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Renew

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DEPARTMENT OF
RENEWABLE RESOURCES



International Year of Soils

A Message from the Chair

The United Nations has declared 2015 as the International Year of Soils. This highlights the global importance of soils as the basis for terrestrial ecosystem productivity and health . . . and our food security.

It is therefore fitting that this issue of RENEW places a higher emphasis on the soils research in the Department of Renewable Resources. As you will see, we have a strong group of professors and students who dedicate their energy to understanding and managing this important resource. Our diverse group of professors and staff also contribute to teaching students about soils in our four distinct undergraduate programs/majors (agriculture, forestry, conservation biology, land reclamation).

When you think about the Department of Renewable Resources, I hope you think of the soils expertise that we have developed and its linkage to teaching and research within the four areas noted above. We take great pride in educating the next generation of soils experts in Alberta and beyond.

Victor Lieffers, Chair

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Investment aims to drive **environmental leadership** in Ag industry

A new grant awarded to soil scientists Dr. Miles Dyck and Dr. Guillermo Hernandez Ramirez aims to help advance the agriculture industry by ensuring efficient use of fertilizers. The end result could see improved productivity and fewer greenhouse gases released during crop production.

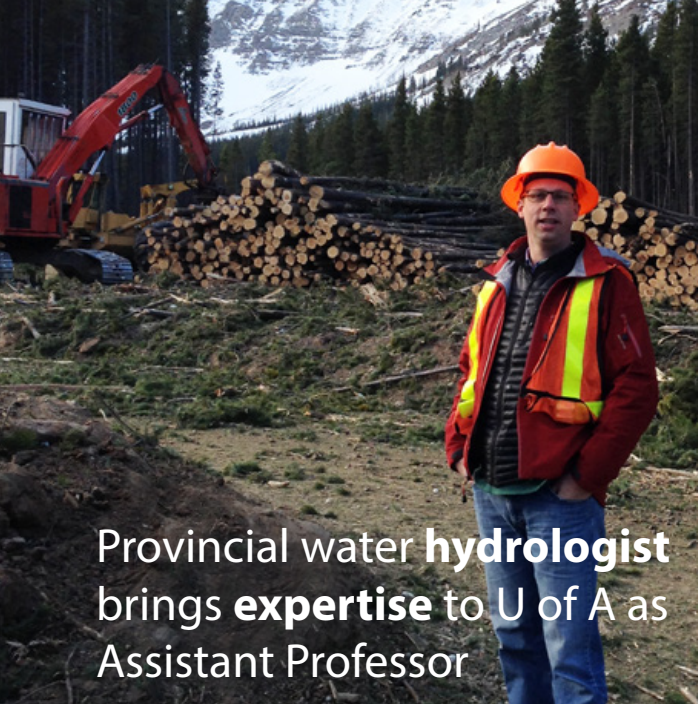
The topic is critical as consumers continue to push for evidence of sustainable on-farm practices. One key measure of sustainability that is emerging is the amount of fertilizer being used to produce crops.

Dyck and Hernandez Ramirez plan to look at how nutrients such as nitrogen and sulfur can be applied in a way that improves uptake by plants and reduces the amount needed to achieve

productive crops. Studies on nitrogen and sulfur have been common to date, but few have looked at how the two nutrients might interact to improve productivity. If the right balance of nutrients can be found, it could also lead to improved carbon sequestration in farm soils – providing a further benefit to the environment.

The project has been awarded \$209,000 from a Canadian Fertilizer Institute-led Growing Forward grant and a \$124,000 grant from Ag funding consortium ACIDF.





Provincial water hydrologist brings expertise to U of A as Assistant Professor

A new collaboration will see respected forest hydrologist Dr. Axel Anderson join the Department of Renewable Resources as an Assistant Professor. Anderson, who is being seconded from the Government of Alberta to the University of Alberta and fRI (Foothills Research Institute), will deliver high quality, relevant research in the field of forest hydrology.

"The opportunities created by this position will really help us continue to build the province's water research program through new collaborations and partnerships," said Anderson.



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Alberta Centre for Reclamation and Restoration Ecology (ACRRE) hosts inaugural event

A new initiative that seeks to build an international centre for reclamation and restoration ecology research, training and outreach hosted its inaugural event at the University of Alberta Calgary Centre on April 7th, 2015.

The 'Research Connections for Resource Managers' event brought together over 45 participants from industry, government and academia to discuss new research findings and identify new applications.

"Today was about connecting our research to the people that can apply it in an engaging, collaborative atmosphere," said Dr. Vic Liefvers, a lead organizer for the event.

Individuals interested in learning more about the ACRRE initiative can find out more at www.acrre.ualberta.ca.

Researchers help document expanding range of invasive Prussian carp

When you think about a villain, a fish may not be the first thing that comes to mind. But the Prussian carp – an invasive species recently documented in Alberta – may just make the cut. It's a warrior at overcoming the odds, and Dr. Mark Poesch has found it has expanded its range in Alberta by as much as 35 times in the last 10 years.

