branchlines

Volume 29#3 Fall 2018

Inside:

forestry
university of british columbia

dean'smessage

This edition of BranchLines once again illustrates the diversity of the work being undertaken in the Faculty. I was particularly struck by the article on conservation by Dr Jeff Sayer. The conservation of a small endemic flycatcher on the island of Boano in the Moluccas (part of Indonesia) encapsulates many of the conflicts that exist between maintaining the livelihoods of local people and maintaining all species.

As Jeff points out, establishing a reserve and excluding people from it will not work as long as the people have no other source of livelihood. An intelligent solution is needed that will ensure both the long-term survival of the flycatcher and the future prosperity of the local people. This will require combining biological knowledge about the needs of the flycatcher with social economic knowledge about the needs of the people. It also requires taking a step back and looking at the bigger picture, in this case the landscape. We don't do this enough and, as a result, we often fail to find solutions that address the needs of both the biodiversity and the people.

Conservation is increasingly about managing people as well as habitat, but this isn't always appreciated. Managing the interactions between people and the environment is complex and often involves making different choices. The current debate around the conservation of caribou in Canada is a case in point, but there are many other examples. In recent weeks, Dr Tara Martin's work in this area has received a lot of attention as she is presenting a number of ways in which decisions can be made based on the available evidence. Tara's research will be featured in the next issue of BranchLines.

The issues surrounding the management of people is also evident in Dr Lori Daniels' work on the management of wildfire risks. In the past 2 years, British Columbia has lost a staggering 2.5 million ha of forests to wildfire. The loss of property, and the massive disruptions to the livelihoods of people throughout BC are only now being assessed. We are beginning to see more resources devoted to protecting communities from wildfire, but a more proactive approach is needed if we are to avoid the anguish caused by wildfires over the past 2 years.

On average, just over 40% of wildfires in British Columbia are caused by people. Why is this still the case when so much effort has been put into educating people about the risks of wildfires? Again, this appears to be an issue of people management: we need to change the behaviour of people. Many of the fires are a result of carelessness or stupidity, others are caused by people who thought they knew how to avoid fire ignitions, but failed to take sufficient precautions. Understanding the best ways to overcome these issues is a major challenge for the social sciences.

Dr Stephen Sheppard's work with the 'Citizen's Coolkit' shows how difficult it is to change the behaviour of people, even when the right tools are available. His research has revealed some of the barriers to uptake, even for something as widely accepted as the impacts of climate change. As is often the case, costs play a major role, including the energy, time and money needed to do something new. Overcoming this inertia is a major challenge, and the time pressures that we are all under don't make it any easier. However, if we are to achieve change, and increasingly we need to do so, we will need to find ways to move forward effectively.

One way we might achieve this is through novel approaches to teaching, and on the back page of this issue, you will find details of a new program called Land One. This is aimed at first-year students in the Faculties of Forestry and Land and Food Systems, and is introducing them to critical thinking in relation to 'wicked problems' such as sustainability, land use, climate change and food security. Understanding how people react to these problems will be an important part of the program.

John L Innes
Professor and Dean

forestrynews

New appointments

Three new faculty members will be joining the Faculty of Forestry at the beginning of 2019.

Susan Day will be joining the department of Forest Resources Management as a professor of urban forestry. Susan will also take on the role of director of our Bachelor of Urban Forestry (BUF) program. Susan is currently an associate professor in the department of Horticulture (college of Agriculture and Life Sciences) at Virginia Tech in Blacksburg, Virginia, USA.

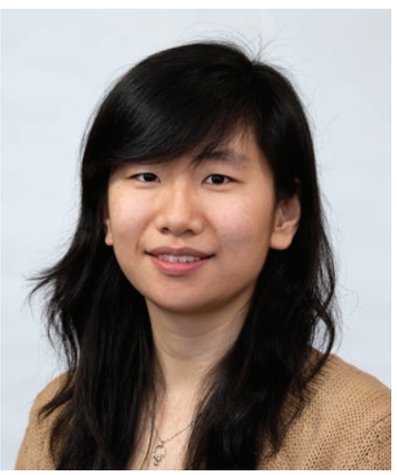
Emily Cranston will be joining the department of Wood Science as an associate professor in a joint appointment with UBC's department of Chemical and Biological Engineering (Faculty of Applied Science). Emily is currently an associate professor in the department of Chemical Engineering at McMaster University in Hamilton, Ontario. In her new position at UBC Emily will hold the President's Excellence Chair in forest bio-products.

Cristiano Loss will be joining the department of Wood Science as an assistant professor of wood building design and construction. Cristiano is currently a post-doctoral fellow at the University of Northern British Columbia in Prince George, BC.

New roles

Intu Boedhihartono, associate professor of tropical landscapes and livelihoods in the department of Forest and Conservation Sciences, has taken on the role of director for the Master of International Forestry (MIF) professional graduate program. The MIF program is now in its 4th year and has a current enrolment of 15 students from 6 countries. Intu can be reached at agni.boedhihartono@ubc.ca.

Suzanne Simard, professor of forest ecology and silvics in the department of Forest and Conservation Sciences), has taken on the role of director for the Master of Sustainable Forest Management (MSFM) professional graduate program. The MSFM program is now in its 7th year and has a current cohort of 22 students. Suzanne can be reached at suzanne.simmard@ubc.ca.



Xinxin Zhu has started a new role in the Faculty as assistant director for the Asia Forest Research Centre. Xinxin has previously been coordinating and managing programs in the Faculty's Asian Strategies team including transfer programs with partner universities, exchange programs and mid-career training programs. In her new role, she will build and maintain connections with stakeholders and work with national and international professionals to help develop best practices in higher forestry education. Xinxin can be reached at xinxin.zhu@ubc.ca.

Awards and recognitions

Kathy Martin (professor of avian ecology and conservation in the department of Forest and Conservation Sciences) has received the 2018 Godman Salvin Medal for an outstanding contribution to ornithology. This award is the highest scientific honour of the British Ornithologists' Union (BOU).

"BOU is thrilled to award Professor Kathy Martin our Godman Salvin Prize for her outstanding contribution to ornithology and to the international ornithological community. Kathy's impressive research record and career has been focused on linking ornithological science and research to on-the-ground resource management and conservation, making her a highly deserving recipient of the Godman Salvin Prize."

BOU citation

Shawn Mansfield (professor of tree molecular biology and biotechnology in the department of Wood Science) has been elected a Fellow of the Royal Society of Canada (RSC) in the Academy of Science, Division of Life Sciences.

"Shawn Mansfield is a world-leading authority on plant secondary cell wall biosynthesis. He is internationally recognized for his efforts linking genomics, biochemistry, and development, and using functional genomics has discovered genes critical to plant growth. His work has significant implications for the improvement of bioenergy crops and forest trees, with the potential to substantially ameliorate the anthropogenic footprint of industrial processing and mitigate atmospheric CO_2 release".

RSC citation

Bruce Larson (Forest Renewal BC Chair in Silviculture and professor in the department of Forest Resources Management) has been appointed to the Forest Practices Board as Vice Chair for a 2-year term. The Forest Practices Board is BC's independent watchdog for sound forest and range practices, reporting its findings and recommendations directly to the public and government. The board audits forest and range practices and appropriateness of government enforcement on public lands, investigates public complaints and current forestry issues, participates in administrative appeals, and makes recommendations for improvement to practices and legislation.

Chiara Longhi (director of Student Services in the Faculty of Forestry) has been named as recipient of this year's UBC President's Service Award for Excellence. This is the top award presented to UBC staff in recognition of personal achievements and contributions to UBC and to the vision and goals of the University. We are honoured to have Chiara's talent recognized by the UBC President this year for her tireless commitment to the student learning experience and to ensuring the wellbeing of our undergraduates. Chiara will receive her award during UBC's graduation ceremonies on November 28.

Wild & Immersive

By Victoria Farahbakhchian

Grade 4 students playing on station 1 of the Timber Cruiser Circuit at the Malcolm Knapp Research Forest

I wave goodbye to my parents as I jump on the bus, joining my friends as we all head to camp. I am excited but I keep worrying who's sharing my room and how I will survive 72 hours without my phone? An hour later, the bus comes to a halt and I am greeted with a sparkling lake, huge trees, and some fancy log buildings. The environment is nice but I can't help wonder what's for lunch. I quickly scurry to my room and fight my way to the top bunk. I am happy with my roommates and one of them snuck in their iPhone… I hope there's Wi-Fi.

We gather in the gymnasium to meet the Wild & Immersive leaders. The staff seemed very excited. Supposedly, we are learning about bats, participating in a survival challenge, playing on the Timber Cruiser Circuit, and doing some long hikes. I half-heartedly put on my shoes, zip-up my hoodie, and line-up outside; joining my fellow peers as we head out into the cold. There'd better be hot chocolate later.

These are familiar thoughts students have as they arrive at Loon Lake for camp. Many are foreign to the outdoors and just the thought of spending an entire day outside is discomforting. As the human-nature relationship changes with time, research continues to acknowledge the importance of people's relationship with nature for both physical and physiological well-being and environmental sustainability. As a result, UBC Malcolm Knapp Research Forest, Alex Fraser Research Forest, and Loon Lake Lodge and Retreat Centre have developed "Wild & Immersive" programs. Wild & Immersive was designed to create and deliver outdoor learning experiences with real-world applications; incorporating responsible curricula with qualified instruction that celebrates British Columbia's natural environment in a fun, unique, and safe environment.

To date, Wild & Immersive has been offering various educational modules to showcase and implement more place-based learning such as survive the wild, life as a tree, and geology rocks; creating an educational escape room and constructing a 2.5 km adventure-play circuit in the forest (see photo). In 6 months, Wild & Immersive has hosted 67 events for over 1,100 guests. Groups range from private and public K-12 schools to post-secondary, corporate, hobby and faith-based adult retreats.

