Future Forests

7 generations of foresters - since the 1700s!
Get to know Indigenous forest gardens
Saving the iconic Arbutus tree
Welcome to the second issue of our revamped Branchlines. This format will be the face of the publication across all of our print and digital platforms for the foreseeable future. We hope that you enjoy its refreshed look and feel. These changes are based largely on input and feedback that we have received from our readership. Thank you very much for engaging!

The theme of this issue is on the future of forestry. But no discussion of the future should take place without a considered reflection of the past. From our humble beginnings as part of the Faculty of Applied Science in 1921 to the founding of the Faculty of Forestry in 1951, the formal launch of our First Nations Initiatives in 1994, the completion of the Forest Sciences Centre in 1998 and the soon-to-open Trimble Technology Lab, we have consistently provided space for scientific inquiry and outstanding professional training.

With nearly 8,000 Forestry alumni around the world affecting change and making impacts in ways that are incalculable, we are most certainly one of the most successful Forestry schools globally – by any measure. Our curricula both respond to and drive progress in the profession. As well, our leading-edge, innovative research continues to make waves in positive and meaningful ways.

This is not done in isolation. To that end, a debt of gratitude is owed to the foresight and ingenuity of those who have walked our halls, and to the present and future graduates, staff and faculty who will shape the research, education and outreach that will take place here in the years to come.

That as the backdrop to this issue on Future Forests, the reality is that the future of forests – and, by association, forestry – is in all of our hands. Looming large are the challenges of climate change, biodiversity loss, the decline of forest-dependent communities and an expanding – and increasingly voracious – human population. These are indeed grand challenges, and grand challenges require grand solutions that are interdisciplinary in nature and society-wide in scale. Forests, as we all know, play a vital role in contributing solutions to address some of these pressing issues. Technological innovations are part of the answer, certainly, but what we need now – more than ever – is to put forward bold, courageous, conservation-based strategies, even if it sometimes means bucking the status quo.

We try our best to do just that in the Faculty of Forestry. This is not an uncomplicated task; challenges that occur in forestry, natural resources conservation and wood products are inherently complex. Moreover, we are – together with our students – a community of some 2,000 individuals with diverse perspectives, worldviews and ideologies. This can make it tricky to distill the multiplicity of nuanced viewpoints into a cohesive, unified position. But we can strive to create a space for open and respectful dialogue, offer up potential solutions through our evidence-based research, teaching, outreach, stories and advocacy; and, ultimately, aim to find some common ground. We have attempted to do this in the current issue of Branchlines by summarizing viewpoints shared in our recent webinars on the contentious issue of old growth forests and by providing some potential paths forward for all.

In the end, we find ourselves in a maelstrom of wicked problems related to the sustainability of our planet, and we owe it to future generations to do whatever we possibly can to tackle this dizzying array of issues head-on. We also recognize that forests and the nature-based solutions that they provide are a big part of the solution, but that this may require disruptive, transformative change. The Faculty of Forestry is responding to this clarion call by providing intellectual space for informed dialogue and by imparting knowledge to the next generation of natural resources managers and change-makers. Together, we can make a difference in creating a healthier, more resilient and sustainable future.

Thank you for joining us on our journey to help push the boundaries of possibility and shape the future of our forests, and all that depends on them. 🌿

Please get in touch with me about this or any other issue at: rob.kozak@ubc.ca

All the best,

Rob Kozak
Professor and Dean
Contents

13 On the cover – Future Forests
3 Covered—featured books
4 Climate micro-certificate
5 Seven generations of foresters
7 Trimble Technology Lab
9 Growing Indigenous forest gardens
11 What’s new at Malcolm Knapp Research Forest
19 Improving the health of Arbutus trees
21 Managing complexity with systems models
24 Future Forests Fellowship
25 Green investing
27 Inroads to old growth management
29 The case for continuous cover forestry
31 Sustainable Functional Biomaterials Lab
33 Undergraduate An Hoang’s passion for conservation
34 Trees of campus

On the back cover
Future Forests Webinar
UBC campaign—moving forestry FORWARD

Branchlines is available on our website at:
forestry.ubc.ca/news/branchlines

We acknowledge that UBC’s main campuses are situated within the traditional territories of the Musqueam, Squamish and Tsleil-Waututh, and in the traditional, ancestral, unceded territory of the Syilx Okanagan Nation and their peoples.

The University of British Columbia
Faculty of Forestry

Branchlines is produced in-house twice a year by the Faculty of Forestry, Development and Alumni Engagement Office at the University of British Columbia.

Editor and Writer: Sarah Ripplinger
(UBC Master of Journalism’08)

Designer and Staff Photographer: Paulo Ramos

© 2022 Faculty of Forestry
University of British Columbia

ISSN 1181-9936

Questions concerning Branchlines or requests for mailing list updates, deletions or additions should be directed to sarah.ripplinger@ubc.ca
Beyond greenwash: Explaining credibility in transnational eco-labeling

By UBC Forestry Asst. Prof. Hamish van der Ven

In this age of transnational corporations and image-focused brands, environmentally-conscious consumers may find it challenging to filter out the noise to put their money behind eco-friendly products. Hamish’s engaging narrative proposes a new approach to eco-labeling that could help lift the veil of greenwashing.

The role of business in global sustainability transformations

Edited by Dalia D’Amato, UBC Forestry Dean & Prof. Robert Kozak and Anne Toppinen

Over 30 scholars and experts share theoretical perspectives, case studies and examples to discuss the role businesses can play in creating a more sustainable world in the next few decades. Emerging concepts and trends are explored in a manner that acknowledges the feasibility of divergent pathways while advocating for an alignment of the visions, actions and time horizons needed to realize meaningful change.

Conservation and the genomics of populations, third edition

Edited by UBC Forestry Prof. Sally N. Aitken, Fred W. Allendorf, Margaret Byrne, W. Chris Funk and Gordon Luikart

This textbook explores applications of genetics and genomics to remove some of the barriers barring inroads to conservation. The third edition discusses major new developments in the contribution of genomics to the conservation of populations and species. Practical examples are provided for many of the approaches outlined, which balance theory, empirical data and statistical analysis.
Less than 15 years ago, climate change was still a hotly debated topic in public and political spheres – despite mounting evidence from scientists around the world of the warming effect caused by the release of carbon dioxide and other greenhouse gases from human activities. Today, industries and governments alike are stepping up to tackle the climate crisis, and greenhouse gas reduction targets and policies have become commonplace across sectors.

Within forestry, working professionals in the public and private sectors with knowledge of climate science and sustainable forest management are better positioned to manage and reduce activities that contribute to climate change. However, with new innovations and best practices being discovered all the time in the field of climate science, professionals need continuing education to stay up-to-date.

UBC Forestry’s Micro-Certificate in Climate Vulnerability and Adaptation (CVA) is an eight-week, online program that introduces students to real-world applications and case studies in sustainable forest management. The course helps students understand how to apply climate change science, models and frameworks to assess climate change vulnerabilities and develop sustainable forest management systems.

“This course fills a gap for training in management practices and the application of new tools in the workforce,” says CVA Program Director and Lecturer Sheri Andrews-Key.

Students can complete modules within the course at their own pace and outside of working hours, making it easier for them to balance their education with work and family responsibilities.

“By providing this training in a flexible manner and in an online environment, we are helping to take the pressure off of students to help meet their skills training needs more easily.”

There are plenty of opportunities to connect with professors and students in the course, such as weekly, live-session coffee hours that include a guest speaker presentation on a course-related topic.

“We have had students take this course from South Korea, Iceland, South America and many other countries,” says Sheri. “Despite the difference in time zone, the flexibility of CVA and its different schedule options allow students from around the world to come together to learn and share information.”

“The focus is on developing skills and competencies,” Sheri adds. “Students who pass will have attained a new understanding that can apply to their unique situations and local contexts.”

Former CVA student, Chris Gruenwald, director of forestry with the City of Mission, was impressed by how the program exposed him to “formal methodology to identify where the Mission Municipal Forest is vulnerable to impacts from climate change,” he says.

