



fall 2019
Renew

in this issue:

- 2** Wildfire assessment tool gaining traction
- 5** Northern ENCS program establishing roots
- 10** Modelling the economics of tree improvement



UNIVERSITY OF ALBERTA
DEPARTMENT OF
RENEWABLE RESOURCES



The Strength of **COMMUNITY**

A message from the Chair

As we close off what has been a unique spring and summer in Alberta, it is time to take a moment to reflect on the legacy of the Department of Renewable Resources, and its predecessors, and to highlight how our research and alumni communities come together. It is this synergy that strengthens our purpose and ensures the impact of our educational and research endeavours.

In celebration of the 90th anniversary of the Breton plots, the annual summer field tour was a huge success. We were gratified by the significant support from alumni and local community members, with over three times the turnout of a typical year.


During alumni weekend at the University of Alberta our Department hosted events to celebrate 100 years of soil science education and research. To help alumni connect with our scientists, Dr. David Olefeldt, Dr. Derek

Mackenzie, Dr. Sylvie Quideau, and Dr. William Shotyk provided lab tours and Renewable Resources staff and scientists engaged alumni in an *Ask a Soil Expert* event. Finally, Dr. Scott Nielsen hosted a *Bears over Beers* forest ecology event. Participants had the chance to hear about Scott's research and then engage in casual conversation with him and other department academics and students. We are very pleased with the outcome of these events and the turnout from our alumni community. We are now gearing up for next year, which will mark the 50th anniversary of the start of the B.Sc. Forestry program.

I hope you enjoy learning more about the diversity of our research and teaching activities in this issue of *Renew*. Please don't hesitate to contact me to discuss our Department's existing work or future opportunities to collaborate with us.

Dr. Ellen Macdonald

Chair, Department of Renewable Resources



Wildfire risk assessment tool gaining traction with communities

A new tool developed by Dr. Jen Beverly, Assistant Professor in the Department of Renewable Resources, is helping residents understand how to plan for wildfires in their communities. Beverly's analysis, called an Exposure Assessment, has been adopted by FireSmart Canada and has already been well received in Alberta and Yukon. Its core strength is connecting wildfire risk to personal values.

"The tool relates fire ignition factors to a geographical location—so if you're standing on that spot, if that's your house, it becomes relatable to your life," Beverly explained. "On these maps, people see their own driveways."

The approach first identifies what hazard fuels are present in and around a community and then considers the potential for ignition by three main pathways: long-range embers, short-range embers, and radiant heat from fires adjacent to a community. A distinct benefit of Beverly's approach is that it identifies and prioritizes areas within a community with the greatest exposure to wildfire risk, enabling targeted mitigation efforts.

For community members working toward better fire safety, this resource can make a difference.

"To be able to tell people something that relates to them uniquely is really powerful," said Michele Longo, a resident of Bragg Creek who worked with Beverly to produce an assessment for her community.

Beverly's focus now is getting the Exposure Assessment in the hands of practitioners who can use it to help communities across Canada. The Wildland Fire Canada 2019 conference in Ottawa is hosting a training workshop this November. To learn more about the Exposure Assessment and workshop, visit Beverly's website: wildfireanalytics.org.

This project was supported by the Forest Resource Improvement Association of Alberta (FRIAA).





Study untangles **impacts** of insects and drought on **boreal trees**

A new study has documented how insect defoliation can lead to higher risk of tree mortality by increasing a tree's vulnerability to drought.

The study, led by Dr. Uwe Hacke and Dr. Vic Lieffers, Professors in the Department of Renewable Resources, found that defoliation by insects affects trees in two key ways. First, by impacting xylem cells that help transport water within trees, and second by reducing the integrity of the phloem tissue that provides trees with sugars and energy. The combined effect is a weakening of a tree's access to nutrients and water, which could make them more susceptible to drought events, which are projected to increase with climate change.



Treatment **technique** shows promise for **remediating** contaminated **soils**

A soil treatment technique to reduce chloroform, a hazardous contaminant used in many industrial processes, has shown success in a recent study by doctoral student Alison Murata and Dr. M. Anne Naeth, Professor in the Department of Renewable Resources.