Wild & Immersive programs have begun to make an impact on our participants' relationship with nature. For example, Grade 10 students from Beta Mini School were asked to write essays summarizing their educational experience, personal-growth, and overall satisfaction about their Loon Lake Wild & Immersive experience. Here is what a few of them had to say:

"The program was an incredibly educational, enjoyable and effective experience in terms of achieving its purpose; the teachers were supportive, the guides were passionate and knowledgeable, the activities were creative and riveting and the experience was unforgettable. I would definitely go back to learn new things and have more fun, if I had the chance."

"Wild & Immersive was an incredible experience, during which I learned so much about natural environments and processes, challenged myself, and had a ton of fun! All of the activities taught me a plethora of very important facts and techniques I had never experienced before, while being engaging, extremely organized, and very enjoyable. Tucked away within the towering mountains and crystal clear waters of Loon Lake, this is a camp I will never forget."

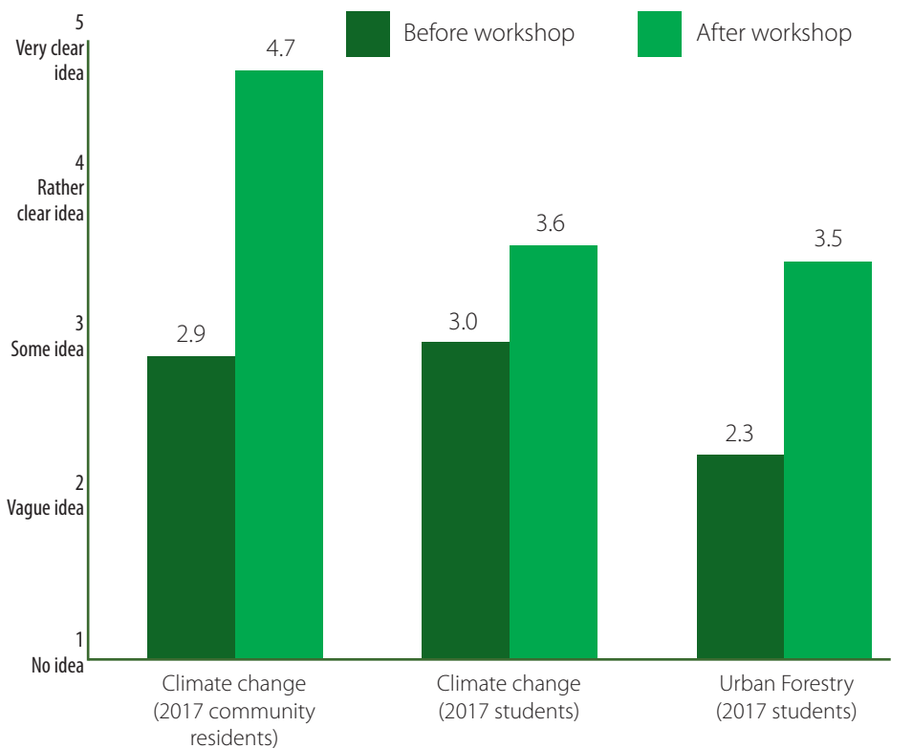
"It was really, really fun! I learned a lot of new things. The leaders were nice and really smart. Maybe one day I'll find myself in their shoes!"

To learn more about Wild & Immersive programs please check out www.wildlearnings.ca or contact Victoria Farahbakhchian (education coordinator, Malcolm Knapp Research Forest) at victoria.farahbakhchian@ubc.ca.

A 'Citizen's Coolkit' on climate change and urban forestry

Climate change is happening, and it is affecting nearly every aspect of our lives. Many national and local governments are increasingly striving to transition to lower-carbon and more resilient communities. Realizing these goals requires not only government leadership but also action by local communities and residents. In BC, 30% of carbon emissions come directly from households, eg from commuting in conventional cars and heating our homes with natural gas. However, many of us do not recognize our contributions to climate change, nor are we preparing for its upcoming impacts.

Urban forests play an important role in combating climate change in multiple ways, including through local cooling, stormwater management and carbon sequestration. Many cities have introduced urban forest targets and strategies to increase local resilience to climate change. For example, the City of Vancouver has pledged to plant 150,000 trees and increase its tree canopy cover from 18% to 22% by 2020, as part of its Greenest City Action Plan. However, there is a gap between the policies and the people. The majority of trees in Vancouver grow on private properties, and that is also where most tree loss has happened over the past 2 decades. Many local residents are unaware of what climate change means to them on the ground and what they can do through stewardship of their neighbourhood urban forest and other actions to mitigate and adapt to climate change. While many people are concerned about climate change, local governments are struggling to engage the 'silent majority' in dialogue and behaviour change to support policy implementation and change on the ground.



Participants' average knowledge score on climate change before and after workshops

Previous research at UBC (led by Dr Stephen Sheppard in the department of Forest Resources Management) and elsewhere has found that in order to more effectively reach the under-engaged in everyday residential neighbourhoods, build climate literacy, and motivate collective action, we need an engaging, interactive process that uses place attachment, experiential learning, and peer sharing.

The Citizen's Coolkit on Climate Change and Urban Forestry ('Coolkit' for short, http://calp.forestry.ubc.ca/home/urban-forestrytoolkit/, see also an earlier article in Branchlines 27#3 page 5) is an example of a novel tool that draws on these principles to foster an engaging process for building climate literacy and resilience. The project is funded by the City of Vancouver, the Vancouver Board of Parks and Recreation, the Vancouver School Board, and a private grant-making foundation. Co-created by a group of researchers, university students, high school teachers, and local citizens in Vancouver, it provides a 'do-it-yourself' package of fun exercises and quests with compelling visuals, appealing to both adults and youth:

- it focuses on the neighborhood block scale to trigger personal connections to climate change (eg how my family and neighbours will be affected)
- it promotes sharing and comparing with/between neighbours and friends to prompt discussion and behaviour change (eg which neighbours use renewable energy)

A climate change tour with Renfrew-Collingwood residents

A grade-10 student presenting his habitat mapping result

- it encourages place-based, hands-on activities for experiential learning through indoor and outdoor activities (eg estimating the amount of tree canopy shading my street)
- it provides a structured process for deepening our learning and engagement on climate change and urban forestry issues where we live, from starting a conversation, mapping with Google satellite imagery, rating the climate friendliness of our block, visioning new ideas for a lower-carbon and more resilient future neighbourhood, to taking action on the ground.

Piloted initially with students in UBC Forestry classes and City Studio projects with City of Vancouver, the Coolkit has gone through 2 rounds of systematic evaluation and revision since 2016. So far, Coolkit has been tested with 105 local residents and high school students through 3 community workshops in 3 neighbourhoods with relatively low tree canopy cover (South Cambie, Kensington Cedar Cottage, and Renfrew Collingwood) and 12 classes in 3 high schools (Windermere, Kitsilano, and Britannia).

For both community workshops and high school classes, the Coolkit team focused on building participants' personal connections with their local urban forest, and learning to identify local climate change causes, vulnerabilities and possible solutions, through activities including a block walk, mapping, or drawing new ideas on Google streetview and satellite images. Pre- and post-surveys were conducted to help the team evaluate the effectiveness and usability of the Coolkit in engaging local residents, teachers and high schoolers on climate change and urban forestry issues. Interviews were also organized with interested community members and teachers.

Preliminary results with residents, teachers and students indicate that they developed better understanding of climate change and urban forestry, especially at the local scale. Awareness of Vancouver's GHG reduction targets before and after the sessions rose from 6% to 100% for citizens, and from 5% to 50% for students. Most participants stated that the Coolkit helped them learn about climate change (85% of local residents and students) and urban forestry (100% of local residents and 92% of students), and they enjoyed the experience, particularly the outdoor experience and hands-on activities. Several reported that Coolkit had changed the way they look at their own neighborhoods.

Despite encouraging results and feedback from the workshops, we also encountered barriers to motivation and action. Even among the interested participants, it was difficult to get them to try out other Coolkit activities in their own areas and send us feedback. Four main barriers were identified through discussion with participants: 1) cost of taking action (energy, time and money needed); 2) social barriers (difficult to connect with neighbours and fear of being judged by others); 3) risks of taking action (eg concern about the wrath of landlords when making gardening choices); 4) uncertainty about climate change or urban forestry issues. Additionally, although being keen about local climate change solutions, participants who were renters felt it would be difficult to make certain changes on the property, such as planting trees.

The full potential of the Coolkit is still being explored, with further testing and evaluation in schools and adjacent neighbourhoods in 2018. With this feedback, the research team will continue to improve Coolkit content/design and develop pathways to overcome the social barriers, so that soon it can be used more widely by interested homeowners and neighbours, schools, and engagement practitioners as a DIY kit. An open source online version (iCoolkit) is currently being developed for testing with communities and teachers in 2019. With such approaches and tools, climate change can become more concrete and 'visible' to local people, through a fun and positive experience that helps make climate-proofing our neighborhoods more achievable.

The researchers would like to hear from readers who might be interested in trying out the Coolkit with neighbours or friends in their own neighbourhood (not just Vancouver). Please contact Zhaohua (Cindy) Cheng at zhaohua.cheng@ubc.ca or Dr Stephen Sheppard at stephen.sheppard@ubc.ca.

