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Renew

in this issue:

UNIVERSITY OF ALBERTA
DEPARTMENT OF
RENEWABLE RESOURCES

Looking Forward

A message from the Chair

As I begin my term as Chair of the Department of Renewable Resources, I'm very proud to be leading an amazing group of academics, support staff, graduate students and undergraduates who share a thirst for understanding the complexities of natural and managed ecosystems.

One of my core goals as Chair is to continue our outreach to you, our community, and expand on our knowledge exchange activities. In this way, we aim to support discussions that will lead to better approaches to management, conservation and restoration of ecosystems and landscapes.

Undergraduate training remains a core focus for our department. Our goal is to improve on our experiential opportunities for students and ensure they are learning the communication skills necessary for their successful transition into the workforce.

We look forward to continuing to provide professionals with the opportunity to continue their life-long learning through our executive education and course-based Master's programs.

Please feel free to reach out and connect with me, and I look forward to working with many of you as we expand our impact through our research and education programs.

Ellen Macdonald
Chair, Department of Renewable Resources

Genomics **study surprises researchers**, showing restricted ability of **trees** to adapt to **climate change**

A recent study published in the journal *Science* has surprised researchers by showing that even after evolving independently for 140 million years, lodgepole pine and interior spruce use the same 47 genes to adapt to the climate in which they live. The findings suggest that trees may be far more restricted in their ability to adapt to climate than expected.

"The lack of different genetic solutions to climate adaptation in these two species, despite having gone through many ice age cycles, implies that trees may be fundamentally limited in their ability to evolve new ways to cope with future climate change," says Andreas Hamann, a co-author of the study.

The discovery has positive implications for helping trees adapt to climate change.

"If a limited set of genes are responsible for climate adaptation, then we can quickly and relatively inexpensively screen natural populations for their preferred climates, and manage them accordingly in reforestation programs," says Hamann.

Genomic screening could complement, and in the future potentially replace, long-term genetic field trials that are currently required to match seed sources to their preferred climates. At present these trials require scientists to wait up to 20 years while the trees grow to maturity, a delay which means scientists are always 20 years behind climate change.

The research project was led by Sally Aitken from the University of British Columbia and was co-led by Andreas Hamann. The *Science* paper was senior-authored by team members now at the University of Calgary and the University of Melbourne.

A thin layer of **mulch** drastically **improves reclamation** in pine stands

The application of mulch to reclaimed oil and gas sites has been criticized in recent years, but a new study suggests that some level of mulch could significantly benefit regeneration on lodgepole pine stands.

Damian Cirelli, Tim Vinge and Vic Lieffers found that a thin (1 cm) layer of mulch produced a ten-fold increase in seedling density on reclaimed oil leases. The mulch provided an ideal microsite for germination by maintaining moister ground conditions and reducing temperature extremes compared to the untreated site. Adding additional seed after mulch application further amplified the success of the treatment.

However, only a thin layer of mulch was beneficial. While depths of 3 cm and 5 cm were tested in the study, the 1 cm treatment was most effective at producing high seedling density and an even distribution of seedlings on the reclaimed sites.

Lieffers noted that a key factor in the success of the treatment was that the mulch was made from logging slash (branches and tree tops) from the reclamation sites. The tree tops in the logging slash had numerous lodgepole pine cones which provided a direct seed source for the reclamation site.

The study was completed in an upland lodgepole pine stand with sandy clay loam soils. Lieffers suggests that further studies could be conducted on sites with dry sandy soils to further evaluate the role of thin layers of mulch in forest reclamation.

The study was sponsored by Devon Canada, NSERC, and Weyerhaeuser.

Restoration ecologist joins Renewable Resources suite of researchers

Justine Karst has recently joined the Department of Renewable Resources as the NSERC Industrial Research Chair in Terrestrial Restoration Ecology. Her program will explore how roots grow and interact with natural and reclaimed soils, with the goal of helping landscapes recover from disturbance, including oil sands mining.

More specifically, Karst will explore how plant roots and associated microbial communities interact in regions where oil is naturally present in soils. This knowledge will serve as a key input for improving vegetation growth and survival on reclaimed areas that may contain residual oil and bitumen in reclamation materials.