“CVA helped me see where we are deficient in knowledge and resources, and how to develop strategies to adapt to climate change.”

“Over the past 10 years, I have noticed the extremes in weather both in winter and summer months, which demonstrates to me that climate change is occurring and is not some far-off esoteric concept,” Chris adds. “Climate change is the challenge of our time; and, we all have a part to play in addressing it.”

Find more information about CVA and UBC Forestry’s three other Micro-Certificates: Co-Management of Natural Resources, Forest Carbon Management and Climate Action and Community Engagement, at: forestry.ubc.ca/programs/certificate

Greenhouse gas emission targets by the numbers

The Government of Canada has set a target to cut the country’s greenhouse gas (GHG) emissions by 40-45% below 2005 levels by 2030, with a goal of net-zero emissions by 2050. In BC, the provincial government has set incremental GHG reduction targets, starting with 16% below 2007 levels by 2025 and ending with 80% by 2050.
You might say that forestry runs in the blood of the Tóth/Chipman family. The ancestors of Georgina Chipman (née Tóth) have been working in the profession dating back to the early 1800s. While Georgina pursued a pharmacy degree at UBC in the 1990s, fate decided that her family’s forestry lineage would be extended when she met UBC Forestry undergraduate Gordon Chipman (BSF’93, DFEN’01 (Diploma in Forest Engineering)).

The story of Georgina’s family connection to forestry begins in 1788 — the year of András Tóth’s birth.

András was born in the Kingdom of Hungary, as it was then called. Living in a largely agricultural society with little industry and the murmurings of social reform, András secured a career as a forester, managing likely hundreds of hectares of mixed agricultural, hunting and forested lands held by Count Antal Grassalkovich in the Region of Gödöllő, east of Budapest, Hungary from around 1810 to 1845.

During this time, the House of Habsburg, a prominent European dynasty, was losing its control over western Europe. Despite uprisings by the Hungarian citizenry, the Habsburg Empire held onto its brutal rule, leading to economic collapse and a state of neglect until the Hungarian Government resumed leadership in 1867. As a result of the instability and strife, András’s sons opted for careers in farming rather than forestry.

It was András’s great-grandson, József Tóth, born in 1869, who took up the torch. Graduating from the Hungarian Technical School with a degree in forestry in 1899, József went straight to work in the Gödöllő Forest Region until his retirement in 1934.

Filling in one of the missing generations between András and his great-grandson is the father of József’s wife, Mária Tóth (née Martin). Tamás Martin was the chief forest ranger for the Isaszeg Forest, near Budapest, sometime in the mid-1800s. However, family records were destroyed during the Second World War, leaving little in the way of documentation to retrace his exact years of service. What is known is that, in 1907, Tamás became a grandfather.

Mária and József’s son, Gyula Tóth, studied forestry in Esztergom, a port city on the Danube River in northern Hungary known for its ornate cathedrals. Graduating in 1927, Gyula followed in the footsteps of his great-great-grandfather, András, by working in the Gödöllő forests before being transferred to the Miskolc Forest Region in north-eastern Hungary in 1938. Managing narrow-gauge forest railway systems was a chief enjoyment in his illustrious career, which included being recognized by the Hungarian government as an Outstanding Forestry Worker of the Ministry, among many other accolades.

Our tale takes a sombre turn following the birth of Gyula’s son, Géza Tóth. By the middle of the 1940s, Soviet Russia occupied several countries in central Europe, including Hungary. During this time, thousands of people were rounded up and thrown into the Gulag forced labour camps. Among the detainees was Gyula. Separated when Géza was only eight years old, it would be half a decade before father and son were reunited.

Despite the hardships and fear spreading throughout the country, Géza was able to attend the Faculty of Forest Engineering in Sopron, located in the north-west of Hungary, in 1955. One year later, invading Soviets forced hundreds of students and professors to flee across the border to Austria.
In need of a new home and institution to complete their studies, Géza, along with 200 of his forestry colleagues and 14 faculty members, embarked on a long voyage across the Pacific Ocean at the invitation of the Canadian Government. UBC Forestry opened its doors to the Sopron school, creating a special degree program to help the non-native speakers adapt to their adopted country.

Géza graduated with a Bachelor of Science in Forestry in 1960, and began his 35-year career as an RPF with the BC Forest Service in Victoria, Kamloops and Prince Rupert forest regions. In 1967, Géza met Diane Osborn (BScPhysio’65). The couple were married two years later. They gave birth to Georgina in 1971, which takes us back to the beginning of our story.

Gordon spent much of his childhood in the backwoods of BC’s Chilcotins, “talking with squirrels,” he says, and listening to stories from his father and maternal grandfather about working in the bush at harvesting operations. Gordon first studied forestry at Malaspina College, and cut his teeth working for the Likely Forest Services in the Cariboo Region of BC, as well as developing cut blocks, living in float camps and traveling in helicopters, boats and float planes around Prince Rupert.

Friends invited Gordon to the UBC Forestry Undergraduate Society’s famed Coconut Parties, and these connections, along with his strong desire to expand his skill set, convinced him to enrol at UBC. Gordon received his RPF in 1995 and worked as a professional forester with Jacobson Brothers Forest Products — which later became Riverside Forest Products and then Tolko Industries — in Williams Lake, BC. Following this, Gordon managed the 80,000-hectare Esk’etemc Community Forest near Williams Lake where he helped establish a district heating system that uses debris piles from the local forest.

In 1997, Gordon and Georgina welcomed Stephen Chipman (BSF’21) into their lives. Just like his father and ancestors, Stephen was drawn to the woods. He worked as a firefighter with the BC Wildfire Service and recently graduated from UBC Forestry. Stephen spent his past two summers as a forester and engineer-in-training with NorthPac Forestry Group in Terrace, BC, where he is currently employed. Only time will tell what lies ahead for future generations.

Learn more about the history of the Sopron Division of the Faculty of Forestry at forestry.ubc.ca/about/our-history/sopron-story

Acknowledgements: Many thanks to Gordon Chipman and Géza Tóth for providing historical information for this article.
After many years of advancement, the forestry profession is increasingly going digital. Research and teaching at UBC Forestry is heading the charge, offering students the best possible opportunities to learn and gain skills using industry-focused digital software and hardware. Thanks to a significant in-kind gift from Trimble, a leading global technology company, UBC Forestry is home to the state-of-the-art Trimble Technology Lab – the first Forestry-focused lab for Trimble and the first lab of this type in Canada.

“The Trimble Technology Lab at UBC gives students and researchers access to some of the most sought-after digital tools that are being integrated into forestry practices across the industry,” says UBC Forestry Prof. and Canada Research Chair in Remote Sensing Nicholas Coops. “Making this technology available under one roof will help UBC Forestry continue to provide the highest calibre educational and research opportunities.”

Housed within UBC Forestry’s Forest Sciences Centre, the Trimble Technology Lab space will help train the next generation of forestry and natural resources professionals, researchers and leaders. Computer-based decision support systems, building information modeling software, rugged field-tablets and 3D laser scanners are among the technologies that will help expand teaching and research opportunities. Educational areas that will benefit from this new lab space include silviculture, stand dynamics, forest biometrics, carbon management, sustainable harvesting systems and resource identification and quantification.

“Trimble is incredibly proud to contribute to the advancement of forestry education and learning opportunities in British Columbia,” says Amy Northcutt, director of education and outreach with Trimble. “This gift to UBC represents Trimble’s commitment to the future of sustainable forestry practices and to the next generation of forestry and natural resources professionals. We’ve chosen to invest into UBC because of the alignment around our mission of transforming the way the world works, and our vision for the future of sustainable forestry and natural resource management.”

“Students graduating from UBC Forestry programs in the coming years will be entering careers in which they will address some of the most urgent challenges surrounding climate change, biomass utilization, wood building design, urban planning, sustainable harvesting and forest management,” adds Amy. “Trimble is proud to support these students and future professionals as they tackle these big challenges of tomorrow.”
Creating Solutions for the Planet

Pictured here in the Trimble Technology Lab is UBC Forestry fourth-year undergraduate student in Urban Forestry, Finn Köepf.
“...humans are an essential part of the relationships...”