The technique uses zero-valent iron to break down chloroform into less hazardous by-products. For Murata and Naeth, the trial results were somewhat unexpected. Previous studies showed chloroform only partially broke down using this technique.

"Other trials may have been too short in duration," explained Murata. "Achieving complete chloroform degradation makes this method much more promising."

The project was funded by the University of Alberta and the Land Reclamation International Graduate School, and the results are informing options to treat contamination at the historic Ellerslie Waste Management Facility.



Conservation of small habitat patches shouldn't be overlooked

Small habitat patches play a crucial role in maintaining biodiversity and should not be overlooked in conservation planning, according to a study by doctoral student David Deane and Dr. Fangliang He, Professor in the Department of Renewable Resources.

Deane's involvement in the study started with a personal curiosity. In a landscape fragmented by human activity, what role might small islands of habitat play in achieving conservation objectives?

To test the biodiversity value of these small habitat patches, Deane and He gathered 175 datasets of species inventories for discrete "habitat networks" –for example, wetland complexes, archipelagoes, and landscapes fragmented by human activity. They then simulated the effects of removing all the smallest patches of habitat within each network. The results of the analysis were clear.

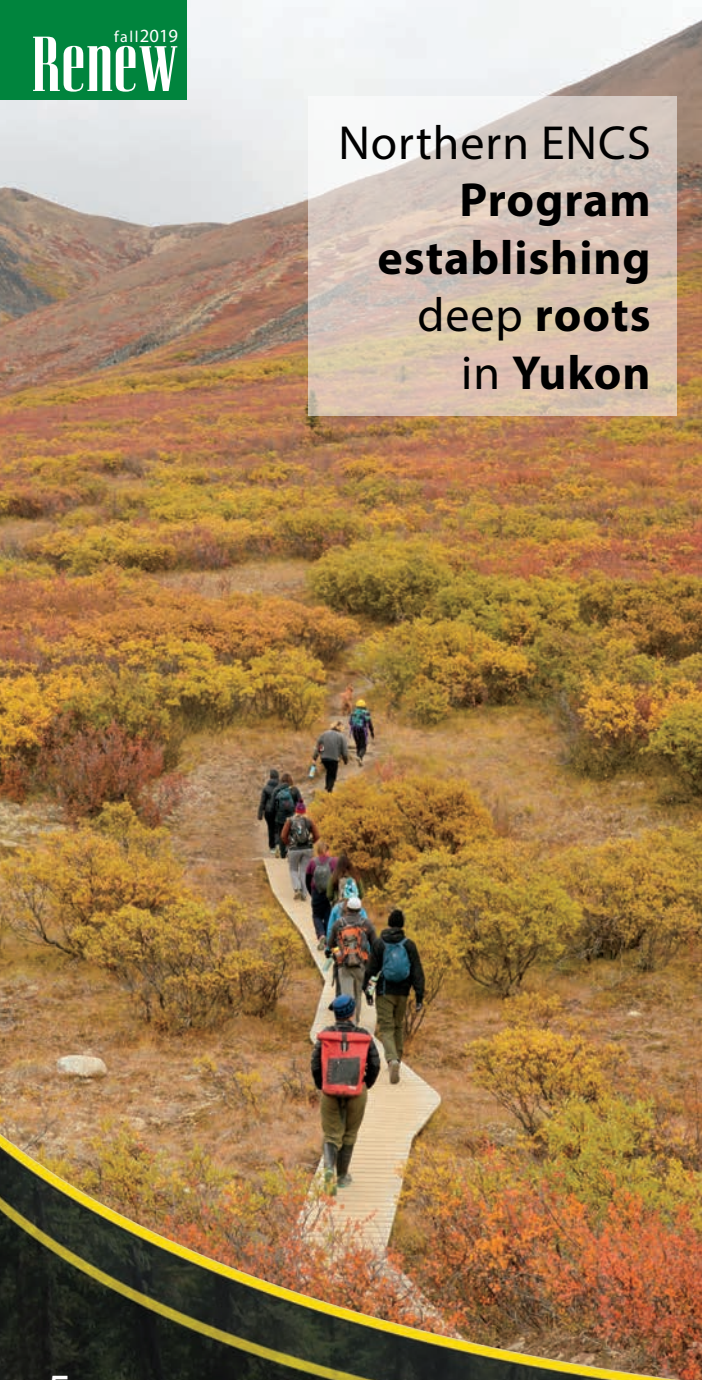
"Eighty percent of the time, there are species in the small patches that you would lose if you wipe those patches out," explained Deane.