> **"…Definitely – I went home and looked at my neighbourhood with the map and looked at where I lived within the complex – and noticed that 'hey the roofs are dark!' and that there's lots of tree cover but the trees don't cover the roofs."**
>
> ***– Coolkit workshop participant, 2017***

Using science to achieve conservation

By Jeff Sayer

The UBC team comes ashore on the coast of Boano Island in the Indonesian Moluccas

I have just returned from the island of Boano in the Moluccan islands of eastern Indonesia. The 17,000 people who live on this small isolated island are amongst the poorest in Indonesia. The timber for building the boats that used to be the foundation of their economy is now exhausted. The main source of income today is the production of an aromatic oil – Cajuput oil, which is distilled from the leaves of the Melaleuca trees that grow on the island. Distilling the oil requires an abundant supply of fuelwood – and supplies of this fuelwood are becoming exhausted. The future of the people is uncertain. One reason I was on the island is because it is the only place left on the planet where a bird, the Kehicap, a small black and white flycatcher survives. There are less than 200 Kehicap left and they are in trouble – the same forests that used to support the lives of the people are also the only habitat for the bird. The fate of the bird and the people are inextricably bound together.

Finding the solutions to problems such as this is the objective of a team of UBC faculty and graduate students who are engaged in a long-term study of the conservation problems of the island. Conventional conservation, establishing a reserve and stopping people cutting timber is not going to be acceptable to people who are struggling to survive. A solution has to be found that is good for the people and the bird. Finding such solutions is not just a problem for ecologists, it is a problem that requires the skills of economists, anthropologists, legal specialists and human behavioral scientists. Modern conservation in the tropics requires a deep understanding of not only the ecology of the system but also economic and social dimensions of the landscape. Conservation requires inter-disciplinary science and it requires long-term engagement. The days are gone when one could develop a conservation plan and hand it over to someone to implement. Teams of scientists have to engage for the long haul and work with local stakeholders to find solutions to constantly evolving local conditions. With colleagues from the Faculty of Forestry at UBC we are doing just this – we are focusing the efforts of our inter-disciplinary team on a long term effort to use science to achieve conservation in a set of "sentinel landscapes", places where unique biodiversity and disadvantaged people share threatened habitats.

Conserving the world's biodiversity is one of the mega challenges facing humanity. Conservation might seem a simple task – just establish parks and reserves and enforce laws. But the reality is far more complex, especially in the tropical developing world where most of the world's biodiversity exists. The conservation problems that I have tried to address have brought me into direct contact with many of the world's most disadvantaged people. The one lesson that I have learned is that conservation programs are difficult to sustain when the local people are struggling to meet their basic needs for food, water, health care and education. In these situations conservation can only succeed if it also helps to improve the livelihoods of the people.

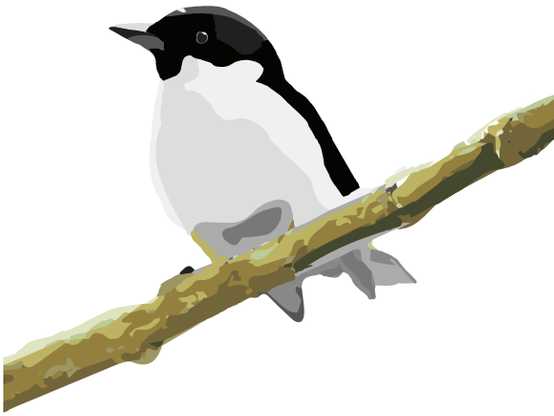
The challenges facing the people of Boano Island and its endemic birds are repeated throughout the islands of Eastern Indonesia and in many other parts of the developing tropical world. My team from UBC cannot solve all of these problems but we can attempt to address them in a few places. We can pioneer approaches that others can apply elsewhere – and we can also help in the training and professional development of the people from local universities, government agencies and civil society organizations to help them develop the skills to reconcile conservation and development in the areas where they live and work.

UBC has now signed agreements with local universities and NGOs in several locations in the islands of Indonesia. Our scientists spend time each year working in the field with our local partners, we will provide opportunities for staff from those partner organizations to come to Vancouver to take graduate courses to enhance their skills and learn from

people facing similar problems in other parts of the world. On our most recent visit to Manusela National Park on the island of Seram our team included UBC doctoral or post-doctoral students from Indonesia, USA, Australia and UK together with younger Indonesians who will join us at UBC next year. Manusela is one of Indonesia's most spectacular national parks, it rises from coastal coral reefs to the 3,000 metre peak of Mount Binaya. The park supports numerous plant and animal species endemic to the Wallacea region – the area whose biodiversity was documented by Alfred Russell Wallace when he visited the area 170 years ago. In the recent past the people of the villages where we worked had augmented their incomes by trapping the rare endemic parrots for the pet trade. The intensity of trapping was not sustainable. Now people are making a living as hosts and guides for eco-tourists who come to observe the birds and enjoy the spectacular mountain scenery. Building a sustainable conservation program requires us to partner with the local people so that we can learn together to strengthen the tourist program, we need to monitor the bird populations and the state of the forest. We need to help the local people to get the maximum benefit from their other main economic activity, harvesting nutmegs and cloves. We have to work with the people to help ensure the sustainability of their coastal fisheries. We stay in the villages, in the peoples' houses and strive to understand the conservation problems as seen through the eyes of the people. We encourage initiatives to improve their livelihoods whilst conserving the forests and their birds. Scientists from Pattimura University on the nearby island of Ambon work with us on this project and their university has now signed an agreement to collaborate with UBC – their students will be coming to study with us in Vancouver in the future.

Another one of our sentinel landscapes is located on the slopes of Rinjani Mountain on the Indonesian island of Lombok. We have been working with local NGOs and the University of Mataram to explore ways of getting more benefits for local people from the management of the forests on the slopes of the mountain. At the time of writing this area has just suffered the devastating impacts of a major earthquake. We were able to transfer money rapidly to our local partners to help the people of the most badly impacted villages. The people in these villages have been our friends and research partners for several years and we were very happy to be able to come to their assistance at this time of need.

The research and education work that we support from UBC does not just yield cold analysis of technical problems. We consider our science to be "sustainability science" where we engage with the people who should be the ultimate beneficiaries of our research, we learn together with them and we become their partners in seeking pathways towards sustainable development. Rich, biodiverse forests are essential for the continued well-being of the people for many reasons. The forests support rare and endangered plants and animals, they provide timber and many other products that are essential for the local economy and they protect the steep slopes of these fragile islands. Our sentinel landscapes are places where the theories of sustainable development can be tested on the ground. These are the places where the international rhetoric of sustainable development has to find its applications. Our landscapes are where the "rubber hits the road" – sustainability science has to provide real time solutions to rapidly evolving and – as with the recent earthquake – unpredictable events. Our laboratories are the landscapes where science can be used to improve local peoples' lives and also find ways of conserving globally valuable forests and biodiversity.



The *Kehicap, Syposiachrus boanensis,* a critically endangered local endemic bird on the island of Boano

For further information contact Dr Jeff Sayer (department of Forest and Conservation Sciences) at jeff.sayer@ubc.ca.

A settlement on the coastline adjacent to Manusela National Park on the island of Seram in the Indonesian Moluccas. Local people are dependent on resources from the forests and the coastal waters

Evaluating resource availability in the Western Himalaya

By Christie Quon and Hailey May

Domesticated livestock in Syawa, Uttarkashi, India

The impacts of climate change will be felt in few places as strongly as in the Himalayan mountain region. Climate change is expected to increase temperatures over 3x the global average in the region, holding drastic ecological and social consequences for biodiversity, endemism-levels, and quality of life for those whose livelihoods are intrinsically linked to the landscape. Recognizing the social, cultural, and historical value of local knowledge, our summer was dedicated to using people-centered methodologies (such as participatory mapping sessions and socio-ecological surveys) in an attempt to analyze the local perceptions of climate change and geospatially model impacts on the availability of natural resources in the Indian Himalayas.

Our first field day required crossing the Ganges River during the monsoon season - in a hand-pulled trolley - and hiking continuously uphill for 4 hours. We stopped only to pry the rubber-like bodies of land leeches from our feet, legs, and arms. Arriving wet, bloodied, and with legs burning, we finally broke through the misty clouds into a blue-sky horizon above the steep alpine forest and roaring glacial river below. One hundred and ten households, 3 villages, and countless cups of chai later, our research revealed the ways in which villagers perceived themselves to be impacted by climate change.

Across villages, many respondents lived below the poverty line, with the majority occupied full-time as wheat, rice, and legume farmers. Respondents indicated significant changes in climate during the past 2 decades, citing rising temperatures, changing precipitation patterns, and the increasing frequency and intensity of hailstorms, landslides, and crop-damaging storms. Villagers reported that these changes in climate had decreased the availability of fuelwood and fodder, as well as their production of crops.

For the resource-dependent communities of Syawa, Shrikot, and Barethi Patti Barsali, a declining availability of natural capital has pushed them further into socio-economic vulnerability. Our welcome into these communities allowed us to see the direct household impacts of climate and environmental change. Some families reported that over half of their household had out-migrated in search of better employment. We witnessed women carrying over 30 kilograms of fodder or fuelwood along roads, fields, and up the sides of mountains. This plight occurs every day - sometimes twice a day - with many women often forced to travel further and further in search of forest products. The diversity of crops in each village has declined due to changes in climate, forcing the switch to monoculture farming that increases the threat of malnutrition in these already vulnerable communities.

If India was a word, that word would be "diverse". This notion was reinforced throughout our 4 months spent conducting research in India, but it was never clearer than during our field work in remote villages of the Himalayan foothills. The diversity of responses from our study is a reflection of the ecological and social diversity present in the Himalayan region. These responses should be recognized for their inherent value to site-specific strategies when faced with a changing climate. The value of community involvement and the wealth of local knowledge is invaluable to climate change strategies, as there will be no effective mitigation without meaningful and consistent discourse beginning at the community level.

