

branchlines

Volume 28#2 Summer 2017



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dean's message



This issue of *Branchlines* is unusual in that it doesn't have an article specifically about wood products derived from

forests. However, many of the articles refer to other "goods and services" provided by forests, reflecting the growing interest in the broad suite of benefits provided by forests. Research into these benefits is increasing, and goes far beyond the traditional view of forestry. However, appreciation of these benefits is embedded in the concept of sustainable forest management, with the recognition that forest management must attempt to balance the many different goods and services provided by forests.

The benefits provided by forests are not always obvious. Two articles in this issue deal with health – of salmon and of humans. Trees provide shade for streams, which in turn helps to reduce stream-water temperature increases. Salmon, which may already have been weakened by disease or stress, are adversely affected by increases in water temperature, and with the warming associated with climate change, maintaining shade levels in forest streams is going to be increasingly important. Amy Teffer's research on salmon suggests that water temperature is critical. Her work also suggests that fish caught in gillnets and subsequently released have increased rates of mortality prior to spawning, and that these rates of mortality are increased by higher water temperatures, a finding of considerable significance.

Shade is also important for humans. With temperature records continuing to be broken, the importance of shade trees in urban areas is being increasingly quantified. The value of the shade provided by street trees has long been recognized around the world, although this is not always recognized by urban planners. The respite offered by high-quality green areas in cities is also well-known, but only now beginning to be fully understood. Research is indicating that trees in urban areas provide many other health benefits, and the work of Matilda van den Bosch and her colleagues is providing important clues to improving the health of our urban populations through the provision of high-quality green spaces. Such research is able to take advantage of evolving techniques to measure stress levels in people and is thus adding a quantitative element

to what has previously been a very qualitative area of study.

Nutrition is another important aspect of human health, and the links between forests, nutrition and human well-being are being increasingly recognized. These links are not restricted to developing countries, although this is where they are particularly noticeable. In Canada, the well-being of Indigenous people is being increasingly tied to their ability to access traditional foods. However, it is not only about access, and there is an urgent need for traditional knowledge to be maintained. The work being done by Tonya Smith and Janette Bulkan with the Lílwat First Nation is doing precisely this.

Within sustainable forest management, the maintenance of biodiversity is a critical criterion. The article on the conservation of spectacled bears by Nina Morell brings together camera trap data and remotely sensed data to enable coarse-scale conservation prioritization. While articles on remote sensing have been frequent in *BranchLines*, the use of camera trap data is relatively new, and our newest faculty member, Cole Burton, has provided a detailed account of how such data can be used to answer many different questions related to biodiversity.

In all the articles, the role that climate change is playing is a dominant undertone. Forest policy in British Columbia has changed as a result of the early recognition of the effects of climate change on forests, and the article by Julie Sheppard examines the extent to which practitioners are taking advantage of the changes to seed zones for western larch. The analysis reveals that there is uptake amongst practitioners, although it will be important to tease out how much of this is due to a genuine concern about climate change and how much is simply taking advantage of the opportunity to plant a rapidly-growing species more widely.

John L Innes
Professor and Dean

forestrynews

Dr Sally Aitken will be taking over the role of Associate Dean, Research and Innovation for the Faculty of Forestry from Dr Nicholas Coops on July 1, 2017. She is a Professor and forest geneticist in the Department of Forest and Conservation Sciences and studies the adaptation of trees to climate. Sally obtained her BSF from UBC and her PhD from the University of California, Berkeley. She received the Canadian Forestry Scientific Achievement Award in 2009 and the International Union of Forest Research Organization's Scientific Achievement Award in 2014. In her new

role as Associate Dean, Research and Innovation she hopes to facilitate collaborations and initiatives that will help our world-class faculty members and graduate students address the grand challenges of forestry and conservation of our time. These include managing forests, conserving biodiversity and developing wood products in rapidly changing environments and global markets. She also plans to make promoting and communicating the scientific advances of the Faculty of Forestry a priority. Sally can be reached at sally.aitken@ubc.ca.



Dr Guangyu Wang has been appointed as Associate Professor in the Department of Forest Resources Management, effective July 1, 2017. Guangyu has a BSc degree from Fujian Agriculture and Forestry University in Fuzhou, China, an MBA from Marylhurst University in Oregon, USA and a PhD from UBC. Before moving to Canada he worked as a business professional for several years in China and the USA. More recently, Guangyu has served as Assistant Dean, Asian Strategies in the UBC Faculty of Forestry. In his new role as an associate professor, he will teach courses in forest management and conservation in Asia and continue to

strengthen his already well-established research programs on the adaptation of Asia-Pacific forests to climate change, and forest carbon policy. In conjunction with his new faculty appointment, Guangyu will serve as Associate Dean Asian Strategies from July 1st, 2017, overseeing the Faculty's exchange programs in Asia, evaluating their success and advising on strategic development of the Faculty's academic programs as they relate to students from Asia. Dr Wang will also be responsible for the directorship of the Faculty's new Asia Forestry Research Centre (see details below). He can be reached at guangyu.wang@ubc.ca



Asia Forest Research Centre

In an effort to bring all of the Faculty's efforts related to Asia under one (virtual) roof, a new Centre is being created in the Faculty of Forestry. The Asia Forest Research Centre will provide a focal point for visitors and an identifiable unit that is an important part of our relations with the external community, especially in China and the rest of Asia. The Centre will have responsibility for developing and maintaining the Faculty's links with Asia, especially China, administering the Chinese elements of the 2+2

and 3+2 undergraduate programs, coordinating the large number of visiting faculty from China, hosting the Asia Pacific Forestry Education Coordination Mechanism office, potentially hosting a future regional office of the Asia Pacific Network for Sustainable Forest Management and Rehabilitation, and a number of other activities. Dr Guangyu Wang will serve as the Director of the Asia Forest Research Centre.

Commonwealth Forestry Conference

The 19th Commonwealth Forestry Conference was held at the Forest Research Institute, Dehradun, India on 3 -7 April, 2017. The Commonwealth Forestry Conferences have been held since the 1920s and last one held in India was almost 50 years ago, in 1968, in New Delhi. UBC Forestry was actively involved in the conference planning and organization and was well represented with 10 delegates and John Innes as the Chair of the Commonwealth Forestry Association.

Who is the Forestry Diversity Crew?



UBC is one of the most diverse universities in Canada and the Faculty of Forestry is one of the most diverse units in all of UBC. With diversity comes exciting new ways of thinking and being, as well as challenges in working together. Also, many institutions are recognizing that diversity, without inclusion and community, is not enough. Embracing diversity isn't entirely new for UBC's Faculty of Forestry. In the 1950s, we welcomed the entire Sopron School of Forestry from Hungary as they fled Soviet oppression. We worked with these new arrivals to help them adapt, adjust, and feel welcome and included in Canada.

Fast forward to 2016, UBC was faced with a new challenge – how to respond to the burning of a pride flag (elsewhere on campus) during UBC's Pride Week? Galvanized by this intolerant act, 3 forestry graduate students, Estefanía Milla-Moreno, Ana Elia Ramón Hildago, and Gillian Fuss, began working to articulate a response. They soon agreed that what was really needed was a platform to discuss and address diversity, inclusion, inter-culturality and building community in the Faculty over the long-term. At the same time, Dean John Innes created a new position to specifically address diversity, equity, and inclusion in Forestry and appointed Dr Sarah Gergel to serve in this role. Also keen to see a long-term and pro-active strategy developed for the Faculty, Sarah joined forces with Estefanía, Ana Elia, and Gillian, and together they obtained funding and support from UBC's Equity and Inclusion Office. And so, the Forestry Diversity Crew was born.

Since then we have grown into a team who actively celebrates diversity in all its forms, and provides space and events for issues of inclusion and equity to be discussed thoughtfully and openly. Through this, we are hoping to bring people together and foster community within the Faculty. In our first



year, we designed and hosted a variety of workshops to fulfill this mission. At our first event, the Pancake Diversity Breakfast, we invited UBC's Equity & Inclusion Office to provide an overview of the types of issues universities are currently facing in terms of diversity and inclusion. We were pleasantly surprised and excited by the "full house" of faculty, staff and students who showed up! We gained valuable feedback on ideas for future workshops and concerns people were keen to explore. Building on this, our following workshop, Unconscious Bias in the Classroom, helped teaching assistants understand some of the deep – and often under-appreciated and unknown – sources of bias we all share which can have important implications for teaching and learning.


Another highlight was making a video celebrating the diversity within our Faculty. "How do you say Forestry?" can be viewed at – www.youtube.com/watch?v=GN7TXb7Y23Q&t=2s. The making of this video surprised all of us, in terms of the role it played in our community, as it was a fun way to build cohesion in our Faculty. It has since reached thousands on social media. Please have a look and share your thoughts as we are keen to hear your ideas for more videos.

