

branchlines

Volume 23#4 2012

In this issue:

- Forest insect outbreaks in a warming environment 6
- Fuelwood in Nicaragua: Finding value in the trees 8
- Innovations in timber design 18
- Fry n' eggs: Sockeye salmon in hot water 15
- Extreme planting 22



Forestry
University of British Columbia

dean's message



One of the goals of UBC is to provide outstanding educational experiences for our students, both undergraduate and graduate. Within the Faculty of Forestry, we have been taking this goal very seriously, and we are now beginning to see the fruits of these efforts. In past issues of Branchlines we have mentioned several of these, such as our field studies opportunity in China. This focusses very much on forestry, and so we have now introduced a field studies tour to India, focusing more on conservation and natural resources management.

We have also previously mentioned the Haida Gwaii Semester – which now extends to 2 semesters a year, with the first dealing primarily with natural sciences and the second being more oriented towards the social sciences. The Faculty has been supportive of this opportunity, which is not restricted to Faculty of Forestry or even UBC students. The first fall semester has recently been completed. The students, who came from a range of backgrounds and universities, have provided indications of how they feel about their experience, and I am taking the opportunity to reproduce a couple here: *“The most significant thing...has probably been the reality of problems humans face. It’s a lot different to talk with people that have experienced and lived with complex problems and to hear their perspectives than to have a professor stand at the front of the lecture hall and tell you what needs to be done to solve a problem because in reality problems are so much more complex. I really appreciate the truths that Haida Gwaii teaches you in class and outside of class.”* Another wrote: *“The Haida Gwaii Semester offers more than just classes, it gives you an opportunity to feel a part of something - beyond this you get to learn about a place that you are living in. Getting to go outside and apply concepts and*

learn new concepts in such a stimulating environment is incredible.” And, finally some words that explain why we encourage such experiences: *“Being on Haida Gwaii has helped me realize there are a lot of open doors I probably never considered before. I think I have more options in my future than I was aware of. The experience truly was an eye opener.”*

At the graduate level, the article by Arnaud De Grave on “Extreme planting” (pages 22-23) provides an account of how an individual student has used such an experience. Arnaud has discovered just how difficult it is to reforest British Columbia’s rugged coastal mountains, and has documented the work of the planters through a series of black-and-white photographs. The photographs were recently exhibited at the Alliance Française in Vancouver, reaching a completely new audience for the Faculty.

Word about the Faculty is getting out. Katy Gibson, currently an undergraduate student in the Forest Sciences program, and the Vice President of the International Forestry Students Association (IFSA), recently wrote to me from an IFSA meeting being held in Germany. She says: *“I thought it would be interesting for you to know how amazing people think UBC Forestry is. People who have never been to Canada are talking about it as if they know it... everyone asks me about the curriculum there and everyone expresses how much they would love to go visit UBC. I am constantly amazed at how well known we are in the world of forestry students.”*

It is now up to us to ensure that we can maintain this momentum.

A handwritten signature in blue ink, which appears to read "John L. Innes". The signature is written in a cursive style.

John L Innes
Professor and Dean

forestrynews

Richard Hamelin receives QE II Diamond Jubilee Medal

In October, Richard Hamelin (Department of Forest and Conservation Sciences) was awarded the Queen Elizabeth II Diamond Jubilee Medal for his work on the genomics of forest pathogens. This award was presented to Richard at an official ceremony in Ottawa on October 18th. The citation for Richard

acknowledged his work in genomics of forest pathogens as the most important effort in forest pathology in Canada. It was also recognized that the impacts of his research have benefited natural resource managers as well as the industry.

Congratulations Richard!



Global tree health:
Can we rise above the gathering storm?

Forests have been increasingly devastated by invasive pests and pathogens for more than 100 years. Despite great efforts the trend continues at an alarming pace and there is much to learn still.

This lecture will have a particular focus on examples from the southern hemisphere where considerably less attention has been afforded to the health of native trees and the delicate and poorly understood balance between demands for increased plantation forestry and the impact that this has on natural woody ecosystems.

Mike Wingfield PhD
Director, Forestry and Agricultural Biotechnology Institute, University of Pretoria, South Africa

Forestry
Public Lecture
Friday Nov 23, 12:00 pm
In the Faculty of Forestry's Centre
for Advanced Wood Processing,
room 2964/65
Pizza and drinks will be served

Michael Wingfield receives UBC honorary degree

At the November convocation ceremony, Dr Michael Wingfield was awarded a UBC Honorary Degree in recognition of his work in advancing forest pathology significantly throughout Africa, Asia and South America. Michael is the Director of the Forest and Agricultural Biotechnology Institute at the University of Pretoria in South Africa and one of the foremost forest pathologists in the world. While at UBC for his award ceremony, Michael gave a lunch time public lecture in the Faculty of Forestry entitled "Global health: Can we rise above the storm?". He outlined the many serious issues facing forests and emphasized the importance of ensuring the health of forests is maintained.

Congratulations Michael!

Editor's Choice...

Congratulations to Drs Hilary Thorpe and Lori Daniels whose research in the Alberta foothills concluded that recent tree mortality rates are driven by stand development rather than climate. Their paper in the Canadian Journal of Forest Research (September 2012, volume 42 # 9) was awarded the distinction of "Editor's Choice" for the issue. Their work provided a counter-example to several recent studies showing climate-change-induced

increases in tree mortality rates. Hilary recently completed her post-doctoral fellowship with Lori Daniels in the Department of Forest and Conservation Sciences and is now working for the Gwaii Haanas National Park, Parks Canada Agency in Haida Gwaii. For more information contact Lori Daniels at lori.daniels@ubc.ca or 604.822.3442.

Master of Sustainable Forest Management update



A team of 4 students from the first class of the Master of Sustainable Forest Management (MSFM) program is excited that they will be travelling to Mexico early in Term 2. Not to relax on the beaches but to work! They will be spending a week collecting information to get started on a Sustainable Forest Management Plan for a private land owner in the State of Jalisco. Brad, Stacey, Charlie and Masa chose the project in Mexico because they all share an interest in doing International work. And fortunately for the group Charlie (from Spain) is fluent

in Spanish! As part of their course work, all of the MSFM students are working in teams to complete sustainable forest management plans for real clients around British Columbia, across Canada and the world. The students develop several management scenarios and identify appropriate criteria and indicators for assessing these scenarios. The final plan will be defended before fellow students, faculty, clients and stakeholders. The class of 14 students come from a range of academic and professional backgrounds including

forestry, landscape architecture, engineering and biology but all share a love of the natural world and are intent on pursuing careers as professional forest land managers here and abroad.

For more information about the Master of Sustainable Forest Management Program (including profiles of participants), please contact the program coordinator, Deb DeLong, RPF MSc at 604.822.0613 or visit www.cbm.forestry.ubc.ca. The application deadline for the 2013/14 academic year is February 28th, 2013.

Recent developments in Asia

The Faculty of Forestry continues to be very active in Asia, and the last quarter of 2012 was no exception. Several Faculty members attended the major celebrations held by Nanjing and Beijing Forestry Universities. These 2 universities are important partners for our 2+2 programs, and it was important for us to show our support. We were pleased to present plaques commemorating their anniversaries to the presidents of

both universities. In each case, we were joined by several other universities in the USA, Europe and elsewhere. We also used the opportunity to develop a number of internship and co-op opportunities for our students.

In late November, we met with a number of potential partners in India. In line with UBC's international strategy, we are keen to increase the number of students coming from India. We have

already been heavily involved in India through our mid-career training program for the Indian Forest Service, and we hope to build on this in the future.

In both cases, we met with and were helped by staff from the BC Forest Innovation Investment organization. This perhaps signals a more stream-lined approach to developing links between British Columbia and Asia.

Department of Forest and Conservation Sciences – a new name in the Faculty of Forestry

We are pleased to announce that the Department of Forest Sciences has changed its name to the Department of Forest and Conservation Sciences to better reflect its teaching and research strengths.

Established in 1981, the Department of Forest Sciences sought to provide the scientific foundations to contribute to sound forest management. The lessons learned from the forest and efforts to conserve elements of forest ecosystems have since been extended and applied to other non-forest species and ecosystems. Today, the department's focus is much broader and includes alpine, grassland, freshwater and ocean environments, as well as forests. Faculty and students are studying genetics and genomics,

bacteria, fungi, plants, animals, ecology and the functioning of whole ecosystems.

"Changing our name is an important milestone to our community – the new name represents what our alumni, students and faculty are passionate about," says John Richardson, head of the department. "It will also be important for recruiting future students and researchers who can more clearly understand our role and the scope of what we do."

Research conducted in the Department of Forest and Conservation Sciences strongly emphasizes the application of results to help address pressing questions about the world's ecosystems. The department is often cited locally,

nationally and internationally for its research on population genetics of endangered plant and animal species, the production and protection of crop trees and unmanaged forest ecosystems, the design and management of nature reserves, the management of animals and ecosystems, the development of restoration practices, landscape conservation, and much more.

