

# branchlines

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## IN THIS ISSUE:

- 3 UBC Recognized for Leadership in Wood
- 4 Ground-Breaking MoU Signed With India
- 13 DNA Detection of Pests and Pathogens
- 14 Assessing Regeneration Using Drones (Cover)
- 16 Snow Cover Mapping for Wildlife on a Changing Planet



# dean's message



In this issue of *Branchlines*, we devote a lot of space to sensing technologies. These are becoming increasingly important, and represent a major departure from some of the more traditional forms of forestry. We have had satellite imagery for a long time, but it is becoming increasingly sophisticated, and the detail that can be captured is always increasing, as is the regularity with which that data is captured. This is enabling much more detailed monitoring to be undertaken, as illustrated by the work on snow cover by Zoltan Mityok and Ethan Berman of the Integrated Remote Sensing Studio. Snow cover is one of the things that we have previously taken for granted, but it is changing rapidly as a result of climate change, and those changes are having profound effects on wildlife.

On the ground work is still required, but is being advanced by a number of technologies. Camera trapping is enabling 'eyes on the ground' at multiple locations and for long periods of time, revealing the behaviour of wildlife (and humans) when it is undisturbed by the presence of observers. Audio monitoring is also helping and is being used particularly for monitoring birds. However, interpreting the data takes time and effort, and the work that is being done in Dr. Bianca Eskelson's lab to automate the process is proving exceptionally useful.

Another technology that is becoming increasingly mainstream is the use of unmanned aerial systems (UAVs), more frequently known as 'drones'. UAVs have developed a bit of a bad reputation because of the way that some people are using them. However, it is not the equipment but the operator that is the problem! Used properly, they can provide incredibly useful information, as shown by Tristan Goodbody from the Integrated Remote Sensing Studio.

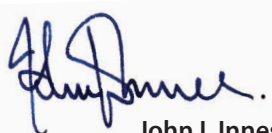
What is particularly interesting is the possibility of combining these technologies to help answer particularly complex problems. We now have the capacity to approach issues that would have taken years and hundreds of observers to deal with in the past. The next step is to ensure that we address some of the most important problems and scientific chal-

lenges that we face – and that funding agencies are strongly supportive of the research that will enable us to do so.

I am very pleased to welcome Sarah Dickson-Hoyle as the second recipient of our prestigious Future Forests Fellowship. Thanks to the generosity of a private Canadian foundation, Sarah is embarking on an incredibly timely project to examine how communities in British Columbia engage in landscape management for fire mitigation and restoration. This is a topic of growing importance given the increases in fire severity and fire season length that we have been experiencing in BC as a result of climate change.

While most of this issue focuses of British Columbia, our international work continues unabated, and I was pleased to see Dr. Guangyu Wang accompanying Minister Catherine McKenna on a recent visit to China. She was developing cooperation with the National Forests and Grasslands Administration of China, the organization responsible for National Parks in that country. Not only were we able to help with that important bridge-building exercise, but the main Chinese partner, Dr. Zonghai Su (who is the Director General of the new Giant Panda National Park) was a visiting professor at UBC Forestry in 2015. We look forward to seeing this relationship develop.

Finally, I would like to welcome the new editor of *Branchlines*, Susan Gagnon. Susan has taken over from Dr. Sue Watts, who edited an astonishing 94 issues of *Branchlines*. I thanked Sue for her work in the last issue, but will do so again here. Susan has been appointed as Assistant Dean Communications, and is developing a strategy for ensuring that all the stories about the fantastic work being done at UBC Forestry reach a range of different audiences. We will be using a variety of means, but I have every expectation that *Branchlines* will continue to be our flagship publication.



**John L. Innes**  
Professor and Dean

# UBC RECOGNIZED FOR LEADERSHIP IN WOOD



“Wander Wood” at the UBC, Vancouver campus

The University of British Columbia (UBC) was front and centre at the 15th annual Wood Design Awards, winning 2 prominent awards that included the Jury’s Choice award for a large-scale robotically fabricated temporary timber installation.

Cited by the jury as having distinguishing detail and textural features, the winning project pavilion, entitled the, “Wander Wood” installation, was designed during a workshop hosted by UBC Forestry’s Centre for Advanced Wood Processing (CAWP) and the School of Architecture and Landscape Architecture in the fall of last year. Among the project team members were UBC project leads **Jason Chiu** and **Jörn Dettmer** of CAWP.

UBC also received the Institutional Wood Design Award: Large for its Campus Energy Centre which features renewable, locally-sourced cross-laminated timber panels supported by glulam columns and 20-metre clear-span beams. The facility also has a

Douglas-fir glulam timber post-and-beam frame.

In addition to winning these awards of distinction, UBC was also invited to be a part of this year’s Wood Design Awards jury, represented by Angelique Pilon, Director of Urban Innovation Research at UBC’s Sustainability Initiative.

More than 100 projects in 14 different categories from locations throughout North America and overseas were a part of the nomination process, and more than 400 architects, structural engineers, developers, and other guests attended this year’s event.

The Wood Design Awards recognize excellence in contemporary design and building with wood and are presented by Wood WORKS! BC, the Canadian Wood Council and its member associations. Support comes from Natural Resources Canada and Forestry Innovation Investment.



# GROUND-BREAKING MoU SIGNED WITH INDIA



The Faculty of Forestry at the University of British Columbia (UBC) recently signed a ground-breaking Memorandum of Understanding (MoU) with India's Ministry of Environment, Forests and Climate Change. The signing marks a significant step in the further development of existing collaboration between the Faculty and 18 forestry

research and education institutes based in India.

Initiatives by the Faculty of Forestry at UBC and various Indian government forest research and education institutions over the past 9 years have yielded numerous benefits. Notable among these benefits are: the training of more than 500 Indian Forest

Service officers from the Indira Gandhi National Forestry Academy; opportunities for UBC students to attend Indian field schools with the Wildlife Institute of India; and a partnership with the Indian Forest Research Institute which led to the organization of the 19th Commonwealth Forestry Conference in Dehradun in 2017, publications and joint research projects.

The signing of the MoU is expected to open doors for an even greater exchange of student researchers, faculty members and post-doctoral fellows between the institutes, as well as provide opportunities for joint large-scale multidisciplinary research projects. Further training activities including joint conferences, seminars, workshops and exhibitions will also be facilitated under the new agreement. The MoU is a significant milestone in further developing this important partnership over the next 10 years.