For UBC Pride Week this past March, we planned a series of events providing resources for our LGBTQ+ community, as well as for those wanting to learn how to be better allies. We created a banner to represent Forestry at UBC's Pride March, and you might have seen our pride flags hung around the building.

We ended the school year in late March with an interactive Cameroonian Drumming and Dance performance by the amazing Jacky Yenga and her fabulous drummer Yoro Noukoussi (or grandpa!). With a focus on building community, Jacky and Yoro's dancing, drumming, and story-telling helped us welcome everyone – even the broader campus





 Join the Diversity in Forestry Crew for
SMOOTHIES
 for
DIVERSITY
 Unconscious bias in and outside the classroom
 Forestry Diversity Committee invites students, staff and faculty to a workshop on power dynamics and hidden biases that can arise during teaching, marking or other student-staff-teacher interactions.
 Free smoothies will be served so bring a cup and an open mind!
 FSC 1220, Tuesday, Dec 13, 10:00-11:30 AM
 Please RSVP: forestrydiversity@gmail.com



Be part of the change, students, staff and faculty working together to create a thriving community!


DRUMS, DANCE AND STORIES

BUILDING A FORESTRY VILLAGE



Enjoy a dynamic performance from the amazing **Jacky A. Yenga** of Cameroon

https://youtu.be/5EBx4H_cgww
www.jackyenga.com
 Thursday March 30th, 4-6pm
 Forestry Atrium




 Join the Diversity in Forestry Crew for
PANCAKES
 for
DIVERSITY
 After pancakes, we invite you to stay and join us for the **Diversity by Design: Exploring Your Intercultural Competencies Workshop**



Students, Staff, Faculty welcome
 GF and vegan pancake options, too
 FSC1220
 Monday
 Nov 7
 at 9 am

Be part of the change, students and faculty working together to create a respectful community

community – to our building. It was also a great way to interact with colleagues, by cutting a rug!

While our group started with a small core of dedicated graduate students,

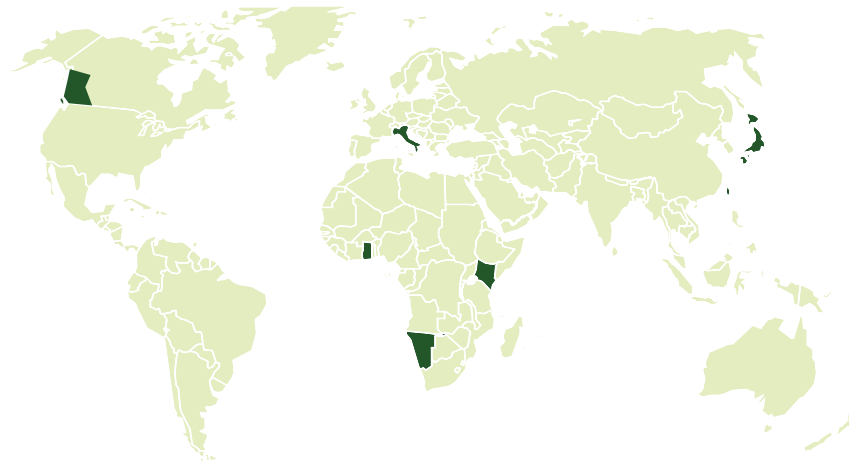
we have now expanded to include Dave, Ricardo, Yemi, Ingrid, Joe, and Erin. We invite you to get involved as we're always open to new ideas and ways to do things better. Are you an

undergraduate student? Even better! We want to include voices from all parts of the Faculty.

The Forestry Diversity Crew meets every 2 weeks during the school year. Please join us and give us your feedback. In the meantime, follow us on social media – come say hi on Facebook (fordiversity) or Twitter (@Diverseforestry) – or come to one of our events in September!

Dr Sarah Gergel is a member of the Department of Forest and Conservation Sciences and the Associate Dean, Equity and Inclusion in the UBC Faculty of Forestry. She can be reached at sarah.gergel@ubc.ca.

Master of International Forestry: 2017



The Master of International Forestry program had another successful cohort of students in 2017. All 8 students from the program secured internships to complete their degree. Five students will travel to Namibia, Tanzania, Japan and Ghana to work on forest conservation and livelihoods projects, while the remaining will stay on in British Columbia to learn from organizations here.

Weina Sun will work with the International Tropical Timber Organization (ITTO) in Yokohama, Japan. Her work will involve preparing reports on certification, timber market access mechanisms, and timber trade for the International Tropical Timber Committee Meeting. Weina works at APFNet and the internship provides an opportunity to compare ITTO and APFNet, including their project management guidelines to build on synergies and to work collaboratively on Sustainable Forest Management-related project management.

Joseph Mumuni will complete his internship at Tropenbos International in Accra, Ghana. He will work on forest governance projects involving small and medium forest enterprises for REDD+ and Forest Law Enforcement, Governance and Trade-Voluntary Partnership Agreements. He will also learn about landscape restoration projects in various districts across the

country. Joseph will prepare a final report based on a desktop review and fieldwork to assess the impacts of these programs on small to medium forest enterprises.

Abel Koka's internship will be with Tanzania Forest Services Agency in Dar-es-Salaam and Moshi, Tanzania. Abel will work with the Agency to explore protocols and guidelines for livelihoods in protected areas. Abel will work in the headquarters in Dar-es-Salaam, dealing with a range of high-level policy programs, and then engage at the Moshi regional level to examine implementation of policies.

Donna Ye will intern at Interfor, one of Canada's largest forest products companies at their offices in Campbell River, Vancouver and Burnaby, British Columbia. She will research, write, and produce an in-depth internal document that summarizes Interfor's Economic Partnership and First Nations Relationships. Her internship goal is to produce a First Nations Economics Partnership Playbook.

Eric Ong will work with the City of Richmond, British Columbia. Eric, an urban forester for the Singapore Government, will work closely with the team implementing Richmond's Urban Forest Management Strategy. Eric will share his learnings with the City of Richmond and government of Singapore.

Grace Sarbeng will work with the Richmond Food Security Society, in Richmond, British Columbia, where she will conduct education outreach with local stakeholders and society members. Grace will also have administrative and operational responsibilities for the Society, including running the group's social media optimization program, maintaining and organizing their seed-bank, and supporting public programs.

Stephanie Lee will be conducting her internship with Bioversity International in Rome, Italy. Stephanie will be working with gender specialist Marlene Elias, on preparing a toolkit on gender equitable community-based forest management (CBFM) in India. As an intern, Stephanie will be tasked with bringing together the various tools produced throughout the project in a compilation on CBFM. The CBFM toolkit will represent the state of the art in thinking about holistic approaches for equitable, pro-poor, community based forest management and governance, for uptake among managing communities and practitioners.

Sarah Sra is travelling to Namibia, where she will work for the Namibia Nature Foundation. Sarah will help support the preparation of land use management plans for newly acquired forests, working with indigenous groups to develop businesses in harvesting medicinal plants, or working on conservation and biodiversity issues in Namibia's national parks.

The Master of International Forestry program is a professional graduate program, providing students with the knowledge and tools to understand the dynamic global forest policy environment. The program is currently being adapted to the changing needs of the international workplace. Dr William Nikolakis took over the coordination role for the program from Dr Joleen Timko in early 2017.

Reconciliation in practice

*By Carlos Ormond, K'iinuwaas Carrie Anne Vanderhoop
and William Nikolakis*

Two years ago, down at the end of Old Massett Village on Haida Gwaii, Chief 7idansuu, James Hart, with his team of carvers started their work on a fallen 800 year old red cedar. The 55 foot Reconciliation Pole was carved from this ancient tree and raised in front of the Forest Sciences Centre at UBC on April 01, 2017.

The Reconciliation Pole tells the important stories of Haida and Indigenous Peoples from across what is now modern Canada. A strong foundation represents the time before colonization and the story continues with the disruption of Indigenous cultures, the decimation of the Indigenous population and the Residential Schools. The pole also speaks to the strength and resiliency of Indigenous Peoples – at the top of the pole the Eagle is about to take flight.

It was affirming that the creation of the Reconciliation Pole coincided with the development of the Haida Gwaii Higher Education Society (HGHEs) Reconciliation Studies semester. The program offers a reminder of the power of storytelling and the importance of approaching reconciliation education in many different ways, through a variety of teachings and mediums, and grounded in diverse perspectives.