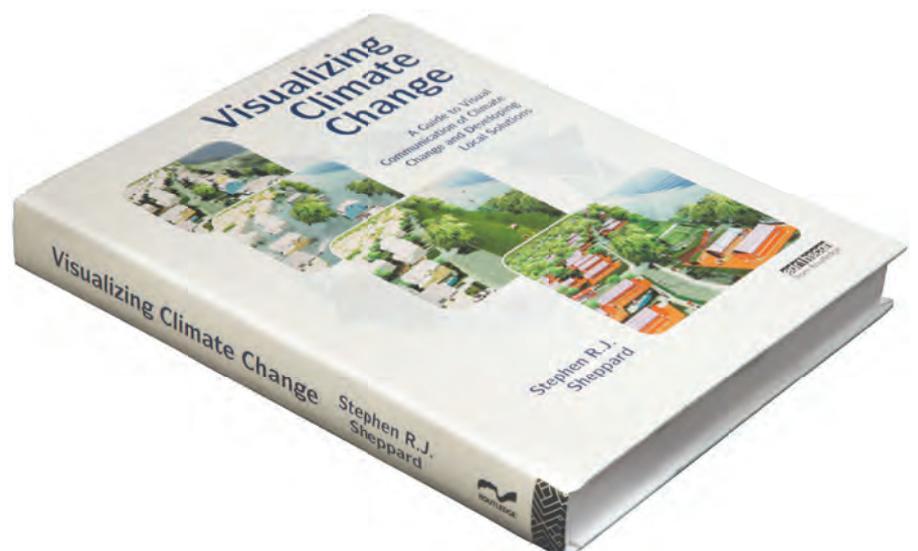
As part of the quest to change the department's name there was wide consultation with other departments, alumni, students and emeritus faculty. We were very pleased with the strongly encouraging responses we received, and the way everyone agreed that the new name better reflected the range of activities in the department.

New book by Stephen Sheppard

"Visualizing Climate Change: A Guide to Visual Communication of Climate Change and Developing Local Solutions" was published this year by Earthscan of London, UK. The book's author, Dr Stephen Sheppard is a professor in the Faculty of Forestry and School of Architecture and Landscape Architecture at UBC. This 514 page guide to using visual media in communicating climate change illustrates both the science and the practical community solutions for climate change, such as local renewable energy and flood protection. It introduces new visual tools (from outdoor signs to video games) for communities, action groups, planners, and

other experts to use in engaging the public, building awareness and accelerating action. The compilation of the book includes research conducted by members

of the Collaborative for Advanced Landscape Planning and others at UBC. For details on purchasing the book, go to www.routledge.com/sustainability.



Forest insect outbreaks in a warming environment

Forest insects are highly sensitive to variations in climate. Because of their short life cycles, enormous reproductive potential, high mobility and sensitivity to temperature, even modest changes in environmental conditions will result in rapid changes to their abundance and distribution. Climate change is expected to affect forest insects through direct impacts to their development and survival, and/or indirect impacts via modifications to their host plants, predators and parasites, and other components of their environment. To date, climate change impacts have been detected in the ecology of a growing number of forest insects. These impacts include shifts in the distribution of thermally benign habitats, altered synchrony with important seasonal events, and reduction in the efficacy of predators and parasites.

Although warming will not necessarily have positive implications for all insect species, there is evidence from historical global warming events that forest insect activity will generally increase. Indeed, it has been recently shown that the amount and diversity of herbivory to birch leaves increased dramatically during an abrupt global warming event comparable in rate and magnitude to modern climate change (the Paleocene-Eocene Thermal Maximum, 55.8 million years ago). Insect outbreaks comprise one of the largest sources of disturbance in northern temperate and boreal forests. This is especially true in North American forests where tree growth loss and mortality caused by eruptive insects annually exceeds that associated with wild fires. Given the sensitivity of forest insects to variations in climate, combined with

evidence of historical increases in their activity associated with a warming environment, climate change is expected to significantly increase the extent and severity of their impacts in northern forests.

Over the past 10 years, Forest Sciences Associate Professor Allan Carroll has been working with students and collaborators to quantify the effects of climate change on eruptive forest insects. Their work involving the mountain pine beetle, the most destructive biotic agent of mature pine forests in western North America, was the first to conclusively document a climate change signal in a landscape-scale insect epidemic. Although mountain pine beetle outbreaks have occurred at least 3 times during the previous century, the area affected by the most recent ongoing outbreak is over 10 times greater than anything



previously recorded. Since 1999, the mountain pine beetle has caused the mortality of mature lodgepole pine trees over approximately 18 million hectares – an area twice the size of Portugal. Allan and colleagues showed that as a consequence of changing climate, the amount of suitable habitat for the mountain pine beetle had nearly doubled since 1970, and that beetle populations had rapidly exploited increases in climatically benign habitats and expanded their range. Furthermore they demonstrated that continued range expansion was probable even under a conservative climate change scenario. This projection was proved correct when in 2004 Allan Carroll's group confirmed that populations of the mountain pine beetle had breached the geoclimatic barrier presented by the northern Rocky Mountains and established in the lodgepole pine forests of the foothills adjacent to the Alberta plateau. Since then the beetle has continued to rapidly expand its range, with infestations detected in 2012 in close proximity to the Yukon and Northwest Territory borders in the north, and the Saskatchewan border in the east.



A pine tree attempts to defend itself from attacking beetles

The dramatic response by the mountain pine beetle to a warming environment is just the first example of climate change-exacerbation of an outbreak by an eruptive forest insect. Since the early work by Allan Carroll and his colleagues on the mountain pine beetle, several additional examples of climate change impacts to insect disturbance have been documented by other researchers in North American forests. Future work by Allan and the Forest Insect Population Ecology Research Group within the Faculty of Forestry will focus on (i) quantification of the role of climate

change in the population dynamics and outbreak potentials of major eruptive forest insect species, including the Douglas-fir beetle, the spruce beetle, and the western spruce budworm, (ii) assessment of the resultant impacts to forest ecosystems of their epidemics, and (iii) construction of a framework within which to predict impacts by eruptive forest insects under a range of future climate scenarios.

Dr Allan Carroll is an associate professor in the Department of Forest and Conservation Sciences. He can be reached at allan.carroll@ubc.ca or 604.822.3360.



Mountain pine beetle infestations east of the Rocky Mountains

Fuelwood in Nicaragua: Finding value in the trees

According to the Food and Agriculture Organization of the United Nations, over one half of the world's annual wood harvest is used for fuel and 74% of this consumption takes place in developing countries. Fuelwood also accounts for a greater share of global energy consumption compared to the sum of all renewable energy sources combined. Since fuelwood consumption is expected to increase, it is important to find renewable ways of increasing production, particularly in developing countries where demand is large.

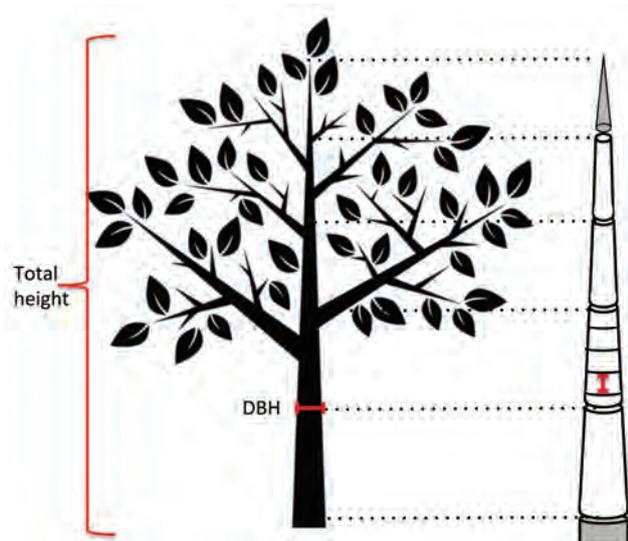
The establishment of tree plantations can play an important role in helping to meet energy demand. When cultivated by smallholders on land not suited for agriculture, it is seen as a means of improving rural livelihoods while helping the environment. In countries like Nicaragua, the need for farm-based tree plantations is particularly important since fuelwood is the country's predominant energy source and deforestation has led to a critical wood supply deficit. However, for landowners to invest in the establishment of fuelwood

plantations, economic viability must be expected. In the context of plantation forestry, economic viability, including the environmental and social benefits derived from plantations, is a pre-requisite for wider adoption of sustainable forest management practices.

For the economic viability of tree plantations to be assessed, a good understanding of yield and market demand is indispensable....and herein lies the problem. Firstly, fuelwood yield is commonly reported by weight but markets in Nicaragua pur-



Oxen-pulled cart loaded with fuelwood on its way to market



Estimating volume by diameter class using a taper model

chase logs by volume based on a small-end diameter. Secondly, growth and yield equations do not exist for tree species commonly favoured by smallholders. As such, the objective of Kahlil Baker's Master's thesis was to determine if plantations of *Caesalpinia velutina* and *Gliricidia sepium*, 2 tree species native to Nicaragua and favoured by smallholders, could be economically viable in a non-industrial setting. To improve the accuracy of the economic viability assessment of fuelwood plantations, a novel approach was used to forecast yield by market-specific product segments, thereby accounting for the effects of market requirements on differential revenues and costs.

This research was subdivided into 3 separate research projects: 1) evaluating market demand, product segmentation and prices by interviewing fuelwood consuming business owners; 2) developing species-specific taper models to estimate volume by product segment; and 3) determining the economic viability of the tree plantations in the smallholder context.