Growing Indigenous forest gardens

BC’s forests were once extensively managed for long-term sustainability and subsistence

Growing up in Greater Vancouver, Jennifer Grenz (BSc Agro-Ecology’04, PhD’20), who is of mixed Nlaka’pamux ancestry from the Lytton First Nation, often relished in family trips to BC’s Southern Interior, Squamish-Lillooet and Coast Mountain regions. There, she would run through the semi-arid hills and valleys with her cousins, tramping through stands of silver fir, white spruce, western larch, paper birch, trembling aspen and Rocky Mountain juniper.

Her deep roots in BC and passion for nature later led Jennifer down various paths. Following her undergraduate degree at UBC in agroecology, she launched an ecological restoration consulting company (Greener This Side), completed a PhD in Integrated Studies in Land and Food Systems at UBC and ran as the North Island-Powell River Liberal candidate.

In January 2022, Jennifer accepted a joint appointment with UBC Forestry and UBC Land and Food Systems as an Asst. Prof. where her research and teaching pursuits will build on her experience in invasive species management, ecological restoration, science communication and Indigenous ecology. What drives her work, she says, is a desire to better understand and apply an Indigenous world view to the management of landscapes.

“I work a lot within Indigenous forest gardens,” she explains. “When you look at the species compositions in some areas in a legacy state that reflects Indigenous forest management practices, you find that they don’t look the same as a typical forest.”

Prior to colonization, Indigenous peoples managed their lands extensively, placing certain plant species at various intensities in different locations to provide food and medicines on a broad scale, Jennifer explains. Forest soil was fertilized with fish bones, similar to how gardeners use fish emulsion to fertilize their backyard plants. Fire was used to conduct quick burns to open up the forest canopy, sweeten the soil (improve fertility) and remove dry woody debris that could ignite into a major blaze.

Many of these practices are being reclaimed and adapted in the modern context by Indigenous communities, says Jennifer, yet few are currently integrated into non-Indigenous-led, large- and small-scale forestry operations, despite their potential to improve climate resiliency.

Indigenous forest gardening was developed and passed down over millennia, which accounts for the sophistication and ingenuity of forest garden practices.
“The soil profile in Indigenous managed forest gardens can be entirely different than neighbouring areas,” says Jennifer.

“I have seen time and again throughout my career situations similar to the one in which salmonberry thrived in nearby Indigenous gardens, but, when a stand newly eradicated of invasive Japanese knotweed was planted with salmonberry, the plants died,” notes Jennifer. “The soils in non-Indigenous gardens are so different that the same result is not yielded.”

Jennifer has set her sights firmly on transferring knowledge of Indigenous ecology, food systems, forest gardens and invasive species management in collaboration with Indigenous communities and governments, as well as research into the soil microbiome and plant-soil interactions. This work, she asserts, can contribute to the much-needed paradigm shift towards relational, sustainable forest decision-making that honours place-based knowledges, community needs and values. These concepts will also be featured in her forthcoming book, *Medicine wheel for the planet: Healing the land by reclaiming an Indigenous ecology*, due to be released by Knopf Penguin Random House in 2024.

“We are dealing with many complex issues from the legacy of invasive plants on the land and a lack of understanding of and relationship with the land and how to steward and tend to plants,” says Jennifer.

While quick burns may work in remote rural areas, they may not be possible near towns and cities. This, Jennifer says, raises the question of what can be done instead. The answer is something she plans to pursue over the coming years.

“Today, we are in need of a reapplication of the food systems lens that guided the land management practices of Indigenous peoples who engineered forest species composition to serve our needs, as well as preserve the long-term health of the forest,” says Jennifer. “This involves a recognition that humans are an essential part of the relationships that allow plants, trees and forest ecosystems to thrive, and need to play a role in the purposeful shaping of lands and waters.”

Indigenous ecology, she says, has this concept baked into its core.

“...humans are an essential part of the relationships that allow plants, trees and forest ecosystems to thrive...”

My question to address this predicament is: ‘how do we reclaim the practices in our Indigenous oral histories and then revitalize them in the modern context?’"
Forestry research, education and field work wouldn’t be the same without access to forested ecosystems. UBC Forestry is fortunate to be in close proximity to vast expanses of woodland that enabled the establishment of our Malcolm Knapp Research Forest (MKRF) in 1949. MKRF and the Alex Fraser Research Forest are both ‘working’ research, demonstration and education forests managed by UBC Forestry. To-date, over 1,000 research studies have taken place at MKRF, and more are on the way!

Located near Maple Ridge, BC, MKRF encompasses 5,157ha of forest; over 200km of trails and roads for walking and hiking; as well as riparian habitats and protected areas for fish, water, soil, wildlife, biodiversity, community values and traditional Indigenous uses. Outdoor Wild & Immersive programming for children and youth takes place here year-round, along with meetings, conferences and retreats at MKRF’s Loon Lake Lodge and Retreat Centre. MKRF is also home to the Gallant Mill, a full-service, custom-cut sawmill and timber manufacturer.

Over the next while, the research forest is looking to expand its infrastructure and renew the Gatehouse facilities, which will feature a new building, classroom, washroom and exhibition space. A new warming hut and a loose-parts playground will also find a home here once funding is secured.

Paul Lawson (BSF’77, MBA’90, RPF)
After over 23 years with MKRF, Paul is moving to a part-time director role before easing into retirement. Paul worked for several forest companies throughout BC prior to starting his own business as a forestry consultant in 1988 and landing the manager role with MKRF in March 1999. Over the course of his career with MKRF, Paul has played an integral role in spurring innovation and building a stable business model. In 2017, Paul was recognized with a Distinguished Forest Professional Award from the Association of BC Forest Professionals for his dedication to elevating the forestry profession in BC, as well as for his leadership, educational outreach and support of forestry research.

Hélène Marcoux (MSc’13, RPF)
Manager, MKRF
Hélène brings to MKRF extensive experience in forestry, strategic planning, decision-making, post-secondary teaching, ecology and small tenure management. She started working at MKRF as an intern from 2013-2014, then taught forest and natural areas management at the British Columbia Institute of Technology until she began her role as manager of MKRF in August 2021. Hélène will draw from her past experience, including her project management and leadership skills, to help realize some of the many upcoming projects at the research forest.

Victoria Farahbakhchian
Field education manager, MKRF
MKRF’s inaugural field education manager, as of May 2022, Victoria was excited about the opportunity to help people access the outdoors and inspire them to learn about the natural environment. Victoria was previously the education coordinator and a graduate student with MKRF. Her new role was established to help create safe, inclusive and educationally immersive experiences for everyone who visits MKRF – from UBC students to community members. One of her main responsibilities is to support the delivery and logistical planning of UBC Forestry’s field camps at both
MKRF and Alex Fraser Research Forest. She also oversees and is growing the Wild & Immersive outdoor education program, potentially expanding its opportunities for children to an adult audience. On top of an undergraduate degree in biology and a Master of Science in ecological restoration, Victoria has 10 years of experience with the City of Maple Ridge creating programs for children and youth. A biologist in training, Victoria is also finishing her professional requirements towards becoming a Registered Professional Biologist.

“I hope to continue bringing more people to the MKRF to share the land-based learnings this place offers.”

Sean Pledger (BSF’09, MSc’16, RPF)
Resident forester, MKRF
Sean was hired at MKRF in May 2022 after conducting research on carbon markets, culturally-driven forest management and biomass supply chains and technology with the Nuxalk First Nation on the central coast of BC. Prior to his role at MKRF, Sean also spent five years as a certification auditor for sustainable forest management and chain of custody systems.