Christie Quon and Hailey May are senior undergraduate students in the Faculty of Forestry's Natural Resources Conservation program. They are recipients of the Queen Elizabeth II Diamond Jubilee Scholarship, which supported their research in the Landscape Ecology and Visualization Lab at the Wildlife Institute of India. For further information, please contact Christie Quon at christiequon@gmail.com or Hailey May at may.hailey@gmail.com.

Can statistics help ornithologists "hear" birds?

Ornithologists would probably agree that most birds in the field are heard rather than seen. Actually, surveys of breeding birds rely heavily on aural detections (around 70% of observations in suburban landscapes and over 90% of observations in closed canopy deciduous forest). This information suggests the potential utility of acoustic recorders for ornithological research and monitoring. Automated acoustic recording devices are recognized as useful tools for studying bird populations because of their capacity to collect large amounts of vocalization data. These devices also have the advantage of providing pre-programmed collection of acoustic recordings across broad landscapes, thus providing spatial and temporal replication for monitoring and minimizing the need for observers to be in the field. Acoustic recorders are particularly useful during periods of high bird activity when field observers face an obvious drop in detection ability.

Despite the advantages of using acoustic recorders for bird surveys, the large data sets collected in bird monitoring projects make data analyses quite challenging. Automatic bird sound detection algorithms can be used as a pre-filtering step prior to other acoustic analyses such as identification and counting. The output format of the detection algorithm is a simple binary decision, which can automatically detect whether there is bird sound in a given period of a recording. The detection algorithm can help an ornithologist skip over large numbers of negative instances in order to focus on the audio region containing positive readings.

As an MSc student supervised by Dr Bianca Eskelson (department of Forest Resources Management – Biometrics Lab), Yi-Chin (Sunny) Tseng has combined her interests in birds and statistics to develop an automatic analysis algorithm. Sunny is originally from Taiwan, a place with amazing avifauna and a key stopover on the East Asian north-south flyway. Sunny spends much of her leisure time in the field listening to birds and recording their sounds. "Listening" is how she learns about birds. At UBC, Sunny has applied logistic regression to build an automatic bird sound detection algorithm. A logistic model is a statistical model that is usually applied to binary dependent variables (in this case the presence or absence of bird sounds in a recording). The logistic model is able to predict the probability of an event. Classification can be achieved by comparing the predicted probability with a cut-off (probability larger than cut-off represents one class, below cut-off as the other). Logistic models are the models of choice in many ecological data classification tasks.

Sunny collected 15,000 audio recordings from a Bird Audio Detection Challenge as her research data. Each recording was 10-seconds long and covered a wide range of environments (eg, grassland, forest, urban areas) with the presence of noise due to weather, traffic, insects, and human speech. Sunny chose the frequency percentiles of a recording as the predictor variables because bird sounds typically had a higher frequency (1~8 kHz) than traffic sound (0.1~1 kHz), human speech (0.1~0.6 kHz), and other sounds often heard. Her model resulted in a 75% accuracy with a 14% false negative rate – suggesting the effectiveness of applying the model to filter out negative instances. Even better, the model took less than 1 hour to process 44 hours of recordings. This fast processing speed indicates potential applications for the model in real-time monitoring of bird populations. Sunny's study opens up new possibilities for automatic, accurate, and efficient analyses of large remote-monitoring audio datasets.

So, can statistics help ornithologists "hear" birds? The answer is "Yes," absolutely, and Sunny is excited about developing more statistical tools to assist in avian acoustic studies.

For further information about this project, contact Yi-Chin (Sunny) Tseng at sunnyyctseng@gmail.com or Dr Bianca Eskelson at bianca.eskelson@ubc.ca.

Sunny recording bird sounds in Williams Lake, BC with her Telinga parabolic microphone

Is your community prepared for wildfire?

By Lori Daniels, Shannon Hagerman and Sarah Ravensbergen

It is shocking that the 2018 wildfires exceeded the area-burned records set in 2017. British Columbians are reeling, as we had not yet recovered from the tremendous impacts and trauma of last summer's fires. In the past 15 months, intense, fast-moving and uncontrollable fires have burned through a record-breaking 2.5 million hectares of forests and grasslands in BC. At the peak of the 2018 wildfire season, 566 fires burned simultaneously. Distributed across the 6 fire regions in BC, 49 "fires of note" were highly visible or posed a potential threat to public safety. Mirroring 2017, more than 20,000 people were on evacuation alert for prolonged periods, many had to flee their homes, and, sadly, numerous homes could not be saved. Collectively, the large fires in northwestern BC burned over 575,000 hectares of forests and generated smoke that made air quality in western Canada the most hazardous in the world for several days during August. Relief from many out-of-control fires will come only after saturating rains this fall.

We are now living the "new normal" – a new reality given ongoing climate change and the fundamental links between heat, drought, and wildfire. Not every fire season will break records, but years like 2017 and 2018 will become increasingly common over our careers and lifetimes. We are already paying tremendous costs – in the past 2 wildfire seasons, suppression costs have exceeded $1 billion. Add on the indirect costs of short- and long-term health impacts due to smoke, stress and trauma to those affected by the fires and wildfire and emergency services personnel, losses of timber, habitat, ecosystem services, and environmental damage. Our society must adapt to become resilient to climate change and learn to live with fire.

Given the extent of forests in BC, many communities are at moderate to extreme risk of burning during a wildfire. Following Firestorm 2003, 685,000 ha of forests in the wildland-urban interface (WUI) surrounding communities were determined to have high-to-extreme forest fuel hazards; another 970,000 ha were considered moderate-to-high in fuel levels. Hazardous fuels and wildfire risk can be reduced by thinning forests or prescribing fire. Since 2004, $216 million has been allocated to this problem, yet only 10% of the high-to-extreme fuels have been mitigated. All but a few communities remain highly vulnerable, although several communities have made excellent progress.

Why don't vulnerable communities in BC take action to reduce wildfire risk?

We have undertaken research to answer this question, supported by a Community Solutions grant from the Peter Wall Institute of Advanced Studies. We reached out to municipalities and First Nations communities in BC and received 77 responses on a survey we conducted from September 2016 to April 2017 (prior to the 2017 wildfires). We have learned that leaders in BC communities are aware of and very concerned about current and future threats from wildfire in the WUI, and wildfire preparedness is a top priority, but barriers are slowing proactive management and the barriers are greater for some communities than others. Our key findings include:

- Almost all of the respondents perceived a very high level of risk from wildfire and that wildfire in the WUI will impact their community within the next 10 years.
- Preparedness varied among communities, although almost all respondents felt that improving community preparedness was vital. Communities with less than 5,000 residents, and First Nations communities and reserves, ranked wildfire preparedness as a more urgent priority than communities with over 5,000 residents.
- Enforcement of bans, restrictions, and fines, raising awareness of ignition risks, and tree pruning, were the most supported actions for mitigating wildfire risk. Community-level management actions that include prescribed fire were comparatively less popular.

Photo: Cedar Photography

- The most important factors limiting progress were a lack of financial resources at the community level, lack of funding from provincial and federal governments, and a lack of time allocated to staff work loads.
- All communities that have not yet developed a community wildfire protection plan or participated in any management actions ranked lack of financial resources at the community level as strongly limiting.
- There was consensus that all agencies – municipal, regional, provincial, federal, and First Nations governments, industry and business, and individual homeowners – must do more to proactively prepare for wildfire.

The responses to our survey clearly show that leaders in BC's communities are highly aware of the risks associated with wildfire and that engagement in fuel hazard mitigation and other wildfire prevention programs might well be enhanced if issues of resources, capacity and support were addressed. Last spring, we shared these findings and were pleased to see them reflected in the recommendations by Chief Maureen Chapman and Mr George Abbott in their report on the provincial flood and fire review. The 2018 wildfire season attests to the urgency of fulfilling the recommendations. While it is reassuring that the BC government has reported progress in addressing the recommendations, we caution that addressing recommendations is not the same as implementing them to their full intent. For example, the previous government reported that all recommendations of the Firestorm 2003 review had been addressed – yet, hazardous fuels surrounding BC communities persist. BC cannot afford to repeat that mistake.

What are the next steps to ensure communities throughout BC are prepared for wildfire?

Given the complexity of the wildfire problem, it is promising that several new governmental initiatives have been announced. At the grassroots, level a new resolution from the Union of BC Municipalities calls on the province to increase the number and size of community forests to help achieve wildfire protection, promote rural development, and strengthen relationships between Indigenous and non-Indigenous communities. Provincially, Mr Doug Donaldson, Minister of Forests, Lands, Natural Resource Operations and Rural Development announced $50 million over 3 years for the province's new Community Resiliency Investment Program, which aims for a holistic approach to wildfire risk reduction and fuel management treatments and allows communities to apply for funding to cover up to 100% of their wildfire risk reduction projects. This is a good start to addressing the much larger fuels problem across BC. Nationally, the Canadian Council of Forest Ministers committed to identify actions to further the Canadian Wildland Fire Strategy during their recent meeting. BC's Minister Donaldson will co-chair the committee on this topic.

Communities and individual citizens must also be part of the solutions and actions to prepare for wildfire. Our research team continues to work with communities in BC. We thank the respondents who participated in our 2016–17 survey and a secondary survey we conducted in June–July 2018. In the coming months we will be interviewing community leaders to co-develop community-based solutions to overcome the barriers and optimize the new opportunities for BC communities to undertake proactive management to prepare for wildfire. If your community would like to participate, please contact Dr Lori Daniels (lori.daniels@ubc.ca).