## MASTER'S PROJECT IN THE FIELD

In January, students from the **Master of Sustainable Forest Management (MSFM)** program travelled to the **Alex Fraser Research Forest (AFRF)** near Williams Lake to meet with Stephanie Ewen, manager and resident forester. For their final semester project, the students prepared a comprehensive sustainable forest management plan for a forest area, through the development of several management scenarios, using appropriate criteria, indicators and modeling software. This year, the students focused on the Gavin Lake area of the AFRF.

They were first given a tour of the research forest and shown various silvicultural systems, the winter harvesting operations, and several research projects. One of the trip's objectives was to understand all of the manage-

ment considerations and constraints in order to formulate potential management scenarios. These considerations included the severe wildfires that burnt over 1,000 hectares of the forest in 2017, the increasing impact of the Douglas-fir beetle, and around half of the forest area being classified as the mule deer's winter range habitat.

The students learned about Stephanie's role as resident forester and had a great experience snowshoeing through the forest. They were impressed to see how one forester can handle so many complex issues simultaneously. For some students, it was a first experience of the interior of British Columbia but most likely will not be their last!

*For more information on the program, contact Deb DeLong at [deborah.delong@ubc.ca](mailto:deborah.delong@ubc.ca)*





# FORESTRY IN PLACE

## SPEAKER SERIES

### INDIGENOUS RELATIONS & LAND-BASED PRACTICES



The Faculty of Forestry's Indigenous Initiatives program hosted a week-long speaker series in March that featured presentations from Indigenous speakers about relationships with the land.

The talks kicked off with Nêhiyaw political science scholar, Denali YoungWolfe who spoke about her PhD project mapping Indigenous sovereignty through assurgency, a term she adopted from the Life Sciences. Denali examines how Indigenous resistance and resurgence are actually a part of assurgent, land-based, and culturally situated practices of Indigenous sovereignty.

Tuesday's talk, led by Anishinaabe legal scholar Kinwa Bluesky, encouraged participants to examine their own relationships with Musqueam territory and what it means to learn from the land.

Wednesday's speaker Sm'hayetsk Teresa Ryan, PhD, discussed her work on the Salmon Forestry Project and how her research interests are aligned with Ancestral Knowledge systems and restoring Aboriginal management of natural resources.

On Thursday, Heiltsuk Tribal Councilor Jaimie Harris and Dr. Stefania Pizzirani discussed their partnership in developing the Heiltsuk Tiny Home project. Their collaborative project focused on developing a community-led housing design that takes into account the community members' social and cultural preferences while accounting for the temperate rainforest conditions of Bella Bella.

The week closed with a panel discussion on Friday which was moderated by Dr. Janette Bulkan with

speakers Seraphine Munroe, Taylor Wale, and Mariko Molander, each presenting a short talk on understandings of consent through the lens of customary and inherent rights of Indigenous peoples.

The Faculty's Indigenous Initiatives program would like to extend its thanks to all who made this event possible, including the presenters, work learn students, volunteers, and attendees, who made time to take part in these discussions.

Several of the lectures from the speaker series were recorded and will be included as part of the Faculty's Indigenous Forestry Information Repository (see page 11).

*For more information, contact Alison Krahn, Program Manager, Indigenous Initiatives (alison.krahn@ubc.ca).*



# ANNUAL SILVICULTURE CHALLENGE REACHES ITS 12TH YEAR

The Silviculture Challenge has become an annual tradition between the School of Environmental and Forest Sciences at the University of Washington (UW) and the Faculty of Forestry at the University of British Columbia (UBC).

The competition was started by **Professor Bruce Larson** and UW **Professor Emeritus David Ford** when Dr. Larson left UW for UBC and Dr. Ford took over the teaching of silviculture at UW. Up until then, Bruce, a silviculturist and David, a forest ecologist,

exchanged a healthy amount of good natured, collegial ‘trash-talking’ over who was better prepared to teach silviculture – an ecologist or a silviculturist. In 2007, David upped the ante and issued a challenge to UBC – come down to Washington and compete to determine which students were better prepared. Since then, the event has continued every year with Professor Greg Ettl taking over for the UW team when David retired in 2016.

Every year, 6 silviculture students are chosen from each school. The 6 students are then divided into 2 teams. Each year, the host school issues a “Challenge” to the other school. The Challenge consists of a silvicultural problem at a given forest stand. The problem is a set of unique objectives and/or constraints for that piece of land (usually 10 to 20 hectares in size). Within a 24 hour period, each of the 4 teams must design a silviculture plan to address the problem.

This year the focus was on a stand located on the Pack Forest (UW’s research and demonstration forest). On the Monday before the competition all 12 students were given the written challenge along with maps and back-

ground information including aerial photos and soil information. Then, on Friday at noon, they were brought to the site and had until dark to collect the information and data needed to construct their plan. After dinner each of the teams retired to a quiet room to work on their plan. At 9:30pm work stopped and the students enjoyed a social evening together hosted by the faculty where they learned about each other, the 2 schools, and forestry practices in the 2 countries.

After breakfast the next day, the teams huddled separately to fine-tune their plan and to prepare and rehearse their 20-25 minute presentations. Work ended at noon and the teams joined each other once again before the afternoon judging. The plans were judged by 3 independent judges from the host school on 3 criteria: innovation, feasibility, and quality of presentation with a plaque awarded to the winning team.

This year the UBC team won, giving the university an overall lead of 7 to 5. Congratulations go out to students Douglas Hodgins, Max Marshall, Fraser Stewart-Barnett, and especially Warren Mayer, Hunter Rigatti, and Xin Yang who had the winning presentation.

**Bruce, a silviculturist and David, a forest ecologist, exchanged a healthy amount of good natured, collegial ‘trash-talking’ over who was better prepared to teach silviculture; an ecologist or a silviculturist “**



Bruce Larson (centre left) with the UBC and UW teams 2019



# NEW APPOINTMENTS



## Emily Cranston

Dr. Emily Cranston has joined as an associate professor in the Departments of Wood Science, and Chemical and Biological Engineering. She is also the UBC President's Excellence Chair in Forest Bio-Products and previously held the Canada Research Chair in Bio-Based Nanomaterials. Emily's research focuses on sustainable nanocomposites and hybrid materials from cellulose and other biopolymers. She holds a PhD from McGill University and completed a postdoctoral fellowship at KTH Royal Institute of Technology in Sweden. Previously she was an associate professor in chemical engineering at McMaster University.

Emily is excited to join the strong team of researchers at UBC focusing on the science and engineering of lignocellulosic materials and participating in training new students (and skiing in her free time!). She can be reached at [emily.cranston@ubc.ca](mailto:emily.cranston@ubc.ca).