Small patches of high-quality habitat were shown to act as lifeboats for species, especially for rare species that were not found in larger patches. Deane suggests land managers need to look beyond simply the size of a conservation area and consider both habitat quality and patch size.

"Don't discount the small patches just because they're small," Deane said.

Deane and He's study has shone light on an age-old debate of whether to conserve many small patches of habitat or a few large patches. But Deane insists it's not an either-or debate. Rather, the important part is to understand what species' needs are, in order to conserve patches that address the conservation objectives of a given landscape.

This study was funded by NSERC.



Northern ENCS Program establishing deep roots in Yukon

It was not long ago that eager students in Yukon had little choice but to travel south for a university education in science. Thanks to the establishment of the Northern Environmental and Conservation Sciences (ENCS) Program, partnered with Yukon College, students are now able to access advanced science education right in their own backyard. The program has grown successfully over the last 10 years, with discussions now emerging about expanding the model into the Northwest Territories.

The Northern ENCS program offers students the ability to complete the third and fourth years of a Bachelor of Science degree in Whitehorse, Yukon. The local access to advanced science education has enabled 90 students to complete coursework in the north, approximately one-third of whom are First Nations students.

The program's ability to adapt to the needs of local students has been key to its success, as has the strong partnership with Yukon College. The program has helped numerous students successfully complete undergraduate degrees close to home.

"Students face different circumstances and challenges in the north. . . To see students completing science degrees in the north is something we are really proud of," stated Dr. Fiona Schmiegelow, Program Director and Professor in the Department of Renewable Resources.

The program is also empowering northern students to pursue graduate studies while remaining in the north. Two recent B.Sc. graduates completed M.Sc. programs in Yukon this year. It's a feat that would have been far more challenging without the local program.



“The program allowed some strong connections to be developed that really helped the process. If you’re based in the north and you want to do work in the north, all of that falls into place much easier,” said Jared Gonet, a member of the Taku River Tlingit First Nation, and recent B.Sc. and M.Sc. graduate through the Northern ENCS program.

The program isn’t just serving students in Yukon, however. Through spring, summer and fall field schools, or a semester in the north, students from the University of Alberta Edmonton campus have been able to expand the scope of their education and be exposed to northern perspectives.

“It’s an opportunity to experience the north and have conversations with and learn from people with local perspectives,” stated Schmiegelow.

To date, over 134 students have taken advantage of the northern field schools with another 22 lined up for the inaugural fall field school this semester. The winter field school has been so popular it has a two-year waiting list.

As part of the growth plans for the Northern ENCS program, one area Schmiegelow hopes to expand

is remote access for northern students. This process enables students in Yukon to join classes taking place at the University of Alberta.

Dr. Ellen Macdonald, Professor in the Department of Renewable Resources, had students from Yukon join her forest ecology class remotely the past three years. She saw firsthand the value of the experience for both students and professors.