Dr Lori Daniels is a professor in the department of Forest and Conservation Sciences. Dr Shannon Hagerman (shannon.hagerman@ubc.ca) is an assistant professor in the department of Forest Resources Management. Sarah Ravensbergen is the research assistant collaborating with us on this project.

Woody aerogels: super-light yet versatile

The term "wood" usually conjures up an image of a hard, heavy, and bulky material. However, new research is proving that wood-based materials do not have to be this way. Dr Feng Jiang is a newly appointed assistant professor in the department of Wood Science who has been looking at rethinking and redesigning wood-based materials in order to make them, literally, as light as a feather. Feng has more than 10 years of research experience in the area of novel wood-based biomaterials. He is currently leading the Sustainable Functional Biomaterials lab at UBC – a group that aims to revolutionize materials (such as the feather-light aerogels described here) derived from wood.

Advancing research in wood-based materials has never been more urgent. Pollution of our oceans by plastics is happening at a rate of over 9 million tons per year and is an issue of increasing public concern. With a typical service life of 15 min, the plastic bag can take hundreds of years to be completely degraded, if it can be degraded at all. Commonly, plastic bags break down into tiny microplastics that are invisible to the human eye, but eventually end up in the human body through food chains. Solving this pollution issue has been haunting all living species since the invention of plastics over 150 years ago. Scientists from both academia and industry are now turning their attention to trees as a source of sustainable and biodegradable materials.

Trees consists of 3 major natural components (cellulose, hemicellulose, and lignin) that make up the volume of wood. Similar to the synthetic polymers that we encounter in our daily lives, wood's 3 natural components are polymers containing many small molecules strung together by chemical bonds. A natural cellulose chain can contain hundreds or thousands of glucose sugars. Derived from CO_2 and H_2O during the process of photosynthesis, glucose sugars can link together to form long cellulose polymer chains, which help to fix carbon and support the upright growth of trees. These individual cellulose chains bundle together to maximize axial strength and form the structural skeleton in the plant cell wall that reinforces trees in the same way that steel can reinforce concrete. The cellulose bundles, also called elementary fibrils or microfibrils, have a diameter of approximately 3.5 nm, are more than one ten-thousandth thinner than human hair, and have mechanical properties as strong as carbon nanotubes and glass fibres.

Although cellulose has been used in papermaking, this industry is declining due to the weak demand for newspaper. Fortunately, with the advances of more sophisticated nanotechnology, bundles of cellulose chains can now be separated from cellulose fibres by biological, chemical or mechanical means. Although isolation of nanocellulose (a bundle of cellulose chains in the form of short and rigid particles or long and flexible fibrils) was first described 70 years ago, its mass production and application have only become fully-fledged during the past decade. Canada, a country with vast forest resources, has pioneered the production of various types of nanocellulose from wood. Products have included a cellulose nanocrystal marketed by CelluForce, and microfibrillated cellulose developed by Performance BioFilaments.

Once isolated from wood cell walls, nanocelluloses can serve as building blocks for reconstruction into materials of various shapes and dimensions, rather like building with children's LEGO block toys. However, in contrast to the physical interlocking between LEGO blocks, nanocelluloses are held together by intermolecular forces of

hydrogen bonding, the same forces that hold water molecules together within a river or as droplets on a windshield. The collective strength of hydrogen bonding depends on the available surface functional groups that interact with each other, making nanocelluloses ideal building blocks due to their high surface area. A nanocellulose with a diameter of 2 nm has a surface area of approximately 1,250 m^2/g. This means that, with a fully extended surface, it would take only 5 g of nanocellulose to completely cover a football pitch. With such exceptionally high surface areas and prevalent surface hydroxyl groups that are responsible for forming inter-fibril hydrogen bonds, nanocelluloses can package intimately with each other to form a 3-dimensional foam-like material without the addition of any chemicals.

Taking advantage of the ultrathin nature of nanocelluloses, and their exceptionally high specific surface area, Feng's lab group is developing super-light all-cellulose aerogels. The term "aerogel" is used to describe a 3-dimensional foam-like structure with a density as low as air (1.225 kg/m^3, or approximately 800 times lighter than water). The aerogel developed in Feng's lab has a density of 1.7 kg/m^3 and porosity of 99.9%. In other words, the nanocellulose aerogel contains 99.9% air by volume and only 0.1 % solid materials. On visual inspection, the aerogel appears as a honeycomb structure with a pore width of around 0.5 mm. This high porosity and low density make nanocellulose aerogel a super-absorbent material that can absorb approximately 300 g of water per gram. As a comparison, paper towels can absorb only about 10 g of water per gram. In fact, this absorbency value is the highest among all other bio-based aerogels or foams reported to date.

Conversion of 1-dimensional nanocellulose into 3-dimensional aerogel structures can introduce a wide variety of applications that could not have been imagined from the original wood or cellulose. The light and super-absorbent properties of aerogels can be useful in wound dressings, beauty products such as facial masks, or personal hygiene products. Feng's group has demonstrated that this woody aerogel can help in environmental remediation, with potential applications such as oil recovery from contaminated oceans, water filtration and purification, CO_2 adsorption, as well as catalyst support for degradation of toxic chemicals. Additionally, this highly porous aerogel structure demonstrates ultralow thermal and acoustic conductivity, properties useful for thermal or sound insulation in buildings. As an outdoor enthusiastic, Feng imagines huge potential for the nanocellulose aerogel in outdoor equipment, either in new water purification technologies, or as a lightweight insulation layer for thermal comfort.

Aerogel is only one of the products being investigated by the Sustainable Functional Biomaterials group. Feng's group is also interested in diversifying the products portfolio of bio-based nanomaterials, including strong filaments, transparent films, porous membranes, nanocomposites, and 3D printed structures. Nanocelluloses have high surface areas and abundant surface functional groups for chemical modification. Once modified, nanocelluloses can demonstrate novel functionalities not existing in traditional wood materials. Feng's ultimate goal is to develop bio-based materials for advanced applications in the emerging energy, healthcare, and environment areas, to potentially alleviate our reliance on the petroleum economy. Trees can produce $10^{11} – 10^{12}$ tons of cellulose annually, approximately 500 times more than the annual production of plastics. Clearly, natural polymers are in sufficient supply to meet human needs for materials. However, new technologies are needed in order to transform these natural polymers into materials with performances comparable or superior to our existing petroleum-based products. Feng and researchers around the world are working collaboratively towards this goal.

For further information, contact Dr Feng Jiang (department of Wood Science) at feng.jiang@ubc.ca.

MNASA Earth Observatory image by Robert Simmon

Can we study regional urbanization dynamics from space?

By Yuhao Lu

The rate of human modification of the terrestrial biosphere has intensified over the past several decades. The term urbanization describes not only the physical expansion and densification of cities but also implies the complex transformation of human society, culture, demography, and, more importantly, the relationships between them. Cities, and the process of urbanization, cause some of the most profound anthropogenic impacts on Earth despite their very small spatial footprint of approximately 3% of the world's terrestrial surface. As a result, cities are responsible for three quarters of our global energy consumption and approximately 80% of our greenhouse gas emissions in order to accommodate over 54% of the global population, a number that is expected to exceed 70% by 2050. Although it seems that cities have little to do with forestry or environmental science in general, I believe that cities can be both the cause and solution to many current environmental and social challenges.

The concept of urbanization has evolved from a collection of isolated and locally dense commercial districts of concrete and artificial constructions, and now extends to networks of social, ecological, and economic mosaics functioning interdependently as a whole. The classic view of urbanization patterns is now challenged by a more connected and heterogeneous decentralizing trend. The localizing mindset of "the closer the cheaper" that drove early urban development is no longer a primary objective espoused by city planners. Efficient transportation and global trading networks have nodalized cities worldwide regardless of their physical distances and, as a result, urbanization has become a global phenomenon with unprecedented rates of growth. Yet, the majority of current urban research is still highly localized, relying heavily on census data.

I have a forestry background, but I have been studying cities as part of my recently completed doctoral research with Dr Nicholas Coops (department of Forest Resources Management and Integrated Remote Sensing Studio) at UBC. I used time series of remotely sensed satellite imagery to quantify both environmental and socio-economic development in 25 cities around the pan Pacific region. Remote sensing derived metrics can be used to assess urban environmental and economic development in a more spatially and temporally consistent manner than conventional census and ground measurements. New imaging and mapping technologies, such as Geographic Information Systems and remotely sensed imagery, have simplified the geographic identification of cities. Remotely sensed data can allow us to monitor, extract, and estimate changes in some key components of urban environments, namely, urban vegetation and urban nighttime lights (NTL) brightness. The urban vegetation dynamic is indicative of overall environmental quality and urban nighttime brightness level is an ideal proxy for urban economic development.

One of the most critical components of Earth Observation and land use monitoring is a continuous archive of images. As part of my doctoral research project, I used data from Landsat-5 TM and Landsat-7 TM/EMT+ (annually from 1984 to 2013) to map urban vegetation. Landsat data have been recorded, organized, and distributed by the US Geological Survey since 1972. Fortunately, Landsat has imaged the Earth's surface every 16 days for almost 40 years and acquired data has been available since 2008. This information represents a unique combination of spatial, spectral, and temporal resolutions that is needed to chronicle both anthropogenic and natural impacts of the land status and dynamics.

I used nighttime lights data (a collection of satellite images taken during the night) to measure urban

brightness as a substitute for socio-economic development. Comparing Landsat images, these data highlight human activities and reveal the "cultural footprint" of each individual settlement. It is undoubtedly one of the most direct measurements of human activity available through remote sensing.