The species is closely related to the common gold fish and is often seen in decorative ponds. It gains its villain status through its ability to survive in tough conditions. For example, it can tolerate low oxygen environments – meaning it can survive in even the smallest pools of water. It can even use another species' sperm to stimulate clonal reproduction in females. Not surprisingly, biologists are worried about how this species might impact Alberta's water ways.

Poesch and his graduate student Cassandra Docherty have been helping understand where the Prussian carp can be found, and where it might be moving to next. To date, the species has been found in the Red Deer River watershed and in the Bow River. Given its ability to tolerate tough environments, it is even found in many of the irrigation canals in southern Alberta. The next step is to understand how the Prussian carp might affect native fish species in Alberta.

Citizens can help document the range of the Prussian carp by contributing information to the Poesch Lab's citizen science project at: <http://www.markpoesch.com/reportsighting.php>.

The project is a collaboration between the University of Alberta and Alberta Environment and Sustainable Resource Development.





Soils expert receives Inspiring Young Scientist Award

LRIGS challenges reclamation professionals with **bucket list**

A professional bucket list created by the Land Reclamation International Graduate School (LRIGS) is serving as a creative way to help reclamation professionals expand their knowledge and challenge themselves to learn more.

The bucket list, designed to be completed within the span of a career, is extensive and includes activities like sampling ground water or completing a rare plant survey. It also goes a step further and challenges practitioners with items like rescuing a project that has run out of funds, or reading a research paper every month to keep up to date on current science. It's a useful tool, regardless of what point practitioners are at in their careers.

The bucket list can be accessed at:
<http://tinyurl.com/LRIGS>.

Dr. Guillermo Hernandez Ramirez received a major feather in his cap when he was recently awarded the Inspiring Young Scientist award from the American Society of Agronomy – a society comprised of over 6,000 soil scientists from around the world.

For Hernandez Ramirez, it was a humbling experience.

“To be recognized in front of my peers, and to receive an award like this is a huge encouragement,” said Hernandez Ramirez.

The award recognizes scientists that are early in their career and have made “an outstanding contribution to sustaining agriculture through environmental quality research, teaching and outreach.” Hernandez Ramirez’s work on carbon and nitrogen cycling in agricultural soils, combined with his strong focus on identifying best management practices for sustainable agriculture, made him a natural fit for the award.



Scientists reaching out to schools, teaching kids about soils

Playing in the mud is a fond childhood memory for many, and it turns out it's a pretty effective way to teach kids about soils too. The fun, hands-on approach is being used by Dr. Scott Chang as part of the University of Alberta's U School – a program designed to expose inner city and rural students to opportunities at the University of Alberta.

For Chang, the sessions are a chance to reach out and connect with the broader public.

"It's an opportunity to show kids how important soils are, how they support us, and how difficult it can be to restore soils if we damage them."

A typical session includes a brief introduction to soils and then it's into the lab to provide students with hands-on experience. The students have the

chance to feel different soil textures and see how different soils behave when they are combined with water and other materials. The approach to learning about soils has received rave reviews and reaches up to 70 students each year.

The program is delivered by Chang with assistance from his graduate students and colleagues such as Professor Emeritus Jim Robertson. To learn more about U School, visit: <http://www.senate.ualberta.ca/USchool>



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Charcoal addition stimulates microbial diversity in reclaimed soils

New research from Dr. M. Derek MacKenzie suggests that charcoal can help increase the diversity of microbes in reclaimed soils – leading to soils that function more closely to those found in nature. The findings are helping managers determine how to establish healthy forests on challenging reclamation sites like oil sands mines.


The work was conducted in the lab and looked at the effect of adding charcoal from a wildfire into a range of reclamation and natural forest soils. The addition of charcoal to the reclamation soils resulted in a significant increase in soil microbial diversity, which MacKenzie says is a key indicator of soil health and ecosystem function.

“If we can encourage microbial diversity in these soils, we may be able to replicate some of the processes that occur naturally in forest soils,” said MacKenzie.

MacKenzie also compared the impacts of charcoal from wildfire to its manufactured surrogate – biochar. While he documented positive effects from biochar in reclaimed soil, it did not have as positive of an impact as the charcoal.

“If we can find ways to make biochar more closely resemble charcoal – like allowing biochar to be colonized by the microbes that naturally occur in forests after fire – we can possibly increase the value of this product in reclamation” said MacKenzie.

The project was supported by the Oil Sands Research and Information Network (OSRIN).



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

Student Profile: Crisia Tabacaru

For Crisia Tabacaru, completing a graduate degree in the Department of Renewable Resources gave her the opportunity to advance the state of knowledge about Alberta's mountain pine beetle population and collaborate with resource managers who could apply her findings.

