Renew

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in this issue:

UNIVERSITY OF ALBERTA
DEPARTMENT OF
RENEWABLE RESOURCES

A new GENERATION

A message from the Chair

Influential research, a commitment to excellence in teaching, and applications of research to solve real-world problems. These are areas where the Department of Renewable Resources continues to lead, and in which we are now expanding with the addition of two new positions.

I am happy to announce that Dr. Brad Pinno will join the department in January as our new Assistant Professor of Silviculture. Thanks to support from our forestry partners we are also seeking a candidate for an Industrial Research Chair in Ecosystem-based Management. This revitalization will lead to new opportunities for the department to expand our research programs to reflect the needs of our partners and the academic community.

Researchers in Renewable Resources have developed long-standing programs in silviculture and ecosystem-based management, and their findings have had significant and lasting effects on forestry, land reclamation, and conservation biology in Alberta. We know these new additions to our department will continue the tradition of multi-disciplinary, influential teaching and research.

I hope you enjoy this issue of Renew as you get a taste of the exciting things happening in our department. As always, please reach out to me with any questions, feedback, or inquiries about collaborative opportunities.

Ellen Macdonald
Chair, Department of Renewable Resources

Artificial intelligence can help **predict** future **wildfires**

Artificial intelligence (AI) may seem to belong in the realm of self-driving cars and tech startups, but it has applications in fire management that may surprise you. A new project has shown that AI can help improve fire preparedness, including coordination of fire resources between provinces.

Using 54 years of historical data, Mike Flannigan and colleagues from the University of Alberta and University of Oklahoma successfully trained a computer model to predict locations of extreme fire weather based on current conditions.

Flannigan notes the new model won't replace existing systems; rather, it can complement tools already being used by fire managers. In a major improvement over past approaches, the new model doesn't rely on precipitation, which has proven to be an inaccurate predictor. Instead, the new model uses more sophisticated variables based on changes in air pressure.

"This machine learning system can be viewed as an early warning system that will help determine where and when severe fire weather will occur," said Flannigan.

This predictive ability will allow fire management agencies to be better prepared by mobilizing resources to high-risk areas, including other provinces.

The study was conducted as part of the Canadian Partnership for Wildland Fire Science with funding from Alberta Agriculture and Forestry.

Yukon courses offer **students** the chance to **experience** the **North**

Students are expanding their horizons while connecting with new landscapes and cultures thanks to a series of new courses in the Yukon. The experience is leaving a lasting impression on students and instructors alike.

The courses are part of the Northern Environmental and Conservation Sciences (ENCS) program delivered in collaboration with Yukon College. Students can spend a week or a full semester learning in the Yukon.

“It’s an incredible opportunity to come north and gain an appreciation for the natural and cultural elements,” said Fiona Schmiegelow, Director of the Northern ENCS program.

The Yukon is arguably an ideal classroom. The nature of land claims in the Yukon provides unique perspectives on Truth and Reconciliation, while permafrost thaw provides an all too real reminder of Canada’s changing climate.

One of the highlights for students and instructors is the cross-pollination that occurs during the courses.

“Each opportunity to blend students from the Yukon and Edmonton is really rewarding in terms of the learning and cultural experiences for both,” said Schmiegelow.

The courses are available during the February Reading Week, at the end of summer, or for the full winter semester. The weeklong courses include a range of experiential opportunities and plenty of time exploring Yukon landscapes. The full semester provides a complete immersion in northern cultures and the Yukon environment. For more information see *www.tinyurl.com/ENCSNorth*.

Familiar and unfamiliar **approaches** help **minimize road impacts** on streams

A recent study has shown that the impact of forestry roads on sensitive streams can be minimized through rapid road removal and modern erosion control measures. These findings could have important implications for road design and sediment control measures in sensitive watersheds of Alberta.

Previous studies have found high sediment production where forestry roads cross streams: silt and sand wash away into the water, negatively affecting aquatic ecosystems. So Amelia Corrigan and Uldis Silins set out to test whether removing and reclaiming roads shortly after forest harvesting might make a difference.

The positive effect of rapid road removal, combined with other erosion control techniques, was substantial. They found no significant increase in sediment levels above and below road-stream crossings—even during major rain events. They also observed very little sedimentation the year after the road was reclaimed.