“I wanted to join MKRF to have the chance to take part in all aspects of forestry on a secure land base where I’d have the opportunity to work with researchers and trial practices that are less commonly employed on crown land.” 🍃

Learn more about Malcolm Knapp Research Forest, including Wild & Immersive programming and other educational and recreational activities, at: mkrf.forestry.ubc.ca
Diversification could be a boon for ecosystems and the economy

A student uses the TimberOps virtual reality tool at the UBC Forestry Action Lab. The technology combines spatial data into a single visual map to help with operational planning and consultation.
In this age of the Anthropocene, the pressures of human activity are impacting everything from fish populations to weather patterns, compelling dramatic shifts in climate and ecosystems that parallel some of antiquity’s most Earth-altering natural disasters.

“The global forest sector has become so challenged by climate change and extreme weather events,” UBC Forestry Assoc. Prof. Dominik Roeser comments from Northern Italy in July 2022, as a record-breaking heatwave seared much of Europe and alighted deadly wildfires.

Growing up and studying in Germany, Dominik saw how that country has tried to find a balance between the needs of the forestry sector and ecologic and human values. Continuous cover silviculture systems, which promote uneven-aged woodlands as opposed to even-aged plantations, were practised to some extent there – as well as in parts of Switzerland, France, Austria and Slovenia – since the late 1800s, according to a 2004 historical review. Today, the practice is one of many sustainable forest management tools applied by foresters, as well as landowners.

Sustainable forest management is defined by the Food and Agriculture Organization of the United Nations as the stewardship of forests to maintain their biodiversity, productivity, regenerative capacity, vitality and long-term ecological, economic and social functions. This can take the form of managing species diversity and age; public and private partnerships to control pests and fire risk; providing corridors for species movement; removing invasive species; and planting species better adapted to changing environmental conditions, according to a 2016 sustainable forestry article.

In British Columbia, Indigenous peoples have lived in harmony with forests for millennia, establishing knowledge and traditional practices derived from hands-on experimentation and cultivation of forest ecosystems. Increasingly recognized for the important role they can play in present-day sustainable forest management, Indigenous approaches are the focus of scholarship and education at more and more institutions, such as UBC, and are being integrated to a greater extent into industry best practices and government policies.

“Indigenous peoples were long-time stewards of the land; and, now industry, academics and government are considering that in terms of helping with designing sustainable forestry frameworks and research questions,” says UBC Forestry Asst. Prof. Danielle Ignace. “It has to be done in a respectful way, but I think we’re at a place to do that.”

Diverse perspectives

Danielle researches the connection between organisms, including humans, and their environment in her field of ecophysiology. A lot of her work now focuses on different ways of knowing.

She often finds herself asking how forestry can bring to the table the voices and perspectives of more disparate communities to identify potential inroads and novel approaches to tackle the climate challenge: “How can we be more inclusive, diverse and sustainable at the same time?”

Answering this question could give voice to the views and knowledge of people from often underrepresented communities, cultures and ethnicities.

“Scientists once worked in a bubble, without a lot of community engagement or concern for the harms and pollution inflicted on the natural environment and human populations,” notes Danielle, who is an enrolled member of the Coeur d’Alene (Schitsu’umsh) tribe from Idaho, US. “Now we are adding that community component to realize a more holistic approach.”

Including diverse perspectives is particularly important when implementing new policies and for decision-making within forestry and other areas of science, technology, engineering and math, aka STEM, she says.

The status quo is increasingly untenable in a political, social, ecological and commercial landscape that must address sometimes diametrically opposed needs when it comes to recreation opportunities in forests, eco-tourism, species migration routes, protection of old growth trees and fish habitats, as well as mitigation measures for wildfires and floods.

Diversifying forest management in BC is a long time coming, remarks Dominik, and something that must be realized sooner rather than later.

“We’ve moved from a narrow focus driven by economics to a more holistic approach that takes into account more diverse landscape values,” he adds. “This involves selecting tailored solutions that work best to achieve multiple values on the landscape and that are driven by changing societal and environmental conditions.”
The need for local engagement

According to Natural Resources Canada, the forestry sector contributed $25.2 billion to the Canadian economy in 2020. That same year, Government of BC figures indicate that forestry contributed $1.27 billion to provincial coffers.

“Forestry has generated enormous amounts of wealth and has the potential to keep doing so,” says UBC Forestry Assoc. Prof. Harry Nelson. “However, this has come at a cost in terms of biodiversity, the aesthetic value of forests, hydrology and other externalities.”

Competition among forestry companies has also historically perpetuated some unsustainable practices in the BC marketplace, notes Harry, who adds that “the volume-based system has not served us well.”

Harry describes a hypothetical scenario in which one out of 20 valleys is harvested. “Harvesting only one valley isn’t enough to cause widespread impacts on species, habitats, streams and watersheds. But, by the time you get to the 18th or 19th valley, the cost to the system has changed.”

Society is taking note, Harry remarks: “this is reflected in such things as how polarized the debate around harvesting old growth trees has become.”

Instead of allowing several companies to log a certain number of trees from one area, i.e., a volume-based system, Harry believes an area-based system could yield a more sustainable result. In area-based systems, each company is allocated a parcel of land that only it can log to a given threshold. This, Harry believes, could change the mindset from one of “how can we most economically get better logs from here than other companies?” to “how can we retain the value of this land over the long-term?”

Additional government oversight and community engagement can also play an important role in managing forest resources optimally and sustainably, he adds.

Challenges ahead

Forests have evolved for around 400 million years, adapting through ice ages, mass extinctions and assorted pests and diseases. Since humans began to live among them, trees have provided us with shelter, sustenance and materials for our tools and lodgings. However, a myriad of human-caused stressors and placing increased pressure on forested ecosystems.

The 2021 heat dome scorched areas in the south-east of BC with above 40-degree-Celsius temperatures. In its wake, UBC Forestry Asst. Prof. David Montwé saw many of the ponderosa pine, Douglas-fir, western larch and other seedlings that Ministry of Forests researcher Deb MacKillop planted the year before stunted or died. Of the lot, ponderosa pine seemed to fare the best: “although it’s still hard to say to what extent before we do the number crunching,” David admits.
Together with the Ministry of Forests in Golden, BC, David is researching new approaches to forest management that will likely be needed to adapt to climate change and the severe weather it heralds.

He sees hope in silviculture approaches such as the shelterwood system, in which the forest canopy is removed gradually over many years to provide seedlings with shelter from the sun’s radiating heat. The approach can also slow or stop a fire by forcing it to leap further to alight neighbouring branches.

Another approach to reduce the impacts of heat and drought is thinning. Curtailing competition for resources, such as water, nutrients in the soil and sunlight, can give individual trees more leeway to focus their energies on growth, he says.

It’s a process that comes at the cost of efficiency, and one that will require new harvester technology and technician training to hit the ground running, he admits, but one that may be necessary to improve forest resilience.

**Next-generation products and services**

Since the dawn of human civilization, global forests have declined by around 46%, according to a 2015 global forest survey published in *Nature*. A 2020 Food and Agriculture Organization of the United States report highlights that, only three decades ago, global forests were estimated to be 420 million hectares larger than they are today.

While deforestation has slowed, there remain questions about how to manage a resource that takes several decades to replenish, and is now largely second-growth.

In the BC context, products produced from wood may need to get with the times, says Dominik.

“Right now, we make the most money from sawn logs. Moving forward, we need to look for more high-value products, such as mass timber, bioproducts, textiles, perfumes and other extractives, to broaden our product base.”

The shift is already happening. Dominik says. “In other parts of the world, a pulp mill is now called the biorefinery. They still make pulp and paper, but they’re also making some more advanced bioproducts out of lignin and other extractives from wood.”

The overall industry diversification picture should also include high-value forest services, such as carbon sequestration, clean water, biodiversity services, recreational opportunities and cultural values, Dominik adds.

Carbon capture and multiple other forest services occupy a great deal of UBC Forestry Asst. Prof. Ignacio Barbeito’s headspace.

“With every forest management practice we select, there are trade-offs to consider that will impact other systems, such as carbon capture stored in trees and soils, along with biodiversity,” says Ignacio.