One of the key objectives of my research was to find models that were capable of examining the relationships between urban environment and socio-economic develop over time and space. For example, the Environmental Kuznets Curve (EKC) theory hypothesizes a non-linear, U-shaped relationship between environmental quality and economic development where environmental performance decreases at early stages of economic development and recovers as the economy reaches a certain turning point. However, the scarcity of reliable and consistent assessment of the relationship between economic growth and environmental degradation limits our ability to understand and test theories such as the EKC.

Using remote sensing, I found that linear trends between urban environment and economic development were the most dominant of the 3 tested relationships (linear, quadratic, and cubic). This result implied that the vegetation changes within cities in the pan Pacific regions were monotonic and irreversible. Despite the dominance of linear models, EKC-like quadratic models (U-shaped) also existed within all of the cities I studied. In the majority of the cities, quadratic models were more spatially clustered compared to linear and cubic models. These results quantified the behavior of vegetation responses to city brightness changes, furthering the discussion of EKC theory by integrating remote sensing observations as a means of measuring environmental performance and human development.

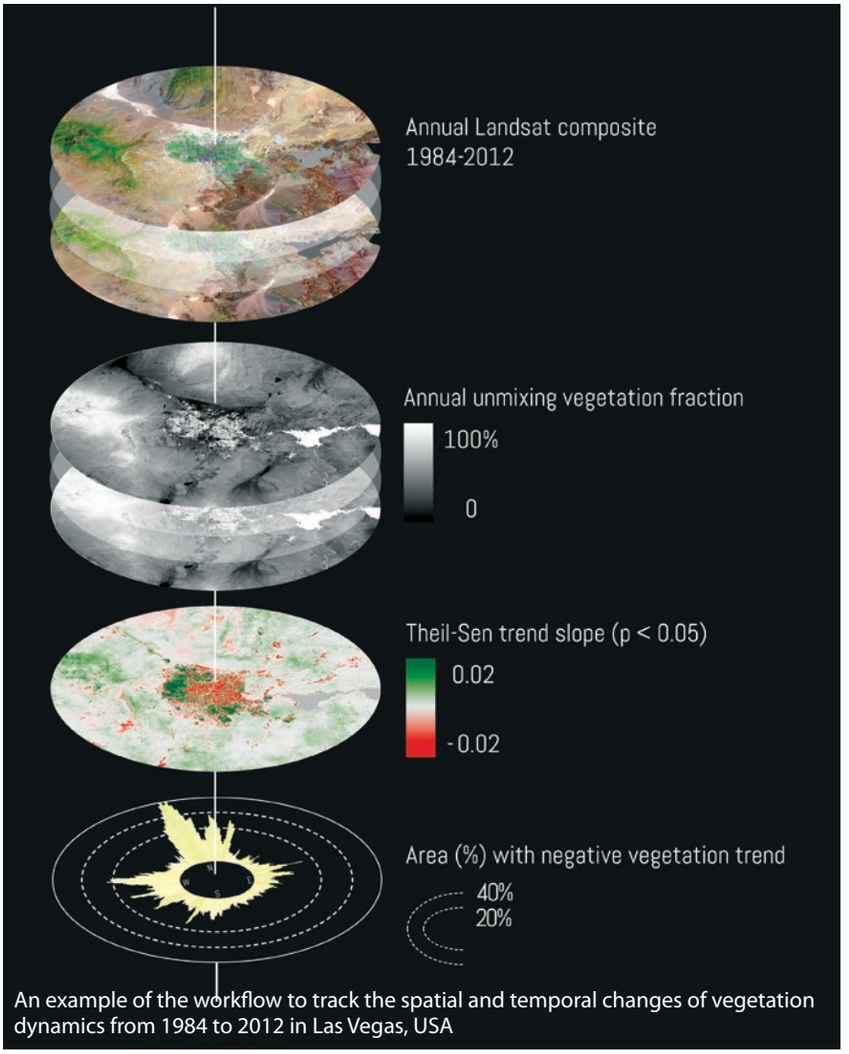
By comparing the spatio-temporal changes of urban greenspace and nighttime lights, I found that cities had both inter- and intra-variations in terms of spatial and temporal changes of vegetation and nighttime lights brightness. I also observed regional similarities, particularly in Asian countries where the relationship between vegetation fraction values and nighttime lights brightness was less linear than North American cities. Climatically, vegetation dynamics tended to be more alike within the same climate scheme among different cities.

Characterizing the relationships between vegetation dynamics and nighttime lights revealed new patterns. Asian cities showed a dominating pattern of cubic relationships when compared to North American cities. While cities with higher economic activity level were more dominated by linear models, patterns were less obvious for middle and low-income cities.

In terms of spatio-temporal patterns of urban environment and economic development, I found 3 pairs of urban environments that were strongly similar to each other namely, Melbourne with Sydney; Tianjin with Manila; and Singapore City with Kuala Lumpur.

Time series of satellite images can provide valuable information about environmental and socio-economic development. I believe that my research with pan Pacific cities will be useful for both planners needing to compare visual land-use patterns and policy makers interested in better understanding inter-and intra- city development in polycentric and highly connected global urban systems.

For further information about this research contact Dr Yuhao Lu at luyuhao@mail.ubc.ca or Dr Nicholas Coops at nicholas.coops@ubc.ca. Yuhao will be starting a post doctoral fellowship at UBC's School of Population and Public Health extending his interest of urbanization to research concerning social and health issues of the general public.



An example of the workflow to track the spatial and temporal changes of vegetation dynamics from 1984 to 2012 in Las Vegas, USA

research lab profiles

TREE RINGS: Reading between the lines

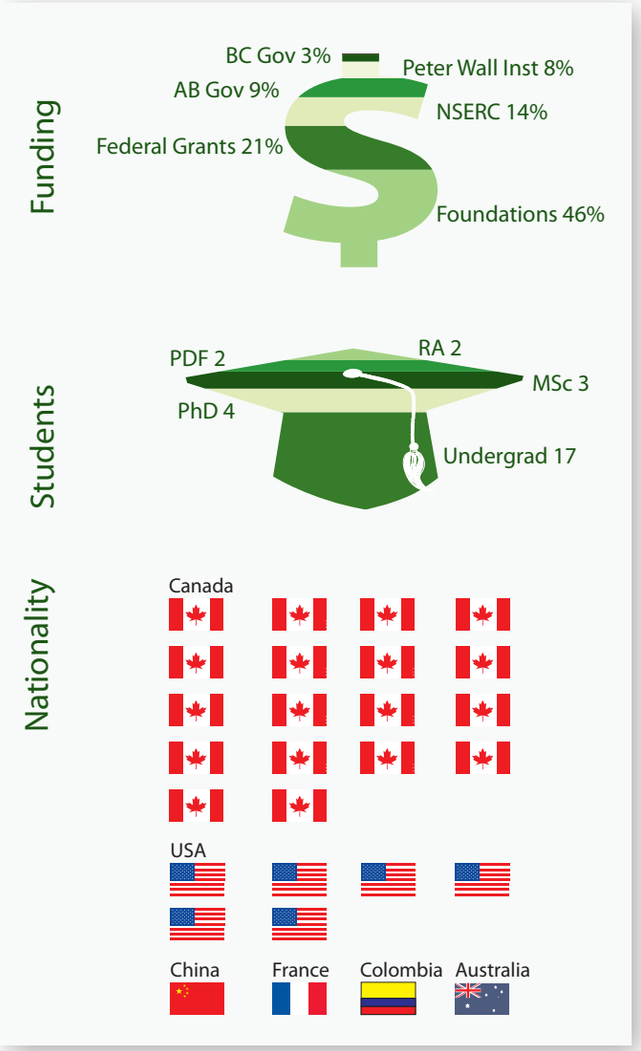
Trees are amazing natural warehouses, with centuries to millennia of history preserved in their rings. In the Tree-Ring Lab at UBC in the Faculty of Forestry, we literally read between the lines, measuring ring widths and other attributes, to disentangle influences of natural disturbances, humans and climate variation and change on forest dynamics. By combining tree-ring analyses with multiple lines of evidence derived in the forest and through lab analyses, we address fundamental unsolved questions: How did historical disturbances shape forest composition, structure, and dynamics? How have human impacts and climate change disrupted historical disturbance regimes? And, what are the consequences? How does understanding the drivers of forest change support efforts to sustain ecosystem resilience in a rapidly changing world? By answering these questions across the diverse forests of BC, Canada, and globally, we aim to provide the evidence-based knowledge urgently needed to address the mounting ecological, conservation, and management challenges of the 21st century.

Dr Lori Daniels leads the Tree-Ring Lab at UBC, fulfilling her life-long aspiration for a career in science and education. As a member of the Forest and Conservation Sciences department, she teaches courses on forest classification and silvics, abiotic disturbances, and the interior field school. Lori aims to inspire and enable students at all levels of scholarship to engage in research. Over her career at UBC, 46 post-graduates and 100 undergraduates have learned specialized skills in dendrochronology (tree-ring science). Currently, the Tree-Ring Lab research team includes 2 post-doctoral researchers, 4 PhD and 3 MSc students, and 2 research assistants. This year, 17 undergraduates were instrumental in achieving our field and lab research goals. Collectively, we share strong interests in conservation and sustainable forest management. As a result, research by team members is collaborative with federal, provincial or municipal governments, indigenous communities, non-governmental organizations and the private sector. Within Forestry, we have built strong collaborations with several faculty members and work closely with the staff at Alex Fraser Research Forest.

Investigating long-term forest dynamics is a tradition in the Tree-Ring Lab. **Vanessa Comeau** (MSc Student) has disentangled the climatic drivers of the alarming dieback of yellow-cedar on Haida Gwaii. Her tree-ring reconstructions reveal decline began several decades ago, with a dramatic increase in mortality in recent years. **Edith Li** (MSc Student) is exploring climate-change effects on tree growth and mortality in upland forests and peat plateaus of the Northwest Territories. In collaboration with the Canadian Forest Service, she is linking long-term monitoring with tree-ring analyses to quantify change.