Corrigan attributes the surprisingly positive results, in part, to sediment control measures. Large spanning bridges, silt fences, and temporary water bars were employed.

Prompt road removal was also a key factor in reducing sedimentation. The time between road building and road removal in their study was only

10 months—a feat made possible because the harvesting occurred over a short time period.

Despite the positive findings, Corrigan emphasizes the importance of collecting long-term data on sediment levels at the treated sites. Natural fluctuations in annual rainfall could still play a role in sediment levels as the reclaimed roads naturally regenerate over time.

Corrigan was co-supervised by Mike Stone at the University of Waterloo and the study was conducted in the Southern Rockies of Alberta. It was supported by Alberta Innovates and Canfor, with additional support provided by the partners of the Southern Rockies Watershed Project.

Save the date: The next **Bentley lecture** is January 25th

The Bentley lecture in Sustainable Agriculture will continue the tradition of providing insight and perspective when Jennifer Clapp, a Canada Research Chair in Global Food Security and Sustainability at the University of Waterloo, speaks on January 25, 2018.

Clapp's lecture is titled "Mega mergers on the menu: Corporate concentration and the politics of sustainability in the global food system."

The lecture will be held at 3:00 pm at the University of Alberta and is open to the public, free of charge. To attend the dinner or discuss sponsorship opportunities, please contact Sharon Katzeff at 780-492-0379. More details will be posted closer to the event at: *www.tinyurl.com/Bentley2018*

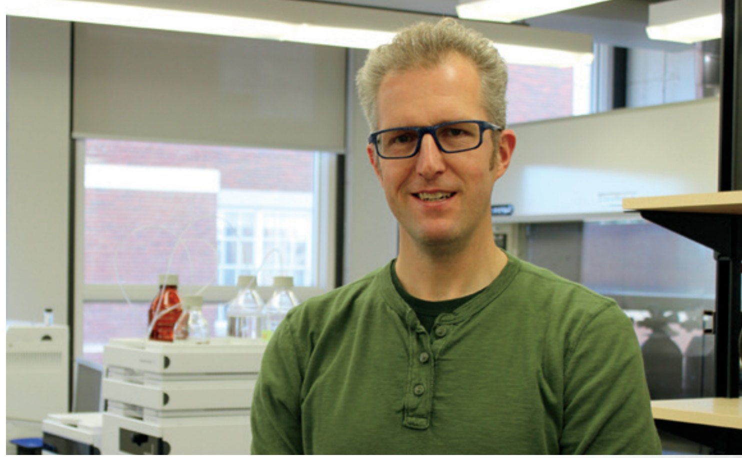
Small **hills increase** plant **diversity** on reclaimed sites

A new study suggests that using a dozer to construct small hills on a forest reclamation site can give plants a helpful boost while saving costs at the same time. The simple technique increased the number and types of plants on an oil sands site. It also reduced costs by lowering the machine hours required.

The key to success was a diversity of growing sites. The small hills—approximately 5 m wide and 1.5 m high—created a range of microsites, from damp depressions to dry peaks. Forest-associated plants were clear winners, with more growing in areas with small hills compared to areas where soil was spread evenly. The benefits of small hills also far exceeded the value of smaller soil ridges and troughs.

Katharine Melnik, Simon Landhäusser and Kevin Devito completed the study with funding from the Land Reclamation International Graduate School, NSERC, COSIA, and TransAlta Corporation.

Study identifies potential **index** for evaluating **reclaimed soils**



Soils are teeming with bacteria and other organisms that slowly consume organic matter, recycling nutrients in the process. Now, a new index could make it easier to understand how well these soil processes are recreated in reclaimed soils.

The index, called the Functional Similarity Index, was developed by Derek MacKenzie and his student Mark Howell. By including a broader range of parameters than traditional indices, the new index could be more sensitive to differences among soils.

"Traditional metrics look at nitrogen, phosphorous, potassium and sulfur in soils, but these are more appropriate for agricultural productivity because these nutrients alone are not the main limiting factors for ecosystem function," said MacKenzie.