“For example, certain silvicultural systems can prolong tree regeneration, thus increasing biodiversity. However, this can also increase the odds that the forest could be negatively impacted by fire or pests within a 140-year versus a 120-year growth cycle.”

Ignacio researches the costs and benefits of different forest regeneration approaches. His work is hands-on and data-driven. He takes countless measurements of tree girth and height. He collects core samples by cutting through tree rings using an incremental borer. And he sifts through stacks of data collected by the Government of BC over the years.

“BC has a wealth of long-term experiments from the 1970s, ’80s and ’90s that can help us address many questions by looking back and also not having to start from scratch,” Ignacio says. “When it comes to forest regeneration investigations, the problem is that it can take many years before we can reach a solid conclusion.”

For example, sifting through past studies, Ignacio was able to see that the pine weevil did not used to be a problem at high elevations in BC. However, “now we are seeing it damaging trees 1,500 metres and above close to Vernon,” he shares.

Ignacio’s research is also helping to fill in blanks surrounding wood quality, as well as how mixed forests can improve forest resilience; interactions between broadleaf and conifer forests can impact their growth and yield; and different harvesting practices can impact all of the above.

“We need to find very high-value products from wood — such as large, old-growth stands — to take more pressure off of traditional forestry products, which are not as easy to source as they once were.”

“Conifers mixed with deciduous species tend to fare better in drier climates and be less prone to the effects of fire,” he notes. “There is a lot of potential to, for example, increase the value of our deciduous forests as a wood product.”
Almost all commercial timber currently harvested in BC is coniferous. Adding more broadleaf trees to the mix could loosen some of the demand on conifers while concomitantly diversifying the market and potentially aligning it with research that supports planting a variety of trees.

“The point here is to not put all your eggs in one basket,” says Ignacio. “We need to start looking at wood quality as opposed to volume, particularly as we are harvesting mostly second growth forest now.”

Science and technology
Natural resources, such as forests, are under increased pressure from the encroachment of human populations and extreme weather from climate change that is leading to more drought, fire activity and flooding. As the stressors mount, many forests in the Pacific Northwest have become more prone to die-off from disease and infestations, such as the mountain pine beetle and spruce budworm.

“We’re trying to hit a moving target,” says UBC Prof. Sally Aitken. “Trees we plant now will be facing hotter temperatures when they’re older, so we need to consider that when selecting seedlings.”

Sally and her team at the Centre for Forest Conservation Genetics and the Genome Canada-supported, applied genomics CoAdaptTree research project look for genetic characteristics to discover the seed source with the greatest potential to be well-adapted to a region. Examples of this include identifying trees that are more drought-tolerant or have the ability to thrive in cooler temperatures as seedlings and warmer temperatures as mature trees.

Her work involves DNA sequencing using massively powerful computers that sift through tens of thousands of genes from different tree species.

“Long-term field experiments can take 10 to 20 years to understand the population differences and what aspects of climate could affect their survival,” notes Sally. “So far, we have been getting similar results from our genomic methods as others have from these long-term field experiments, but in a fraction of the time.” Once the right mix of seedlings is identified, ‘assisted migration’ is used to transport seedlings to areas where they’re better suited to the climate — and future climate projections — within or outside of their naturally occurring ranges.

In BC, this could look like planting western larch outside of its range or planting a species of Douglas-fir found in a slightly drier or warmer environment within a Douglas-fir range, Sally explains.

Models and big data
Technology has become essential to much of the data collection undertaken by researchers at UBC Forestry. Advances in remote sensing, software, web applications, as well as big data and number crunching seem to have become the norm rather than the exception.

UBC Assoc. Prof. Tongli Wang’s climate and ecological modelling applications provide a glimpse into the future. Tongli’s scale-free climate models downscale the currently available gridded climate data to specific-point locations through a dynamic local downscaling algorithm, providing more accurate climate data.

His models integrate historical and future climate data into the same package, and cover BC (climatebc.ca) and other parts of North America (climatena.ca), along with the Asia Pacific (web.climateap.net). With over 2,500 subscribers, Tongli’s applications have served as important tools for climate change-related studies and applied work, particularly in the development of ecological models.

“There is a mismatch between the climate that trees have adapted to and the climate that they will face in the coming years,” says Tongli. “This mismatch can cause problems for trees in the future. To help deal with this, scale-free, climate data-based ecological models can project the range of suitable climate conditions in which trees can survive and grow given different climate scenarios.”

Tongli and his team work on projections that range from forest ecosystems to individual tree species and tree populations.
Their scale-free climate models also help UBC Forestry researchers, such as Canada Research Chair in Remote Sensing Prof. Nicholas Coops.

The Integrated Remote Sensing Studio Nicholas heads is at the leading edge of technological innovations that are pushing the boundaries of possibility. At the fingertips of Nicholas and his team is everything from drones to satellites, LiDAR, aeroplanes and mobile phones. These high-tech tools collect data on forest structure and dynamics; biodiversity; carbon accumulation; leaf chemistry characteristics; as well as the impacts of natural disasters and climate change.

"Historically, forest management has been limited by a lack of high-quality data," says Nicholas.

The desire to protect ecosystems and species has been around for a while. However, it was often unclear how many ecosystems and species were at risk, where they were located and the multifaceted dynamics at play over time. Unknowns such as these – that are further exacerbated by a changing climate – can throw a wrench in the works when trying to decipher the potential advantages and disadvantages of different forest operational and management approaches.

"Now we are in the midst of a revolution in computing, remote sensing technology and digital information that is giving us much better models and predictions around what is happening on the landscape, such as tree height, canopy cover and volume," says Nicholas. "This data is helping us make much better decisions to protect such things as species at risk, riparian areas and fish." A trend, Nicholas adds, that can hopefully lead to even better decision-making in the future.

Join us for our Future Forests Webinar on December 1, 2022 to hear industry expert insights on where the profession is heading: forestry.ubc.ca/events/future-forests-webinar

Assoc. Prof. Tongli Wang's ecological model projections of how BC Biogeoclimatic (BEC) zones create highly detailed visual aids for developing forest adaptive strategies in BC.
The Arbutus tree is hard to miss. Its orange bark and gnarled, twisting branches stretch out from hillsides towards large bodies of water. Yet, over the past few years, the only broad-leaf evergreen in Canada has been showing signs of distress. Affected by fungal pathogens and other diseases that can cause its leaves to darken and drop, UBC Forestry graduate student Priya Puri (BSc(Forest Sciences)’20) and other researchers in BC and the US, are collecting vital data that could help save this iconic tree.

“We hope that this research will fill in some gaps to explain why Arbutus trees are declining,” explains Priya, who is currently in the second year of a Master of Science in Forestry under the supervision of Prof. Richard Hamelin and Prof. Peter Arcese.

Samples from Arbutus tree bark, leaves and surrounding soil are sent to a lab for analysis, Priya explains. There, technicians look for causal agents that might make one group or subgroup of tree more vulnerable to the effects of climate change or other environmental factors. In particular, Priya is interested in the trees’ microbiome: the collection of helpful and harmful bacteria, fungi and other microorganisms present in and around them.

“I’m looking at the whole microbiome of Arbutus trees to see which communities of microorganisms – such as different fungi, bacteria and other small, single-celled organisms – might affect tree health, either negatively or positively, or sometimes both at the same time,” Priya explains.

Pathogens that fall into the negative category are part of the pathobiome; whereas, those pathogens that have a positive effect on a tree’s health and longevity form part of their symbiome.

While it is yet unclear exactly why Arbutus trees have been on a slow decline throughout their native ranges since the 1970s, climate change is likely at least partly to blame, Priya says.
Although Arbutus are drought-tolerant, the cumulative effects of dry weather, changing temperatures and external stressors can make them more vulnerable to the effects of disease.

Priya relates this to the concept of the disease triangle, which highlights the interaction between disease, environmental conditions and the host and pathogen, according to a 2006 *Nature Reviews Microbiology* article, “The disease triangle: pathogens, the environment and society.” This conceptual model has been expanded to consider how microbes associated with pathogens and their hosts within a certain environment can initiate disease – something that Priya is rethinking in light of emerging pathobiome theories.