## Susan Day

Dr. Susan Day has joined the Faculty as the new program director for the Bachelor of Urban Forestry program and professor of urban forestry in the Department of Forest Resources Management.

Susan's research focuses on managing urban soils to enhance tree growth and longevity in the context of urban challenges such as stormwater mitigation, land development, and building construction. Susan holds a PhD in Forestry from Virginia Tech and a Master's from Cornell University. Previously she was associate professor of urban forestry at Virginia Tech where she was instrumental in the development of the urban forestry program and its eventual accreditation by the Society of American Foresters. She has extensive experience in interdisciplinary curriculum development and is excited to create new opportunities for urban forestry students. She can be reached at [susan.day@ubc.ca](mailto:susan.day@ubc.ca).



## Cristiano Loss

Dr. Cristiano Loss has joined the Department of Wood Science as an assistant professor and the Associate Chair in Wood Building Design and Construction. Before arriving at UBC, Cristiano was a member of the research group responsible for developing the Italian seismic design guidelines for timber structures. He holds a PhD in Engineering of Civil and Mechanical Structural Systems and was a post-doctoral fellow and instructor in timber engineering at the University of Trento.

Since his arrival to UBC, Cristiano has formed the Advanced Wood Building Systems Engineering Lab. The objective is to generate a research cluster for the development of high-performance wood-based systems and structures and related performance-based optimum design procedures for the next generation of mid and high-rise buildings. He can be reached at [cristiano.loss@ubc.ca](mailto:cristiano.loss@ubc.ca).



# AWARDS AND RECOGNITIONS

## SUSTAINABLE FOREST MANAGEMENT EDUCATION PROGRAM RECOGNIZED BY IUFRO

Congratulations to the **Asia Pacific Forestry Education Coordination Mechanism** (AP-FECM) for being recognized for their outstanding work in the International Union of Forest Research Organization's (IUFRO) Global Competition on Best Practices in Forest Education.

AP-FECM is a winner in the category of tertiary education for its work on the "Innovative Sustainable Forest Management Education in the Asia-Pacific Region" program. The program offers innovative methods to transform forestry education.

It includes a global online community platform, award winning online courses, the use of emerging technology, and an effective team-based model for course development and operations. There are currently 5 free massive open online courses that can be accessed at [sfmcourses.com](http://sfmcourses.com) and 10 more courses in development.

The AP-FECM is comprised of 58 member organizations and its executive office is hosted by the **Asia Strategies Team** at UBC's Faculty of Forestry.



## McTAGGART COWAN LIFETIME ACHIEVEMENT AWARD

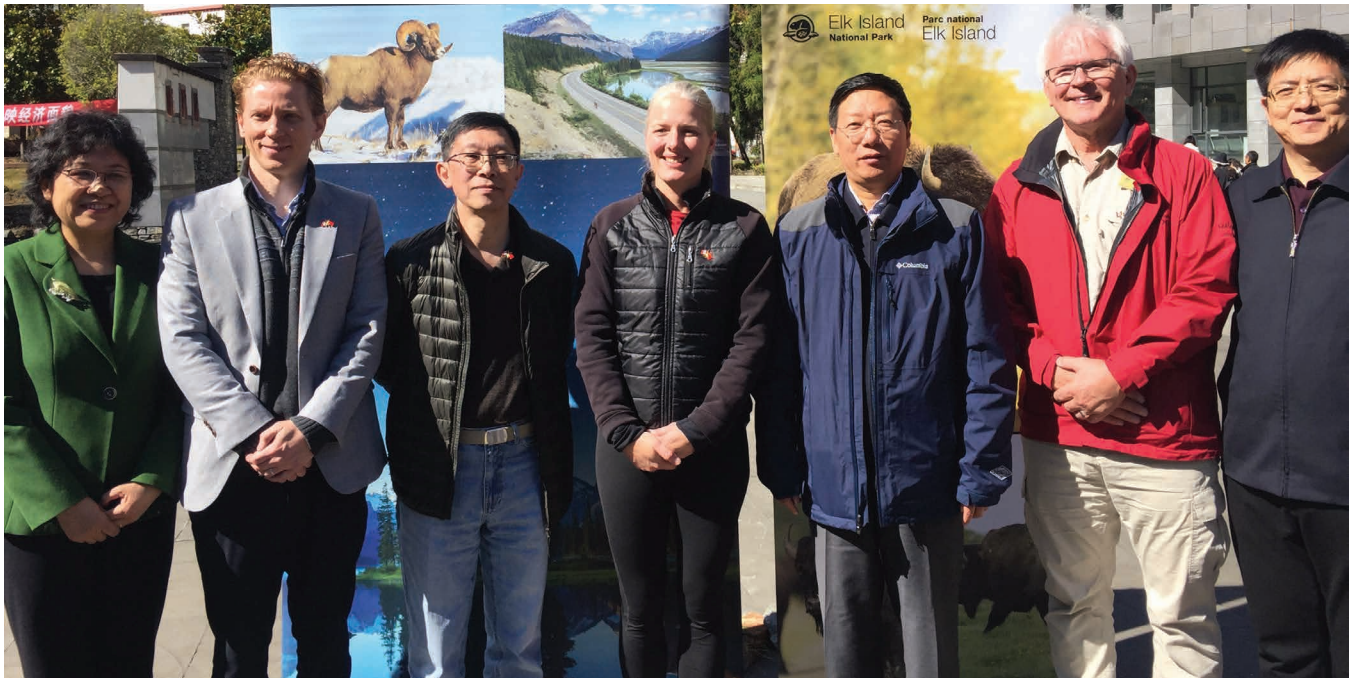
Congratulations to **Dr. Fred Bunnell**, Professor Emeritus at the Forest and Conservation Sciences Department for receiving the Ian McTaggart-Cowan Lifetime Achievement Award from the Canadian Section of The Wildlife Society. The award recognizes individuals who have made outstanding contributions to the understanding, conservation, and/or management of wildlife in Canada over their career. Dr. Bunnell has received more than a dozen national and international awards, but finds this award special – McTaggart-Cowan was his hero as an undergrad at UBC before leaving to study abroad.



Dr. Bunnell (pictured left) receiving his award



# CANADA-CHINA COOPERATION ON CONSERVATION



The Faculty of Forestry's **Asia Forest Research Centre (AFRC)**, led by Dr. Guangyu Wang, associate dean at UBC's Faculty of Forestry has focused its research on supporting China's conservation efforts. As part of this, the AFRC facilitated an international learning initiative on sustainability in China, engaged in research on China's pilot national park system, and fostered strong relations between China and Canada's respective national park systems.

