his PhD at the end of the summer he will return to Oji Paper Co. Ltd. in Japan.

These are just three brief stories from a group that currently consists of 17 nationalities working together at the FPB/Bioenergy Group. As can be seen from the stories of Linoj, Jinguang and Seiji, every researcher has followed their own path while contributing significantly to UBC's internationally recognized research expertise in the biofuels/bioeconomy/sustainability area. There is a common thread of UBC's Place and Promise between all the stories that bridge the Asia/Pacific countries – including India, China, Japan and Canada. We recognize and encourage hard work and excellence, we embrace the Olympic ideal (faster, stronger, higher, while recognizing the importance of team work) and have a common desire to accelerate the commercialization of sustainable bioeconomy that will reduce our dependence on fossil based hydrocarbons such as oil and coal.

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Africa Forests Research Initiative on Conservation and Development

AFRICAD – the Africa Forests Research Initiative on Conservation and Development – is an ambitious endeavour based out of a modest office on the fourth floor of the Forest Sciences Centre at UBC. Co-founded by Drs Joleen Timko and Rob Kozak, AFRICAD received seed funding from the UBC Hampton Fund to work in Africa's forested regions on applied research that addresses poverty alleviation, sustainable livelihoods, social equity, and conflicts over forest resources. We have built a small team of researchers, drawing upon a collective set of expertise from our work involving effectiveness evaluations, alternative tenure and business models, criteria and indicators for sustainable forest management, forest certification, sustainable business management, decentralization and co-management, environmental and social impact assessments, and environmental compliance auditing.

We are engaged primarily in the generation of knowledge through scientific inquiry and the communication of knowledge through teaching and capacity building, on the interlinkages between forests, poverty, and livelihoods in Africa. We collaborate with local people, policy-makers, civil society, governments, other research institutes, and ENGOs to ensure that our research is policy-relevant and applicable to local needs.

We pursue research under four main themes:

Dynamics of Human Health in Forest Environments: Deforestation and forest degradation, soil erosion, and water pollution can directly impact how well people in rural, forest-dependent communities achieve sustainable livelihoods. Diseases can be exacerbated by environmental degradation, while ecosystem services can contribute to human health and local livelihoods. We are conducting research to better understand the dynamic interactions between human health and forest ecosystems. AFRICAD's foundational study assesses the interlinkages between HIV/AIDS-affected households and forest resources in Malawi, with a particular focus on local forest-related innovations that have been developed locally to reduce vulnerability to HIV/AIDS.

Effectiveness of Conservation and Development: Initiatives that seek to integrate conservation and development (ICDs) are often founded on the fact that, amidst abject poverty, the long-term prospects for biodiversity conservation are poor. This is a particularly salient issue for Sub-Saharan Africa given that extreme poverty exists in a predominantly rural population dependent on natural resource subsidies for maintaining health and livelihoods. Yet, efforts linking conservation with poverty reduction and improved livelihoods have not yet been successful on a large scale. Calls for evidence-based approaches to evaluate the effectiveness of ICDs have arisen from a concern over the lack of empirical evidence showing the results of ICD interventions. We will be working on a study to systematically identify and test a set of key human, social and financial factors and conditions likely to lead to ICD success in Sub-Saharan Africa.

Equity, Social Justice and Conflict: 'Conflict' in regard to forest resources can take several forms. Armed conflicts in Africa have affected forests because combatants often take refuge in forested areas and use the spoils

of war, such as 'blood timber', to fund their activities; defoliants reduce forest cover; loggers and farmers access forested areas by taking advantage of roads built for military purposes; and refugees and displaced people use forests for hunting, collecting fuelwood, and cutting trees to build new/temporary homes. Conflicts can also occur when industrial forest practices impact on local landowners through large-scale forest concessions or plantations for biofuel feedstock. Many of these conflicts are linked to poverty and an inequitable access to forest resources, and will persist in forested areas without major policy reforms. Ownership and the control of land is a key part of the problem as well as the solution. Tenure reform must revolve around the restitution of property rights and customary and traditional rights and our research focuses on devolution, decentralization, and community ownership of forest resources. We are working with colleagues in Ghana and Ethiopia to establish a study to assess the socio-economic implications of industrial plantations of the biofuel *Jatropha curcas* in order to better address emerging conflicts over land.