The Chair is sponsored by NSERC and COSIA. Karst will collaborate closely with Canadian Natural Resources Limited, Imperial Oil Resources, Shell Canada, Suncor Energy and Syncrude Canada.

New forestry **students** brush shoulders with **alumni**, **trees** in first week

First-year students in the University of Alberta's forestry program kicked off the school year with a tour of the province's diverse forestry operations. The applied experience was all about getting students into the field to see real-world operations and build lasting connections with peers and forestry professionals.

"We showed the students as much variation as possible, ranging from mill tours, to forest operations, to assessing stream crossings, to gaining an appreciation for fire management," said Vic Lieffers, the lead coordinator on the tour.

The trip was made possible through the generous support of West Fraser, Millar-Western, Alberta Newsprint Company, the Hinton Training Centre and the Government of Alberta.

Scientists **contribute expertise** during tense moments of **Fort McMurray** wildfire

Only a few short months before the Fort McMurray wildfire, Uldis Silins (forest hydrology), Mike Flannigan (wildland fire science) and colleagues completed a study on municipal drinking water risks from wildfires in Alberta's forests. The plan was for the study results to guide the province and municipalities over the next several years. But as the magnitude of the Fort McMurray wildfire became apparent, they found themselves putting many of their research recommendations directly into action.

For Silins and his colleagues, the knowledge gained from a 12-year study of wildfire effects in the Alberta foothills proved invaluable for helping the city of Fort McMurray understand risks to their drinking water supply and how to manage those risks.

"Because of our past work on the Southern Rockies Watershed Project, we were in an excellent position to provide assistance early on to the community," said Silins.

He and his colleague, Monica Emelko from the University of Waterloo, started by helping the province and city of Fort McMurray develop a decision support framework to clarify what needed to be done and when. They then helped the city anticipate broader impacts caused by the fire, such as ash and carbon flushes in the river, and potential strategies to minimize negative effects on the city's drinking water supply.

"Wildfires often happen far upstream of municipalities and their drinking water intakes, and so there is usually an opportunity for the river to dilute the impacts. In this case, the fire happened right on top of the city and provided little opportunity for ash, carbon, and other contaminants created by the fire to be diluted in the Athabasca River before reaching the water treatment plant," said Silins.

For Mike Flannigan, his phone didn't stop ringing for weeks.

"I think I had about 120 different interview requests just on the first day of the fire. I wasn't even able to respond to half of them," said Flannigan, referring to the deluge of media requests seeking his input in understanding the massive event.

Flannigan's key goal was communicating the message that these events are bound to happen, and reinforcing the need to raise awareness about wildfire risks to protect communities located in forested regions of Alberta.

"The more we have people living and recreating in forested regions of the province, the higher the probability of wildfire events. So these communities need to rely heavily on education around fire prevention such as the FIRESMART program," said Flannigan.

Now that the fire is out, Flannigan and his government colleagues have moved into action and established research plots to understand how the fire burned and are using this information to refine fire prediction models.

In the end, both Silins and Flannigan were extremely happy to be able to help the community in this time of need. Silins referred to the experience as an "opportunity of a lifetime," although both of them hope they won't see another community face an event of this magnitude anytime soon.

Premiere forest **ecology conference** coming to Edmonton

Foresters, biologists, reclamation scientists and managers are invited to assemble in Edmonton for the 11th North American Forest Ecology Workshop (NAFEW) taking place June 19–22, 2017 at the University of Alberta.

The event will draw participants from across North America to engage in applied discussions about research and management of forested ecosystems. Keynote speakers will cover topics such as sustainable land-use, adaptation to climate change, and restoration in a changing world.

Registration for the event will open in early 2017. You can find out more at: www.nafew.org.

Forestry professor **receives** national scientific achievement **award**

Phil Comeau was recently awarded the Canadian Institute of Forestry's Scientific Achievement Award at the Institute's annual conference in Vancouver, BC. The award highlights the significant contributions he has made to the management of forests in western Canada.