The Tree-Ring Lab is widely recognized for its research on fire regimes and forest dynamics, which is key for understanding the causes and consequences of 20th century change. **Wesley Brookes** (MSc Student, co-supervised with Dr Allan Carroll) combined fire-scars with tree ages to reconstruct 400 years of historical fires near Knife Creek in UBC's Alex Fraser Research Forest. Past fires burned every 15 years, on average, but abruptly stopped 75 years ago. Today, 76% of trees established and persisted in absence of fire, yielding dense forests susceptible to crown fire. Similarly, in southeastern BC, **Greg Greene** (PhD Candidate) has shown that high-grade logging in the early 1900s, followed by fire suppression, disrupted 900+ years of frequent surface fires. The resulting 100-year-old forests include an astounding 4,000 to 18,000 trees per hectare, in which rare veteran trees die at accelerating rates. In these forests, ecological restoration would offset the unintended consequences of 20th century forest and fire management. A similar story is emerging east of the Rockies where **Cameron Naficy** (Post-Doctoral Researcher, co-supervised with Dr Nicholas Coops) is integrating LiDAR, vegetation inventories, historical photographs, and tree-rings to reconstruct historical fire severity in the southern foothills of Alberta. His research is providing the empirical bases of new models on mixed-severity fire regimes, a key goal of the multi-disciplinary and multi-agency Landscapes in Motion research project. Adding to this long-term perspective, **Raphaël Chavardès** (PhD Candidate, co-supervised with Dr Bianca Eskelson) has developed a novel monthly drought code based on the Canadian Forest Fire Weather Index System and reconstructed 350 years of fire-season drought indices for southeastern BC. Working with 1,886 fire-scarred disks collected across Canada's mountain forests, he has pinpointed years when fires burned synchronously at sites across the region and is investigating multi-century climate-fire relations to provide benchmarks for assessing the 2017-18 fires.

Taking an interdisciplinary approach, our recent research integrates physical and social sciences, enriched by Indigenous knowledge, yielding an enhanced view of fire as a vital process in many forests. **Kelsey Copes-Gerbitz** (PhD Student) is collaborating with the T'exelc (Williams Lake Band) to explore the cultural and ecological fire history of the Williams Lake Community Forest. **Sarah Dickson-Hoyle** (PhD Student), the newest member of the research team and recipient of the 2018 Future Forests Fellowship, will use a place-based approach to document local social-ecological histories, integrating Indigenous and western knowledge systems. Both research projects are collaborative with Dr Shannon Hagerman and seek to integrate science and Indigenous knowledge to promote fire-resilient forests and communities.



In the wake of the 2017-18 wildfires in British Columbia, we have expanded our research horizons with 3 new projects. First, **Sarah Ravensbergen** (Research Assistant, co-supervised with Dr Shannon Hagerman) has surveyed community leaders in BC to understand community perceptions of wildfire preparedness and fuels management. Second, working with Dr Harry Nelson, we have embarked on a cost-benefit analysis comparing reactive and proactive wildfire management using the 2017 wildfires in the Cariboo Region as a case study. Third, funding from the Intact Foundation enabled a timely new collaboration with the St'uxwtéws (Bonaparte Indian Band). **Paul Pickell** (Post-Doctoral Researcher) used remote sensing to map the severity of the Elephant Hill fire and our field teams, including 5 UBC and 2 St'uxwtéws students, established 100 monitoring plots to measure fire effects and post-fire forest recovery. We replicated this study at the Gavin Lake block of the Alex Fraser Research Forest and are inviting new partners to expand this time-sensitive research on the effects of the 2017-18 wildfires and forest recovery.

You can find us at http://treerings.forestry.ubc.ca. Dr Lori Daniels can be reached at lori.daniels@ubc.ca or on Twitter @ LoriDanielsUBC.

development & alumninews

Forestry alumni receive achievement awards

Forestry alumni **Gerry Burch** and **Kahlil Baker** are 2 of just 8 UBC alumni to receive an Alumni Achievement Award for 2018. These awards honour inspiring members of the UBC community whose extraordinary endeavours and leadership have created positive social change.

Gerry Burch will receive the Volunteer Leadership Award for his decades of service to the Faculty of Forestry. Although he received a BASc in 1948, as Dean John Innes says, "he has never truly left. He has been an invaluable alumnus for over 70 years and continues to support the Faculty of Forestry."

Gerry helped found the Faculty's Alumni Fundraising Committee and served as its Vice-Chair. He was also Co-Chair of the Growing for the Future Faculty of Forestry Campaign that built the Forest Sciences Centre.

Gerry played a vital role in the creation of the BC Forest Products Ltd Forest Genetics Scholarship for graduate students in the late 1960s, and has personally established 2 undergraduate scholarships for Forestry students: the Gerry and Jean Burch Bursary and the Gerry Burch Scholarship in Forest Sciences. He has also shared his wealth of knowledge and expertise through talks for the UBC Forest Club and the Burgess-Lane Memorial Lecture.

Gerry's career has been marked with excellence, and he has received many honours in recognition of his achievements. He even has a forest named after him on the south slope of Cowichan Lake on Vancouver Island. He has been, and continues to be, a leader in all topics related to British Columbia's forests, our province's most treasured resource.

Kahlil Baker will receive the Young Alumni Award for his innovative reforestation project that links 2 critical global issues: poverty and the environment.

Kahlil received an MSc in Forestry in 2012, followed by a PhD in 2017. In 2007 he founded Taking Root, a nonprofit organization designed to connect smallholders in northwest Nicaragua with the global market for carbon offsets. Through Taking Root, the sale of carbon credits and sustainable wood products serve as financial mechanisms to support widespread reforestation while providing much-needed income to smallholders.

Before Taking Root, smallholders routinely cut down trees on their land to sell wood or grow food for their families, leading to deforestation. With this program, smallholders can feed their families through the income generated by carbon credits, while reforesting their land with native species.

The program currently has 409 smallholders enrolled, and employs 25 full-time and over 1,000 seasonal workers. To date, Taking Root has made over $1 million in community payments, with revenues earned from carbon offset credits and sales of sustainable wood products.

So far, a land area equivalent to over 2,000 soccer fields has been reforested. Kahlil's design for multi-species tree planting allows for fast growth, shade corridors, and variable harvesting periods. It also reduces soil erosion.

The Faculty of Forestry congratulates Gerry and Kahlil on these well-deserved awards, and is grateful for their contributions to UBC and the greater community.

The 2018 Alumni Achievement Awards will take place on Thursday November 15, at the Vancouver Convention Centre West. For more information please visit alumni.ubc.ca.

Where there's fire, there's alumnus Bruce Blackwell

Growing up in Vancouver, **Bruce Blackwell** attended Prince of Wales Secondary School and started his academic career at UBC studying biology. That changed when he had an opportunity to fight forest fires in the summer. "I got exposed to fires and forestry and said to myself, 'this is what I need to do,'". He moved over to Forestry and completed a BSF in 1984.

"The problem was that I graduated in a recession. We had over 100 people in my class, and only 5 had jobs at graduation," he says. "I worked building mountain trails and in sports retail."

Eventually Bruce got a job at UBC preparing wood and soil samples for research. That small project grew into a much larger one, then became the basis of Bruce's Master's research. His thesis on the effects of prescribed fire on soils, vegetation and fuels was the foundation of his professional career.

"I thought I could make a career consulting on fires, but at that time (1989) people just wanted to put them out," he says. "So I drew on other parts of my education and consulted in silviculture and other aspects of forestry. I called my firm BA Blackwell and Associates, but in the beginning there was just me."

From that modest beginning Bruce has built a thriving consulting business with a focus on integrated forestry and environmental consulting services. Today the North Vancouver-based company has a team of 5 associates and 25 staff, and is the premier resource for fire and fuel management expertise in British Columbia.

Bruce's firm has been involved with strategic planning for Vancouver's urban forests, restoration of Stanley Park following the 2006 blowdown, a provincial government review of the 2003 wildfires, a watershed strategic plan for the Capital Regional District, and advice during First Nations treaty negotiations. In addition, Bruce and his team have developed numerous wildfire protection plans and wildfire risk management systems across British Columbia and Alberta.

"My business has grown gradually, and I've always tried to emphasize quality over growth. I learned from the recession not to get too big too fast," he says.

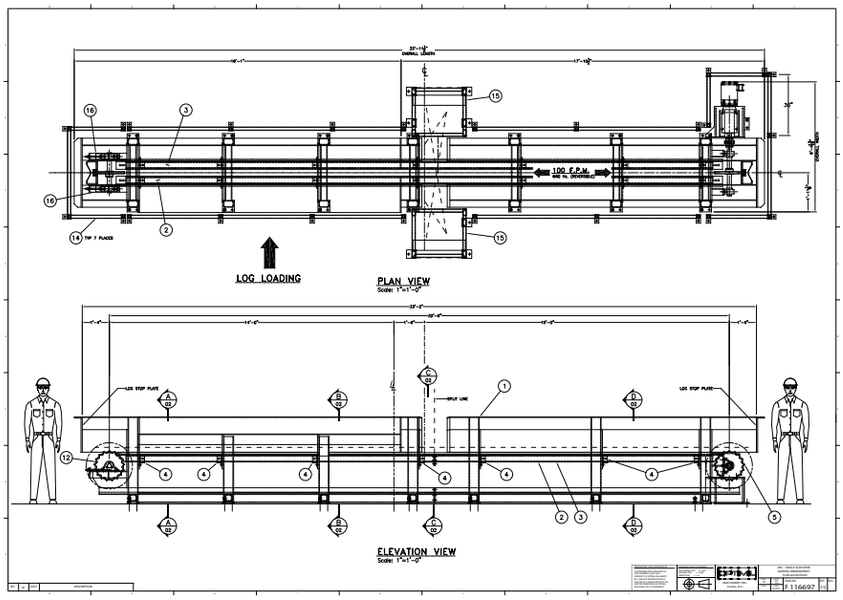
Bruce has consistently hired UBC graduates, especially those from the BSF and MSFM (Master of Sustainable Forest Management) programs. He taught fire science at UBC before Dr Lori Daniels joined the Faculty, and is a popular guest-lecturer in her course on fire. He's also been a volunteer speaker at the Student Industry Networking evening, offering advice about careers in forestry.