Livelihoods and Economic Development: There is a pressing need to better understand the impacts of industrial forestry on local people's livelihoods and to explore the efficacy and viability of various pro-poor conservation-based alternatives, such as community forests and small-scale forest enterprises. Based on previous work conducted by the Rights and Resources Initiative in Washington, DC, we will assess the enabling conditions and constraints facing alternative business models on publicly held forestlands in Central and West Africa. One of our graduate students has recently returned from The Gambia where she was evaluating the impacts of micro-loans on small-scale forest enterprises.

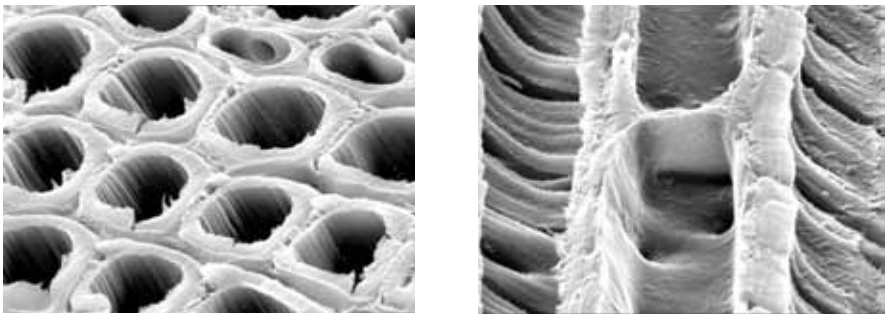
AFRICAD's applied research efforts broadly support Canada's commitment to helping the world achieve the Millennium Development Goals which aim to make the world safer, healthier, and more equitable. At the university and faculty level, our research can help to strengthen university-wide collaboration across multiple disciplines (medicine, forestry, political science, agriculture) by blending various research tools (participatory action research, remote sensing, etc.). We also hope to contribute to the development of novel curricula at UBC, and to further research partnerships across the various disciplines involved. We currently operate on soft funding and are seeking funding opportunities to enable us to establish AFRICAD as a permanent fixture in the Faculty of Forestry.

For more information about this project visit our website: www.africad.ubc.ca or contact Dr Joleen Timko at joleen.timko@ubc.ca or Dr Rob Kozak at rob.kozak@ubc.ca

Wood anatomy of *Xanthocyparis vietnamensis* – a new conifer species in Vietnam

A NEW CONIFER species was discovered in 1999 by a botanist from Kew (Dr Phillip Cribb) searching for orchids in the remote Bat Dai Son limestone mountains of Hi Giang Province in northern Vietnam. The species has been placed in a new genus *Xanthocyparis* (*vietnamensis*) with one other conifer species, our own yellow cedar, formerly *Chamaecyparis nootkatensis* (now *X. nootkatensis*). Both species have pungent durable heartwood. Yellow cedar's wood is highly regarded and is widely used in British Columbia for shingles and shakes, windows, cabinets, doors, boat building (including first nation's canoes) and totem poles. The wood of *X. vietnamensis* is also highly regarded by people in northern Vietnam who climb the precipitous limestone ridges where the tree grows to obtain its wood.

Scientific studies of *X. vietnamensis* commenced soon after its discovery. Since then several studies have analysed and described the morphology of the tree and its vegetative components. DNA analysis has been used to confirm the placement of *X. vietnamensis* in a separate genus. An opportunity to study the wood of *X. vietnamensis* arose recently when a lecturer from Vietnam, Nguyen Quy Nam, sent a small piece of its wood to Dr Phil Evans of the Department of Wood Science. In 2002 Phil described the wood anatomy of Australia's Wollemi pine with colleagues Drs' Roger Heady and John Banks (now deceased) at the Fenner School of Environment and Society at The Australian National University. The opportunity to describe the wood anatomy of another newly discovered conifer was something too good to miss.



