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Renew

in this issue:

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DEPARTMENT OF
RENEWABLE RESOURCES

Leaving a **Legacy**

After five years as Chair of the Department of Renewable Resources, Dr. Vic Lieffers is passing the torch to his successor. As this transition takes place, I'd like to thank Vic for his contributions and highlight a few of the many achievements he made during his tenure.

Vic worked extremely hard to bring new faculty members to the department. Bringing in bright, talented professors is no easy task, but Vic successfully attracted seven new scientists to our faculty. Their specialties are diverse and have allowed us to build our capacity in land reclamation, forest genetics, conservation biology, water and soil sciences. These faculty members will undoubtedly contribute substantially to the field of natural resource management and enhance the department's solid research foundation. Coupled with the re-alignment of the department's forestry and environmental conservation sciences programs, it is very well positioned to continue to fulfill its vision for a very long time.

Vic's efforts to strengthen connections with the external community also resulted in a significant increase in the amount of research projects conducted with stakeholders. His efforts will have a lasting impact, ensuring that our academic programs and research activities are meeting your needs and ensuring that the Faculty continues to provide solutions to global challenges.

As Vic transitions out of the Chair's office in June, we thank him for the legacy he has left and welcome Dr. Ellen Macdonald as she takes up the reigns. Stay tuned to hear about Ellen and her vision for the next five years in the Fall 2016 edition of Renew.

Stan Blade, Dean
Faculty of Agricultural, Life & Environmental Sciences

New **tool highlights** important wild **berry locations**

Important locations for wild berries in the oil sands region of Alberta are now easier to find thanks to a new mapping tool developed by Scott Nielsen.

The tool predicts where berry producing plants are likely to occur and where the volume of berry production is likely to be highest. It does this by combining topographic, soil and vegetation information, together with field data from 21 wild berry species, like blueberries and saskatoons.

Wild berries have been a staple for many years in Aboriginal communities, but many communities have expressed concern that current development and reclamation activities are compromising key berry resources. The new mapping tool allows Aboriginal peoples and land managers to identify important areas for berry picking when considering and reviewing oil sands development plans.

Nielsen said the new tool can also help plan where restoration activities could be used to increase berry production, and he is planning experiments to test restoration effectiveness.

"If a core goal of restoration is to replace or increase berry producing patches, then carefully planned disturbances – like prescribed fires or forest thinning – could help produce far more wild berries," Nielsen said.

The project was funded by the Cumulative Environmental Management Association (CEMA), the Alberta Biodiversity Monitoring Institute (ABMI), Canada's Oil Sands Innovation Alliance (COSIA), and Alberta Innovates. The report can be accessed here: http://ow.ly/4n9mE0

Adding **mycorrhizal fungi** to soil boosts **wheat productivity**

New research from Scott Chang and Anthony Anyia (Alberta Innovates - Technology Futures) has shown that adding mycorrhizal fungi to wheat during seeding can increase productivity and help crops withstand drought conditions. The results could provide a welcome boost to Canada's agriculture industry.

Mycorrhizal fungi are already present in agricultural soils, but Chang and Anyia's research found that the addition of an inoculant helped boost the presence and function of these important fungal species. Having more mycorrhizal fungi in the soil helped wheat plants take up more nitrogen and phosphorous from the soil, increase their uptake of water and produce higher yields.

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In addition, mycorrhizal fungi improved wheat's ability to withstand drought conditions because it had a more extensive root network with which to soak up water from the soil. By improving the resilience, nutrient uptake and productivity of wheat, Chang believes that inoculating crops with mycorrhizal fungi holds significant promise in Canada's Prairie Provinces.

This research was conducted within a greenhouse experiment, and Chang believes that field trials are a key next step for testing the relative value of adding mycorrhizal fungi to various agricultural crops during seeding.

The research was supported by NSERC, Alberta Innovates – Technology Futures, the China Scholarship Council and The Agriculture Funding Consortium.

Dust, not upgrading, the main source of **heavy metals** in **mosses** surrounding the oil sands

A new study by William Shotyk concludes that the amount of lead and other heavy metals present in the oil sands region is exactly what would be expected, given the current dust levels from development in the region.