Unlike these traditional metrics, the new index looks at microbial activity within the soil. It also looks at the nutrient supply of all elements that are essential to plants, not just traditional agricultural measures. Multivariate statistics are then used to tease apart how well these parameters interact in reclaimed versus forest soils.

Given the sensitivity of the index, it could be used to identify reclamation sites needing additional help to recreate key soil processes such as nutrient cycling. It could also allow practitioners to easily track how reclaimed soils are recovering over time.

MacKenzie notes that while the science may seem complex, the index itself is versatile. It can be expressed on a simple scale appropriate for a particular use—for example, as a rank from one (similar to reference forests) to five (very different from reference forests). Even when using a simplified ranking system, the index will be sensitive to differences in reclaimed soils that may not be evident using traditional metrics.

The study was supported by Syncrude Canada and conducted at the landmark Aurora Soil Capping Study, north of Fort McMurray. It was recently published in the journal Applied Soil Ecology.

New **technology brings** scientific **expertise** to your **desktop**

A high-tech classroom at the University of Alberta is making it possible for you to sit in on Department of Renewable Resources seminars, right from the comfort of your own office. This new opportunity is helping practitioners and policy makers stay up-to-date about the most recent scientific findings and their applications.

To learn more about the seminars, and to stay up to date on the seminar schedule, readers can sign up for the department mailing list by contacting Christie Nohos (*christie.nohos@ualberta.ca*).

Two **plant biologists** receive national **awards**

Two researchers in the Department of Renewable Resources have received national awards for their exceptional work in plant and tree biology.

Uwe Hacke received the David J. Gifford Award in Tree Biology from the Canadian Association of Plant Biologists in early July. The award recognizes Hacke's contributions in the field of tree physiology, specifically his work on the transport of water and nutrients in trees.

René Belland received the Magister Teaching Award from the Canadian Botanical Association for his excellence in teaching. Belland teaches moss identification, and thanks to his engaging and energetic teaching style his course is often completely full an hour after registration opens.

Soil **texture** below **wetlands** is key to **reducing** road **impacts**

New roads are often constructed to access resources in the boreal forest, and avoiding wetlands is a high priority. But what happens when there is no other option? A new study suggests that knowing the texture of the substrate that rests beneath the wetland could help reveal where road impacts will likely be highest. The findings could help improve road-building practices in Alberta's wetlands, including the oil sands region.

Scott Nielsen and his student Caitlin Willier looked at roads built on wetlands in northeast Alberta. They compared bogs, which are fed mostly by rain water, and fens, which have flowing water and are fed by regional runoff.

Roads built across bogs impacted the surrounding tree and plant communities, but the strength of this effect depended on the substrate underlying the bog. Roads had a lower impact where substrates were coarse (e.g., sand or gravel), and a stronger impact where they were fine (e.g., clay). Sandy and gravelly soils allowed water to move down from the peat into the soils, while fine-textured soils were less permeable and forced the water to move horizontally across the wetland. Roads, in turn, blocked this horizontal flow and created flooding on one side of the road and drying on the other.

Unlike bogs, fens were negatively impacted by roads regardless of the type of underlying substrate. The relative impacts, however, were still smaller in fens underlain by sandy or gravelly soils.

The work has important implications for road building within wetlands. Specifically, understanding the underlying substrate is critical to route selection. When roads through bogs or fens are unavoidable, those peatlands underlain by sandy or gravelly substrates should be prioritized.

The study was conducted as part of the Alberta Biodiversity Conservation Chairs program and was sponsored by COSIA, Alberta Innovates, NSERC, ABMI and the Government of Alberta.

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Young researchers board cruise ship for **prestigious research opportunity**

It was the smell of fresh coffee that woke them. Sunrise was an unreliable alarm at this time of year in the Arctic. They boarded zodiac boats and cruised past towering icebergs. As they made landfall, Carolyn Gibson and McKenzie Kuhn parted ways with their vacationing shipmates and trekked up a steep path to their research site.

It was the ideal lab. Gentle pools of water sat atop the tundra, while the ocean below stretched out as far as the eye could see. Despite the cool breeze on their faces it still felt unreal—after all, this research excursion into the Arctic was a dream come true.