“Similar to COVID-19, if you’re already stressed and not feeling well, the disease is probably going to hit you a lot harder.”

Priya is also investigating whether a probiotic that gets applied to Arbutus bark, leaves, surrounding soil or seeds, along with specific microbiomes associated with certain seed sources, could improve Arbutus health and survival rates.

Much stands to be lost should the Arbutus disappear from the south-west, says Priya. They support nesting birds with their branches and berries; pollinators with their flowers; and other trees, such as the Garry oak and Douglas-fir, through their root system, which also helps keep soil in place. Arbutus bark is used by Coast Salish Nations for medicines, the wood for carvings and the berries for teas.

“We want everyone to be able to cherish this tree 20 and 100 years from now,” says Priya. “They provide a lot of ecological and cultural benefits to our coastal forest systems and communities.”
As forest management becomes increasingly data-driven, modelling is an approach that more researchers, government representatives and forestry professionals are using to sift through reams of information to develop recommendations, processes and regulations. The research of UBC Forestry Asst. Prof. Gregory Paradis involves high-tech, number crunching software that identifies patterns and creates projections designed to guide forest management policies and best practices.

In his 2020 paper published in *Environmental Reviews*, Gregory and co-authors proposed the development of decision support systems (DSSs) to help decision-makers mitigate invasive species in forests. Forestry issues and factors have become increasingly complex with the advent of novel technological innovations and changing needs and values. As a result, the paper argued, tools such as DSS may well increase in importance and prevalence.

“Forest management planning and the forest sector have often focused on the forest itself; however, the goals of sustainable forest management require analysis of what’s happening in the forest and what’s happening with the timber that is extracted from the forest at the same time.”

A key advantage of modelling tools such as DSS is that they are able to draw from and condense high volumes of statistical data. From the start of the global pandemic, many Canadians quickly became accustomed to hearing about COVID-19 models and how they were being consulted by public health officials to set policies and regulations. The same principles apply to modelling in forestry.

Designing accurate models requires gathering as much information as possible and considering weaknesses or uncertainties that could compromise results.

Managing complexity with systems models

*Looking at the bigger picture through a systems modelling lens offers data-driven paths forward to achieve forest operations and management goals*

As forest management becomes increasingly data-driven, modelling is an approach that more researchers, government representatives and forestry professionals are using to sift through reams of information to develop recommendations, processes and regulations. The research of UBC Forestry Asst. Prof. Gregory Paradis often involves high-tech, number crunching software that identifies patterns and creates projections designed to guide forest management policies and best practices.
Modelling is one mechanism that could be used to forecast the cumulative effects of the forestry system and make research-based observations about opportunities to improve that system” – Gregory Paradis

From Gregory’s perspective, a key challenge when developing sustainability impact models for BC’s forest sector is how to ensure that they are robust. What factors should be identified and fed into each model? What could be missing?

For example, Gregory describes how maximizing carbon sequestration by way of effective supply chain decision-making requires the simultaneous modelling of forest management procedures and standards within forest ecosystem services management and forest products supply chain management. However, at present, government-run forest ecosystem planning and industry forest products fibre procurement planning operate largely in isolation.

This, Gregory points out, “is possibly leaving some sustainability enhancements on the table.”

Mapping the big picture

Systems modeling in agriculture began around the 1950s as a way to optimize farm decisions and evaluate the economic benefits of policies on rural development, according to the article, “Brief history of agricultural systems modeling,” published in the journal Agricultural Systems. This, the authors note, led to additional economic, ecological and biological modelling of farming systems, such as grasslands used for grazing cattle. One of the draws of the approach was its ability “to study the complex behaviour of ecosystems as affected by a range of environmental drivers.”

Applications of systems modelling in forestry followed suit. In 1972, the Systems Analysis Working Group of the Society of American Foresters was formed to promote the development of operations research models designed to help solve many of the challenges facing forestry and the forest industry.

According to “Brief history of systems analysis in forest resources,” discussions at the first Systems Analysis and Forest Resource Management Workshop, held in 1975, surrounded “multiple-use and land-use planning, timber management,
timber harvesting & transportation, forest fire and data management.”

Much has changed in forestry operations and management since the 1970s, but systems modelling continues to be used to forecast the potential outcomes of hypothetical scenarios. It can also aid in accounting for multiple and sometimes disparate interests and goals, says Gregory.

**A systems approach**

“Forests are systems, supply chains are systems, governments are systems under policy frameworks, societies are systems in terms of communities that interact and do things based on inputs and outputs,” Gregory explains. “They behave according to certain rules that can lend themselves to predictions.”

When running yield optimization simulations, Gregory and his team often integrate game theory to help anticipate the behaviour of agents, such as branches of government or industrial licensees.

Because each agent must follow certain rules, Gregory can “use knowledge of these processes to guess which way the frog’s going to jump, e.g., what would happen if we add a new pellet mill to this existing supply chain and have it co-funded by government and industry, and have them turn a profit?”

If one approach shows positive economic, social and environmental returns, agents may opt for that approach over the status quo, Gregory says. Models of positive outcomes derived through joint ventures can argue that case, too.

“A big part of the strategic outlook of my lab – the Forest Resources and Environmental Services Hub (FRESH) – for the next few years is: ‘What would be the potential outcome if we join together forest ecosystem and forest sector supply chain management both in BC and across Canada?’ asks Gregory.

“How might a new, collaborative approach potentially improve the environmental and commercial sustainability of forest activities?”

Initially launched in 2013 by former UBC Forestry Assoc. Prof. Verena Griess, FRESH investigates ecological, economic and social aspects of sustainable forest and natural resources management in collaboration with academics within UBC Forestry’s Integrated Remote Sensing Studio. The FRESH research team leverages knowledge from management studies, silviculture, operations research and risk assessment theories to optimize processes and build sustainable forest management plans.

“With the urgency of the climate crisis, now is a really good time to use tools such as systems modelling to estimate the potential added value of collaborative innovations in BC and to start realizing the benefits as soon as possible.”

“Carbon reduction often comes with a cost; so, sometimes there’s no way to have your cake and eat it, too. But operations research can provide models of how to get as much carbon storage as possible at as low a cost as possible.”

Learn more about Gregory’s work and the FRESH lab: [fresh.ubc.ca](http://fresh.ubc.ca)
Upcoming challenges in the forestry profession will require insights and leadership from students moving through postsecondary education today. In recognition of this, and through the support of a private grant-making foundation, UBC Forestry established the Future Forests Fellowship (FFF) in 2013. Amounting to $280,000 over four years, FFF is one of the largest awards of its kind, and will once more be directed to an incoming doctoral student in forestry in 2023.

“This fellowship recognizes young scholars from around the world who are on track to become future leaders in forestry,” says UBC Forestry Dean and Prof. Rob Kozak. “Through their forward-thinking graduate studies, they are advancing the profession by taking a critical lens to some of the most pressing environmental challenges facing our planet, and proposing innovative solutions and interdisciplinary collaborations to realize sustainable change.”

The fellowship was first awarded to Sara Barron in 2013 for her research on how urban forests can be designed to be climate-ready, support local ecosystem services and improve the health and well-being of local residents. Today, Sara is the program director for both UBC Forestry’s undergraduate and graduate urban forestry programs.

“Without FFF, I would not have had the means to pursue a PhD,” says Sara. “The award changed my life; and, I look forward to spending my career paying this forward to our forestry students.”

PhD candidate Sarah Dickson-Hoyle received the fellowship in 2018 for her research into collaborative wildfire management and community led restoration. In partnership with the Secwepemcúl’ecw Restoration and Stewardship Society (SRSS) and its member Secwépemc communities, she aims to identify solutions to improve collaboration between First Nations and the BC government across all stages of wildfire management, including recovery. To-date the fellowship has supported Sarah in conducting research on the Elephant Hill wildfire in collaboration with the SRSS, as well as completing field work in partnership with St’uxwtéws (Bonaparte First Nation) that involved monitoring the recovery of culturally significant plants following Elephant Hill.