Shotyk and his team looked at moss samples collected from peat bogs within 70 km of oil sands mines and upgraders, from bogs surrounding the city of Edmonton and forest moss from remote regions of central and northern Norway. They found that although heavy metals such as lead are present in moss samples from the oil sands region, it is not due to the upgrading of oil sands bitumen as has been suggested by previous studies. Rather, the heavy metals are proportional to the amount of dust generated by open pit mines, tailings ponds and traffic on unpaved roads.

Furthermore, the concentrations of heavy metals in mosses from the oil sands region were lower than samples collected in mosses around Edmonton, and equivalent to levels found in mosses from areas as remote as central and northern Norway. Shotyk suggests that these comparisons provide important perspective for the magnitude of changes occurring in the oil sands region.

The one exception in Shotyk's study was vanadium, a trace metal that is present in bitumen. Shotyk's study found that the concentration of vanadium in moss near the oil sands industry was two times higher than in remote areas of Norway which represents current "background" values for trace metals.

The study was recently published in the journal Environment International and was supported by Alberta Innovates – Energy and Environment Solutions.

New **model** may help predict where **lightning** strikes spark **wildfires**

In the past, predicting where lightning strikes might spark a wildfire was like trying to find a needle in a hay stack. But a recent model developed by Karen Blouin and Mike Flannigan suggests that lightning strikes can in fact be predicted with reasonable accuracy, as long as the data are available.

Blouin and Flannigan found that weather variables, such as the likelihood of a thunderstorm, and topographical variables, such as elevation and terrain, were key predictors of lightning strikes. Their model also predicted important increases in lightning activity along the eastern slopes of the foothills and the Swan Hills of Alberta.

The information from this model is important because lightning-caused wildfires can be challenging and expensive to fight. In Alberta, nearly half of wildfires are started by lightning but they are responsible for 71% of the burned area. Thus, increasing the ability to predict lightning-caused wildfires will help government managers better prioritize and position their limited fire suppression resources.

Although the model shows a lot of promise, Blouin and Flannigan acknowledge the data required for the model can be difficult to obtain. The model is most accurate when real time data are available, but the availability of such data requires a network of specialized weather monitoring stations which are currently not available. Nonetheless, a lightning prediction model like Blouin and Flannigan's is an important first step in building a system to predict lightning-caused wildfires.

The study was published in the International Journal of Wildland Fire and was funded by the Western Partnership for Wildland Fire Science.

Long-term **research** investments **paying off** for **EMEND** partners

After over 17 years of research and insights into a new approach to forest management, partners of the Ecosystem-Based Management Emulating Natural Disturbances project (EMEND) believe the best is yet to come.

In just 17 years EMEND has already helped the forest industry understand how leaving trees behind during harvesting can promote biodiversity and social license. For example, EMEND has shown that by leaving some trees behind during harvesting (i.e., retention harvest), the impacts on biodiversity are less than traditional clear-cutting. Similarly, EMEND has shown that the value of retained trees likely increases over time because the trees accelerate the recovery and recolonization of key wildlife and invertebrate species.

In addition to the major research conclusions which have helped inform harvesting practices, EMEND has served an important role in communicating sustainable practices to forest sector customers.

"EMEND is a strong part of our message to customers because it demonstrates we are investing in cutting edge research," said Doug Kemmerley, North American Sales Manager for Daishowa-Marubeni International's Peace River Pulp, one of the forest companies partnered on the project.

So why do the partners believe the best is yet to come? EMEND was designed to last a full forest rotation, 80-100 years, and after 17 years it is evident that the research and knowledge produced at EMEND is just the tip of an iceberg. Every year new insights and deeper understandings of how the boreal forest responds to forest harvesting are emerging.

To continue the legacy of EMEND, the Department of Renewable Resources is currently working to attract new partners in order to sustain the long-term support for the EMEND research program.

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Biodiversity expert advances to prestigious Tier 1 Canada **Research Chair**

Biodiversity expert Fangliang He says his advancement to a Tier 1 Canada Research Chair will help take his research on climate change and species survival to the next stage.

"This appointment provides me with a great opportunity to study global problems while combining a strong link to local land-use challenges," said He.