In September 2017, the HGHEs, in partnership with the UBC Faculty of Forestry, will be welcoming 20 students from Haida Gwaii and across Canada, for the inaugural Haida Gwaii Semester (HGS) in Reconciliation Studies. The Reconciliation Program is the first of its kind in Canada. The program offers a 5-course semester based in Old Massett and Massett, Haida Gwaii, and includes a broad spectrum of perspectives on reconciliation and restitution that cross space and time. Students will explore key principles and discourses of reconciliation, legal mechanisms, and transitional approaches to social justice and equity alongside deeper anti-colonial and transformational calls for reconciliation. Central to these approaches are the voices and experiences of Indigenous Peoples and their nation building aspirations. The program also explores case studies from around the globe to examine international frameworks for reconciliation. Importantly, in the local context students are exposed to perspectives of reconciliation on Haida Gwaii. Students will engage with local guest lecturers both inside the classroom and out in the field, and will closely examine the protocols, shared decision-making processes, and co-management systems specific to Haida Gwaii.

Haida Gwaii offers a unique place for students to explore reconciliation. Haida Gwaii represents the traditional, ancestral and unceded territory of the Haida Nation. It is the only place in the province of British Columbia to have true joint decision-making between First Nations and the Crown around lands and natural resources. The communities of Haida Gwaii

understand the need to broaden the scope of cross-cultural engagement and collaboration to ensure a sustainable future of the islands. The HGHEs provides a foundation for a unique semester program that shares the story of the ground breaking work that has been accomplished by co-management between the Haida Nation and communities of Haida Gwaii. This co-management framework was laid out in the Gwaii Haanas Agreement, Kunst'aa Guu - Kunst'aayah Reconciliation Protocol, and the ongoing Haida Aboriginal title case.

The program has received financial support from the UBC Faculty of Forestry; Gwaii Trust Society; Northern Development Initiative Trust; BC Ministry of Forests, Land, and Natural Resource Operations; and Indigenous Northern Affairs Canada; and support from the Council of the Haida Nation, Skidegate Band Council, Old Massett Village Council, and the municipalities of Haida Gwaii, who have all helped in making this semester a reality.

The courses proposed for this semester are intended for university students in their third or fourth year of study in a variety of programs. More information is available at www.hghes.ca.

The Reconciliation Pole represents the past, present and future for Canada. The Haida Gwaii semester in Reconciliation Studies is an important step towards a future of reconciliation in Canada.





Photo: Petra Szekeres

Are salmon sick?

A sockeye salmon is exposed to a standardized gillnet entanglement treatment at the Cultus Lake Salmon Research Laboratory

Canada's prized Pacific salmon have been returning in fewer and fewer numbers, which begs the question: are salmon sick? Until recently, very little was known about infectious disease in wild salmon because studying disease in wild animals is difficult. Infectious disease is not easily tracked or confirmed in wild fish. Think about it – watching a wild salmon get sick and die in a river or at sea is near impossible. Aside from observations of tattered and straggling adult Pacific salmon dying at spawning grounds or mass mortality of fish in lakes during low oxygen events, disease-associated mortality is rarely seen. Sick fish in the wild tend to disappear, likely into a predator or scavenger's stomach. What we do know about salmon disease comes from hatcheries, fish farms, and other culture settings where fish can be monitored and even medicated. Though we can make assumptions about how diseases of cultured fish might progress to kill wild salmon, captive and wild fish experience very different environments and have unique genetics and immune defenses that will influence whether bacteria, viruses and other pathogens will cause disease in the same way, at the same rate, or to the same end.

Pacific salmon, like most animals (including humans), pick up pathogens throughout their lives. Pathogens can infect salmon as eggs in freshwater, as juveniles in freshwater or estuaries, as young adults in the ocean, and finally as mature adults returning to freshwater spawning grounds where they will die soon after spawning. By the time salmon reach adulthood, a bustling community of microorganisms resides

in their tissues. Different organs like gills or liver can harbour completely distinct microorganism communities that affect fish in different ways. But just because a pathogen is present doesn't mean the fish is sick. Many pathogens can hide and even thrive inside their hosts for hours, days or years without causing disease, until environmental conditions drift outside the optimal range for either host or pathogen. The physiological responses of hosts tell us whether pathogens are truly causing harm. A combined approach of screening for pathogens and measuring the fish's immune and stress responses paints a comprehensive picture of fish health.

Amy Teffer is a PhD student in Dr Scott Hinch's lab at UBC's Department of Forest and Conservation Sciences and Dr Francis Juanes' lab at the University of Victoria. She is working with scientists at the Department of Fisheries and Oceans Canada, including Dr Kristi Miller, and First Nations fishers to better understand disease development in wild adult Pacific salmon. She is especially interested in how climate and fishing-related stressors affect pathogens that might kill salmon on their way to spawning grounds. She has adopted a research approach similar to recent human health applications involving high-throughput quantitative polymerase chain reaction (qPCR) along with other techniques to measure disease development in adult salmon. By collecting wild salmon as they enter freshwater and holding them at a field laboratory, Amy can take non-lethal biopsies of small amounts of gill tissue every week until fish die, then biopsy internal organs

and look for signs of disease. She uses qPCR to analyze thousands of tissue samples for multiple infections and host responses. She also measures circulating stress hormones and other blood properties to find out how pathogens might be causing fish to die. Pacific salmon die naturally after spawning, but if they die too soon, they miss their one chance to reproduce. Maturation itself is a hormonal and morphological transformation that likely diverts precious resources away from immunity. Certainly, for an animal on a one-way trip to reproduce, disease development seems inevitable. But timing is everything and stressful migratory conditions likely act as an accelerator of disease and death.

Rising river temperatures caused by climate change are creating very stressful migrations for salmon. Temperature is 'the master factor' for all fish as they cannot regulate their body temperature. So, if the water is warm, so are the fish. Pathogens are also affected by temperature and can be more harmful to their hosts when waters are warm. High temperatures may also amplify the effects of fisheries capture, since more fish die after release from fisheries when rivers are warm. Intense fisheries target returning salmon in the ocean and rivers using a variety of gear types including hook-and-line, gillnets, beach and purse seines, and others. High demand for wild salmon makes for a high likelihood of capture as fish swim toward spawning grounds. Because different species of salmon migrate at the same time, fisheries targeting one



species may catch another, and must release non-target catch to the river. Fish can also escape from gear after being caught. Fish that are released or escape generally continue their migrations stressed and injured. Capture and handling can remove scales, skin and protective mucus, while the stress of capture can reduce immune defenses. These are ideal conditions to cause new infections or amplify pre-existing ones. Understanding how temperature and capture stressors might interact to enhance disease development and early mortality of adult salmon will help managers more accurately estimate the total number of fish surviving to spawn and inform their decisions about when to fish.

To date, Amy's research has provided evidence to support a role of disease and high temperatures in causing mortality following capture and release from a gillnet, one of the most frequently used fishing gears in the Fraser River. Her experiments have examined coho, Chinook and sockeye salmon treated with gillnet entanglement and air exposure, and then held

in flow-through tanks at cool or warm temperatures until the spawning period (weeks or months later). In a recent publication, she showed that how long fish are entangled in gillnets before release impacts their chances of surviving to spawn and developing infections. The study simulated the thermal experience of fish migrating in the river and found that most fish died while temperatures were at their highest. When compared to surviving fish, dying fish showed distinct infections and immune responses and females died sooner and more frequently than males. Sex-specific effects are important to consider as the number of offspring produced each year depends on the number of spawning females. Amy is working to explore these relationships further, pairing her findings with telemetry studies headed by another PhD student, Arthur Bass, who uses similar molecular methods but tags and tracks fish through the river. This work is ongoing in Dr Hinch's lab, which was just funded to continue its exploration of disease consequences of capture without air exposure (escaped fish) and will incorporate newer technologies and another generation of students.

Amy has participated in several review papers describing Pacific salmon disease ecology and various factors contributing to their premature mortality. The first manuscript from her thesis research is available in the open access journal, *Conservation Physiology*, and she has several others in the pipeline for publication.

For further information about this research contact Amy Teffer at akteffer@gmail.com or Dr Scott Hinch at scott.hinch@ubc.ca.