“Ethical and impactful community-based research requires substantial investments of time and resources,” says Sarah. “My research would not have been possible without the FFF.”

“As BC faces ongoing impacts from climate change, there is a need to transform current approaches to forest management and for First Nations to lead this process.” 🌿

Applications for the 2023 Future Forests Fellowship are now open. The deadline for completed applications is November 25, 2022 at 4 p.m. PST.

Find out more at: forestry.ubc.ca/future-forests-fellowship
Global forestry assets could be poised for rapid growth

UBC Forestry alumnus, David Brand (PhD Forestry ’85), knows the value of forests well. After serving as the director general of science and sustainable development with the Government of Canada’s Department of Natural Resources, David held roles with Australia’s largest forestry business. He also worked with a farmland and timberland investment organization before founding the global nature-based investment company, New Forests, in 2005.

David started New Forests with a $1 million loan, and has grown the business to a leading investment manager of approximately 1.25 million hectares of forest, valued at around $8.75 billion. A strong believer in the principles of sustainable forest management, David’s vision for his company includes creating opportunities within the forestry sector for communities to transition to a greener and more sustainable future.

“Community involvement and partnership are part of the transition to sustainable land use and natural climate solutions,” David says. “Community members need to be part of a shared value solution to generate returns and ensure success.”

As a certified B Corp – working in the best interests of communities, employees, consumers and the environment – New Forests also supports the climate change mitigation opportunities forests can provide. Circular bioeconomy technology, such as wood-based bioproducts, along with the carbon sequestration potential of trees, are part of New Forests’ investments in real assets, as well as natural capital strategies.

“Forestry has become a key player in the sustainability transition,” says David. “It’s like all roads lead to Rome. Forestry investment can help in both mitigation and adaptation to climate change, as well as support nature conservation and create benefits to rural communities, including Indigenous communities.”

Forestry’s return on investment comes from the sale of timber and other forest-related goods and services, along with biological growth. Similar to wine, the more forests age, or in this case grow, the more valuable they can become.

A relatively new opportunity, forestry investing started to gain appeal around the 1980s and 1990s, largely in the form of assets sold to institutional investors in the US, says David. It has since piqued the interest of investors looking for ways to balance their portfolios with longer-term options.

“Forestry has no inherent correlation with the stock market or bond rates,” explains David, making it an attractive investment opportunity, particularly when weathering volatile market conditions.
What we’re trying to accomplish is looking at how the forestry sector can be recast as a solutions-based sector that leads in the transition to a sustainable society.”

The longer time horizon of forest assets does come with a degree of risk from externalities such as climate change, wildfire and other natural disasters, although many can be mitigated through management practices and insurance,” David shares.

Because real assets tend to be scarce or finite, demand for them increases with population growth. For example, real estate is a real asset that grows in value in a tight market with few available homes and lots of people looking to buy. Trees are a finite resource in that there is limited arable land upon which to grow them. With global populations estimated to reach 10.9 billion people by the year 2100, demand for trees and the services they provide could be on an upwards trajectory.

“As human populations and the global economy continue to grow, sustainability is likely to be an ongoing, central trend in investing,” says David. “Everything people do that creates a more sustainable outcome is going to become more valuable.”
A path forward for old growth forest management
The present state and potential future of old growth forests has been a hot topic in British Columbia. Protests surrounding logging of old growth trees in the Fairy Creek valley near Port Renfrew captured significant media attention in 2021 and 2022, and discussions about how best to manage old growth trees have been ongoing within government, the forestry profession, non-governmental organizations and industry circles.

In April 2022, UBC Forestry held a panel discussion entitled “Old growth forests — what is the path forward?” The session was moderated by UBC Forestry Prof. Sally Aitken and featured Registered Professional Forester (RPF) Cam Brown (BSF’93), elected Chief Councillor for Huu-ay-aht First Nations Robert J. Dennis Sr. (Emchayiik), independent ecologist Rachel Holt (RPBio, RPF) and Tahltan Nation member Garry Merkel (DSc hc).

After a lively and insightful first session, a second “Follow-up Q&A session” was held in May 2022 to offer an opportunity for further discussion with audience members. Following this, panelists Rachel and Cam came together to draft a document that summarizes the key takeaways from the events. Highlights from their report are included below.

**Common ground on BC’s old forests**
Both Cam and Rachel agreed that change is needed to address gaps and integrate new strategies that respond to recommendations found in the old growth strategic review (OGSR) report, “A new future for old forests: A strategic review of how British Columbia manages for old forests within its ancient ecosystems,” published by an independent working group co-chaired by Garry and RPF Al Gorley in 2020.

Panelists agreed that old growth forest management objectives should achieve healthy, resilient ecosystems by taking into account that:

- Biodiversity and ecosystem resilience is at risk when the amount of old growth forest deviates from natural/expected amounts and due to climate change
- Defining exact risk thresholds is challenging, and can vary based on stand types and natural disturbances, placing some forest areas at high-risk with more or less old growth harvesting
- As outlined in the OGSR, managing for ecosystem health should involve a combined look at high-risk thresholds and the full range of risk levels across the land base
- Low absolute levels of old forest can weaken landscape connectivity, reducing the overall effectiveness of retention strategies
- Landscape and stand management strategies should consider retaining the biological structures of forests to mitigate against risks to biodiversity loss

**Managing for big tree old growth**
Big trees constitute a smaller percentage of the many tree types within forests, but remain an equally important asset to overall forest health and resilience. In past, many more large, old growth stands were logged than other tree types. As such, what remains should be a significant consideration in retention strategies; and, the proportion of old growth stands within overall forest distribution should reflect historic, rather than present, ratios.

**Panelists also noted that:**

- Tree size is an important consideration among many when designing old forest retention strategies
- Maintaining biodiversity should be prioritized over minimizing timber supply impacts when selecting old growth retention areas
- Short-term deferral of harvesting very large, rare stand types keeps the door open to more options

The around 11 million hectares of old growth forest in BC — representing 21% of the province’s forested lands — is around 45-50% of what existed hundreds of years ago. However, the panel noted that figures such as these do not quantify levels of risk to biodiversity, which can be better explored by:

- Looking at ecosystems and the distribution of stand types/sizes in isolation
- Incorporating into retention strategies: forest area productivity and the retention of large stands at historic abundance levels
- Externalizing protected areas and non-timber harvesting land bases (THLBs), as commercial logging cannot occur in protected areas but can in non-THLBs, even if more rarely than in THLBs

Panelists agreed that tree height and diameter at breast height are the best metrics in the Vegetation Resources Inventory to identify large stands. However, what constitutes a big tree changes by ecosystem and is often subjective. Panelists recommended consulting the Government of BC’s Old Growth Technical Advisory Panel’s map of old growth forests. It provides a provincial scale analysis of old growth trees and is organized into five size categories using height and diameter specific to every ecosystem by biogeoclimatic variant.

Read more about “Old growth forests — what is the path forward?” and watch recordings from the events at: forestry. ubc.ca/events/old-growth-forests-the-path-forwards
Suzanne and Dominik’s multidisciplinary research will showcase this approach to forest management within UBC Forestry’s 5,157-hectare Malcolm Knapp Research Forest near Maple Ridge within the Lower Mainland’s temperate rainforest, along with the 10,000-hectare Alex Fraser Research Forest near Williams Lake in the interior dry-belt of BC.

Demonstrations could move novel forest operations and high-tech equipment into the mainstream

Born and raised in Calgary, Jill Kantelberg spent her summers camping and hiking with her family in BC’s interior where she marvelled at verdant forests of pine, spruce and aspen. This experience, and the times she has ridden horseback under the trees in Germany and France, informed the passion the interior designer has for the natural beauty of the forest, along with her powerful desire to support innovative harvesting practices.