Last May, the Go Global Initiative introduced students to the way in which forests are managed in China. One of its courses, Exploring Forestry and Conservation in China, was launched to encourage participation from students with varied backgrounds comprising students and faculty from UBC's Faculties of Forestry, Science, and Applied Science. The course provided them with hands-on opportunities to examine both the ongoing development of the Chinese forest and wood industry, as well as its conservation efforts. This involved lectures that took place in Nanjing Forestry University

with field trips to nature reserves, local industries, and plantation areas in the subtropical province of Fujian. Next year, the AFRC will launch an Ecological Restoration and Urban Forestry course giving students the opportunity to learn from scholars from Beijing Forestry University and attend field trips to discover conservation and landscape management techniques in Inner Mongolia.

AFRC has also spearheaded research studies to enhance the management of China's developing national park system. The 2 research projects, conducted on 10 pilot parks, involve comparative analyses of best practices in national park management in countries with over a century of park management experience, and an evaluation of the challenges and opportunities for success in China's pilot national park system. As part of this endeavour, the AFRC received two delegations of forestry professionals from China's National Forestry and Grassland Administration (NFGA) and Fujian province, and facilitated training events for them with Parks Canada.

The AFRC also worked with Parks

Canada in their efforts to support protected areas in China. Late last year, Dr. Wang accompanied Catherine McKenna, Canada's Minister of Environment and Climate Change, to Sichuan province in China where several agreements were signed. The first was with China's NFGA to further strengthen protected area cooperation between the 2 countries. The second was a twinning agreement between Canada's Jasper and Elk Island National Parks and China's Giant Panda National Park. The Director General of Giant Panda National Park, Dr. Zonghai Su, was a UBC visiting professor in 2015 and this was part of a renewed MOU between both countries to promote bilateral cooperation for the mutual benefit of the parks. Future collaboration is expected between the AFRC, Parks Canada and the NFGA.

Many strides have been made by the AFRC in support of China's conservation efforts. With networking, research, training workshops, new courses and international conferences lined up in China and the Asian-Pacific region, the AFRC team anticipates an even more productive year!



# 3MT WINNER USES COMPUTER MODEL FOR BIRD SONG



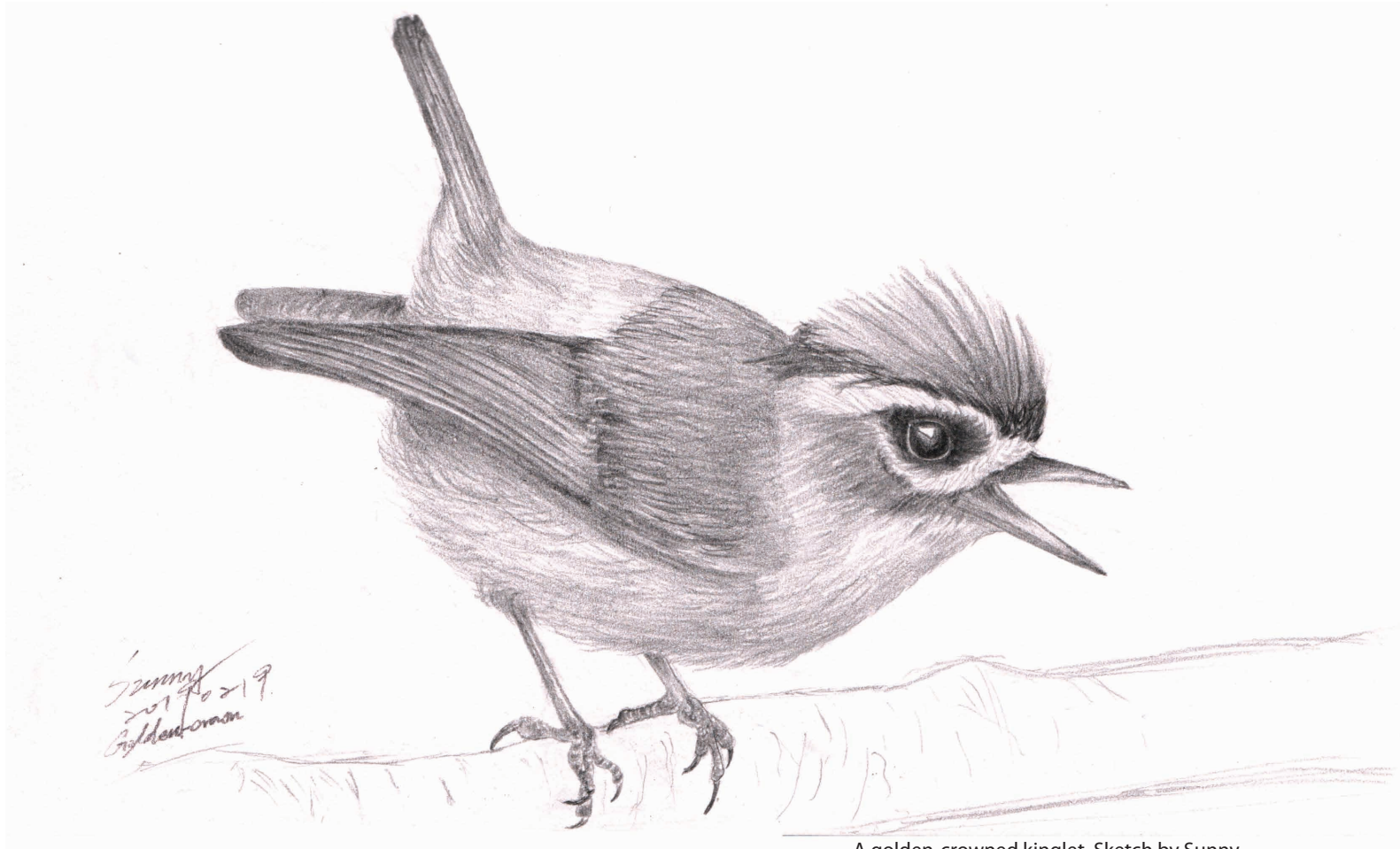
First prize winner, Sunny Tseng

Congratulations go out to **Sunny Tseng**, MSc Forestry student from **Dr. Bianca Eskelson's lab** for winning 1st place for her presentation, *Automatic Bird Sound Detection* in the Faculty of Forestry's Three Minute Thesis (3MT) competition. Sunny was among a group of semi-finalists who competed this year on topics ranging from the effects of road perception on grizzly bear movement to monitoring forest fires with nanosatellites to changes in urban green spaces since the 1980s.