Macroparasite infection of a female sockeye salmon

Climate change and changes in silvicultural practices



Climate change will have profound impacts on our forests and the ecosystem services that they provide. In the past, trees were able to keep up with historical climate fluctuations and changes and were adapted to

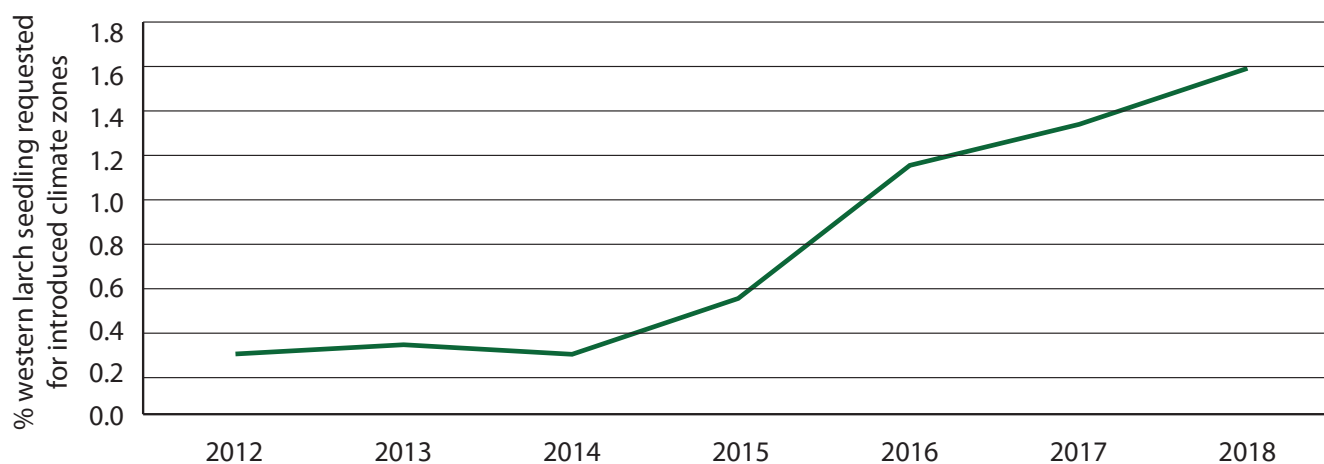
their local conditions. However, with a changing climate, trees may not be able to move quickly enough to adjust to their new climate conditions and become maladapted.

Julie Sheppard, a graduate student

in the Department of Forest Resources Management, chose to focus her research on one way forest policy makers, managers and foresters have been addressing this through changes in silvicultural practices. Traditionally, reforestation efforts have been based on the idea that local is best. However under changing environmental conditions this is no longer the case. Assisted migration is a climate change adaptation strategy that involves the manual movement of tree seedlings to areas that are climatically suitable for their growth both now and in the future. While assisted migration has been extensively discussed as a possible adaptation strategy, BC is the first jurisdiction to actually develop an assisted migration policy. The Province made several changes, starting in 2008, to provide more flexibility in selecting seeds outside of the traditional range. In 2010 they expanded the range in which western larch could be planted to areas outside where it has historically been found.

A key part of successful adaptation is implementation, and what Julie was most interested in (and the focus of her research under the supervision of Dr Harry Nelson) was whether or not forest managers and site level decision makers were taking advantage of these policy changes and to what extent assisted migration was taking place at the operational level. Julie used western larch as a case study as this was the first species that could be transferred greater distances outside its natural range.

Western larch is a highly valued species for both economic and ecological



reasons. It is said to be one of the strongest woods in Canada and is used for heavy construction, rail ties, piling and bridge timbers. It is able to produce such strong wood because it has a longer growing season than most other conifers enabling it to put on thicker late rings each year. These late rings are of higher density than early growth. Wild seed can be difficult and expensive to collect. To help combat this issue, a breeding program was developed in 1987. This program has ensured that there is an adequate amount of high quality seed to be deployed to the new climate zones.

Julie examined the extent to which practitioners were taking advantage of the opportunity by reviewing the seedling requests made for western larch for the new climate zones. She found there had been uptake of assisted migration of larch at the operational level as well as some interesting trends. The year after the policy was introduced, larch planted in the new climate zones comprised 0.28% of all seedlings planted in the province. That percentage grew to 1.6% over the following 6 years. Over the next year there will be 2.7 million western larch seedlings grown in nurseries for planting in new western larch territory in the spring of 2018. Though 1.6% may seem small, considering that seedling requests are dominated by lodgepole pine and hybrid spruce, it is a respectable percentage of seedlings being requested for the new climate zones.

Along with the general rate of uptake Julie was interested in who was doing the uptake and where it was occurring. Using ArcGIS she was able to

extract the areas for each Biogeoclimatic (BEC) zone and management unit that lay within the climate seed transfer zone. She then calculated the per hectare seedling request for each attribute over the study period.

The BEC classification system was formally adopted by the government in 1976 and has been foundational to forest management and decision making ever since. Under climate change these climate regions are predicted to shift dramatically and Julie was interested in how this may be reflected in the zone selection for larch planting outside the natural range. In the contemporary seed zones for western larch the species is most frequently planted in the ICH, IDF, MS and occasionally the ESSF. In the climate seed planning zones larch was planted in these same BEC zones, but interestingly planted rates were the highest in the SBS zone. This is a zone not previously thought to support the growth of larch but is considered to be one of the more sensitive ecosystems under changing climates. It could be that practitioners in these areas are noticing the effects of climate change and are thus taking proactive actions. It may be not so much the traditional SBS that people are preparing for anymore, but for a warmer version of the SBS.

Over the whole study period the most requests per hectare came from Timber Supply Area management units. This may be due to larch's fast initial growth as by planting this species, licensees can reach their free to grow requirements faster. Julie also

reviewed several Community Forest management plans and found they had selected larch to account for changing climate conditions and to diversify the species portfolio. These examples indicate the potential motivations around planting larch to meet different objectives. Larch is often considered when multiple objectives exist for a stand due its economic and ecological benefits. Foresters who planted larch outside its natural range before these policy changes came into effect have reported significant performance and productivity from these stands.

A 2014 survey by the Association of BC Forest Professionals indicated that respondents wanted to see more options for climatically suitable species. Julie Sheppard's research shows that action is being taken when the option is available. The future of forest resilience will require the continued efforts of policy makers, researchers and practitioners to ensure that adaptation measures are successfully being developed and implemented. This work emphasizes the need to consider practitioner's objectives and motivations around following policies changes as we move into climates of uncertainty and plan for the forests of the future.

Julie Sheppard is a recently completed graduate student from the dual-degree Transfor-M program. Her program combined an MSc at the University of Freiburg and an MF degree at UBC's Faculty of Forestry. Julie can be reached at juliemsheppard@gmail.com. Dr Harry Nelson, assistant professor in the Department of Forest Resources Management, can be reached at harry.nelson@ubc.ca.

Keeping an eye on the wild

The challenge of conserving biodiversity on an increasingly human-dominated planet has been aptly described as a wicked problem – one that defies a simple technical solution. With humanity's ecological footprint expanding across local and global scales, finding a balance between economic development and ecosystem protection is proving difficult. People and nature are intertwined within complex socio-ecological systems, and “win-win” solutions – wherein economic growth and biodiversity conservation go hand-in-hand – are often hard to devise, and even harder to implement. In a complex arena of competing cultural values and substantial scientific uncertainty, navigating a path to sustainability requires transparent decision-making guided by reliable evidence. This evidence must not only reflect indicators of economic activity, many of which already have a large influence on public discourse (eg, GDP, S&P 500); it must also include measures of biodiversity status or ecological “health”, which are much less well established. In other words, better biodiversity monitoring is needed to help us confront inevitable trade-offs between our economic aspirations and our commitments to protecting other species.

Many components of global biodiversity remain poorly known (tropical insects, for example), but even our most charismatic wildlife suffer from a lack of effective monitoring. The conservation and management of iconic large mammal species – from lions in Africa to grizzly bears in British Columbia – is often impeded by incomplete or inaccurate information. As wide-ranging, low-density, and wary animals, many mammals can be difficult to detect. The IUCN Red List classifies more than 15% of mammal species worldwide as



Data Deficient, and the knowledge gap grows wider when we consider the status of particular populations within species. Even one of the leading attempts to track trends in vertebrate populations, the Living Planet Index, includes only a fraction of global species and populations. Furthermore, its population trends are derived from a patchwork of data sources of uncertain accuracy, and are rarely linked to management actions or drivers of change, meaning that lessons for decision-making are typically weak or absent. Consequently, while adaptive management remains an oft-stated goal in wildlife science, good examples of “learning by doing” remain elusive. Many policies thus rely on opinions more than evidence, leaving them vulnerable to criticism, particularly when they pertain to controversial issues (of which there are many in modern wildlife management). For example, a recently published review of efforts to manage conflict between people and predators was titled “Predator control should not be a shot in the dark”, with the authors concluding that we lack sufficient evidence to gauge the effectiveness of controversial culling programs and guide the next management decisions.

So how do we improve our monitoring of large mammals and other wildlife,

and thereby enhance our ability to make informed conservation decisions? Dr Cole Burton – assistant professor in Forest Resources Management – and his colleagues believe the use of remote cameras holds considerable promise. These popular tools (also known as camera traps or trail cameras) are widely used by outdoor enthusiasts – such as hunters scouting for a big buck – but their use in ecological research has exploded in recent years. Early applications focused on photographing large, patterned carnivores, like tigers and leopards, whose unique coat patterns are used to track individuals and create data suited to traditional statistical techniques such as capture-recapture models. However, researchers soon sought to capitalize on the broad range of terrestrial mammal and bird species “captured” by camera traps, species that generally lack such individually identifying features. With more and more cameras deployed around the world, an expanding collection of animal “selfies” is quickly filling computer hard drives in the offices of university researchers, government biologists, conservation practitioners, and citizen scientists. This collection has spawned efforts to develop new systems for more effectively processing, analyzing, and synthesizing wildlife image data. Just as meteorologists developed a network of weather stations to improve understanding of global climate, Dr Burton



Wolf pack “captured” during surveys in northern Alberta



Rare photograph of a Syrian brown bear in the Caucasus mountains

and his collaborators believe that networks of remote cameras can improve monitoring of wildlife distribution and abundance across large spatial scales, ultimately addressing key ecological questions and informing conservation policies while helping connect people with nature.