"Connecting with students works both ways," he says. "I can teach them some of what I have learned, and in return I meet them and talk to them and can eventually hire the best ones for our business. Consulting work isn't for everyone – it's deadline driven; there's a lot of stress – but it's very rewarding."

In 2015 Bruce established the BA Blackwell and Associates Scholarship in Fire Science. The scholarship is awarded annually to a graduate student studying fire science. "I really think we need to emphasize fire more," he says. "Over the years I've mentored many people in this area, and now some of them have businesses of their own. But there's so much work to do there's no real competition among us."

Bruce urges students to get as much practical experience in the forest as possible. "You need that operational experience if you want to practice in BC," he says. "Getting your RPF, for example, is just as valuable if you want to work in a niche area like urban forest conservation".

Industry partners contribute to student learning in wood processing



Thanks to a partnership between 3 companies in the BC forest industry, the Centre for Advanced Wood Processing (CAWP) at the UBC Faculty of Forestry is now home to a customized version of equipment used in sawmills throughout North America. The auto rotation conveyor, scanner, and optimization system was generously donated by **Optimil Machinery**, **Hermary**, and **MPM Engineering**; all local manufacturers supplying sawmill equipment worldwide.

Dr Julie Cool, assistant professor in the department of Wood Science, has spearheaded the project. "I was keen to have equipment I could use to teach sawmilling concepts and expand students' learning experience. I also wanted to showcase Canadian manufacturers – ideally local ones," she says. "The challenge was to find equipment that would fit our available space, since sawmilling machines are typically massive. I also didn't want to compromise what students could learn through hands-on practical experience."

The entire assembly is 34 feet long, weighs about 16,000 pounds, and is capable of scanning logs that are 10 - 12 feet long. The auto rotation conveyor moves the raw log through the scanners that create a digital 3D image of the log, while the optimization system determines the most effective way to cut the log for best yield, highest value, or other parameters that might be programmed into the equipment.

Jason Chiu is the managing director of CAWP, and is excited about the potential uses of the equipment. "Students are already learning the concept of optimization of raw logs, and now they can apply that concept using this equipment. In a workplace situation, they will be able to make better recommendations for quality and value outcomes," he says.

Optimil's donation is the auto rotation conveyor; the piece of equipment that helps move the raw log through the scanner, before the digital image is created. Arlen Dickson manages the service and engineering department at Optimil Machinery.

"Like many projects, this one started with a conversation between UBC and our president, Ross Chapman," he says. "The collaboration made sense for us because a lot of UBC Forestry graduates end up working for companies where Optimil's equipment is operated."

Hermary, a company that provides 3D vision solutions for a variety of industries contributed the scanner. Terry Hermary is a co-partner in the business.

"Once this technology is installed in a sawmill, it's very hard to get up close to it and see what's actually going on. Wood chips are flying; there's a lot of noise," he says. "The equipment we built for CAWP allows students to operate and demystify it. Understanding scanning technology and applying the optimization concept is a real advantage for someone just entering the industry."

The final component of the equipment is the optimization software designed by MPM Engineering, who has been creating sawmill optimization systems for over 30 years. This software helps find the optimal cutting solution for a scanned log based on the intended outcomes of the processing chain.

Rob Danzer is director of MPM. "This equipment will allow students to improve their analytical and decision-making skills. They will take the data from the scanners, build a model that truly represents an individual log, ana-

"Understanding scanning technology and applying the optimization concept is a real advantage for someone just entering the industry."

This equipment will allow students to improve their analytical and decision-making skills. "

lyze the data, and use a set of rules to find the highest value for the desired product," he says. "And then they can figure out how to position a piece of machinery, if it were just downstream, to actually produce that product, and report on the results."

Julie Cool sees additional potential for this equipment. "When you are scanning logs you can begin to connect what happens in the forest with what happens in the sawmill," she says. "The scanner gives you information about curve, diameter, and so on. Since you know exactly where the log came from you can then start linking growth history to certain processing outcomes.

"Ultimately, I'd like to see us harvest a stand of trees, conduct research on it as each log goes through the processing chain, and give feedback of what we learn to the forest managers," she says. "This new conveyor system provides a valuable link in that processing chain, and I'm really looking forward to helping students learn about it."

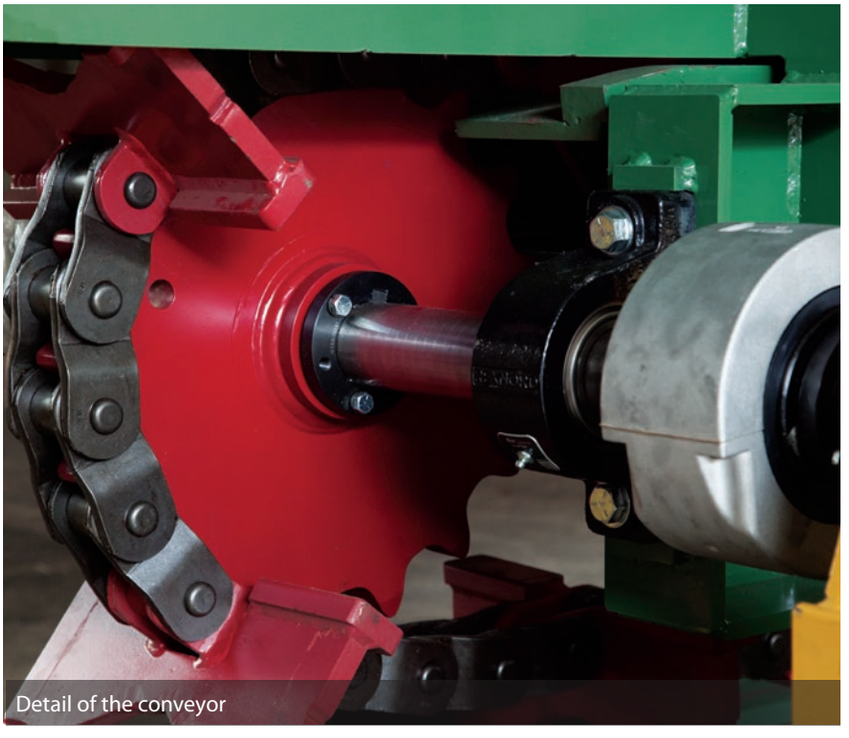
The auto rotation conveyor will be a key learning component in the Sawmilling and Drying course, a third-year requirement in the Wood Products Processing program. An additional undergraduate course is being planned for 2019.

The Faculty is deeply grateful to Optimil Machinery, Hermary, and MPM Engineering for their generous contributions of valuable equipment and technology that will make a difference in applied learning and ultimate job readiness.

If your company is thinking about ways to enhance student learning or research at UBC, please be in touch. Contact Sarah Doran-Coelho at 604.822.0898 or sarah.dorancoelho@ubc.ca.

Terry Hermary (Hermary), Rob Danzer (MPM Engineering), Arlen Dickson (Optimil Machinery)

Taking delivery at CAWP



Detail of the conveyor

LANDONE

In September 2018, the Faculty of Forestry launched an exciting program in partnership with the Faculty of Land & Food Systems (LFS). Land One is a 15-credit integrated course suite for first-year LFS and Forestry undergraduates, where students learn in a small cohort of 50 to 60 individuals. The program aims to improve students' experiences during a major transition in their life – that is, leaving their familiar high-school environments (and potentially their homes) and entering university life. Students also enjoy a dedicated Land One shared space where they can read, study or just hang out.

Students in Land One take core courses together in the same classroom – Math, Biology, Economics and Writing – and benefit from more personalized and immersive education through a Land One Integrative Seminar. Classes in this program revolve around cases illustrating some of the complex issues encountered in the world of forestry and agriculture – sustainability, land use, climate change, and food security, to name a few examples. The intent is to provide students with the competencies to critically think about these wicked problems and the confidence to provide meaningful solutions for addressing them.

Land One promises to generate many other benefits as well. In addition to building a stronger sense of connection of students with their home faculties, it creates a greater sense of community where students feel that they belong to a group of learners, peers and friends. The Land One program also aims to provide personalized mentoring, support and guidance to students when needed and to enhance their education through experiential learning (eg field trips, hands-on activities) and by providing a real-world context as a backdrop to their foundational, first-year courses. Ultimately, our goal is to provide students with a 'toolkit' to increase the likelihood of success in the later years of their education and careers.

All of these characteristics make Land One an excellent choice for dedicated and motivated incoming students, especially those who want a remarkable first-year experience and would like to acquire the necessary skills to tackle complex, real-world problems.

If you would like to learn more about Land One, visit our website: http://landone.ubc.ca/ or email us to: land.one@ubc.ca.

Newsletter production

branchlines is produced in-house by the Faculty of Forestry at the University of British Columbia.
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ISSN 1181-9936

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