The fuelwood market:

The largest industrial consumer of fuelwood in the region of interest, the province of Madriz, Nicaragua, is a group of 89 low technology bakeries owned and managed by women that produce a popular cookie-like product. These bakeries were interviewed to identify the different types of fuelwood consumed, fuelwood demand expressed in traditional purchasing units (generally standard sized carts pulled by oxen) and prices. The second step was to determine the volume of fuelwood by product segment present in each cartload so that prices could be matched with log volume. Contrary to expectations, when prices were converted to a cubic metre basis, small diameter logs were more valuable per unit of solid volume but more expensive to transport. This was because less wood could fit within a cartload. As a whole, the industry was determined to consume close to 8,000 m³ of non-plantation fuelwood annually, valued at the equivalent of 327 full-time agricultural workers' salaries.

Fuelwood log volume by market-specific sizes:

Since the price of fuelwood in Nicaragua varies depending on a log's small-end diameter, the ability to predict tree volume as a function of diameter class is important. This is traditionally done by using taper equations. Unfortunately, none have ever been published for any tree species native to Central America, let alone Nicaragua. As such, the objective of this research project was to see if a taper model originally developed for coniferous tree species in Canada could be adapted to *Caesalpinia velutina* and *Gliricidia sepium* trees. To do so, the DBH and height of just over 30 trees of each species were measured. Additional diameter measurements were made every 2 m above DBH to the top of the trees. The taper model was then fitted from this data set so that diameter at any height of the tree could be estimated knowing the tree's DBH and total height. Mathematical integration was then used to estimate volume for every 10 cm section from the base to the tip of the tree assuming each section followed a standard geometric shape. Overall, the results were very precise as the models were able to predict over 95% of the variation in volume for both species.

“The establishment of tree plantations can play an important role in helping to meet energy demand.”

Economic viability and yield:

To forecast fuelwood log volume by product segments, species-specific yield models based on 3 separate sub-models were developed: 1) mean diameter at breast height (DBH) predicted over time; 2) mean height as a function of mean DBH; and 3) taper as a function of mean DBH and mean height. To assess economic viability, information on costs, discount rates, market requirements and fuelwood yields by product segment were combined using the net present value and the internal rate of return. It was concluded that fuelwood plantation yields according to product-specific requirements were essential for the economic viability analysis. In the context of this study, farm-based *Caesalpinia velutina* and *Gliricidia sepium* fuelwood plantations could be economically viable over longer rotations. However, barriers to entry such as access to capital and the need for reaching economies of scale made it unlikely that fuelwood plantations could be economically viable for smallholders without institutional support.

Kahlil Baker is now furthering this research at the PhD level to develop and evaluate forms of inclusive business models to catalyze reforestation initiatives by connecting smallholders to profitable markets. For further information on this project, Kahlil can be reached at kahlilbaker@gmail.com.

Wildfire Management

Challenges in a changing environment



On November 20, 2012, Dr Lori Daniels and the Forestry 320: Abiotic Disturbance class hosted a panel presentation and discussion featuring 4 of British Columbia's experts on wildfire management. Lyle Gawalko is the Manager of the BC Wildfire Management Branch. Al Neal is the Provincial Strategic Planning Leader for BC Ecosystem Restoration. Rick Kubian is the Resource Conservation Manager of the Lake Louise Yoho Kootenay Field Unit for Parks Canada Agency. Bruce Blackwell is a Fire Ecologist and the principal of BA Blackwell & Associates. Collectively, they have more than 100-years of fire-management experience in British Columbia, which they shared with us to discuss contemporary approaches to wildfire management given a range of challenges posed by environmental change.

The legacy of traditional wildfire management

Smokey Bear has done a great job over the last half century to convince the public that wildfires are bad. Unfortunately, the difference between accidental, human-caused fires and natural wildfire was lost in the theme of the Smokey Bear campaign. This has led the

general public to perceive all wildfire as bad. The media also plays a large role in describing wildfires as only destructive because they tend to focus on wildfires that threaten human safety and property.

These perceptions of fire were also reflected in public policy. Until 2011, the wildfire management strategy for the province of BC was dedicated to protecting people, property, forests and grasslands from fire. The fire detection and suppression rate was outstanding – 92% of fires were suppressed while less than 4ha in size within 24 hours of detection. Within the province, we have developed tremendous expertise – our fire fighters and fire managers are world renowned for their outstanding fire-fighting skills and rate of success.

Paradoxically, protecting some forests from fire during the 20th century has resulted in changes to forest composition and structure and increased fuel loads, resulting in a shift toward more extreme fire behaviour with more severe effects than occurred historically. These effects are most pronounced in low elevation forests – the same forests that surround our cities and towns (the “wildland-urban interface”), that serve as drinking water

supply to our communities and that provide much of the timber that sustains rural economies.

Superimposed on changes due to fire exclusion and suppression are global warming and widespread insect outbreaks such as mountain pine beetle that have increased fuels in many forests, particularly at mid- and high elevations in our mountain forests. With cumulative human impacts and interactions between natural disturbances and climatic change, our forests and fire regimes are changing. In response, wildfire management strategies are also changing.

A new mandate for wildfire management

Lyle Gawalko explained the new provincial wildfire management strategy that was unveiled in 2012. The new mandate is to “deliver effective wildfire management and emergency response support on behalf of the government of British Columbia to protect life and values at risk and to encourage sustainable, healthy and resilient ecosystems.” This has resulted in a shift toward a diversity of management strategies, in addition to fire suppression, which the panel of experts presented and discussed.

New wildfire management practices aim to promote innovative wildfire management science, practices, technology and decision support models. A primary change in wildfire management is the shift towards “modified responses” to wildfire rather than full suppression. The modified response strategy aims to allow fire back into the landscape and encourage the natural fire cycles to promote healthy and resilient ecosystems. Wildfires are being left to burn more often when human safety or property is not at risk, with protection of forest resources as a lower priority for suppression efforts.

In addition to the shift in wildfire response, landscape fire management planning aims for fire-adapted communities and fire-resilient ecosystems. At the local scale, proactive fuel management aims to reduce loss and damage from wildfire through community wildfire protection planning and fuel hazard reduction. Community fuel hazard assessments and reductions are being done in high hazard areas surrounding communities. Most often fuel management has been applied in communities in the interior of BC. However, Bruce Blackwell illustrated the need to assess hazards and risk to communities in a range of forest types using the Greater Victoria watershed as an example.

Strategic planning is supported by on-the-ground management – including many new and innovative approaches. Harvesting options are being implemented to reduce wildfire hazards. These include harvesting large-scale fire breaks in strategic locations and harvesting to reduce stand densities by thinning understory trees. Silviculture regimes are being implemented to develop natural fire breaks such as leaving patches of deciduous tree species or shaded fuel breaks. As well, prescribed burns are being implemented in strategic

locations to reduce the fuel load, create natural fire breaks, and reduce the potential fire severity when fires do ignite. Sometimes multiple prescribed burns are done to bring down the fuel load to levels that would occur naturally without fire suppression.

Extension to other forestry professionals and communication with the public are essential components of the new wildfire management strategy. Natural or prescribed wildfires that are an essential part of the ecosystem are not often covered by the media as news-worthy events,



Unfortunately, the difference between accidental, human-caused fires and natural wildfire was lost in the theme of the Smokey Bear campaign.”

so the public only hears about wildfires during negative situations. Rick Kubian provided a great example on public education about prescribed burning by setting up an information centre within viewing distance of a prescribed burn. Fuels management is a large part of the new management strategy. Holding information sessions in towns that have high fuel hazards in the urban interface is important to convey the hazards and options for mitigation available to residents. Timing prescribed burns to avoid peak tourist travel but to coincide with appropriate weather and wind conditions direction is important to reduce the possible far-reaching negative impacts of wildfire, such as road closures and smoke air-quality issues. Innovative fuel management designs need to be demonstrated to local residents to show that fuel loads can be reduced in an aesthetically pleasing manner. Al Neal provided examples of successful efforts in the East Kootenays by working with local community groups to convey to residents the importance of wildfire within the ecosystem and the role of proactive intervention.

A challenge to the next generation of foresters

Implementing these new wildfire management strategies may be challenging. It will require developing new expertise among forest and fire professionals, support and cooperation from the public and rural communities, and funding from multiple levels of government. Change brings uncertainty and is always a challenge – these are exciting times that pose tremendous opportunities for UBC Forestry graduates as they pursue professional careers in forest and wildfire management.

This article was submitted by Dr Lori Daniels from the Department of Forest and Conservation Sciences (Forestry 320 instructor) and Hans Erasmus, a student member of the class. Lori Daniels can be reached at lori.daniels@ubc.ca or 604.822.3442.