Dr Burton’s lab at UBC – the Wildlife Coexistence Lab, or WildCo – is using camera traps to study several wildlife species and management issues in western Canada and around the world. His early application of the method in West Africa shed light on the status of a threatened and poorly studied mammal community in Mole National Park, Ghana. This expansive woodland savannah park protects regionally important populations of large mammals such as leopard and elephant, but faces mounting pressure from illegal hunting and habitat degradation, which appear to have driven the local extirpation of the critically endangered

West African lion. Recent research by Dr Burton and colleagues in the southern Caucasus region has combined camera trapping with non-invasive genetic surveys to reveal an unexpectedly large population of Syrian brown bears (a threatened relative of North America’s grizzly bear) in an area undergoing new mining development. And WildCo members are currently using camera traps to assess the impacts of industrial development on wildlife communities in northern Alberta’s boreal forests. Much management attention in this region has focused on the effects of oil and gas development on threatened populations of woodland caribou, with the footprints of energy extraction opening up caribou habitat to wolves and other predators. Energy companies are investing considerable money into trying to restore these areas – particularly linear disturbances such as seismic exploration lines – and thereby reduce predation pressure on caribou, but

comparatively little has been invested in monitoring the effectiveness of this landscape management initiative. Dr Burton’s team has deployed camera traps across restored and unrestored seismic lines to monitor the behavioural and population responses of caribou, their predators, and other members of the boreal wildlife community. By replicating the standardized photographic sampling over time and across spatial scales – from individual cameras to arrays within landscapes under different management treatments – the team hopes to guide efforts to conserve not only caribou, but also the many other species inhabiting these changing forests that fall outside the scope of single-species management priorities.

Ultimately, it is this integration of remote camera data across species, time and space that holds great promise for improving wildlife monitoring at large scales of management relevance. Coordinated camera experiments and networks for data synthesis are emerging through partnerships among researchers, practitioners, and citizens, including Dr Burton’s new WildCAM initiative: Wildlife Cameras for Adaptive Management. While the wicked problem of biodiversity conservation will not be solved solely through better monitoring, there is hope that the rigorous collection, analysis and dissemination of reliable evidence on wildlife status can help us navigate the challenging road ahead.

For further information contact Dr Cole Burton, Department of Forest Resources Management, at cole.burton@ubc.ca.



A camera “trap” in action

Finding pathways to restore Indigenous food sovereignty

By Tonya Smith



Neqwniqwaoz (cottonwood buds) soaking in oil. They are used medicinally by the Lílwat Nation to treat a number of ailments

The bumpy road shakes us all around in the truck as we near where the mountain flattens out. Ruts in the road carved by glacier melt mean that a 4x4 truck is the only way to drive in these alpine areas. Jordan, our capable driver, knows this and all the Forest Service Roads throughout Lílwat Traditional Territory in British Columbia. Jordan, a Lílwat First Nation member and self-proclaimed country music fan, former rodeo cowboy and athlete, is also the First Nation forest company's field supervisor. As we ascend the mountain, he recalls places along the way where he has seen food and medicine plants growing in the previous year. Cottonwood, fireweed, juniper... each plant has a purpose and story.

Jordan sits next to Jean Nelson in the front seats. Jean is a Lílwat elder known for her expertise in Indigenous plant knowledge, along with her quick humour and legendary fishing skills. Next to me in the back sits her younger

sister, Susan Wells, who is leaning far out the truck window as she calls out in Ucwalmícwts, the Lílwat language, the plants she sees as we bump along. When we get to our destination – a mountain huckleberry patch dense with big, juicy black berries – we hop out of the vehicle and prepare our gloves, shovels and buckets. We leave the field this day with buckets full of food and books full of scribbles; our field notes about how and why to harvest the plants that Jean and Susan will later spend the evening and following days processing at home.

One and a half years later, I enter the Lílwat Nation Cultural Centre in February 2017 to a room full of community members. I bring with me 4 large boxes of books. These books are the collection of Lílwat knowledge gleaned in many days out in the field and in conversation with Lílwat plant experts like Jean, Susan and Jordan. Today we are gathering to celebrate the release

of the 400-page guide, which shares the Indigenous plant knowledge that was taught in our meetings together. The book, requested by Lílwat elders, will help community members and others to learn about Lílwat Indigenous foods and medicines. These foods are an important part of Lílwat food sovereignty, which is the ability of the community to control their food system. The book is called 'Gifts of the Land', as these plants are considered gifts that are offered by the land, not resources, in Lílwat teachings. Lex Joseph, Cultural Technician, begins our book launch with a Lílwat song in Ucwalmícwts, his strong voice accompanied by a steady march of beats on his hand drum. A prayer follows the song, and then short words are said about the project by some of its collaborators.

Our celebration is catered with some local foods including dried salmon, berries and tea that Lois Joseph, Director of the Cultural Centre,



has gathered for the event. Everyone lines up to get copies of the book, and within an hour our small first print run has been sold out. (A second press of the book will be available in June 2017 at the Lílwat Cultural Centres in Whistler and Mount Currie). Today is also an exciting day because after the launch, I am meeting with the Lílwat Cultural Heritage and Language Authority (LCHLA), a council of community representatives, to plan and gain approval for our next research project together. The LCHLA has been working with us during the 2-3 years of making the book to identify Ucwalmícwts words for plants through processes of language rediscovery, and make sure the stories included in the book may be shared with a wider public as per cultural protocols. Our research has also produced recommendations for forestry companies to minimize waste and disturbance of food and medicinal plants during forest harvest. During our research, we have built both relationships and momentum around the goal of supporting Lílwat bush foods (foods from the forest) and medicines. Rather than ending our collaboration here, we have decided to work together on a new initiative, the Lílwat Nation Food Security Project. This project will allow us to continue on our journey of identifying and protecting food harvest and cultivation areas in Lílwat Territory, which are often invisible to settler-colonial society.

We have chosen the themes of Food Security and Food Sovereignty for the next project to encompass all of the broad community goals around food. Due to the ongoing impacts of settler colonialism and intergenerational effects of the Residential School System, food insecurity is a potent problem in many Indigenous communities. When we started

to talk about the project, community members presented many questions, which include how to engage Lílwat youth to support their knowledge and ability to access Indigenous foods, how to supply local foods to the Lílwat grocery store, and how to best protect the Territory in order for the bush foods to be available in the future. Our project will be led by a team of elders and food experts in the Lílwat Nation who have volunteered to guide the research. Throughout 2017 and 2018, we will use Indigenous research methods to determine how to support food security at the community-level.

Our research will ask questions such as: what supports food security for different groups within the community today? What hinders it? What did food security historically look like for the Lílwat Nation? What are community protocols around obtaining project consent, and how will consent be communicated in our research for deciding how to best support food security? How do different sources of food, such as market foods, agricultural foods, and bush foods each interact with food security, and the related idea of food sovereignty?

We will also ask if the 'ecosystem services' framework can support food security and sovereignty. Ecosystem services (ES), which are 'benefits for humans from ecosystems', are a new way to understand and value nature. Research in ES provides new tools and methods to understand how the environment does things like provide clean water, soil, air and food, regulate natural cycles, and protect cultural benefits. Ecosystem services have been used to improve communication about the non-market values of land use. Importantly, Lílwat ways of knowing (epistemologies) and ways of being (ontologies) may not be compatible with the idea of ES, which uses words such as 'products' and 'resources' to describe the relationships between humans and nature. We will work with elders and food experts to explore the theoretical harmonies and discords between the ES framework and Lílwat teachings about human-nature relationships. However, it is possible that applications of ES research may provide tools to make Indigenous food-related practices more visible. For example, new tools in ES research allow us to map out the production of foods throughout landscapes, and overlap this food map with other uses. This could support the Lílwat Nation in 'counter-mapping', allowing the Nation to tell the story of their Indigenous foods in the assertion of their sovereignty. It may also present new ways to communicate cultural values about land to non-Indigenous land use managers in the area. Critically, Lílwat teachings might present better theoretical underpinnings for research to support food sovereignty. The Lílwat Land Use Plan offers some related guidance: Wa7 kelh ti7 s7átsxstum tákem i stsuqwao7lhkálha, i qu7lhkálha, múta7 ti wa7súpuminem. Wa7 úmñem ti tmícwlhkalha ku áma, snilh tu7 ti7 kwes úmñentumulhas ku áma. "We will provide for the land so that it can provide for us."