Scanning electron microscope photographs of the wood of *X. vietnamensis* showing rounded tracheids and helical striations on tracheid walls, which are characteristic of compression wood found in the leaning stems and branches of conifers. Note the smooth end wall in the vertical parenchyma cell in the centre of the photograph on the right

Over the last few months Phil and Roger Heady have examined the wood anatomy of *X. vietnamensis* using both light and scanning electron microscopy. All of the samples that have been examined to-date, however, show the presence of quite severe compression wood. Compression wood is formed in leaning stems and branches, and its wood anatomy is somewhat different from that of 'stem' wood. The electron microscope photographs below, which were taken by Roger Heady, show the presence of rounded tracheids and very pronounced helical striations, which are characteristic of compression wood. The abundance of compression wood in the samples suggests that they were cut from branches. Therefore a full description of the wood anatomy of *X. vietnamensis* will depend on the availability of samples of stem wood. However, observations to-date suggest that the wood of *X. vietnamensis* has all of the characteristics expected of a conifer belonging to the family Cupressaceae including distinct growth rings, vertical parenchyma filled with resin, smooth ray and vertical parenchyma end walls (see photo below), uniseriate opposite pitting on tracheid walls, cupressoid cross-field pitting, horizontal walls of ray parenchyma smooth, and occasional bordered pits found on tangential walls of tracheids. These results should help clarify the phylogenetic relationships of *X. vietnamensis* with other conifers.

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Cavity-nesting communities in the subtropical Atlantic forest of northern Argentina

THE ATLANTIC forest of South America is one of the world's biodiversity hotspots. Much of the forest has been lost to agricultural demands – particularly in Paraguay and Brazil. One of the largest remnants of old growth forest is in the province of Misiones in northern Argentina where many of the bird species are considered to be threatened or near-threatened and yet little research has been done on the ecology of the bird communities.

Kristina Cockle (a graduate from our Forest Sciences program) has been working on a project to conserve threatened Atlantic forest birds in Misiones (http://pinoparana.fundacionazara.org.ar). She and her team were faced with making decisions about conservation, when almost nothing was known about the ecology of the bird community. Kristina enrolled as a doctoral student with Dr Kathy Martin to answer some of the key questions that would allow her conservation group, government and landowners to make better management decisions for the species rich bird communities in these subtropical forests.

Cavity-nesting vertebrates may comprise up to 30% of vertebrate forest communities, interacting in a 'nestweb' analogous to a food web, in which the central resource is cavities. Kristina found that most cavities in the Atlantic forest were formed by natural decay processes in which the heartwood was exposed by physical or insect damage, rather than by woodpeckers (as is the case with most North American cavities). Naturally

Kristina examining a cavity-nest.

Red breasted toucan poking out of nest cavity.

decayed cavities take much longer to form and are most abundant in primary forests with higher densities of older trees.

There is conflicting evidence about whether species that depend on existing cavities are limited by the availability of cavities. Kristina conducted the first nest-site limitation experiment in a tropical forest, and found that cavity-nesters were limited by cavity availability in both primary and selectively logged forest. Although selectively logged stands had half the basal area of primary forest, they had nine times fewer tree cavities and seventeen times fewer nests of cavity-nesting birds. While most research in North America has shown that cavity-nesters select snags or unhealthy trees for nesting, Kristina's work showed that cavity-nesters in the Atlantic forest relied primarily on large live trees, infected with heartrot but otherwise healthy. This finding has major implications for forestry practices as large live trees are usually targeted for harvesting. It is hoped that education, new policies, and even financial incentives

Andrea Norris measures dendplat chick.

Woodcreeper on box.

Cavity crew 2008.

could be used to help encourage foresters to limit the harvesting of these ecologically important trees.

Food availability, predation and insect parasitism may also play key roles in limiting populations of cavity-nesters. Andrea Norris, spent 3 months studying the effects of botflies (*Philornis spp.*) on nestling development and survival in one of the most common secondary cavity-nesting passerines in Misiones: the Planalto Woodcreeper (*Dendrocolaptes platyrostris*). She found that botflies had a negative impact on the weight of older chicks in logged forest, but not in primary forest, and only half as many chicks survived to fledging in selectively logged forest as in primary forest. The negative effects of botflies were diluted in nests with larger broods of nestlings. Taken together, these results suggest that parents were better able to compensate for insect parasitism in primary forest. The conservation implications of these findings are that habitat degradation may influence not only how many pairs can breed in the limited number of cavities, but also their ability to cope with insect parasites.