Multifaceted Genetic Data Centre



Killer whale

Photo: Jamie Myers

The Genetic Data Centre (GDC), established in 1998 through support from a Canadian Foundation for Innovation Grant, and with laboratory space provided by the Faculty of Forestry, provides guidance for biologists on the relative advantages, utilities, and costs of molecular genetic techniques, and if needed, offers space and equipment for their research. Such a facility is particularly valuable to researchers who do not have the equipment necessary for molecular marker work, but have research problems for which molecular genetics can provide new insights, directions and results

In the areas of population, quantitative and conservation genetics, researchers often have little or no molecular equipment and/or training. As well, there are large capital costs for molecular research. The GDC houses: ultra-low freezers for storing tissues and apparatuses for extractions of DNA, RNA and proteins; tools to assay DNA and RNA fragments, leading to the discrimination of various genetic markers and the generation of DNA sequences to study phylogenetic relationships; space to cultivate organisms (growth chambers, shaking incubators) for eventual molecular research; and other equipment for the ever-expanding field of genomics.

The hub of the Centre is the automated sequencers, which allow both the assay of large numbers of samples for either (a) DNA sequences, or (b) genetic markers such as AFLPs (amplified fragment length polymorphisms)

and SSRs (simple sequence repeats, or microsatellites) and access to other genotypic markers such as T-RFLP and transcriptome expression differences. In addition to housing extensive molecular equipment, providing technical advice and training on using possible genetic markers to fit the project and budget are integral parts of the Centre's service to researchers. Once the genetic data have been collected, we offer information on appropriate resources for data analysis and provide computer software for analysis of band fragments and sequences. Likewise, support and advice on the appropriate usage of population and genomic genetics statistics are readily available to all of our patrons.

The efficiency of the GDC allows patrons to study the variations of individuals, populations and species at the molecular level, from tissue to data point, ultimately enabling graduate students and post-doctoral fellows at the cusp of their careers to produce high quality publications in the area of evolution and molecular ecology of natural populations. We believe that one of the mandates of this facility is to strengthen the research careers of Canadian scientists and scientists around the world. For 14 years, the Centre has been training graduate students, postdoctoral fellows, and faculty members in the use of molecular tools, data collection and data analysis. Ultimately, the GDC has also promoted networking and collaboration among researchers. This inter-faculty



Bee pollinating blueberry

Photo: Gwen Huber

laboratory is a common meeting ground for molecular applications in population, quantitative and conservation genetics, thus creating an optimal infrastructure to encourage collaborations within the University as well as extending molecular genetic applications to researchers throughout British Columbia, Canada and the rest of the world.

Many important projects have been completed in the GDC including current research involving the mountain beaver (*Aplodontia rufa*), the most primitive living rodent and the only genus in its family, Aplodontiidae. Using mitochondrial and nuclear DNA sequencing data, researchers discovered that two subspecies (*A rufa rufa* and *A rufa rainieri*) of mountain beaver that were thought to live only in Canada are in fact an extension of the *A rufa olympica* population in Washington State, due to their genetic relatedness. Their abundance in the US is so great that the forest industry has long poisoned and culled them as pests for their natural tendency to eat young tree seedlings and yet, in southern BC, these animals are blue-listed by the Endangered Species Act. Aside from deducing the local populations' genetic relationships, we also investigated the phylogeny of all 7 subspecies of *A rufa* from the most northern edge of the range in southern BC to mid-coastal California. Our findings produced molecular evidence of differences

between *A rufa* subsp *pacifica* and the other 6 subspecies. Further morphological data needs to be collected to resolve the phylogenetic status of these primitive species.

Of pressing importance, pollinators are dwindling. Given their vital role in crop and fruit production, their population decline is resulting in large negative agricultural impacts. Doctoral student Gwen Huber is conducting experiments on cultivated highbush blueberry and its relationship with pollinators. Her research is one piece of a complex network of research in the NSERC-CANPOLIN project. The investigation of pollinator choice in relation to various floral characteristics, such as shape and chemical

makeup, can provide guidance to blueberry growers. In conjunction, genetic data will measure the inbreeding values correlated with fruit production/fitness of the cultivars, another valuable point for blueberry growers.

Finally, one of the GDC's longest standing projects involves the research department of the Vancouver Aquarium Marine Science Centre. The Aquarium's head of cetacean research, Dr Lance Barrett-Lennard, and his colleagues have been collecting tissue samples of killer whales, sea otters, harbour porpoises and other marine mammals for many years. GDC staff extract DNA from these samples and use a variety of genetic markers and techniques to analyze them. For example, microsatellite loci are used to determine paternity and mating patterns among the resident and transient killer whale populations off the Pacific coast, and mitochondrial DNA sequences to determine population affiliation and dietary habits.

Projects requiring molecular tools and analyses are most welcome. Please visit the Centre's web site at www.forestry.ubc.ca/gdc/index.htm or contact Dr Carol Ritland at critland@mail.ubc.ca or 604.822.3908.



Harbour porpoise

Photo: Neil Fisher

Improving forest management and protection in China



A major project entitled “Development of the Chinese National Sustainable Forest Management Systems and the National Forest Certification Standard” has recently been completed. It was sponsored by the BC Innovation Council and the Ministry of Science and Technology of China, and started in 2008. The project was undertaken jointly by the Chinese Academy of Forestry Inventory and Design and the UBC Sustainable Forest Management Research Group. The research aimed to develop a Chinese National Sustainable Forest Management Standard that would improve forest management practices and environmental protection in China. The Standard had to be sufficiently robust to be endorsed by the Programme for the Endorsement of Forest Certification, thereby enhancing the

competitiveness of Chinese wood products exported to international markets. Ultimately, the work is intended to help China manage its forests responsibly and to reduce the demand for illegally logged wood from neighboring countries.

As a result of the project, 2 administrative bodies were established, the Forest Certification Committee and the National Technology Committee on Sustainable Forest Management and Forest Certification Standardization. Throughout the project, emphasis was given to bringing researchers, industry participants and government agencies together in developing the national standards. The research has significantly contributed to the scientific underpinnings of the China National Standard, and has provided technical support for pilot studies that

led to the revision of the national standards. The National Sustainable Forest Management Standard for Forest Management Units has been promulgated, and a Guideline for Best Forest Practices that integrates sustainable forest management criteria and indicators into forest management planning has been released.

A key part of the project involved connecting 2 systems: forest certification and forest management practices. This has resulted in the principles of sustainable forest management being introduced. Demonstration sites for this integration were located in Nanchuan, Chongqing (southwest of China) and Qinyuan, Liaoning (northeast of China). More than 300 professionals were trained, and more than 50,000 local people were involved in the pilot projects

and the development of the management plans.

Further standards for the certification of bamboo plantations and forest plantations are being developed jointly by the Chinese Academy of Forestry and the project team and will be issued after approval from the Forest Standards Committee of the State Forestry Administration. Beijing Zhonglinlian Forest Certification Co Ltd, affiliated with the China Forestry Industry Association, has been developed as the first Chinese certification body and training center for auditors.

The project has resulted in the development of 4 national-level forest standards. A book in Chinese of the Application of Sustainable Forest Management Criteria and Indicators will soon be published by China Forestry Publishing House. With the Chinese Academy of Forestry, the research team co-organized an international Conference on Sustainable Forest Management in August 2010 in Yichun, China.

Drawing upon British Columbia's rich experience and technologies in sustainable forest management, the project has also developed a Chinese version of the sustainable forest management (SFM) indicator knowledge base and its website. The Chinese website aims to promote understanding of the criteria and indicators in the Chinese community, and to facilitate communication between people who work with indicators in the SFM field. It should also help forest managers and professionals to select a set of suitable indicators for local forest management. Access to the database is free, and an unusual feature is the ability for users to add/edit and review indicators, write their own blogs, discuss issues, share photos and experiences.

The project has paid particular attention to providing support for the efforts being made to improve China's certification standard so that it will meet the requirements of the Program for the Endorsement of Forest Certification Schemes (PEFC). China

became a member of the PEFC in 2011 and has been working intensively with the PEFC to achieve the endorsement of the standard. By August 2012, more than 1.2 million ha of forest has been certificated under the China National Standard, and the number will be expected to increase to 3.39 million ha. In comparison, the Forest Stewardship Council has certified 2.67 million ha of forest in China.

The development of certification in China has been very slow in the past two decades. 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. Helping China to meet PEFC requirements will provide an opportunity for the Canadian forest products industry to integrate with the Chinese forest products industry.

For further information contact Dr Guangyu Wang, Director of Asian Strategies, at guangyu.wang@ubc.ca or 604.822.8437.



Intractable time-lag effects on future generations



The idea of sustainability – environmental sustainability in our case – is largely predicated on the interests of future generations. The 1987 Brundtland Commission expressed the concept as “meeting the needs of the present generation without compromising the ability of future generations to meet their own needs.” In a similar manner, nearly all definitions of sustainability place future generations in a pivotal role – ie, future generations’ interests must be accommodated in environmental decision-making or it doesn’t qualify as sustainability.

Most of the conceptual issues surrounding future generations have been resolved in the past two decades. But at least 3 issues remain: (a) inequities among rich and poor nations, and between the rich and poor people within nations; (b) the distinction between natural resources and essential environmental conditions; and (c) insufficient governance mechanisms for handling time-lag effects on future generations. As reviewed in this article, recent scholarship in the Faculty of Forestry has focussed on the latter issue.