Tonya Smith is an Indigenous ally and student of the Lílwat Nation. She is currently a PhD student under the supervision of Dr Janette Bulkan in the Department of Forest Resources Management. For further information about this work, please contact Tonya at tonya.smith@ubc.ca or Dr Janette Bulkan at janette.bulkan@ubc.ca.

Mapping health with urban trees



The world is changing rapidly with increasing urbanization, change of lifestyles, and a climate that is getting warmer and more unpredictable. With more sedentary lives, more social stress, and less interactions with natural environments, people are increasingly affected by chronic disorders, such as depression, cancer, diabetes, obesity, and cardiovascular and chronic respiratory diseases. These kind of disorders are rarely possible to cure with traditional medical methods. We must therefore learn and invest more in preventing these conditions and

avoiding the need for health care in the first place. Similarly, morbidity and mortality related to climate change and polluted environments, such as heat stroke and asthma, are also better addressed through prevention using various mitigation and adaptation techniques.

Within this context, urban green environments have a certain role to play. In recent years there has been an exponential surge in studies that demonstrate various benefits from exposure to green spaces. Across the world, research groups are using increasingly

refined methods for exploring different health aspects of urban greenery and for improving evidence of the beneficial effects of urban green space. This research spans across several disciplines, including urban forestry and planning, landscape architecture, epidemiology, health geography, and medicine.

The health benefits from urban green spaces can be characterized as ecosystem services. Urban green spaces can provide cultural ecosystem services by offering places for recreation, physical activity, stress relief, and social interactions. All of these factors are important health determinants – physical activity is among the stronger predictors for life quality with relation to decreased prevalence of depression, obesity, diabetes, cardiovascular mortality, and much more. Equally, reduced stress and social interactions have a protective effect on several mental and physical disorders. This means that green spaces that promote physical activity, social interactions, and reduce stress can provide many health benefits.

Green spaces also provide several regulating ecosystem services of importance to human health. Through shading and evapotranspiration, trees prevent the worst effects of the urban heat island, potentially reducing the prevalence of heat stroke. Some studies also show that air pollution levels are reduced by trees, but the findings are somewhat inconsistent and the effects seem to depend on local and contextual factors.

Dr Matilda van den Bosch is an assistant professor jointly appointed between the Department of Forest and Conservation Sciences and the School of Population and Public Health at UBC. Matilda was co-author of a 2016 report from the World Health Organization entitled “Urban green spaces and health – A review of evidence”. In a follow-up scientific review of systematic reviews, Matilda and a colleague concluded that the evidence on improved mood and happiness associated with access to green spaces is strong and consistent, as is the evidence on a substantial heat reducing impact. The

evidence for reduced stress is weaker, but a positive tendency is clear. Equally, physical activity in relation to green space accessibility has been extensively studied and reviewed. Many studies find a relationship, but it is still unclear if the physical activity is actually taking place in the green space and if the relationship is mostly explained by a self-selection effect. However, the tendency towards a positive association is indisputable.

Intriguingly, a broad range of studies have shown that several specific diseases are affected by exposure to green spaces. Epidemiological studies have demonstrated that the incidence and prevalence of diseases such as asthma, cardiovascular disorders, and depression are lower in areas with a high proportion of green spaces. Several studies also suggest better pregnancy and birth outcomes in green areas. Many of these associations with direct health outcomes are likely to be explained by mediators, such as the previously mentioned improvements in mood and reduced heat stress.

This kind of research is, out of necessity, interdisciplinary. At UBC, an interdisciplinary collaboration is ongoing between the Department of Forest and Conservation Sciences (FCS) and the School of Population and Public Health (SPPH). This collaboration, which also involves engagement from Metro Vancouver, will allow for highly detailed analyses of different types of land use in Vancouver and the relation to mental health outcomes and several other health variables. The researchers will study the influence of accessibility to, for example, deciduous or coniferous trees, mixed forests, lawns, or shrubs. By using aggregated data on population health, they will be able to analyze potential differences in health depending on how close a person lives or works to different environments.

Previous studies on greenness and health have, to a great extent, relied on remote sensing and Normalized Vegetation Difference Index calculations. This provides a relatively coarse estimate; basically providing information on whether an area is green or



not green. Thus it is difficult to say anything about the type of greenery, something that may be of high relevance for expected health outcomes. Through this research collaboration, the researchers hope to advance knowledge and be able to provide better recommendations for urban green space planning with improved public health as an outcome.

Through a recently established pan-Canadian research consortium known as CANUE, another collaboration between FCS and SPPH is developing. CANUE involves all the major academic institutions that work with environment and health in Canada and aims to collect and standardize data on various urban environmental factors and exposures. By partnering with Canada's largest cohort and health databases, the purpose is to link data on environmental exposures to a broad range of common health outcomes, such as cardiovascular and chronic respiratory diseases, mental disorders, stroke, and cancer. This project will also provide opportunities for studying children's health and its relationship to the environment both prenatally and during early life. The urban environmental exposures to be studied include, for example, air pollution, noise, climate change, and green spaces.

As a first step, SPPH and FCS researchers will work on identifying greenness metrics, including a critical review of data accessibility, validity,

and accuracy. The group will also implement and validate new metrics and develop high resolution urban greenness scores on a national level. Once this part of the work is finalized, statistical methods will be used to link advanced greenness data to health data across time and space. This will also enable inter-city comparisons of the environment.

An important aspect, and which UBC's part of the project will pay particular attention to, is the equal distribution of high-quality green spaces across various population groups. In general, green spaces are less abundant in disadvantaged areas, which means that healthy environments are sparse where they are needed the most. Previous studies have suggested that the positive health effects of green spaces are particularly pronounced in vulnerable populations, such as the socioeconomically underprivileged.

The penultimate goal of the CANUE project, and of most of the research on forests and green spaces in urban areas, is to create healthier cities for improved public health across various populations, while maintaining healthy and functional ecosystems in and beyond cities.

For further information, please contact Dr Matilda van den Bosch, Department of Forest and Conservation Sciences and the School of Population and Public Health, at matilda.vandenbosch@ubc.ca.

Illustration: Dave Williams, UBC

The case for spectacled bears



In the midst of the global biodiversity crisis, the task of conservation is like triage – we have a limited budget to try to both protect the species facing extinction and keep ecosystems providing services that we rely on, things like clean water, renewable resources, and cultural values. With so many at-risk ecosystems and so few resources, land planners and decision makers are faced with a future of tough conservation trade-offs. And yet it is certainly the case that the majority of our conservation funding is being poured into just a few species.

These days, the media spotlight drives the conservation agenda, and so policy action often revolves around charismatic species. We use the term “flagship species” to refer to threatened species that act as an ambassador for a defined issue, campaign, or habitat. The question is, can our focus on only a few critically endangered or otherwise media-darling charismatic species help with the crucial groundwork of protecting species and ecosystems before they’re critically endangered?

What has been found is that a well-constructed flagship species initiative can help gain invaluable conservation lever-

age. In addition to being highly effective at securing otherwise inaccessible private funding, flagship approaches can result in overall biodiversity gains when the focal species share habitats and threats with species that would otherwise not receive conservation actions. But a flagship species approach usually contributes best to conservation goals when applied within a broader “systematic conservation planning” framework. This means selecting areas for conservation actions which contribute most to the representation of biodiversity, at the least cost. Decision makers are increasingly employing software like Marxan, a prioritization platform developed out of the University of Queensland, which takes spatial input layers to create solutions that can inform reserve design decisions.

MSc student Nina Morrell, along with her supervisor Dr Peter Arcese in the Department of Forest and Conservation Sciences, is using species distribution models, existing field and remote-sensed data, and spatial prioritisation tools to optimize conservation plans for spectacled bears. Spectacled bears are vulnerable species occupying a narrow strip of the Andean mountains from Bolivia to Venezuela; a range that covers

only 3% of the area of South America but coincides with the habitat of at least 76% of South American species. To date, limited action has been taken to incorporate knowledge on the distribution of spectacled bears with local or broad-scale conservation planning. The political environment, challenging terrain, and naturally elusive behavior of spectacled bears make them one of the most under-researched bear species globally.

Nina is combining several years of camera trap survey data from the Spectacled Bear Conservation Society in Peru with remote-sensed spatial variables to model spectacled bear density and habitat use, both at the local scale and across their range. Initial results suggest that road density and forest productivity are critical predictors of bear density. With an improved picture of where bears are and how they are using habitat, Nina will conduct a coarse-scale conservation prioritization using Marxan. This product may be used as a pilot study by managers wishing to maximize the occurrence of spectacled bears and simultaneously protect the largest number of migrant and endemic species.