Sunny's talk centred around a computer model she designed to detect bird songs in audio recordings. She tested the model on 15,000 recordings and found 90% accuracy in detecting bird sounds when there was a bird actually singing in the recording. Moreover, she found that the detection was nearly 50 times faster than that of humans. Her model underscores the fact that, more and more, researchers are using audio data because of its efficiency and accuracy.

The 3MT is an academic competition for graduate students that fosters presentation and communications skills. Founded by the University of Queensland in 2008, the popularity of the competition has steadily increased worldwide with UBC hosting since 2011. Participants have just 3 minutes to explain the breadth and significance of their research project to a non-specialist audience.

The presentation can be viewed on the UBC Faculty of Forestry YouTube channel.



A golden-crowned kinglet. Sketch by Sunny.



# MORE STUNNING IKEA “HACKS”

The end of the school term in the lab of the Centre for Advanced Wood Processing building means one thing – the transformation of inexpensive Ikea stepstools into beautiful, refined works of art. This year didn't disappoint with 55 4th year **Wood Products Processing** students presenting a colourful, creative and lacquered medley of pieces to die for. Taught by professor **Phil Evans**, the students received hands-on education in industrial coating technologies for value-added wood products and will leave the course with mementos that last a lifetime. Visit the Faculty of Forestry Facebook page to view examples from this year.



# INDIGENOUS FORESTRY INFORMATION REPOSITORY

The Indigenous Forestry Information Repository (IFIR) is a new in-house, faculty-specific resource for instructors, researchers, and staff at the Faculty of Forestry. The IFIR was created earlier this year in response to feedback from students and faculty interested in expanding the Indigenous content in the Faculty's curricula. It helps to fulfill the commitments to Indigenize curricula and public programming outlined in UBC's 2018 Indigenous Strategic Plan and the Faculty's Strategic Plan.

Led by Program Manager of Indigenous Initiatives, **Alison Krahn**, along with a team of faculty, researchers, students, and members of the First Nations Council of Advisors, the IFIR is organized primarily into "intensives" which focuses on a broad range of topics regarding Indigeneity and forestry. These include engagement, land, governance and story work and others. Each intensive contains 3-5 courses and modules.

The IFIR is hosted on a CANVAS page (an online, learning management

system) and is designed to be easily incorporated into existing courses with ready-to-go classroom materials including facilitators' guides, lecture slides, and assessment pieces.

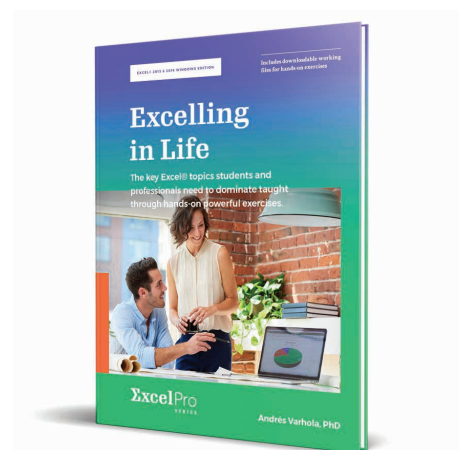
Those in the Faculty who wish to access the repository or have questions may contact Alison Krahn, Program Manager, Indigenous Initiatives at [alison.krahn@ubc.ca](mailto:alison.krahn@ubc.ca). She and her team also welcome contributions and feedback as they continue to grow and develop the project.

# EXCELLING AT SPREADSHEET SKILLS

As an instructor in forestry and earth sciences, **Dr. Andrés Varhola** recognized a gap in his students' skills. He spent a lot of time teaching basic Excel® so they could complete assignments, rather than focusing on the underlying hydrology or climatology content.

Not finding the ideal Excel® text-book in the market to overcome this,

Andrés decided to tackle the issue directly. Described as a "short book about Excel® that entertains," he wrote *Excelling in Life* as a fun and friendly hands-on guide for readers of all backgrounds that meaningfully improves their spreadsheet proficiency. The book is available in print and digital formats through Amazon or [excelpro.com](http://excelpro.com).





# CANOPY GAPS AND MULE DEER WINTER RANGE

*David G. Hamilton*



UBC's Alex Fraser Research Forest Knife Creek block UAS overflight mapping, November, 2018

The maintenance and enhancement of mule deer winter range is the primary management objective of the UBC Faculty of Forestry's Alex Fraser Research Forest (AFRF). However, over the past several years, the AFRF has experienced an outbreak of Douglas-fir beetle in the Knife Creek block near 150 Mile House. This has resulted in the death of ecologically and economically valuable Douglas-fir in the forest. In response, and with the objective to preserve the mule deer's winter habitat, the AFRF is making single-tree sanitation also part of its primary objective management practices.

Single tree sanitation operations involve the removal of individually infested Douglas-fir. The objective of these operations is to realize the economic value of the timber killed by the beetles before it decays. Single-tree sanitation is an expensive and time-consuming process that requires skilled surveyors, harvesters, and operators to extract individually affected trees from the stand. The harvested trees are then removed from the forest with the waste produced from harvesting burned on site in order to remove the Douglas-fir beetles contained in the infested trees. The resulting canopy openings reduce the landscape connectivity and fragments the mule deer habitat.

In order to reduce habitat loss and increase landscape connectivity over the long term, the AFRF is legally obligated to replant and manage all canopy openings greater than or equal to 0.1 hectare that have been created as a result of salvaging opera-

tions. As the assistant operations manager of the AFRF, and as part of my master's in geomatics and environmental management (MGEM) I studied the impact of sanitation harvesting on the mule deer winter range habitat.

Measuring forest stand characteristics using unmanned aerial systems (UAS) or drones in order to improve forest inventory collection has become a major area of study because it provides accurate inventory data to help make informed management decisions. Research has shown that UASs can collect aerial photography to detect canopy openings with greater time and financial efficiency than using ground surveying. For these reasons, UAS systems were selected to test the efficacy of canopy gap detection in the area.

The objective of my project was to determine if UAS photogrammetry is a feasible way to detect sanitation openings. All openings greater than 0.1 ha and created by sanitation harvesting will be detected by mapping the non-forest areas and validated using the orthomosaic image.