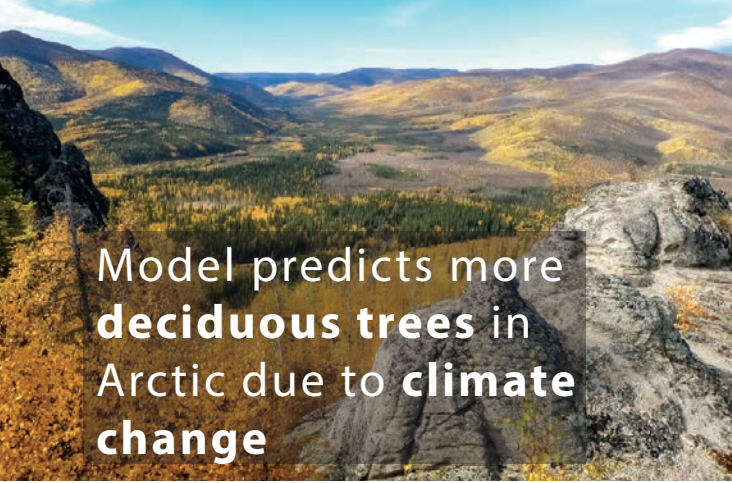
“It really enriched the class to have students in the north. We could see and hear different experiences and challenges in the north,” said Macdonald.

All in all, it’s been a whirlwind of development for the Northern ENCS program. From Schmiegelow’s perspective, she’s pleased with the progress.

“We’ve really woven the north into the fabric of the program,” stated Schmiegelow.

To learn more about the Northern ENCS program and its various offerings you can visit: www.tinyurl.com/NorthernENCS





Model predicts more deciduous trees in Arctic due to climate change

A new modelling study predicts that Arctic forests will shift from coniferous- to deciduous-dominated due to the compounding effects of climate change and wildfire. The result could be a near doubling of deciduous trees in the Alaskan boreal by 2100.

The main mechanism underlying the predicted shift in forest type is nutrient cycling. Warmer temperatures and wildfires are predicted to increase the depth of the thawed, nutrient-rich layer of the soil, which favours establishment and growth of deciduous tree species. Leaves shed from these trees then decompose rapidly and add even more nutrients to the soil, creating a self-reinforcing loop.

Alumnus Zelalem Mekonnen and colleagues at the Lawrence Berkeley National Laboratory used the ecosys model, developed by Dr. Robert Grant, Professor in the Department of Renewable Resources, to produce the modelling results. This study has recently been published in *Nature Plants*.



LRIGS receives prestigious Emerald Award

The Land Reclamation International Graduate School (LRIGS), a one-of-a-kind program spearheaded by Dr. M. Anne Naeth, Professor in the Department of Renewable Resources, recently received an Emerald Award recognizing its contributions to environmental stewardship in Alberta.

LRIGS is the only program of its kind in the world that focuses on land reclamation and brings students into an interdisciplinary, international environment that includes industry, government, and academic experts. The school has graduated 65 students who are now mainly employed in land reclamation.

Emerald Award recipients are selected by an expert panel of judges and are chosen to showcase environmental excellence in Alberta.

Multiple futures possible for Alberta's lodgepole pine forests after beetle outbreak



Forest managers hoping for natural pine regeneration following mountain pine beetle outbreaks in Alberta may be disappointed, according to a recent study led by Dr. Ellen Macdonald, Professor and Chair of the Department of Renewable Resources.

“Natural regeneration of lodgepole pine is going to be poor on most of these sites,” said Macdonald. “If the objective is to have a fully stocked lodgepole pine forest, treatments will be needed.”

Macdonald worked with several colleagues to survey sites across west-central Alberta for signs of lodgepole pine regeneration as part of the Beyond Beetle project. While pine regeneration was poor, other species such as aspen, white spruce and black spruce, showed somewhat better regeneration in stands following the beetle outbreak. Alternative management options—such as leaving stands to regenerate as different species mixes—may warrant consideration.

“There are other possibilities for what could happen to these forests. They could transition to something else,” said Macdonald.

Dr. Nadir Erbilgin, Professor in the Department of Renewable Resources, led a companion study looking at the health of trees that survive mountain pine beetle attack. He concluded residual trees will play a key role in the on-going succession and future resilience of these forests.

To assist managers with evaluating their options, Macdonald, Erbilgin, and their team produced a field guide and video explaining their main findings and applications. The materials have been well received by practitioners and are available online at tinyurl.com/BeyondBeetleGuide and tinyurl.com/BeyondBeetleVideo.