"Over Phil's career, he has endeavoured to solve real-world problems with an innovative and multidisciplinary approach. His long-term trials have provided the scientific knowledge for the improvement of silviculture and tools used by forest managers across Canada," said Dana Collins, the Executive Director of the Canadian Institute of Forestry.

Comeau said he was honoured to receive the award and that collaboration has been a key part of his career: "By embarking on collaborative research, I've been able to learn new things, share ideas, and accomplish far more than I would have on my own."

New study explores how **disturbances shape** soil fungi and **forest productivity**

A new grant is helping researchers untangle key questions about soil fungi in forests by exploring how disturbances such as fire, mountain pine beetle and forest harvesting affect these important organisms. The findings could prove to be useful for increasing future forest productivity and the resilience of lodgepole pine trees to pests and insect outbreaks.

"When studying forest health, we have historically focused on what has happened above ground, but what is happening below ground is critical to understanding the future health of a forest," said Nadir Erbilgin, the lead investigator on the study.

Erbilgin and Post-Doctoral Fellow Jonathan Cale say this study is particularly important in light of climate change projections which suggest that wildfires and insect outbreaks will be more common as our climate warms. But how soil fungal communities will respond to this new disturbance regime is an important knowledge gap.

"If we can better understand how soil fungi respond to disturbances and combinations of disturbances, we may be able to suggest fungal inoculants for use in lodgepole pine seedlings to help improve growth and vigour," said Cale.

The study was recently funded through the prestigious NSERC Strategic Grants program. The project is a collaborative effort with Justine Karst (UofA), J.C. Cahill (UofA) and Suzanne Simard (UBC). Funding and in-kind support have been provided by Canadian Forest Products, Mikro-Tek Inc., ANC Timber Ltd., Millar Western Forest Products Ltd., Sundre Forest Products Ltd., fRI Research and Alberta Agriculture and Forestry.

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Preparing **students** to provide **solutions**

Student Profile: Murtaza Jamro

High tech labs are becoming a core component of land reclamation research, and it turns out they are a key tool in attracting and training top students as well. Murtaza Jamro, a graduate student from Pakistan, has made extensive use of the advanced labs in the Department of Renewable Resources to answer research questions relevant to Alberta operations.

Jamro worked with Scott Chang and Anne Naeth to determine how mixing LFH or peat with mineral soil influences the biogeochemistry and nutrient availability in reclaimed oil sands soils. His study showed that mixing organic matter (LFH or peat) to mineral soil lead to increased nutrient availability and enhanced soil microbial processes. The findings suggest that a 50:50 mix of either LFH and mineral soil, or peat and mineral soil, can provide necessary nutrients to vegetation while enabling managers to maximize reclamation coverage when organic materials like LFH are limited.

Jamro recently defended his PhD and is an excellent example of how our research infrastructure and programs are attracting and educating the next generation of scientists and resource managers. In this way, we are *preparing students to provide solutions.*

Jamro's research was supported by the Helmholtz Alberta Initiative.

Heated **sediments** release **arsenic** into **ground water**, but the arsenic's fate remains unclear

A new study by Tariq Siddique has shown that industrial operations that heat below-ground sediments, like in-situ oil sands extraction, have the potential to increase arsenic levels in ground water. However, the specific implications for ground water quality remain unclear.

Siddique and Ph.D. student Babar Javed used sediments collected from multiple depths below the earth's surface and treated them with high temperatures (200°C) in the lab, simulating the effects of Steam Assisted Gravity Drainage (SAGD) operations. They found that sediment samples exposed to high temperatures released arsenic at levels that are two orders of magnitude higher than the maximum acceptable limits for drinking water set by Health Canada.

But Siddique is careful not to sound an alarm just yet. Rather, he says this study is one in a series that is helping us understand how arsenic is being released and what happens to it over time. Siddique says arsenic may return to the surrounding sediments once the groundwater moves away from in-situ oil sands operations and begins to cool, a process known as sorption. However, the arsenic could also stay mobilized in ground water, in which case measures may be needed to remove it.

The study was supported by NSERC.

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