The results are expected before the summer planting season of 2019 and will be used to plan objectives for the management of the Knife Creek block of the AFRF. The aspiration is to maintain the habitat of mule deer in the face of the Douglas-fir beetle infestation.

*David G. Hamilton is the Assistant Operations Supervisor UBC's Alex Fraser Research Forest. He may be reached at [David.Hamilton@ubc.ca](mailto:David.Hamilton@ubc.ca).*



# DNA DETECTION OF PESTS AND PATHOGENS

*Arnaud Capron*

In the never-ending battle against pests and pathogens, correctly identifying the opposition is the first step in the fight. This requires visual inspections, often followed by microscopic observations. Increasingly, genomics has become an integral part of the toolbox of forest health experts. DNA detection, using a method called Polymerase-Chain Reaction, or PCR, is an extremely sensitive and accurate method that can recognize the genetic fingerprints of pathogens or insects directly from environmental samples.

As the threat from Forest Invasive Alien Species (FIAS) has increased in concert with the growth of international trade, the need for fast and effective biosurveillance tools is more critical than ever to the protection of Canada's forests. Unchecked, FIAS could cost an estimated \$2 billion a year to Canada due to export restrictions. Along with Professor Richard Hamelin's team, I developed DNA-detection assays for the detection of several FIAS. Among them are 2 of the "most wanted" organisms on the Canadian Food Inspection Agency's list: *Phytophthora ramorum*, the agent responsible for Sudden Oak Death and *Lymantria dispar asiatica*, the Asian Gypsy Moth. Those assays are now helping to determine potential incursions in Canada and the US.

DNA testing is still conducted in laboratories that require specialized equipment and expertise. To democratize DNA testing it is essential to bring it into the field and into the



Richard and Arnaud checking the portable instrument in the field

hands of the people who need it most. Our team has decided to tackle this challenge.

As part of this challenge, I repurposed a miniaturized portable battery-operated instrument; a type of tool initially developed for the detection of bioterrorist threats for the military, and applied it to the detection of forest pests and pathogens. This resulted in a complete field-ready, sample-to-data protocol, with a simple "tool-less" DNA extraction and amplification method that works on leaf tissue and insect material and can be performed in the field. I further devised a DNA amplification mixture that is stable at room temperature for up to a year (unlike regular mixtures that require refrigeration) and pre-loaded in small plastic strips. Assembling the reaction only requires adding the extracted samples to this strip and placing it in the portable instrument and - voilà! This entire portable lab can fit in a small backpack so that DNA testing can be done in the most remote places. What's more, the instrument is cellular, Wi-Fi and GPS-enabled so that results can be uploaded to the cloud in real-time. Richard and our team envision having foresters and technicians carry their portable labs so that forest health surveys can be done on site and in real-time in the future.

*Arnaud Capron is a research associate in Richard Hamelin's Forest Pathology Lab in the Faculty's Department of Forest and Conservation Sciences. He may be reached at [acapron@mail.ubc.ca](mailto:acapron@mail.ubc.ca).*



Asian gypsy moth *Lymantria dispar*



# ASSESSING REGENERATION USING DRONES

*Tristan Goodbody*



Forest regeneration following harvest comprises an important aspect of forest stewardship. In order to ensure that harvested stands regenerate to emulate their pre-harvest state, silvicultural strategies must be established to maximize the potential for successful reforestation. Natural regeneration, where stands are left to regrow with little-to-no human intervention, offer substantial reductions in silvicultural costs, but provide little control over the distribution, density and content of re-establishing forests.

These attributes, often fundamental to effective silviculture planning, play important roles in the future quality and quantity of timber and non-timber attributes, as well as the rate of forest growth. Given that the long-term ecological and socio-economic sustainability of forests is globally important, artificial reforestation, often in the form of replanting nursery-grown trees, seed dispersal and soil scarification, (disturbing the forest floor in a controlled manner), are critical for ensuring that forests regenerate. These operations are among the most commonly conducted silvicultural strategies to replace a harvested area with new forest.

To understand whether or not our methods are succeeding, data on the stocking density, health and composition has to be routinely acquired. Traditionally, this data is manually collected through field sampling which is cost and time-intensive and

often acquired over vast areas of forest. For example, publicly owned land in British Columbia could require over 1 million hectares of surveys to be conducted annually. Therefore, there is a need to establish efficient and cost-effective ways to provide silviculture inventory data. My PhD thesis primarily focused on enhancing forest inventories using remote sensing to better understand the potential of taking measurements from photos to improve inventory data and, by extension, strategies. By creating 3D models of forests using aerial imagery, digital photogrammetry provides useful inventory data on the spatial distribution and structure of forest resources.

To better understand the role digital photogrammetry can play, I tested the potential of using unmanned aerial systems (UAS), commonly referred to as drones. My completed study focused on the applicability of digital photogrammetry using UAS aerial imagery for inventorying regenerating stands of differing ages near Quesnel, BC. This region has a long history of resource management, with forestry being a socio-economically important industry. The goal of my study was to determine the effectiveness of UAS imagery and 3D point clouds for detailing the spatial distribution and structure of regenerating stands approximately 5, 10 and 15 years since planting.

The stands chosen for the study were similar in size, aspect,



slope and species composition. Field samples were collected where coniferous and deciduous tree numbers were tallied, and level of deciduous competition and bare ground cover were estimated. Plot centres were marked with high-visibility spray paint to simplify locating them with future imagery. Following field sampling, imagery was acquired using a commercial grade UAS about 100 m above ground. The UAS was flown in a pre-programmed grid pattern to ensure a significant amount of overlap in photos. Overlap is essential for producing 3D digital photogrammetric point clouds.

Along with point clouds, orthoimagery, (the geometric correction required to compensate for lens distortion), also greatly benefits from the generation of high imagery overlap. Orthoimagery is created by merging aerial images together so that the given perspective is from directly above the ground. This means the very top of objects like trees can be analyzed. The orthoimagery was further processed to generate vegetation indices, which are ratios of spectral data, (red, green and blue information the camera sensor collects). These ratios are useful for providing information about forest cover that we may not be able to derive with the original imagery. I wanted to determine whether these ratios could provide data that would otherwise be missed.

I then combined the 3D point cloud data with the processed imagery to see whether their grouping was effective at helping to differentiate between conifer, deciduous and bare ground. To do this, I used an approach called object-based image analysis, which segments input data based on the combined 3D point cloud and imagery inputs. Object-based image analysis creates segments from input data where they have similar statistical information. Simply, the statistics are classified to provide a means of analyzing the spatial distribution of regenerating forests as well as their structural information across ages.

