

Studying Permafrost: Élise Devoie presents her research

This article by Environment North member Kerstin Muth was first published in the Chronicle Journal on October 23, 2017

The word permafrost conjures up something very stable, permanent. The definition, ground that is frozen for two or more years in a row, conveys this as well. However, dramatic changes are occurring in Canada's North due to climate warming, especially in areas of "discontinuous permafrost". Discontinuous permafrost refers to a landscape in which some areas are underlain by permafrost and others are not. This type of permafrost is found in a band stretching across the middle of the country involving the territories and northern regions of most provinces. In Ontario most permafrost is discontinuous, and it begins roughly north of Sandy Lake in the northwest and extends to Moosonee to the east.

Much of the discontinuous permafrost is found in peatlands. These peatlands formed after the glaciers receded. Ingredients for a peatland include: poorly drained soils, flat terrain, shallow depressions, cool temperatures, and low oxygen levels. Under these conditions bacterial action is reduced and the plant production exceeds plant decomposition. Over time a decomposing vegetation deposit develops into a layer of ``peat`` which, in some areas can be up to six metres thick. Peatlands contain about 30 per cent of the Globe's store of carbon. When permafrost thaws, stored carbon, is released into the atmosphere.

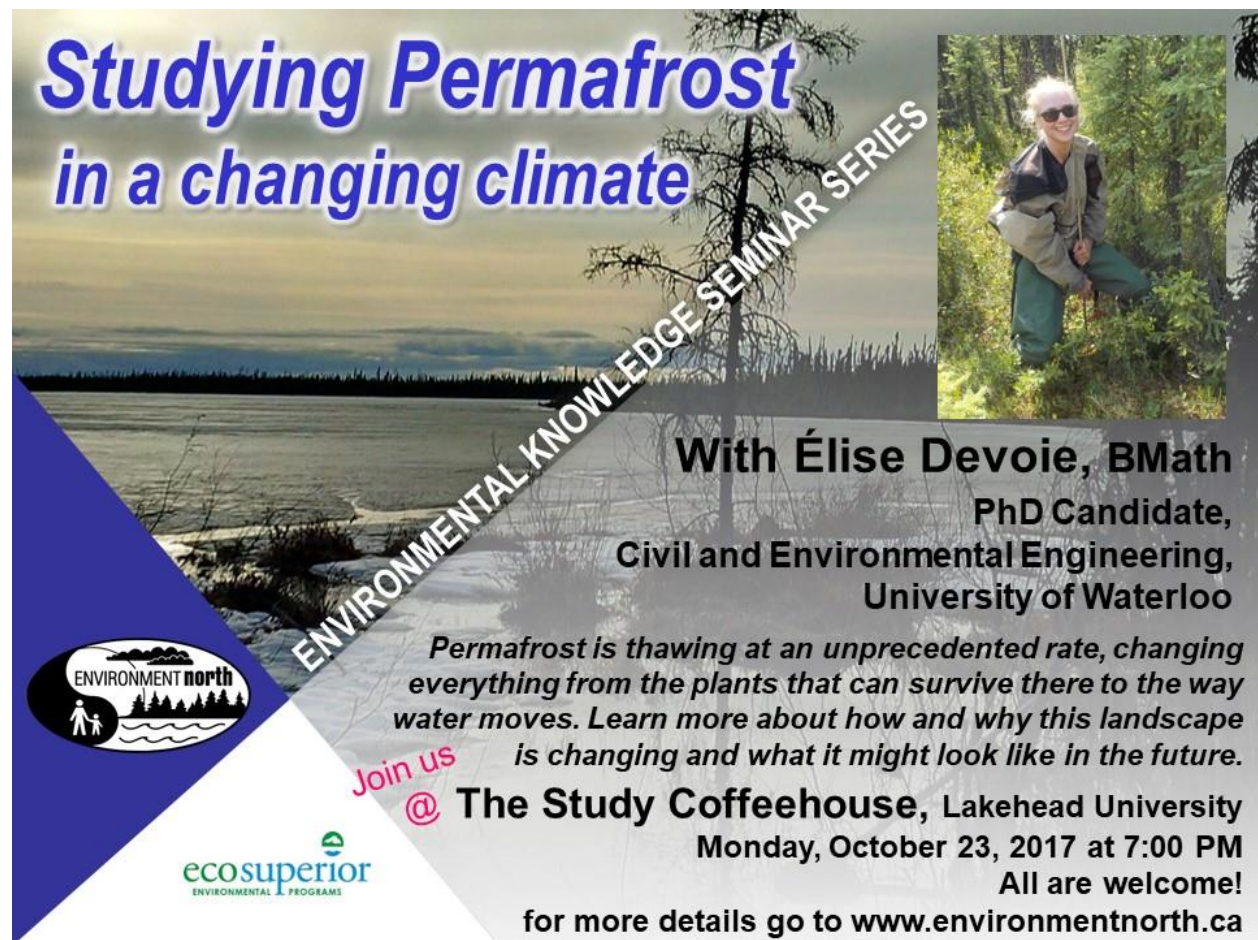
Thunder Bay, well south of the permafrost, has an average annual temperature of 2.9 degrees Celsius over the past 30 years (1977-2016). The average annual temperature was 2.3 degrees for the 30 previous years (1941 to 1970). Climate warming is occurring at even greater rates in northern Canada and this is having a major impact on the landscape and water in these discontinuous permafrost zones. Permafrost thaw has many implications for the plant and wildlife and the infrastructure of human communities and the release of carbon, especially in the form of methane, will result in additional climate warming.

A big part of scientific research is collecting the data. This can be done in a laboratory or studying the environment with field work. Élise Devoie is a graduate student at the University of Waterloo studying the permafrost and her "field" is the Scotty Creek Research Basin in the Northwest Territories. To get there involved flying to Yellowknife followed by another plane trip, a truck ride and finally snowmobiling to the destination. She spent four months in a tent, along with three colleagues, gathering information about the permafrost in peatlands and has witnessed the changes in the firsthand.

Élise is developing a soil freeze-thaw cycle model to predict a number of impacts: ground surface sinking and destabilization, changes in water movement and ecosystems that can exist in the new environment. In order to support the development of the model, the

mechanisms of thaw in the landscape must be understood. In the field she examines the thaw patterns, rates, and quantifies what changes are occurring. Using this data, she later tests the mathematical relationships representing the freeze-thaw processes. This will provide a better understanding of the rapidly changing discontinuous permafrost environment and create a tool that can be applied to other cold regions in the world.

Élise grew up in Thunder Bay and spent a lot of time enjoying the outdoors with family and friends. She is now combining her love of the outdoors with her skills in mathematics and scientific analysis to help understand how the future might look in degrading permafrost areas. You can find out more about her northern adventures by reading her blog post, or better yet, come meet her in person at the next Environment North Environmental Knowledge Seminar on October 23, 2017 the Study Coffeehouse at Lakehead University at 7:00 pm.



**Studying Permafrost
in a changing climate**

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PhD Candidate,
Civil and Environmental Engineering,
University of Waterloo

Permafrost is thawing at an unprecedented rate, changing everything from the plants that can survive there to the way water moves. Learn more about how and why this landscape is changing and what it might look like in the future.

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@ **The Study Coffeehouse, Lakehead University**
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All are welcome!
for more details go to www.environmentnorth.ca

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