But first, we should examine a few arguments from the past to see why the current focus is on time-lag effects. One popular but flawed notion was that we cannot know what future generation’s interests will be because they do not yet exist. And without knowledge of their interests, we cannot accommodate future generations in environmental decisions. This argument is flawed because it confuses individuals’ preferences with public interests. We

do know that future generations will require, at a minimum, all-purpose natural resources and options to develop others.

A second argument maintained that the present generation, and previous generations, had to fend for themselves, and therefore future generations should do so as well. Ostensibly, this argument was intended to absolve ourselves from duties to future generations. The major flaw in this argument was the hidden assumption that neither the human population nor the natural environment had changed in previous decades. Of course, we know that neither is true. The human population has more than doubled since 1960; oceanic fisheries are collapsing; we are in the beginning of the sixth major mass extinction event of all geological time; and the climate is changing – all of which threaten the viability of human civilization sometime in the not-so-distant future.

A third argument, known as the ‘repopulation paradox,’ contends that we cannot harm future generations, and therefore the concept of sustainability need not include future generations’ interests. Intuitively, this appears to be mistaken. And most of the literature on sustainability simply assumes that we can harm future generations. Isn’t this what sustainability is all about? But the ‘repopulation paradox’ is solid. Here is a condensed version of the argument. Major public policies change how at least some people behave. (Such policies would not be effective if they failed to do so.) Changes in behaviour are multiplied throughout society to a surprising extent. Even if only some people change their behaviour, their subsequent interactions with individuals in the grocery store, in traffic, and so on, make small changes to others’ daily events, and who in turn affect even more others.

Here is the surprising result: present people will inadvertently determine who is born in the future. This phenomenon was first

noticed in London, England, during WW II. Nine months following the bombing-induced black-outs, there was a spike in the number of babies born. So if present governments were to implement major environmental policies that are good, one set of persons would be born in the future. If, instead, those same governments were to implement bad environmental policies, a completely different set of persons would be born. Provided that their lives were worth living, those born as a consequence of the bad policies should be glad those policies



Liberal democratic government was designed to promote the interests on average of currently living citizens (ie, the electorate). It was not designed to directly promote the interests of people from other countries or future generations..”

were implemented because otherwise they would not have existed.

The overall conclusion is that we cannot harm future persons in the usual sense of ‘harm’ – ie, we cannot make a future person worse off than they otherwise would have been because that person would not exist in an alternative scenario.

Despite its counter-intuitive appearance, the ‘repopulation paradox’ has not been refuted since it was published 30 years ago. However, we still have obligations to future generations in the sense that we can make one future population better off than another future population (albeit different populations) by implementing better rather than worse environmental policies. Put differently, this

means that we can attempt to leave a better natural environment for whomever comes into existence.

A glitch in liberal democratic governance is our final issue. Here’s why. Liberal democratic government was designed to promote the interests on average of currently living citizens (ie, the electorate). It was not designed to directly promote the interests of people from other countries or future generations unless – and this is key to the argument – the current electorate wants to institute sustainability policies for the sake of future generations, and then only to a limited extent. This issue is most prevalent when thinking about long-term time-lag effects.

Long-term time-lag effects are the product of environmental changes made by the present generation for short-term net benefits to society but simultaneously produce foreseeable net burdens to future generations. Some of the world’s largest environmental issues embody long-term time-lag effects, including biodiversity loss, climate change, and nuclear waste storage

Liberal democratic governments cannot legitimately enact policies aimed at intergenerational issues containing time-lag effects because they do not have the authority to do so. A political party acquires the legitimate authority to assume the powers of state only by way of the consent of the majority of persons in the electorate (or some distorted version of the majority), and that power can only be exercised within constitutional limits.

The upshot is that liberal democratic governments face a dilemma regarding long-term time-lag effects: (a) they can legitimately fail to enact sufficient sustainability policies, or (b) they can illegitimately enact the necessary sustainability policies.

Paul Wood is an associate professor in the Department of Forest Resources Management. He can be reached at paul.wood@ubc.ca or 604.822.0951.

Innovations in timber design



Tension test of timber joint with glued-in rods

Canada has long been a leader in building with timber, but, over the past few decades, most of the innovations in timber design have occurred elsewhere in the world, and the structural use of timber in Canada is mostly limited to low-value commodity products in residential light-frame construction. While such use of timber will continue to be important for the Canadian forest sector, there is much larger potential for timber to be used as a structural material. With a stronger currency, Canada needs to use ingenuity, innovation, and scientific leadership to produce knowledge-based high-value wood products that can compete on a global scale. There is an acute need for research to develop novel and value-added structural applications for wood to maximize the

benefits from sustainably harvesting Canada's abundant forests, to reduce the carbon footprint of buildings, and to expand the use of wood as a sustainable material beyond traditional residential construction. The "Wood First Act" in British Columbia aims to "facilitate a culture of wood for construction in BC by requiring the use of wood as the primary building material in all new provincially funded buildings". This and similar local policies create an ideal climate for turning research outputs into tangible outcomes. Building on the advances in wood based products, such as Cross-Laminated-Timber (CLT), more sustainable wood based building systems can help shift the Canadian forest sector from commodity production to value-added, knowledge-based manufacturing and use.

Computer-Numerically-Controlled (CNC) timber manufacturing technologies play a crucial role in expanding the use of timber as a structural material, specifically within the non-residential sector, and in the context of the growing importance of sustainable and seismic-resistant buildings. CNC manufacturing has the potential to change the status of timber from a bulk, low-tech, low-value material mainly chosen for its price to a much more value-added, application-specific, and high-tech material selected for its qualities. Modern architecture demands adequate techniques that materialize more elaborate free-form structures, meaning that timber must expand the range of applications usually associated with it. CNC processes allow timber to be used more rationally in an appealing architectural context, since the constraint of industrial repetition of identical elements is lifted, without losing the benefits of prefabrication. Designers and fabricators are enabled to exploit the efficiency and flexibility of an uninterrupted digital chain of information from design to manufacturing. CNC manufacturing has the potential to drive structural improvements, for example, by enabling ductile and robust structural components and joints, either in pure wood systems, or in conjunction with other materials. Being able to accurately shape timber sets the basis for novel structural solutions, which ultimately peak in multifunctional hybrid structures (blending wood and other materials) that achieve the perfect match between archi-

tectural form, structural function, and building physics functionality. Hybrid structures that integrate different materials can significantly increase the applications of timber in structures beyond current limitations. An example of such a material blend are timber concrete composite floors (shown in the photo below).

Numerous examples, mostly in Europe but increasingly also in North America, show that timber has the potential to expand into segments that are the traditional stronghold of steel and concrete with architecturally and structurally challenging designs. The benefits of using timber in non-residential construction (namely enhancing seismic performance by reducing the weight of the structure, shortening the construction time, and reducing the carbon footprint by sequestering carbon in the structural members, amongst others) are undisputed. There are, however, perceived shortcomings with respect to the joint performance under seismic load, one of the reasons explaining the low market share of timber in the non-residential sector. Overcoming these perceived shortcomings will allow timber, and its wood product

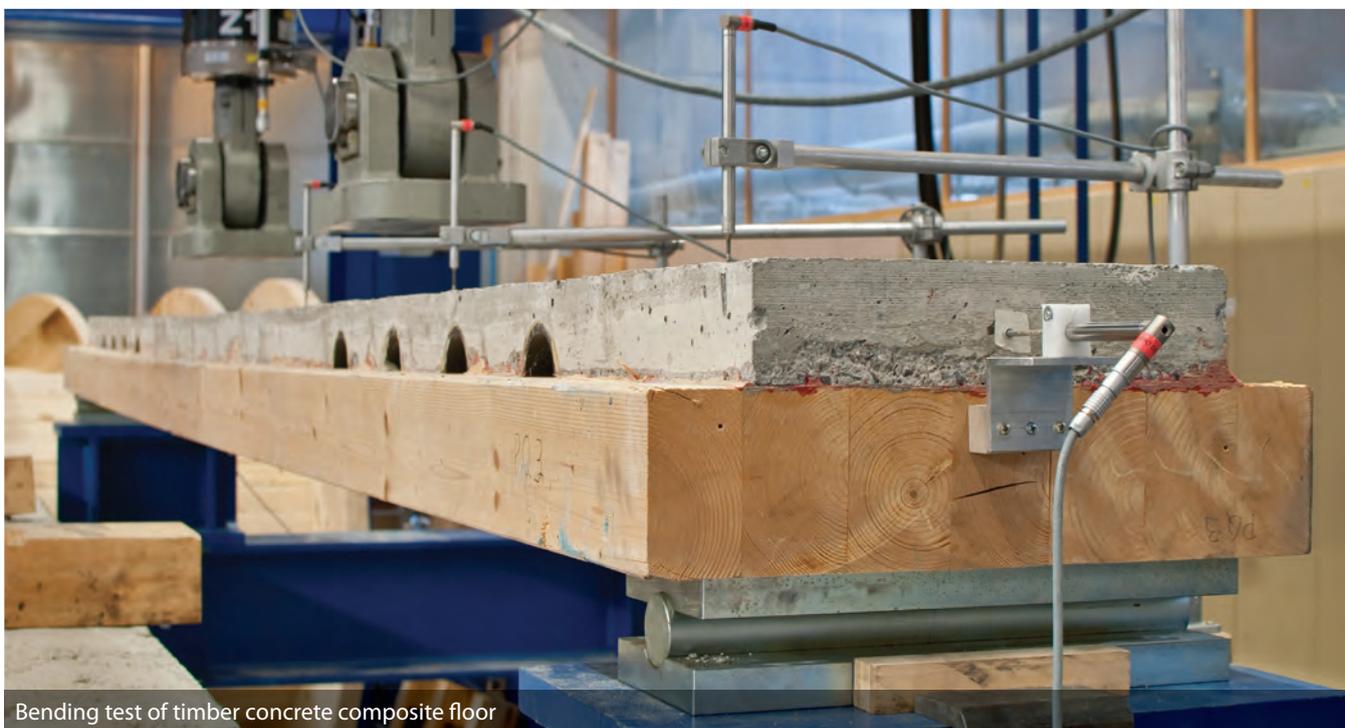
derivatives such as CLT, to further expand into the non-residential construction sector. Currently practiced joining techniques often show exposed metallic parts, rely on mechanical connectors that undermine timber's natural low thermal conductivity and fire