This was a single day, one of 13 in total, that Gibson and Kuhn experienced this summer on board the cruise ship *Ocean Endeavour*. The young scientists were selected by Adventure Canada to serve as Resident Scientists on a cruise ship with over 100 vacationers.

Gibson and Kuhn's goal was to better understand how small pools of water, and the organic material beneath them, contribute to carbon cycles around the world. Their work in Arctic ecosystems further south had shown large fluxes of methane, a powerful greenhouse gas, from these pools. But this opportunity was unique—they were sampling in a region too remote to have been studied before.

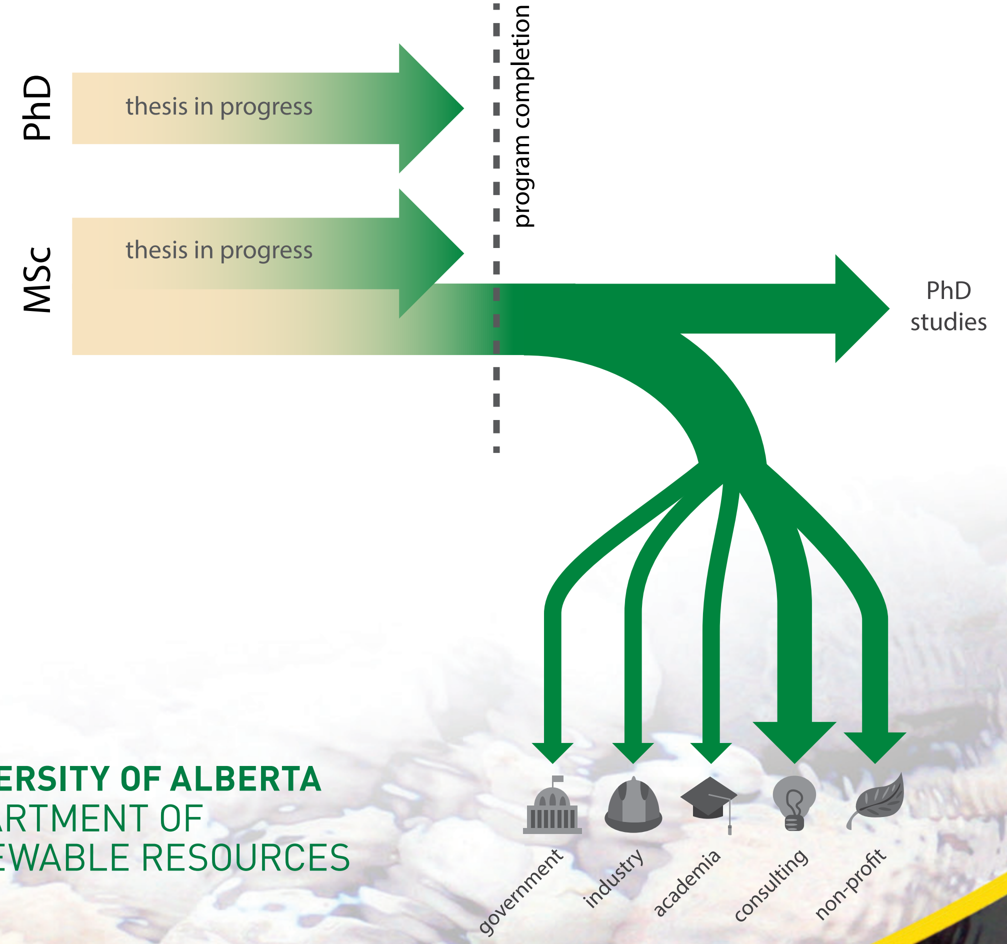
Reflecting on the trip, Gibson was clear about the impact on her career.

"To feel that Adventure Canada invested in us, at such a young age in our research careers, was incredible and humbling," said Gibson.

Gibson recently defended her thesis and Kuhn is compiling the data from the voyage to incorporate into her current graduate thesis. Both are students of Dr. David Olefeldt in the Department of Renewable Resources.

Measurable Impact: A look at the **Land Reclamation International Graduate School**

After six years, the Land Reclamation International Graduate School (LRIGS) has helped train numerous land reclamation professionals. Here is just a snapshot of where some of the students are now.



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