Andrea Norris and Kristina Cockle are doctoral candidates in Dr Kathy Martin's cavity-nester research group, studying how disturbance events influence cavity-nesting communities. You can read more about their NSERC- and FSP-funded research at http://sites.google.com/site/andrearnorrisresearch/ or http://pinoparana.fundacionazara.org.ar. or contact Andrea at arnorris@interchange.ubc.ca or Kristina at kristinacockle@gmail.com

Continued from front page

Our collaborations with China started in the late 1980s through CIDA and World Bank research and extension projects. Formal educational links with China, which were initiated in 2004, now include collaboration agreements between UBC's Faculty of Forestry and all of the major Chinese forestry education and research universities and institutions. In 2006, we established an undergraduate transfer program (2+2 program) with Nanjing Forestry University. In this program, Chinese students spend the first two years of their degree program in Nanjing and then transfer to UBC Forestry to complete their third and fourth years. Successful graduates of this program receive a UBC degree. A similar transfer program was established with the Fujian Agriculture and Forestry University in 2009 and collaboration is underway with the Shandong Agricultural University and Beijing Forestry University. In September 2009, seven undergraduate students from Nanjing and Fujian started their studies at UBC Forestry through this transfer program. We expect 7-10 new students to arrive in September 2010.

Nanjing Forestry University has established a special stream in their Overseas College for students planning to move to UBC in their 3rd year. Their first intake of 19 students will be eligible to enter UBC in September 2011. We are teaching these students during their first two years through short teaching modules delivered by our faculty members in Nanjing and through video conference lectures from our Vancouver campus. Nanjing has also made changes to its curricula to better reflect the equivalent programs in UBC Forestry.

We have also been actively involved in building educational collaboration between Chinese forestry universities and western universities. Together with the Chinese State Forestry Administration, the Canadian Forest Service, the Chinese Education Association of Forestry, the Association of University Forestry Schools of Canada, Beijing Forestry University, and the International Partnership for Forestry Education, we organized two International Forestry Education Symposia for 2008 and 2010 in Beijing and Vancouver respectively. These symposia brought and will bring together senior level administrators of Chinese and Canadian forestry education institutions, and representatives from other international organizations concerned with forestry education. The Beijing Symposium was held December 7-11 2008 at the Beijing Forestry University. Senior level administrators from more than thirty Chinese universities, from five Canadian universities and representatives from other universities around the world, met for two days to discuss problems facing post-secondary forestry education, potential collaboration among universities and sharing of combined expertise through web-based learning technologies. The proceedings of the first symposium are available at www.forestry.ubc.ca/ISFE. Full video coverage and presentations are available at: http://bj2008.forestryeducation.org/front.cfm. The follow-up symposium is being held in Vancouver, British Columbia on May 17th-21st, 2010. The primary goal of the meeting is to discuss progress with issues and themes that were identified at the Beijing Symposium. This symposium will provide a forum for reporting on joint educational programs and initiatives and will explore future synergies and collaborations in areas of forestry education promotion, enhancing effectiveness of regional forestry education networks, E-learning and course-based masters graduate programs.

We consider China as one of our major international focus areas and intend to build on the good relationships developed over the years. In January we hired Dr Guangyu Wang as Director of Asian Strategies. Prior to moving to Canada for his doctoral studies with Dr John Innes, Guangyu was the President and CEO of the Fujian Forestry Investment and Development Co. (one of China's top ten forestry companies), Deputy Director of World Bank Forest Projects and Director of International Forestry Program in Fujian, China. Guangyu has played a key role in strengthening ties with the Chinese forestry sector and forestry universities.

This issue of BranchLines focuses on our many projects with China (pages 1-11) as well as other, what we hope you will find, innovative research projects in Africa (page 12), Belize (page 19), Argentina (page 15) Vietnam (page 14) and India (page 10). As the old adage advises, the Faculty acts locally and thinks globally!

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Mangrove recovery after hurricanes in Belize

OFFSHORE ATOLLS along with the Meso-American Barrier Reef have served as the first line of protection against hurricanes and storms for the coastline of mainland Belize, Central America. Turneffe is an offshore atoll of 525 km^2, of which 125 km^2 is dominated by mangrove forests. The remainder is shallow lagoons, seagrass beds and coral reef. Development is taking place on the cays in this atoll. These small islands and their fringing mangrove forests are nesting sites for turtles and sea birds, fish nurseries and provide critical habitats for the endemic blue morph parrot snake (*Leptophis mexicanus hoeversi*), and the American crocodile (*Crocodylus acutus*).