“... timber has the potential to expand into segments that are the traditional stronghold of steel and concrete...”

resistance, and constitute the limiting element for the overall load-carrying capacity of timber structures. Furthermore, modern timber architecture is increasingly moving towards “free-forms” which have to be materialized through processes for which traditional manufacturing methods are unable to provide the required levels of complexity and tolerances. Beyond that, the design of “free-forms” using current joining techniques frequently leads to aesthetic dissonances,

since most current joints are only adapted to connect parts that are arranged parallel or orthogonal to each other. Research to allow joints to achieve their full structural potential requires a comprehensive understanding and integration of material science, structural engineering, and architectural application. Such work often involves other materials that exhibit higher levels of complexity (ie glued-in rods as shown in the photo opposite).

Dr Thomas Tannert is the Associate Chair in Wood Building Design and Construction at the University of British Columbia. This research cluster is unique in North America and brings together experts from Civil Engineering, Architecture, and Wood Science and will establish an interdisciplinary research program to deliver innovative wood based building solutions. One of the group's specific research objectives is to develop reliable design tools for timber elements, joints, and systems. Multiple technological solutions will be developed that include advances in the implementation of prefabrication of hybrid structural systems and novel joining solutions. Thomas can be reached at thomas.tannert@ubc.ca or 604.822.1334.



Bending test of timber concrete composite floor

Fry n' eggs: Sockeye salmon in hot water

Pacific salmonid species are important in British Columbia, for reasons ranging from commercial markets, to cultural values, and as a source of ecologically relevant marine derived nutrients. Forest ecosystems rely on the decaying carcasses of anadromous salmon, which have been shown to significantly increase productivity to nearby plants and trees, to the extent that this effect can be seen using dendrochronology and carbon isotope analyses. The commercial fishery based on Pacific salmon, especially for sockeye salmon, is a highly valued aspect of BC's economy. As well, these fish are an integral aspect of First Nations culture as both a food resource and an important cultural connection with the land.

Within UBC Forestry, Scott Hinch's lab group has been studying Pacific salmonids for over 2 decades, with a focus on sockeye salmon as the most commercially important of the 5 Pacific salmon species. Under the guiding hand of Dr Hinch, researchers in the Pacific Salmon Ecology and Conservation Lab, study the migration biology and ecology, reproductive biology, and behavior of these fishes, using a variety of techniques ranging from telemetry to physiology, gene expression to hatchery rearing. They are interested in the effects of recreational angling, commercial fishing, and climate change on the viability and abundance of this important resource.

Charlotte Whitney has focused her research on climate change, aiming to further understand the thermal tolerance limits during early juvenile development of many genetically distinct populations of sockeye salmon. This research builds upon work by Dr Erika Eliason, who was able to show that sockeye salmon populations have developed different



...Charlotte and her fellow researchers were also able to suggest that these populations of sockeye salmon may be adapted to their historical thermal experience during spawning and early incubation."

thermal tolerance limits as migrating adults based on physiological differences in heart morphology. Using water temperature data gathered over the past decades in the Fraser River, she suggested that differences in overall aerobic swimming ability are related to different environmental conditions among groups, whereby those fish that commonly migrate through highly variable thermal conditions have developed a wider thermal

tolerance during this life stage.

While those results suggest that some populations of sockeye salmon may be more able to tolerate the increasing water temperatures that are predicted with climate change, they were limited in scope to a single aspect of the variable salmon life history. Suggesting thermal tolerance limits for adult salmon does not allow one to extrapolate to how emerging fry will manage changing conditions in rearing lakes, where they spend the first year or two, depending on the species, before out-migrating to the ocean as smolts. In order to understand effects of climate change on the life cycle as a whole, it was necessary to investigate how different populations would respond in other aspects of the life history.

With this in mind, Charlotte and other members of Scott Hinch's group, in collaboration with the Department of Fisheries and Oceans' Environmental Watch group, set out in the fall of 2010 to make fish babies. Lots of fish babies. They collected thousands of eggs from reproductively mature individuals from many populations, all spanning a large geographic range across the province. By crossing egg and sperm from individuals within a population, they created individual families from each group and reared them in a common environment. They compared the response of each population to

3 water temperatures, reflecting ideal incubation conditions, elevated temperatures, and very high water temperatures for the species in this region. Since populations of sockeye salmon migrate to natal spawning streams and reproduce throughout the fall, they had to replicate Charlotte's experiment over 3 months in order to include 9 diverse groups.

Over the next weeks, they used measures of survival, growth rates, and hatching timing to compare population-level thermal tolerance. While previous research has suggested species-level thermal limits, these results are the most comprehensive study to include so many populations at this life stage.

Specifically, they asked whether populations differed in their thermal tolerance during embryonic development, or from fertilization to hatching, and whether that thermal tolerance relates to historical water temperatures of natal streams. Furthermore, they investigated the variation in hatch timing among populations, and whether this was related to survival rates.

And indeed, populations matter. Thermal tolerance varied widely across groups; while the warm-adapted summer spawning populations responded to elevated incubation temperatures with barely reduced survival rates of close to 90%, the late spawning and cool adapted populations

experienced mortality of close to 90%. This is hardly a new concept; population differentiation and adaptation to natal environmental norms occurs across species and taxa, especially in species where populations are geographically or temporally segregated across an environmental gradient. This research agreed with this simple conclusion, but Charlotte and her fellow researchers were also able to suggest that these populations of sockeye salmon may be adapted to their historical thermal experience during spawning and early incubation. Additionally, this thermal tolerance at the embryonic life stage does not seem to relate to adult thermal tolerance; indeed, the population with the worst thermal tolerance in Charlotte's study was the same group that displayed the best thermal tolerance at the adult life stage in Erika Eliason's work.

All this goes to show, that climate change will affect species, populations, and life stages differently. We now know that we cannot presume knowledge of a population-wide response by understanding a single aspect of the life history alone. As a jumping off point for future research on population dynamics and evolutionary ecology, Scott Hinch's group can use these data to suggest certain populations to include in studies of the heritability of thermal tolerance. Additionally, they can explore the variability in stress response among populations as a factor of thermal tolerance, and as an influence on reproductive biology. By using these results, they can inform policy decisions on harvest limits and habitat management to mitigate the effects of climate change on sockeye salmon viability in the province.

Charlotte Whitney is a recent MSc graduate. She can be reached at charwhitney@gmail.com. Dr Scott Hinch can be reached at scott.hinch@ubc.ca or 604.822.9377.



Photo: Matt Casselman

Extreme planting



There is not a lot in common between crawling on a steep clear-cut heli-bloc, burdened with a bag of fertilizer on one's shoulder and investigating manufacturing-conscious design methods for the micro-parts that comprise hearing-aid devices. Arnaud De Grave has gone from one to the other in the course of a single year, radically changing his life. We have asked Arnaud to comment on what inspired him to make the change.

Originally educated in manufacturing engineering teaching and holder of a PhD in industrial engineering, I have always been attracted to forests and mountains and could often have been heard saying: "Why am I not a forester?" whenever I was dissatisfied with whatever I was involved professionally. Finally deciding that a change was necessary, I quit my job as an associate professor in Denmark and applied to the MSc program at UBC Forestry under the supervision of Dean John Innes. When I arrived in British Columbia in September 2011

I could not differentiate a birch from a lamp post and believed that all conifers were pines.

Amongst other interests, I am a self-taught freelance photo-journalist who prefers creating projects that go further than simple one-day shooting sessions and require an ethnographic type of immersion. Furthermore I primarily work with old film cameras, developing the negatives in my bathroom. So from time to time I have been disappearing from UBC Forestry and going into the outside world to document my favourite topic: ordinary people working in challenging conditions. For my first large project, in 2006, I shared a month of a missionary priest's life in the jungle of the Philippines and produced a fund-raising exhibition, sending over 1000 euros to help education of children in the village that hosted me. Since then my photographic assignments have taken me all over the world: to the provinces of eastern India, the Carpathians, Japan, South Korea,

Yemen in the midst of the Arabic spring (with very limited success as I was refused access to the country and sent back to Europe as an international criminal). Some of my work can be seen on the website of the non-profit organization BOP (Bricolages Ondulatoires et Particulaires, which could be translated as "wave and particles crafts"), and which I co-founded in 2005.