This project was funded by the Forest Resource Improvement Association of Alberta (FRIAA), Alberta Innovates–BioSolutions, fRI Research, and Alberta Agriculture & Forestry.



UNIVERSITY OF ALBERTA
 DEPARTMENT OF
 RENEWABLE RESOURCES



Preparing students to provide solutions

Student Profile: Morgane Merlin

Morgane Merlin is equally comfortable with high tech sensors or a paintbrush in hand. For Merlin, art and science have always been complementary disciplines, and she's been able to explore the combination of the two through her doctoral studies in the Department of Renewable Resources.

"I've always tried to keep doing art during my thesis," she said. "It's very different from science, and it allows me to express myself differently, with less constraints."

Merlin recently earned the opportunity to act as an Artist in Residence for the European Geophysicists' Union General Assembly, where she ran a workshop on science illustration.

"I think some people discovered you don't need to be Michelangelo to draw your science," she said. "You just need some time and you just need to try."

Morgane's creativity is equally apparent in her approach to science. As part of her research, Merlin, Dr. Kevin Solarik, and Dr. Simon Landhäusser, Professor in the Department of Renewable Resources, cut a mature aspen tree at its base. They then placed the bottom of the tree in a large tub of water on a scale and supported the tree with a 10 meter tall tower. Their goal was to accurately measure water use by the tree. In turn, this allowed them to properly calibrate sap-flow sensors and determine where to place them on the tree for the most accurate results. Their research is informing studies about how trees use water in reclaimed areas, harvested areas, and forests affected by drought, insects, and even climate change.

Merlin's blend of technical expertise and applied research are great examples of how the Department of Renewable Resources is *preparing students to provide solutions*. Her study was funded by Canada's Oil Sands Innovation Alliance (COSIA), TransAlta and NSERC.



UNIVERSITY OF ALBERTA
DEPARTMENT OF
RENEWABLE RESOURCES

New tool enables economic evaluation of tree improvement options

Forest managers have a new tool to evaluate the economic trade-offs of tree improvement on their tenures. The module integrates directly into existing forest growth models and can be run in-house by company staff.

The economic evaluation pulls together key variables related to tree improvement investments, including seedling and orchard management costs, and considers these alongside other crucial economic factors such as log price and harvesting costs. This approach enables foresters to explore balancing a wide range of values on individual tenures. The module includes both traditional and new genomics-based approaches, and is also able to directly link to GYPSY, a growth and yield model widely used by foresters across the province.

The module development was led by Dr. Wei-Yew Chang (UBC) in collaboration with Dr. Barb Thomas, Associate Professor in the Department of Renewable Resources.

Speaking about the utility of this module, Thomas said, "It's really powerful. Forest companies can punch in their company specific numbers to see what variables make tree improvement a positive economic scenario for securing fibre."

To help foresters integrate the tool into their planning, Thomas, Chang, and their team recently hosted a workshop for individuals from



government and industry. Thomas hopes the tool will support forest managers to include more tree improvement in their planting programs, which could help companies increase wood volume on an increasingly limited landbase.

The study was funded as part of the Resilient Forests (RES-FOR): Climate, Pests & Policy–Genomic Applications' Genome Canada project, led by Thomas.

Credits:

Content: Matthew Pyper, Sarah Nason
Fuse Consulting Ltd.

Photos: Gabriel Rivest/Northern
ENCS (Cover, p.5), GOA (p.2),
Alison Murata (p.3),
Hoopla Media (p.7),
Morgane Merlin (p.9).

fall2019
Renew

Department of Renewable Resources
University of Alberta
751 General Services Building
Edmonton, AB T6G 2H1
CANADA

Phone: 780-492-4413

Fax: 780-492-4323

www.rr.ualberta.ca



UNIVERSITY OF ALBERTA
FACULTY OF AGRICULTURAL,
LIFE & ENVIRONMENTAL SCIENCES



UNIVERSITY OF ALBERTA
DEPARTMENT OF
RENEWABLE RESOURCES