Fangliang He is a Canada Research Chair in Biodiversity and Landscape Modeling and is well-known for his work in species diversity, conservation and community ecology. Under his new program he aims to develop tools and models that assess the extinction risk of threatened species and vulnerable ecosystems.

The Tier 1 Canada Research Chair is a seven year appointment with annual funding of $200,000.

Road **salt** is **stressing** Edmonton's **trees**

A long term study by Janusz Zwiazek has shown that Edmonton's trees are stressed out, and the main culprit is the salt applied to melt ice on roadways during the city's winters.

Zwiazek looked at 16 sites along Edmonton roadways and found high salt levels in the soils and in the leaves of trees. In addition, Zwiazek found that the salt was harming mycorrhizal fungi in the soil – fungal species that are key for helping trees access water and nutrients. The end result is a higher proportion of stressed and dying trees along city roadways and high tree replacement costs.

To help solve the challenge, Zwiazek and Alejandra Equiza are now exploring whether adding mycorrhizal fungi back into the soil can help trees better cope with the high salt levels along these busy roadways.

The long-term study was funded by the City of Edmonton.

New **equipment** allows scientist to **monitor** the **pulse** of **remote ecosystems**

A recent $600,000 grant awarded to David Olefeldt will equip him with the tools he needs to make significant advances in understanding Canada's remote peatlands and watersheds.

Olefeldt says the grant is potentially game changing for his research program. Previously, field crews would have to trudge into remote regions of Canada's North, collecting only a few water, soil or air samples at a time. Now, Olefeldt and his team will be able to deploy instruments that will take key measurements constantly, over the course of a full season.

"The ability to collect real time, high frequency data in remote areas is very exciting and really opens the door to new understandings," said Olefeldt.

The instruments will help Olefeldt understand how disturbances, such as wildfire and permafrost thaw, are impacting greenhouse gas emissions from peatlands in Canada's North. In addition, Olefeldt's work will help local communities understand potential threats to their water sources, and provide baseline data to help understand how climate change is impacting water quality in Canada's North.

The equipment grant was awarded by the Canadian Foundation for Innovation and the Alberta Advanced Education Research Capacity Program.

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

Student Profile: Stefan Hupperts

Stefan Hupperts says that completing a graduate degree in the Department of Renewable Resources allowed him to work with a cutting edge scientific community while also focusing his research on practical applications. Now, with a Master's degree in hand, his research has helped shed light on how soil fungal communities respond to oil sands reclamation.

Hupperts worked with Simon Landhäusser and Justine Karst on a field study that explored how mycorrhizal fungi are affected by different surface soils used in oil sands reclamation: peat, forest floor material, or subsoils. He then compared the recovery of mycorrhizal fungi in these reclaimed soils with those in soils from harvested sites and the intact forest.

He found the type of reclaimed soil had little effect on the mycorrhizal community. Similarly, soils from the harvested site and intact forests showed no difference. Rather, the fungal species present were strongly tied to what type of tree was planted on the site. The team suggests, therefore, that planting a mix of tree species is likely the best way to establish a more diverse mycorrhizal community in the early stages of forest reclamation.

Stefan is an excellent example of how our research programs are helping train the next generation of resource managers. In this way, we are *preparing students to provide solutions*.

The project was funded by members of Canada's Oil Sands Innovation Alliance (COSIA) and NSERC.

New book sheds light on the **plumbing system** of **plants**

Knowledge about how plants transport water, and what it means for their survival, is now easier to find thanks to a new book by Uwe Hacke.

Hacke studies the xylem structure of plants – the system that transports water up plants and which Hacke refers to as a plant's 'plumbing system'. Understanding a plant's xylem structure is fundamental to understanding how plants use water and how they respond to drought.

The new book – Functional and Ecological Xylem Anatomy – brings together knowledge from some of the top scientists in the world to advance the study of xylem structure in plants. Recent drought events and die back of forests in western Canada highlight the increasing importance of this field of research.

Hacke hopes the book will be an important contribution to the field of tree physiology.

"Every once in a while a book comes along and really helps to move a discipline forward," said Hacke.

The book was published by Springer and is available at: http://ow.ly/4mPKHG.

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