All these circumstances combined into the creation of an exhibition entitled: "Extreme Planting - les Hommes qui plantaient des arbres en Colombie-Britannique" at the Alliance Française of Vancouver. Adopting my usual modus operandi, during May 2012 I followed a group of tree planting veterans in coastal BC, approximately at the same latitude as Port Hardy but on the mainland. Planting in such terrain is very different to the planting happening in the interior, where armies of students labour during summer, planting millions of seedlings on reasonably flat ground. Bivouac West, the company hiring



these very experienced professionals, let me work with them as an assistant to the foreman (hence the carrying of fertilizer bags and seedling boxes) and permitted access to the back-breaking job of reforestation under these extreme conditions. Not only is the daily job very challenging for the planters, but setting the logistics for the reforestation contracts (in this case with the provincial government) is a very demanding enterprise due to unpredictable weather conditions, availability of seedlings, barges, equipment failure, etc.

All this made for an unparalleled adventure and permitted me to gain first-hand experience of aspects of forestry that I would never have obtained while sitting comfortably in a UBC classroom.

The goal was also to provide visibility to the company and to an activity that is not well known even in Canada (and particularly BC); everybody knows a planter or has their own idea about it, but few are aware of the extreme conditions that planters operate in on the BC coast. I was able to shadow the planters whilst they navigated slopes of up to 45 degrees, waist deep in slash, trying to find a suitable spot for different species of tree (mostly western red cedar, yellow cedar and sometimes spruce), all the while respecting density constraints and keeping up a planting average of more than 150 trees per hour. My personal record was 80 trees, but I would rather not say how long I took to plant them. During October 2012 I exhibited a



selection of 20 photographs at the exhibition, all hand printed on fibre paper in the UBC photo-society's darkroom; an opening speech at the vernissage was given by Dean John Innes. What I am particularly pleased about is my discovery of some words in the guest book written by some of the planters portrayed in the photographs: "It looks as I remember it..."

Pictures from Arnaud's exhibition can be seen on BOP's website (www.bop-photolab.org) and prints can be bought by contacting him at the address below.

Far from being put off by the experience, Arnaud would like to continue investigating and documenting different aspects of the forestry world, both academically and from a photographer's perspective. He is now focusing on his Master's research project looking at opportunities for ecological and community-based management of forested land surrounding ski resorts as they shift from a strictly winter season to a year-round business. He envisions multiple case studies in BC, supplemented by studies from elsewhere in the world.

The Faculty of Forestry is a strong supporter of enabling students to gain "enhanced educational experiences", and particularly encourages students to gain field experience whenever they can.

Arnaud De Grave can be reached at arnaud.de.grave@gmail.com.



Stable isotope analysis and forestry



Certified isotope standard reference materials

Environmental research using stable isotope analysis has come a long way since oxygen isotopes were first applied in the early 1950s for the determination of oceanic paleotemperatures from carbonate rocks. Although stable isotope analysis was initially the domain of physicists and earth scientists who tinkered with primitive dual-inlet isotope-ratio mass spectrometers (IRMS), by the late 1960s to early 1970s, biologists discovered the power of stable isotope analysis for understanding biological fractionation of carbon isotopes in plants using different photosynthetic and metabolic pathways. With the introduction of continuous-flow IRMS in the 1980s, stable isotope analysis became increasingly accessible, benefitting a variety of disciplines such as agriculture, oceanography, medicine, forensics and fraud inves-

tigations, food sciences, ecology and anthropology. Today, the fields of stable isotope geochemistry and biochemistry are well-established.

So, what are stable isotopes and why are they so useful in environmental research? A stable isotope is a non-radioactive and safer-to-use variant of a chemical element. The variants all have the same number of protons in the nucleus, but a different number of neutrons. Thus, the isotopes of a given element all have the same atomic number, but differing atomic masses. For the 5 light elements important in biological systems—H, C, N, O and S—the natural abundance of the minor (heavier) isotopes is several orders of magnitude less than the natural abundance of the major (lighter) isotope, resulting in very small ratio values. For example, ^{13}C constitutes only 1.1% of all carbon whereas

^{12}C comprises 98.9%, leading to an absolute $^{13}\text{C}/^{12}\text{C}$ ratio of ~ 0.0112 . As the isotopic ratio of an organism is affected by its metabolism and by the environment in which it lives (eg, temperature, water source, nutrient supply, trophic levels, etc., causing isotope fractionation), stable isotope analysis of natural and experimental systems can be a powerful tool in environmental research. The isotopic ratios in a sample are measured using an IRMS and the results are compared to the known ratio of an internationally recognized standard, such as Vienna Pee Dee Belemnite for C isotopes. Other organic and synthetic standard reference materials with certified isotopic values can be used for quality control. The isotopic value of the sample is expressed as a delta or “del” (δ) value, which is a measure of the sample’s ratio difference with respect to whatever



Gas chromatograph combustion oven

international standard was used for comparison.

There is a huge variety of stable isotope applications within just the forest and ecological sciences. Here are some recent examples from the Department of Forest and Conservation Sciences. Students in the Belowground Ecosystem Group use labeled (artificially enriched) stable isotopes of C and N to trace nutrient cycling and microbial activities within the soil. Doctoral candidate Carolyn Churchland (Dr Sue Grayston) uses a novel tree-stem injection ^{13}C labeling technique to measure a mature tree's range of influence on the soil microbial community within nearby clear-cut sites, (see BranchLines July 2012); masters student Henry Yang (Dr Chris Chanway) uses a foliar ^{15}N dilution method to quantify N fixation by endophytic bacteria isolated from lodgepole pine seedlings to assess the effects of soil N levels on N fixation and pine growth promotion by the bacteria; and doctoral student Jacynthe Masse (Dr Grayston) is investigating how the N cycle rebounds in oil sands soil reclaimed 20 to 30 years ago by using ^{15}N tracer techniques coupled with DNA analyses (this allows for the determination of which soil microorganisms are responsible for N cycling). Dr Rob Guy's Tree Physiology Lab uses H, C, N and O stable isotopes at natural abundances to compare the ecophysiology of trees such as poplar, with a focus on the

exchange of material and energy across the plant-environment interface, growth phenology, resource-use efficiencies and environmental stress. Doctoral student Lee Kalcsits is using N isotopes to gauge variations in N-use traits on balsam poplar genotypes grown hydroponically on either nitrate or ammonium. This approach provides a useful integrated, time-averaged method of measuring multiple N-use traits for plant breeding in agricultural and forestry practices. Dr Lori Daniels' Tree Ring Lab reconstructs the impacts of natural and climatic variability, along with anthropogenic disturbance, on temporal forest dynamics through the examination of tree rings. Proposed research will investigate past defoliation events in Douglas-fir by the western spruce budworm. Such defoliation activity causes reduction of the radial growth in the trees, which can be inferred from growth suppression

in tree rings. ^{13}C isotope variability in tree rings will be examined.

All of the above projects are supported in part by the Stable Isotope Facility in the Department of Forest and Conservation Sciences. The Facility specializes in C and N isotopic analysis and has analyzed a variety of sample types, both at natural and isotopically enriched abundances. The Facility is equipped with a continuous-flow IRMS and two peripheral devices: an elemental analyzer for the analysis of solid materials such as soils and plant tissues, and a gas chromatograph for the analysis of aqueous samples such as dissolved fatty acid extracts from soils. We are always interested in engaging in the development of new projects and look forward to promoting stable isotope applications in forest sciences research.

For more information about these research groups and projects, contact Chris Chanway (chris.chanway@ubc.ca), Carolyn Churchland (carolyn.churchland@gmail.com), Lori Daniels (lori.daniels@ubc.ca), Sue Grayston (sue.grayston@ubc.ca), Robert Guy (rob.guy@ubc.ca), Lee Kalcsits (kalcsits@interchange.ubc.ca), Jacynthe Masse (jacynthe.masse@alumni.ubc.ca) or Henry Yang (henry.yang.ubc@gmail.com). For more information about stable isotope analysis in the Department of Forest and Conservation Sciences, or to submit samples, contact Alice Chang (alice.chang@ubc.ca) or visit <http://isotopes.forestry.ubc.ca>.



Loading sample into elemental analyzer autosampler

development & alumni news

It has been a busy autumn for the Development & Alumni team with several alumni and UBC-wide events celebrating and showcasing UBC talent. The Faculty's Start An Evolution fundraising and alumni engagement campaign, part of the UBC-wide campaign, has made great strides thanks to your support. As the year comes to a close we wish to thank all of our alumni and friends who have actively participated in creating a vibrant and

dynamic UBC forestry community. We look forward to bringing you more stories in the New Year, until then we wish you all the best for the festive season, and if you haven't already, encourage you to take a look at the revamped forestry website to find out the latest news and how you can get involved, www.forestry.ubc.ca.

Emma Tully, Director of Development & Alumni Relations, emma.tully@ubc.ca.