This project adds to a growing body of research demonstrating how prioritising the land needed to sustain flagship species can enhance overall conservation performance. Because the spectacled bear range overlaps hundreds of water catchments that provide critical water provisioning services to humans, there are potential synergies to achieve that not only benefit biodiversity but also human well-being. This is particularly poignant given regional trends in climate and deforestation.

Nina Morrell is an MSc student in the Department of Forest and Conservation Sciences. For more information about this project please contact Nina at nina.morrell@ubc.ca or Dr Peter Arcese at peter.arcese@ubc.ca.

From PhD thesis to social enterprise



Reforestation is a global priority but it is expensive and sometimes in direct conflict with farmers' needs to earn an income. As part of his PhD research in the UBC Faculty of Forestry and now through a social enterprise, Kahlil Baker is trying to turn this problem onto its head. How can market forces be harnessed to incentivize farmers to grow trees on their farms in a way that improves their income?

For over a decade, Kahlil has been working with thousands of farmers in Nicaragua, a country that has suffered one of the highest rates of deforestation in the world, to grow trees on their farms. Over the past few years through his PhD research, he conducted a series of choice experiments with these same farmers to examine their perceptions towards participating in reforestation programs and paired that with detailed data on how agriculture and forestry contribute to on-farm incomes.

He found that farmers earned on average less than \$2/day from working on their farms and were therefore very willing to grow trees provided that it could help improve their income. At the

margin, the annual opportunity cost of farmland was only \$90 per hectare so it wouldn't take much for growing trees to be an attractive proposition.

The problem was that the net income that most farmers received from selling wood was negative after taking transaction costs into account. This helps explain why few farmers are financially motivated to grow trees on their farms, although non-financial values were also found to be important in that decision.

Encouragingly, small increases in the net income farmers received from selling wood had a disproportionately large impact on the probability that they would participate in a reforestation program. The results suggest that every \$1/m³ increase in the net income farmers receive from selling wood leads to a 47% increase in the probability that they would participate in the marketplace and therefore more likely to grow trees on their farms.

Kahlil is now using these findings to launch a social enterprise tasked with increasing forest cover by helping farmers get more value from their trees. Trees that were planted years ago



are being thinned out, which frees up more room for the other trees to grow. These thinnings, with diameters that would otherwise be considered non-commercial, are transformed into value added products that highlight the beauty and diversity of native tropical woods. These products are then sold to distributors in Canada and the world with the proceeds shared with farmers.

This model is not restricted to timber. A majority of the world's coffee, cacao and many other globally traded commodities could be grown under the forest canopy. This means that the same market forces could be used to drive reforestation all over the world.

Given that there are over a billion farmers in low-income countries around the world that grow trees or manage remnant patches of forest on their farms, creating better access to markets could play a very important role in reversing tropical deforestation.

Kahlil's work was recently featured in a new CBC series called *We Are Canada* in celebration of Canada's 150th anniversary. The show highlights the work of young Canadian change makers that is shaping and defining the future of Canada in inspiring and imaginative ways. See: www.cbc.ca/player/play/932291651890/

This social enterprise is still in its early phases and actively looking for partners to help it expand. For further information on this project contact Kahlil Baker at kahlil@takingroot.org.

Traditional recognition and Forestry's involvement in Indigenous research

By Seraphine Munroe



Seraphine (3rd from left) and family, visiting headdress in the Royal Ontario Museum

Much of the common discourse surrounding Canada's 150 years in Confederation has been to shed light in celebration of settlement and success. However, for many First Nations people in Canada, the 150 years marks a time to reflect on dispossession and oppression.

For one First Nations family in central British Columbia, May 15th, 2017, marked a significant moment that was over a hundred years in the making. A headdress, known to the family as their ancestral family chief's symbol of jurisdiction over their family territory, was found at the Royal Ontario Museum in April 2017.

During the period of the 1880s to 1890s, the family chief (known in the First Nations Dakelh Language as Keyohwhudachun) was recorded to have 'given' the headdress to Father Adrien Morice, a well-known missionary in the area. Much of the information concerning the whereabouts of the headdress was lost until research by family members connected the headdress back to the Museum. On May 15, the family was very excited to be able to connect with this prestigious headdress taken nearly 140 years earlier. This moment further symbolized a family legacy that legitimized authority over their heritage.

The headdress (which is made from flute shaped seashells strung on the

hair of revered female ancestors) is associated with a long line of descendants that are a part of a larger network of family territories also known as Keyohs. The people from these territories are strongly connected to the forests, with much of their cultural activities taking place on their family lands.

During the past 150 years, families faced significant oppressive changes to their way of life. Between residential schools and the establishment of reserves; the Dakelh, like many other First Nations across Canada were restricted from practicing their cultures, including the use of traditional regalia such as an ancestral headdress. Furthermore, modern threats to the forests, specifically clear-cut logging practices with intensive road building, continued to erode cultural uses. In response to these pressures, the family associated with the headdress solidified their Keyoh by creating a formal society known as the Maiyoo Keyoh Society to consult and seek accommodation. The Keyoh family were involved in various attempts to reassert control and diminish the erosion of cultures related to poor forest practices. However, despite various blockades and countless meetings between the Ministry of Forests and the local band, the Keyohs were unable to establish adequate lines of communication with the government. Fueled by frustration over a continued

lack of consultation, the family sought alternative avenues for decision making authority. One such consultation was with the University of British Columbia's Faculty of Forestry.

In 2007, Jim Munroe, president and spokesperson of the Maiyoo Keyoh Society, contacted the Faculty of Forestry for assistance in developing a consultation process. This has led to a strong relationship between several Keyohs and the Faculty of Forestry. Over the past several years, UBC's Faculty of Forestry has been a major contributor to Indigenous research by providing an environment of mutual benefit that has allowed students to gain meaningful practical experience and First Nations to acquire a deliverable that supports their consultative efforts.

Currently, many family members are involved in both the governance and academic endeavours related to protecting their rights. UBC Forestry has had a significant influence in the community and is currently "home" to Maiyoo Keyoh family member, Seraphine Munroe. Seraphine is working on her MSc degree in the Department of Forest Resources Management under the supervision of Drs Gary Bull and Verena Griess. She attributes her efforts in research to her Indigenous experience on her traditional family territory stating, "I grew up being told by my grandmother that we must never take more than we need, and we must not forget where we came from". Taking these statements as a core value of her upbringing, Seraphine is investigating the intergovernmental complexities to protecting traditional values while providing a sustainable livelihood.

For further information contact Seraphine Munroe, MSc student in the Department of Forest Resources Management, at seraphinemunroe@live.com.

development & alumni news

Largest single grant for forestry graduate student renewed



The Faculty of Forestry is proud to announce that the Future Forests Fellowship has been renewed for a second 4-year period beginning in September 2018. This prestigious award is the largest in the world for an incoming PhD student, providing \$70,000 per year for 4 years.

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.

The first (and so far only) recipient of the Fellowship is Sara Barron, whose research looks at how future urban forests can be designed and planned to be climate-ready, support local ecosystem services, and improve the health and well-being of local residents. In 2013, Sara's research proposal beat out applicants from a number of countries including Poland, India, Iran, Brazil, the US and the UK.

Sara recently spoke about the impact of the Fellowship on her work:

"The award has given me confidence in my research, and freedom to explore both academic and volunteer pursuits related to our field. The confidence shouldn't be overlooked. You aren't just giving students financial support, but adding a boost to their step, a validation that their research is important.

"The award has allowed me to attend conferences and build relationships internationally in places like Sweden, Manila, Australia, and the United States. These conferences and the people you meet at them are so important and inspiring for young academics.

"Being offered financial freedom to pursue my studies also allowed me to volunteer for our Faculty. I thought of this award as a call to service, and volunteered with my supervisor Dr Sheppard to help shape and create our Faculty's new undergraduate program in urban forestry.

"Through that experience, I discovered a personal passion for teaching. I was fortunate to have the chance to create and co-teach the new urban forestry program's second year course on urban forests and human well-being. I now realize that teaching is something I would like to pursue, and hope to continue to find opportunities to engage with our students in the years ahead."

Sara is also clear about the impact of the award in practical terms:

"Like many of my fellow students, I paid my own way through my undergraduate and masters degrees. I often



The award has given me confidence in my research, and freedom to explore both academic and volunteer pursuits related to our field."

worked 20-40 hour weeks to pay my tuition and living expenses while studying during those years, so I have a very strong appreciation for the opportunity to study without those constraints.

"It is difficult to put into words the gratitude that I have for the donors in providing this award. It is a true honor."

The Future Forests Fellowship will be 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. Research must be conducted at least in part in British Columbia, and should result in outcomes with practical applications in BC.

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.