Her task was to help answer a longstanding question: do prescribed burns help propel the mountain pine beetle population by providing them with a wealth of easy-to-attack trees? The question was of direct relevance to managers in Alberta who were delivering prescribed burns, but feared how this might be affecting mountain pine beetle numbers.

Crisia found that low-density mountain pine beetle populations did indeed increase their numbers within prescribed fires but this increase did not

translate into outbreaks. In fact, the mountain pine beetle populations were potentially being kept in check by predators that were also colonizing the burned sites. The rapid death of trees after the prescribed fires also meant the habitat required by mountain pine beetles – living trees – were no longer available to support growth of the population. Her findings could help inform future decisions about the use of prescribed fires in Alberta's mountain parks.

Crisia 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*.

Crisia's project was supported by fRI, Parks Canada, Alberta Environment and Sustainable Resource Development and NSERC.



Linkages between uplands, lowlands key focus of large scale reclamation project

For years Dr. Simon Landhäusser has focused on how to grow and establish forests on challenging reclamation sites. But a new research project is forcing him to think beyond just the forest and consider how trees might impact the surrounding wetlands too.

The research is part of the Sandhill Fen Pilot Project, a large scale reclamation project managed by Syncrude. The project is challenging researchers to ‘think outside of the box’ as it is the first project in the oilsands region to look at the interaction between uplands and lowlands.

“We’re shifting the question from how do you build a healthy forest, to how do you build a healthy forest that sustains a wetland. It’s helping us understand the trade-offs in our reclamation programs” said Jessica Piercey, an environmental scientist with Syncrude.

The research is based on a relatively simple concept. When rain falls on a site, a certain amount is taken up by the trees and a certain amount runs off and makes its way to the wetlands. The project asks: If we have a lush, thirsty forest on the uplands, how might that impact the amount of water that is available for the wetlands? A second question of interest is: Are trees actually stealing water from the wetlands by tapping their roots into the wet areas and literally moving water up-hill into the drier areas.

The project is still in its early stages and Landhäusser expects to have some of the first conclusions ready within the next two years. The results will help guide future reclamation programs that have to consider both the needs of upland forests and the needs of low lying wetlands.

The research was supported by Syncrude, NSERC, COSIA and TransAlta.

Scientist sees **bright future** for **stable isotopes** in soils research

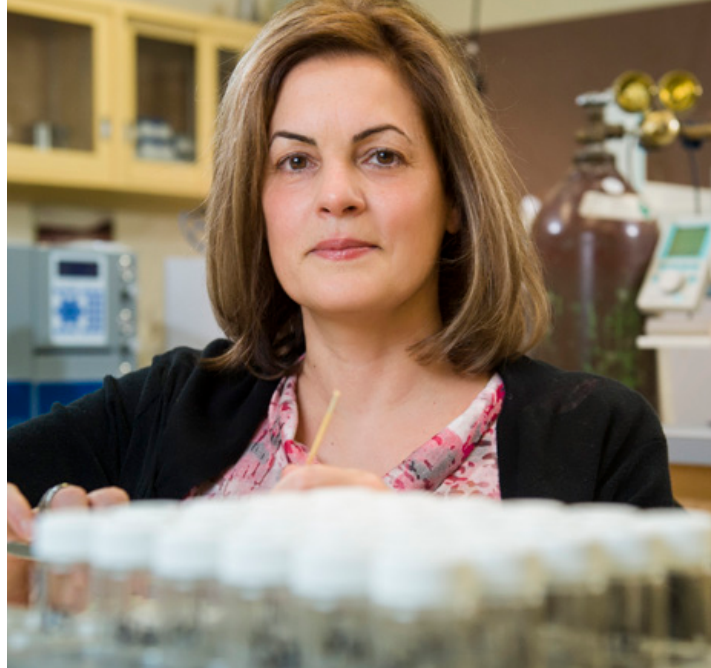
When you think about the soil beneath your feet, it can be hard to picture what is going on at the microscopic level. But in the field of soil science, it's where all the action is. Dr. Sylvie Quideau says that new equipment and new analyses are redefining the scale at which scientists can study and understand soils – and its opening up new frontiers for managing this valuable resource.

More specifically, recent advances are creating opportunities to study stable isotopes in soils. In essence, by 'tagging' tiny molecules in the soil, researchers are able to track these molecules as they flow from plants into the soil and back into plants.

"Isotopes are a key tool that help us better understand what constitutes a healthy, functioning soil," said Quideau.

The questions that can be studied by using stable isotopes are nearly endless. For example, Quideau is looking at how climate change might influence the ability of boreal forest soils to store carbon. She is also using isotopes to understand how reclaimed soils function in comparison to undisturbed soils in the oil sands region.

The future certainly looks bright for the use of stable isotopes in soils research. With recent investments from the Canadian Foundation for Innovation, Alberta Advanced Education and Technology and NSERC, the University of Alberta is becoming an international hub for researching stable isotopes in soils.



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