This study helped to outline the potential of UAS acquired imagery for quickly, accurately and reliably providing highly-detailed spatial and structural information on forest regeneration. These data greatly increase available managerial data to determine the spatial distribution of regeneration on the land-base, while providing details about their structure through time. This methodology could be adopted to determine the effectiveness of silvicultural strategies, applied treatments such as deciduous brushing or replanting initiatives and ensuring that legislative obligations are being upheld. This approach provides an abundance of spectral and structural information that can be tracked through time, enabling multi-temporal silvicultural inventories and opportunities to project growth estimates through time. These data could also facilitate improved tracking of regeneration success for due diligence purposes. Given that forest regeneration obligations are auditable, the acquisition of imagery and structural data provides evidence for why managerial decisions were made, thus reducing managerial risk, and improving the quality and quantity of data for evidence-based decision making.

*Tristan Goodbody is a post-doctoral fellow in Dr. Nicholas Coops' Integrated Remote Sensing Studio. He defended his PhD thesis in March 2019. Tristan can be reached at [goodbody.t@gmail.com](mailto:goodbody.t@gmail.com).*



Drone imagery of stand regeneration at 5 years



Drone imagery of stand regeneration at 10 years



Drone imagery of stand regeneration at 15 years



# SNOW COVER MAPPING FOR WILDLIFE ON A CHANGING PLANET

*Zoltan Mityok & Ethan Berman*



Snow dynamics influence more than just the quality of our ski season. They are important drivers of wildlife behaviour, including the seasonal behaviour of many species. In addition, they can impact wildfire dynamics and, let's not forget, worldwide seasonal snowmelt provides water for more than one billion people. Finally, with climate change also influencing the spatial and temporal characteristics of snow, it is vital to better understand how shifting snow patterns impact a range of ecosystem processes, now, and in the future.

As MSc students based in UBC's Integrated Remote Sensing Studio, we have been hard at work constructing fine-scale resolution snow cover

maps and using them to explore how snow influences grizzly bears and mule deer throughout the year. We believe that the results of our analyses will strengthen land managers' informed decisions as they tackle the challenges of climate change and wildlife conservation.

In landscapes with harsh seasonal conditions, snow cover can dictate food quality and distribution, and, along with cold temperatures, can result in patterns of hibernation and migration. For hibernating species such as grizzly bears, the accumulation of snow in the fall and melt in the spring may influence where and for how long they den. In addition, once they

emerge from their dens, the patterns of snow melt can impact habitat selection since valuable food resources are often frozen underground.

For migrating species, such as mule deer, the extent of snow cover plays an important role in how and where deer select their winter range. Migration is the invaluable adaptive behaviour that allows hooved animals such as mule deer to optimize seasonal needs. This dynamic part of their life cycle is especially important during the winter. Not only is a great deal of forage buried under snow pack during winter months, but deep snow can cause them to exert much more energy compared to when the same area is snow-free dur-



ing warmer periods. Mule deer must therefore work harder to find winter range habitat that has enough canopy cover, unburied forage and limited snow cover in order to survive the year's most arduous season. Moreover, habitat loss is believed to be affecting mule deer survival. We therefore must work equally as hard to mitigate winter range habitat loss, which can only be achieved by first identifying those areas that provide the right conditions for deer survival.

Using his newly developed, daily produced snow-cover data, which spans a large part of Alberta and factors in the time period 2000 – 2018, Ethan has formed a base-line relationship for how a threatened grizzly bear population in west-central Alberta uses the landscape in relation to spring snow conditions. He found that, annually, during the period following den-emergence until the end of May, the bears are more likely to use areas where a lower percentage of ground is under snow cover and where the snow melts sooner. Given future regional climate projections for warmer spring weather and fewer days with snow on the ground, these findings have important management implications for threatened bear populations. Human-caused mortality is the most significant factor influencing bear survival if grizzly bears are choosing to use areas with less snow in the spring as they are more likely to encounter humans who tend to populate lower-elevation, snow-free areas. Moving forward, fine-scale snow data can be used to gain insight into which parts of the landscape consistently melt sooner and are used by bears during the critical spring months. This knowledge can then be passed on to land managers to help inform decisions regarding safe and sustainable human-bear coexistence.

Zoltan has also developed snow maps that have raised the bar in terms of quantity and quality, being both produced daily and provided at a finer resolution of 30m per pixel. Together, we are able to produce improved snow maps by fusing satellite imagery from 2 of the most well-known satellite systems: *Moderate Resolution Imaging Spectroradiometer (MODIS)* and *Landsat*.



Zoltan and Ethan in the field near Lillooet, BC

By fusing snow cover maps together within his area of study in south-central British Columbia, Zoltan was able to determine which characteristics of snow cover influence mule deer when selecting winter ranges and quantify the range of canopy cover, forest edge, forage and bare ground they select within such habitats.

The area studied largely includes the St'át'imc First Nation territory extending from Garibaldi Provincial Park to just south of the Cariboo Chilcotin Coast region. The St'át'imc are concerned about their territory's declining mule deer populations which, both presently and historically, have provided their communities with sustenance and are considered integral to their cultural identity. St'át'imc First Nation's government staff and elders have partnered with UBC to conduct this research and have heavily influenced the focus of the study. Many benefits were born out of this partnership, particularly the increase in shared knowledge, and the strengthening of relationships between St'át'imc Government Services and UBC. Zoltan has been able to share with and organize new datasets for St'át'imc and will run a technical training workshop for St'át'imc government staff later this year. Concurrently, St'át'imc have

provided essential local and traditional knowledge, which has helped to form the research design and locate mule deer migration routes. With a better understanding of how the timing, extent and duration of snow cover affects where mule deer seek out winter range, St'át'imc First Nation, forestry, and conservation groups can work together to identify and prioritize areas that need to be conserved and improved for mule deer populations.

Advances made in fine-scale snow mapping can lead to a better understanding of how wildlife species use their habitat. Moreover, fused snow maps may now be used to better estimate flood water volume, identify long-term trends of snow cover to gauge climate change impacts and, perhaps one day, even measure snow depth from space. Insights gained from wildlife research and snow dynamics are essential for smart and sustainable management practices for the present, and for generations to come.

*Zoltan and Ethan finished their master's degrees in Nicholas Coops' Remote Sensing Studio in the Faculty's Department of Forest Resources Management. They may be reached at zoltan.k.mityok@gmail.com and bermane@gmail.com respectively.*



# FELLOWSHIP WINNER RESEARCHES FIRE AND COMMUNITIES



PhD student **Sarah Dickson-Hoyle** (above) is the second recipient of the **Future Forests Fellowship**, the largest award in the world for an incoming doctoral student in forestry.