More information about eligibility and the application process is available at future.forestry.ubc.ca. Applications will open on August 1 2017 and close on November 24 2017.

Alumnus reflects on a half century in forestry



On paper, **George Richards'** career as a forester began in the late 1950s. But if you ask him it really started many years earlier, as a young child in Golden, BC. "My family lived in a home with wood stoves, so I learned early the value of wood" he says. "Golden was a really small town back then. There were just 5 kids in my high school graduating class!"

That early experience would lead George into a career that spanned several decades and culminated in his role as President and CEO of Weldwood Canada (now West Fraser). Along the way he worked in plywood plants and sawmills, travelled across Canada and internationally, worked as a consultant, and experienced many significant changes in the industry.

George came to UBC in the mid 1950s. There he met Selma-Jo, who was studying Commerce; after graduation she worked as a teacher. Selma-Jo and George were married partway through their degree programs, and after graduation in 1959 moved to Nakusp, where George worked as a forester with Celgar.

That experience led George to the role of Chief Forester with Northwood (now Canfor) in Prince George. "At that point I started to get involved in sawmill manufacturing as well as woodlands," he says. "Then I became General Manager at Peace Wood Products in Taylor."

George's long working relationship with Weldwood began in 1975, when he was appointed General Manager of the Burns Lake operation. "We built the mill in Burns Lake and then the one in Houston," he says. "I learned the importance of getting involved when you work in a small community. You have to volunteer, attend community events, and get to know key people, not because you feel obligated but because it's part of the culture and it helps create mutual respect."

As he moved up the ranks in Weldwood, George took on additional responsibilities for the plywood business in BC, and for operations in eastern Canada that included one of the first OSB mills in Canada.

George was appointed President and CEO of Weldwood in 1992, and held the position until he retired in 2000. However "retirement didn't stick," he says, "I worked as a consultant for 10 years after that, working with Fraser Paper, Canfor, and Western Forest Products."

Today George is an avid fisherman and gardener, proud grandfather of 5, and active volunteer. He was involved in fundraising to build the UBC Forest Sciences Centre in the 1990s, and has helped fundraise for the Vancouver Prostate Centre, the Tom Buell BC Leadership Chair in Salmon Conservation, the UBC-VGH Hospital Foundation, Lions Gate Hospital, and many more. In 2002 he was awarded the Queen's Golden Jubilee Medal for his community work.

Both of George's sons are UBC alumni (one in Forestry, the other in Engineering) and his eldest granddaughter is attending UBC Okanagan. So he has some reflections for current students.

"Today the forest industry is full of challenges and opportunities," he says. "The broader use of the forest base, the application of technology at all levels, the reduction in physical volume of the resource: they all affect the careers of today's graduates."

"But if I had to do it all over again now, I would still focus on managing people. That's the best way to manage and maximize return for all stakeholders."

Award supports students in professional masters program



A student in the Faculty's first professional Masters program is the inaugural recipient of an award created by the **Association of BC Forest Professionals** (ABCFP).

The Master of Sustainable Forestry Management (MSFM) is a 9-month professional master's program that prepares students for careers as professional forest land managers. Now in its sixth year, the program is accredited by the Canadian Forestry Accreditation Board and the Society of American Foresters.

Dr Stephen Mitchell RPF established and leads the MSFM program. "It's designed specifically for people who are early in their career who have a relevant academic background and some work experience," he says.

The MSFM program admits about 20 students each year and now has a network of 83 alumni. 100% of gradu-

ates find work in their chosen field.

"The students are highly motivated, and we know we have to meet and exceed their expectations," Stephen says. "We are very aware of that and we are grateful to have the full support of the Faculty in delivering our program."

Through their registered charity ForesTrust, ABCFP has established a \$30,000 endowment that will provide an annual prize for outstanding students in the MSFM program.

"By providing scholarships and bursaries to forestry students through ForesTrust, we are supporting young people who are pursuing a career in forestry and who will play an important role in continuing to sustainably manage BC's forests for future generations," says Christine Gelowitz, RPF and CEO of ABCFP.

This year the award went to Matthew Shields. Matt's background in

human geography and urban planning (BA from McGill University) led him to enter UBC's School of Community and Regional Planning. But one year into his studies he found that his growing interest in natural resources planning wasn't being satisfied.

"I took an 8-month break, then figured that forestry was where I wanted to go. I enrolled in the BSF program and ever since then I feel like one opportunity after another has opened up for me," he says. "About a year later Professor Peter Marshall recommended that I look into the MSFM program."

In an unusual move, all students in the MSFM program voted on who would receive the prize. "When I found out at the Silver Ring Ceremony that I was going to receive it, I knew it was because of the respect of my colleagues," Matt says.

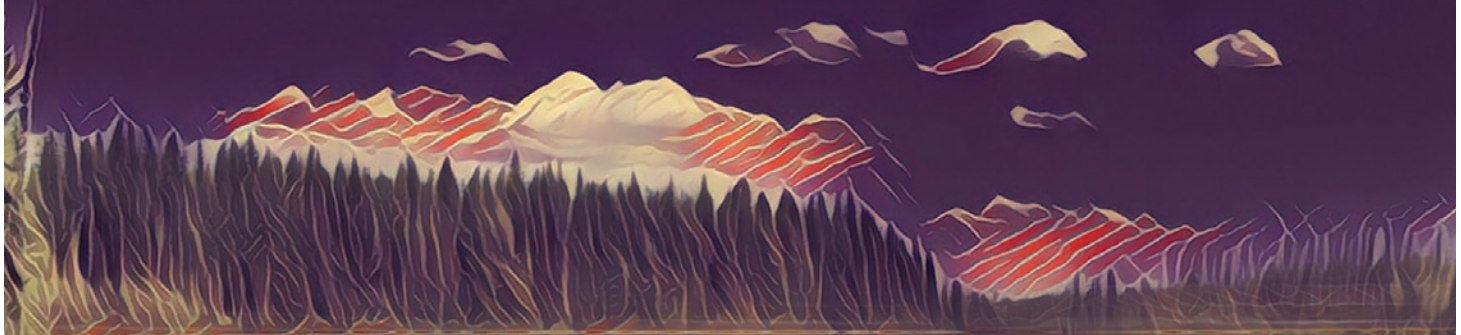
He adds, "I really want to thank Steve (Mitchell) and Deb (DeLong, the MSFM program coordinator). They have created an exceptional program, one where students are supported in all aspects of their life during their time there. I also want to thank ForesTrust for establishing this award.

Matt has now begun work with BA Blackwell and Associates. Bruce Blackwell RPF (BSF 1984, MSc 1989) is a UBC alumnus and Principal of the firm.

The Faculty of Forestry is grateful to the ABCFP and all other donors who help enrich students' lives through scholarships and bursaries.

To find out more about establishing a student award, please contact Emma Tully at 604.822.8716 or emma.tully@ubc.ca.

UBC Forestry Alumni and Friends Tour & Dinner – Gavin Lake



Join us on **Tuesday, August 29th**, 2017 for an afternoon in the woods at Gavin Lake with former classmates, friends and current students to celebrate Ken Day's last Fall Field School.

We will meet at the Gavin Lake Forest Education Centre parking area and begin with a tour of the Gavin Lake Block of the Alex Fraser Research Forest. Following the tour, mingle with students, faculty, fellow alumni and friends during a reception and dinner where we will celebrate Ken Day's final Fall Field School as Manager of the Research Forest. The evening will end with a moderated discussion panel with members of the forestry community.

Class of '91, '92 and '93 "25th ish" reunion

Calling all members of the classes of '91, '92 and '93 – join us and celebrate 25ish years! Save-the-date in your calendars for Saturday, October 28th and Sunday, October 29th, 2017 at the Marriott in Richmond, BC. Reunion activities will include a dinner on Saturday night and brunch on Sunday.

Please email jason.pope929@gmail.com to confirm your email address for an invitation.

Newsletter production

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Gavin Lake Forest Education Centre, directions can be found at: <http://afrf.forestry.ubc.ca/contact-us/>

The event is free and guests are welcome, but advance registration is required. You are welcome to join us for one or more parts of the event.

For more information or to RSVP (by Tuesday, August 15th, 2017) contact Debbie McPherson at debbie.mcpherson@ubc.ca or 604.822.8787.

Staff update

Janna Kellett has transitioned from Alumni Manager to Student Advisor within the Faculty. The Alumni E-Newsletter will be on hold until the new Alumni Manager starts in September. If you have any questions in the meantime, please contact Sarah Doran-Coelho at sarah.dorancoelho@ubc.ca or Debbie McPherson at debbie.mcpherson@ubc.ca.

Janna would like to thank all alumni for the many ways they have engaged and supported the Faculty and the Alumni Program over the past 4 years. We look forward to introducing you to the new Alumni Manager in the next issue of Branchlines.

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

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