Mangrove forests are unique amongst vegetation communities in that they span the marine and terrestrial environment. Because of their exposure, mangrove forests bear the full brunt of hurricanes and tropical storms. Hurricanes are recurrent disturbances in the Caribbean and their frequency and intensity are key factors in the disturbance and recovery aspect of mangroves. In October 1961, Hurricane Hattie, a category 5 hurricane (Saffir-Simpson Hurricane Scale), hit Turneffe Atoll, and destroyed entire cays, fringing mangroves and human settlements. Dr David Stoddart, a geographer from Cambridge was studying the reef systems of Turneffe Atoll in 1960 and took photographs and mapped some of these cays. He returned immediately after Hurricane Hattie and re-photographed and re-mapped the same cays. There has been an increase in human disturbance on Turneffe Atoll in recent years, but large areas have not been altered since Hurricane Hattie. In 2000, Hurricane Keith (category 1), affected the northwestern side of the atoll.

Red mangrove.

Tino Chi, now a doctoral candidate in UBC's department of Forest Sciences, had looked at mangrove productivity at Turneffe as part of his masters research. His observations led him to a series of questions about the role of hurricane and wave disturbance on vegetation dynamics and island geomorphology. Based on Stoddart's work and aerial photographs, Tino reconstructed cay size, shape and vegetation cover over time for specific islands on the eastern side of the atoll. Tino established transects and 293 vegetation plots at eight locations to characterize vegetation composition, size and density.

The1945 air photos show that the eastern side of Turneffe Atoll had 42 cays. The 1961, pre-Hurricane Hattie, air photos show the same result. However, the 1961 post-hurricane air photos show that 25 cays were severely affected by the hurricane, and five cays lost all of their vegetation and most of their substrate. The aerial photos taken in 2008 show 35 cays.

Four of these are new cays since Hurricane Hattie. Humans altered the vegetation on many cays prior to the hurricane. The dominant vegetation on the 42 cays was coconut palms (*Cocus nucifera*). Most of the settlers abandoned Turneffe Atoll after Hurricane Hattie and the dominant vegetation is now mangrove forest. The orientation of cays is highly dependent on the orientation of the reef crest directly to seaward. Cays and their fringing mangroves are migrating in a northwestern direction away from the reef crest. Substrate for the establishment of mangrove vegetation includes rubble and sand that comes directly from the fringing reef. Depending on the intensity, speed, location and direction of storms, cays can be severely eroded, partially eroded, or built from new storm deposits. Cay vegetation, particularly mangroves provide a physical barrier and consolidates newly deposited material.

Since the limestone platform underlying Turneffe is gradually subsiding, the long-term stability of cays and mangrove forests on Turneffe Atoll depends on the capacity of the system to maintain peat and coral substrate at elevations near to sea level. Mangrove forests occupy beachfronts and are therefore in conflict with the interests of developers. Recognizing the fragility of this system and the recurrent nature of severe hurricane disturbance should lead to more conservation-oriented practices. The results of this study will be shared with the University of Belize, the fisheries and forestry departments in Belize and stakeholders from Turneffe Atoll.

Partial funding for this study has been provided by the Belize Protected Areas Conservation Trust, Friends of Turneffe Atoll and NSERC. The University of Belize and the Smithsonian Institution have provided logistical and in-kind support. For further information on this project contact Tino Chi at tinochi@interchange.ubc.ca

Awards

Drs Shawn Mansfield (Canada Research Chair in Wood and Fibre Quality) and Yousry El-Kassaby (NSERC Senior Chair in Applied Forest Genetics and Biotechnology), have been selected to receive the prestigious 2010 IUFRO Scientific Achievement Award given in recognition of distinguished scientific achievements in forestry research. Shawn and Yousry will be presented with their awards during the opening ceremony of the XXIII IUFRO World Congress, Seoul, South Korea, August 2010.

Electronic versus paper?

Branch Lines 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").

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