The Future Forests Fellowship is made possible by a private Canadian foundation, which created it to draw attention to how forestry research impacts global issues. It is awarded to a student whose intended studies fit within one of the Faculty's areas of excellence and who is starting their first doctoral degree.

Sarah will receive \$70,000 per year for 4 years to pursue her research in fire science and the interface between ecological restoration and wildfire management. She is co-supervised by Dr. Lori Daniels and Dr. Shannon Hagerman.

Sarah received dual Bachelors degrees in Arts and Science, and a Masters degree in Forest Ecosystem Science, from the University of Melbourne, Australia. "My BA is in human geography and my BSc is in botany," she said. "The opportunity to combine these 2 disciplines allowed me to explore the relationships between social and environmental science."

Partway through Sarah's undergraduate studies, the State of Victoria was hit by a series of bushfires (wildfires) in February 2009. The Black Saturday bushfires burned over 450,000 hectares, destroyed over 3,500 buildings and left 173 people dead. One of many responses to these fires was the development of new courses and research at the University of Melbourne and Sarah decided to focus her studies on fire ecology and management.

"I decided almost then and there that I wanted to work with one particular professor and pursue graduate research in fire social sciences," she says. "I developed a tailored Masters course plan with my advisor and conducted research into community-based prescribed burning and grassland conservation in rural Victoria."

Throughout her academic career, Sarah has been an active member of the International Forestry Students' Association (IFSA). Through her involvement in IFSA,

Sarah has attended and presented at a number of international science-policy conferences.

In 2014, Sarah attended the International Forestry Students' Symposium hosted by students from UBC, Thompson Rivers University, and the University of Northern British Columbia. There she established connections that would eventually lead to her application for the Future Forests Fellowship.

"I stayed in touch with UBC on social media, and was on the mailing list for Branchlines," she says. "Then I met Dean Innes at a conference in Cairns in 2017 just as applications for the Fellowship were opening."

Sarah is currently in the design phase of her research project, which will look at how communities in the south-central Interior of BC engage in landscape management for fire mitigation or restoration.

"I'm interested in the different capacities, knowledge and histories of these communities," she says. "It goes beyond consultation. What does it actually mean to integrate diverse forms of knowledge into fire management strategies? What existing capacities are there, and how can they be supported? How can collaborative management approaches restore both ecological and cultural values in BC's fire-prone landscapes?"

"I'm really looking forward to going to these communities and having some deeper conversations in the near future."

Sarah is grateful for the opportunities afforded by this Fellowship. "I feel that receiving this fellowship reflects the fact that wildfire is a pressing issue that needs multiple approaches in the ways we manage and restore fire-prone ecosystems," she says. "In addition, this financial support gives me the time to focus exclusively on my research and to volunteer with IFSA's training and mentoring programs."

The Fellowship is a clear expression of the impact of philanthropic support on graduate-level research. The Faculty is deeply grateful to the private foundation that made this landmark contribution.



# MEET THIS YEAR'S ALUMNI BUILDER AWARD RECIPIENT



Bruce Blackwell receiving his Alumni Builder Award from Dean Innes

To celebrate its 100th anniversary, *alumni ubc* created the Alumni Builder Awards in 2017. These awards recognize alumni who, in their own way, have made important contributions to the success of UBC and its alumni community.

The Faculty of Forestry congratulates **2019 Alumni Builder Award recipient Bruce Blackwell** BSF'84, MSc'89 whose professional career and volunteer contributions have enriched forestry, community and the Faculty.

Growing up in Vancouver, Bruce Blackwell started his academic career at UBC studying biology before transferring to Forestry and completing a BSF in 1984.

Bruce graduated during the recession but eventually 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 Masters research. His thesis on the effects of prescribed fire on soils, vegetation, and fuels was the foundation of his professional career.

Since completing his Masters at UBC in 1989, Bruce has built a thriving consulting business with a focus on integrated forestry and environmental consulting services. Bruce's firm has been involved with strategic planning

for Vancouver's urban forests, the 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, he and his team have developed numerous

wildfire protection plans and wildfire risk management systems across British Columbia and Alberta.

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 Professor Lori Daniels joined the Faculty, and is a popular guest-lecturer in her course. He's also been a volunteer speaker at the Student Industry Networking evening, offering advice about careers in forestry and last year generously gave his time to be on 2 panel discussions being hosted by the Faculty on wildfires.

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.

*If his profile reminds you of another exceptional alumnus, let us know. Stories of connection, engagement and contribution are always welcome. Contact Michelle Lindsay, Alumni Engagement Manager at [michelle.lindsay@ubc.ca](mailto:michelle.lindsay@ubc.ca) or 604.827.0297.*



Bruce's firm has been involved with the strategic restoration of Stanley Park following the 2006 blowdown



## LETTER FROM THE EDITOR

Dear Branchlines Readers,

I would like to introduce myself to you as the newly appointed Assistant Dean, Communications for UBC's Faculty of Forestry. It is truly an honour to have the opportunity to work with Dean Innes and the many who comprise this remarkable, innovative, world-renowned Faculty.

My responsibilities in this role are comprehensive; one of them is editing *Branchlines*. I proudly accept the "Branchlines torch" passed on from Dr. Sue Watts who previously edited 94 issues and now continues in the Faculty as a valued lecturer, mentor and teacher of communication skills to graduate students.

Over the coming months, I look forward to developing the strategic direction of the communications program for the Faculty. A large component of this will involve communicating the many amazing stories of the Faculty's research, educational programming, service and initiatives through *Branchlines* as well as our many other media channels.

Should you wish to contact me, please do not hesitate to email me at [susan.gagnon@ubc.ca](mailto:susan.gagnon@ubc.ca).

Warm Regards,

**Susan Gagnon**

Assistant Dean, Communications

## CALLING ALL ALUMNI TO STAY CONNECTED

Keep your email address up to date with the alumni office to stay informed on upcoming events, reunions, and to receive the monthly e-newsletter.

If you are not already receiving these emails, we'd love to connect! Simply email Michelle Lindsay at [michelle.lindsay@ubc.ca](mailto:michelle.lindsay@ubc.ca) with the subject "Here I am." In the body of your email please write your full name, degree and graduation year. From there, we will sign you up and your Faculty of Forestry alumni emails will start arriving.

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

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