Jill and her partner Michael McCain’s transformational gift of $250,000 to move Canada towards continuous cover forestry practices is making possible innovative research, teaching and partnerships led by UBC Forestry Prof. Suzanne Simard and Assoc. Prof. Dominik Roeser.

Continuous cover forest management systems retain tree densities and formations that best suit the local climate and ecosystem. Also known as selective or partial harvesting, the approach involves removing only a select number of trees, leaving many still in place. The practice originated in Europe in the late 1800s, and has been mainly used there up to now. This has opened the door for BC to become a leader in demonstrating the potential of continuous cover forestry.

Suzanne and Dominik’s multidisciplinary research will showcase this approach to forest management within UBC Forestry’s 5,157-hectare Malcolm Knapp Research Forest near Maple Ridge within the Lower Mainland’s temperate rainforest, along with the 10,000-hectare Alex Fraser Research Forest near Williams Lake in the interior dry-belt of BC.

“We are committed to taking steps towards sustainability and climate change, and we have chosen forest ecology as one of our platforms.”

– Jill Kantelberg
Building on Suzanne’s Mother Tree Project, Suzanne and Dominik’s continuous cover forestry practices project will identify and fine-tune partial retention silviculture systems that best suit the parameters of local conditions, values and objectives. This will involve mapping and recording the carbon sequestration, biodiversity protection, forest regeneration and timber harvesting potential of the continuous cover method.

Suzanne and Dominik’s project is building consensus among different branches of forestry by combining learnings from research into the interconnectedness of trees with novel operational solutions. The end goal will be to demonstrate how this collaboration can yield positive results that can be carried forward to future projects, partners and teams.

The Mother Tree Project found that current harvesting techniques can result in the loss of 60% of forest floor carbon sequestration, along with mosses and lichens that are important stores of water and nutrients within forests.

Suzanne and Dominik’s continuous cover project will test how smaller equipment designed for the selective harvesting of trees can minimize impacts to the forest floor and biodiversity during harvesting.

“Continuous cover gives us another forest management tool,” says Dominik. “The research that we are conducting thanks to Jill and Michael's support can set the scene, and help us understand the bottlenecks and potentialities when it comes to achieving our objectives with continuous cover forestry practices and technology in the province.”

“Demand for knowledge about partial harvesting practices is rapidly increasing in BC, but the knowledge, equipment and trained professionals needed to implement partial retention is currently lacking.”

– Dominik Roeser

“After I read Dr. Suzanne Simard’s book, Finding the Mother Tree, I was transfixed by her scientific discoveries of mycorrhizal interactions among trees, and the consequences these discoveries could have on the ways trees are both harvested and re-established.”

– Jill Kantelberg
Recent biomaterial developments by researchers and students at Asst. Prof. Feng Jiang’s Lab

Functional
Stainable
Biomaterials
Lab

Learn more at
nanocellulose.forestry.ubc.ca
Wood fibre-based foamboard
This wood-based foam is high-quality, safe to touch and biodegradable. It is used in building insulation to replace traditional polyurethane foam or glass fibre mats, as well as for packaging cushioning or as hydroponic foam for agriculture.

Cellulose-based transparent film
Cellulose-based transparent film is a biodegradable and eco-friendly alternative product with the strength, flexibility and transparency similar to or even better than some petroleum-based plastic films.

Cellulose-based superelastic aerogel
This superelastic, thermal-insulating and lightweight cellulose aerogel, made with proprietary technology, avoids the ethical and environmental drawbacks of the down and synthetic down filling found in such things as jackets, sleeping bags and duvets.

Cellulose-based ionic conductive hydrogel
Ionic conductive hydrogel made from cellulose scaffolding features high ionic conductivity, low-temperature tolerance, high mechanical performance and biodegradability that could be used in wearable electronics, artificial skin, sport sensors and electrodes for health monitoring.

Cellulose-based 3D printed material
3D-printed cellulose can be used for high-performance structural components – such as lightweight vehicles, housing and packaging materials – that can support over 15,000 times their own weight.

These leading-edge products made of cellulose and other wood-derived biomaterials could one day be on a store shelf near you. 🌍

Descriptions provided by Yuhang Ye, PhD candidate; Zhengyang Yu, PhD student; Yifan Zhang, master’s student; Jiaying Zhu, PhD student; Penghui Zhu, PhD; and Yeling (Yale) Zhu, PhD.
Rhinoceros poaching is an ongoing scourge propelled by global demand for the ungulate’s prized horns. Each year, the horns of hundreds of rhinos—mostly located in South Africa—are sold as trophies or for traditional medicinal purposes.

An Hoang learned of the illegal rhino horn trade while in grade school in her home country of Vietnam. The thought that poaching could push some species of rhino to extinction cut her to the core. An won an essay writing competition, held by Wilderness Foundation Africa, to visit the Hluhluwe-iMfolozi Nature Reserve in South Africa and learn more about the issue. This experience ultimately steered her in the direction of studying conservation.

Now in her fourth year towards a Bachelor of Science in Natural Resources Conservation (NRC) at UBC Forestry, An has already added several other academic achievements to her list. These include being awarded the prestigious HSBC Emerging Leader Scholarship award, as well as receiving a Wesbrook Scholar Designation, Karen McKellin International Leader of Tomorrow Award and Faculty of Forestry International Student Scholarship.

Over the summer of 2022, An pursued her advocacy work to help protect rhinos from illegal poaching as a Wild Rhino Representative with Wilderness Foundation Africa in Vietnam.

Undergraduate student An Hoang found her calling through the fight to stop wild rhino poaching

What interested you in forestry?
I initially wanted to study psychology, but after I got sponsored to visit South Africa in 2017, my whole life changed. My passion for conservation only grew stronger when I found UBC Forestry’s NRC program.

What are your career aspirations?
After my co-op position as an outreach team member with Parks Canada, I found that my passion lies in science communication and outreach. I want to eventually go back to Vietnam to raise awareness and teach people about conservation. Currently, conservation back home simply means not littering. There’s no discussion on demand reduction, sustainable living, local involvement or inclusive conservation, and I want to change this. I’m not exactly sure what I want to do after I graduate yet. I would very much like to find a position that fits me, then eventually find my research interest for my higher academic career.

What are you looking forward to in the final year of your studies?
While not knowing what I will do after graduation scares me a little, I’m looking forward to finishing up my bachelor’s degree and applying my knowledge to real-life situations.
The legacy tree

In October 2008, UBC Forestry recognized the longstanding generous support of Charlie Johnson (1936-2007, BSF 62, RPF) with the planting of a Douglas-fir tree and installation of a memorial plaque. Charlie co-founded Pacific Regeneration Technologies Inc. and was the director of the Silviculture Branch of the Ministry of Forests. Together with his wife Sue Johnson, whom he met on UBC campus, the couple has contributed over $1.75 million to various UBC Forestry initiatives since the 1990s.

Following the passing of Sue in 2021, UBC Forestry extended our recognition to this much-beloved family with the installment of an additional plaque in Sue’s honour. The legacy Sue and Charlie leave behind will continue to empower UBC Forestry students, researchers and staff to strive to support the health and well-being of natural ecosystems across British Columbia, Canada and the world for years to come.
The forestry profession is in the midst of a major transition. New markets for high-value timber products and novel bioproducts are being explored. More people, companies and institutions are calling for greater protection of animal habitats, eco-tourism and biodiversity. Indigenous and local communities have a more prominent seat at the table. And a greater emphasis is being placed on how to tackle the global climate emergency through sustainable forest management than ever before. Our panel of industry experts will discuss some of the challenges and opportunities that lie ahead.

Featuring UBC alumni guest panelists:

• **David Brand** CEO, New Forests  
• **Linda Coady** President & CEO, BC Council of Forest Industries  
• **Domenico Iannidinardo** Senior VP – Forest & Climate and Chief Forester, Mosaic Forest Management

**December 1, 2022 | 12:00-1:00pm**

To attend please register at:  
[forestry.ubc.ca/events/future-forests-webinar](http://forestry.ubc.ca/events/future-forests-webinar)