Garry Merkel receives UBC Honorary Alumnus Award



The Faculty of Forestry joined with alumni and friends of UBC to honour Garry Merkel at the annual UBC Alumni Achievement Awards, hosted by UBC's Alumni Affairs. This gala evening provides an opportunity to celebrate just a few of the outstanding members of UBC's global alumni community, which includes thousands of accomplished people whose collective contributions are making the world a better place.

UBC's Faculty of Forestry was privileged to have had the chance to celebrate the accomplishments of Garry, who received the Honorary Alumnus Award. Garry has worked closely with UBC's Faculty of Forestry and First Nations House of Learning to engage the Aboriginal community and increase its presence and influence in both university and industry settings. He has been

instrumental in attracting Aboriginal students and providing counsel on improving the forestry sector's ability to work effectively with Aboriginal communities. Garry founded his own consulting firm in 1985, Forest Innovations, which helps organizations build the relationships and processes required to meet their goals.

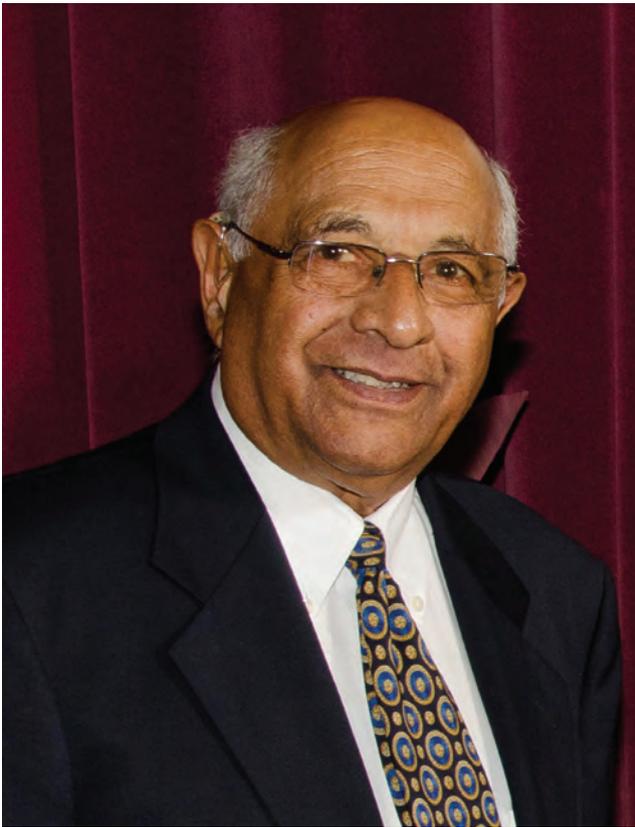
Upon accepting his award to great applause, Garry, joined by his mother, wife and brother, gave deep thanks to his family. "You can't do these things without family," Merkel said. "You can't do these things without friends. You can't do these things without people who really, really care."

Also honoured this year were: Memory Elvin-Lewis, BA'52, PHD, DSc'12 and Douglas Mitchell, CM, AOE, QC, LLB'62 co-recipients of the Alumni Award of Distinction; Nolan Watson, BCOM'01 and Julia Fan Li, BCOM'06 co-recipients of the Outstanding Young Alumnus Award; Alia Dharamsi, BSC'10, (MD'14) for Outstanding Future Alumnus Award; the Hon. Alfred Scow, CM, OBC, LLB'61, LLD'97 and Paul Mitchell, QC, BCOM'78, LLB'79 co-recipients of the Blythe Eagles Volunteer Leadership Award; Peter Nemetz, BA'66, PHD received the Outstanding Faculty Community Service Award; and Haile Debas, MD, DSC'01 the Global Citizenship Award.

To learn more about Garry Merkel and to watch his thought-provoking interview please go to www.alumni.ubc.ca/events/awards/. Congratulations Garry and welcome to the UBC Forestry alumni community!

Nominations are now open for the 2013 Alumni Achievement Awards; please get in touch with Janna Kellett at 604.827.3082 if there is someone in the forestry community you think deserves to be recognized – deadline January 31st 2013.

Alumni giving back



Pioneering the path to success

Tom Pallan's family has celebrated a lot of firsts, including being one of the original Indo-Canadian families to settle in Canada. "We've been here since 1906," explains Tom, founder of the highly successful Pallan Group.

In addition, Tom was the first person of Indo-Canadian heritage to graduate from the Forestry program at UBC. Today, at age 80, he shows the same pioneering spirit. Tom recently became part the first cohort of alumni volunteers to read and rank the new Broad Based Admissions (BBA) application forms submitted by prospective students.

"Part of the reason Forestry students are required to submit an essay with their application is because UBC wants to attract well-rounded people who will be helpful to society," Tom reveals.

"You can tell a lot about an applicant by the way they express themselves, their interests, and commitments," he continues. "For example, if they embark on something – do they stay with it? People from all over the world apply to UBC. Sometimes the writers are not proficient in English. You have to look past the words and try to understand what the writer is saying. You have to be so careful not to hurt someone's chances."

Helping students along the pathway to higher education is very special to Tom. "Canada was a different place back when I was young," he explains. As part of

a minority group, Tom and his family endured a lot of adversity and hardship, but they were determined to rise above it. "Our philosophy was to work hard and raise ourselves – that's why we all went to school."

Tom's father worked as a laborer before he started a small business selling firewood. "He put 5 of us through university," says Tom proudly. Tom's 4 brothers also graduated from UBC – 2 foresters, 1 electrical engineer and 1 teacher.

In 1958, Tom donned cap and gown and graduated from UBC with a double major in Forestry and Engineering. He also earned his Master's degree in Forestry before starting Pallan Timber Products Ltd with his father in 1959.

Today, Pallan Group includes 3 divisions: forestry, custom lumber cutting, and real estate – respectively Pallan Timber, Howe Sound Forest Products, and Pallan Holdings. With his sons at the helm, Tom is enjoying life as the partially retired CEO.

“My forestry education has served me and my family very well,” says Tom. “I have had a very busy and productive working career that was made possible by the education I received at UBC. Now, it’s time for me to start giving back to my alma mater.”

"My forestry education has served me and my family very well," says Tom. "I have had a very busy and productive working career that was made possible by the education I received at UBC. Now, it's time for me to start giving back to my alma mater."

Besides volunteering as a BBA reader, for the past 2 years Tom has participated in the spring and fall convocation for Forestry graduates, presenting the gifts the University gives to each Forestry graduate.

"All alumni should ask themselves the following: what small gesture can I make that, in some way, will help the current generation of students in pursuit of their university education?"

For more information about the Broad Based Admissions program or to find out how you can share your time and talent with current students contact, Janna Kellett, 604.827.3082, janna.kellett@ubc.ca or visit <http://getinvolved.forestry.ubc.ca/>.



Does BC's forest industry have an image problem? UBC Dialogues in Victoria

On the evening of November 13th, 85 members of the UBC alumni community in Victoria, and other interested members of the public, gathered at the Hotel Grand Pacific for the most recent in the series of UBC Dialogues events. The November dialogue was moderated by Luke Brocki, a freelance journalist, and was started with the question – Does BC's forest industry have an image problem? The panel consisted of: John Innes, Dean of UBC's Faculty of Forestry; Doug Konkin, Deputy Minister, Ministry of Forests, Land and Natural Resource Operations; Garry Merkel, founder of Forest Innovations; and Linda Coady, Senior Research Associate at UBC's Liu Institute for Global Issues.

Panelists had only 2 minutes to put forth their perspective on the question, and from there the discussion opened up into a broader conversation around the state of forestry today. The audience participated with challenging questions for the

panel and by adding their perspectives. The event concluded with a reception where guests were able to engage the panel in smaller discussions and mingle with fellow UBC graduates and community members.

The dialogues are hosted by UBC Alumni Affairs. They are held in various communities throughout the Lower Mainland and Vancouver Island with the goal of engaging alumni in a lively dialogue on topical and sometimes highly-charged issues. The series provides an opportunity to hear from those working in the front lines of the subject area being tackled – covering educational, government, community and industry perspectives.

To hear the discussion and find out the answers to the question visit: www.alumni.ubc.ca/events/dialogues/ to listen to the podcast. Upcoming UBC Dialogues events are also posted on this site.

Are you a Natural Resources Conservation grad with a major in science and management?

If so, a new forestry designation is now available. Recent grads from the Natural Resources Conservation degree program in the Faculty can apply for the Association of BC Forest Professional's newest designation: the Natural Resource Pro-

fessional or NRP. The NRP designation allows you to practice aspects of professional forestry throughout the province. To find out more and to see which programs qualify, visit the ABCFP website at www.abcfp.ca.

Newsletter production

branchlines is produced in-house by the Faculty of Forestry at the University of British Columbia.

Editor: Susan B Watts, PhD, RPF, susan.watts@ubc.ca

Designer: Jamie Myers, jamie.myers@ubc.ca

© 2012 Faculty of Forestry
University of British Columbia
ISSN 1181-9936



Questions concerning **branchlines** or requests for mailing list updates, deletions or additions should be directed to sue.watts@ubc.ca.



Forestry
University of British Columbia



www.forestry.ubc.ca



Return undeliverable Canadian addresses to:

Faculty of Forestry
University of British Columbia
Forest Sciences Centre
2005 – 2424 Main Mall
Vancouver BC CANADA V6T 1Z4