

The ecohydrological functioning of the Canadian Western Boreal Plain and its response to wildfire

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The Western Boreal Plain of Canada is characterized by a mosaic of forest and peatland ecosystems. The region is home to the Albertan oils sands which accounts for 175 billion barrels of oil. The effective reclamation of mined areas within this region requires the construction of resilient ecosystems that can maintain the hydrological conditions necessary to sustain ecological growth and carbon sequestration under a changing climate. You will join an interdisciplinary international team of academics from the University of Birmingham, the University of Alberta, Wilfred Laurier University and McMaster University to examine the ecohydrological functioning of this forestland-peatland landscape in order to inform future landscape design and reclamation. Investigating the response of landscape units along a 60 km hydro-geological transect, you will focus on the hydrological mechanism that transmit water between key hydrological stores and characterise their behaviour during the post fire recovery.

The complex of forestland and wetland of the Utikuma region is the target environment for the restoration of the Alberta oil sands. This region has been intensively studied for over a decade by the partners of this project, providing a detailed understanding of the hydrological function of the different landscape units (peatlands and forests) and their interactions. In 2011, a large area of the study site was burnt as part of a 90,000 ha wildfire, providing the opportunity to investigate the processes and mechanism that enable such landscapes to recover from large scale disturbance. This knowledge is essential for the design and development of resilient landscapes as part of the oils sands restoration projects.



Mosaic landscape of the of the Western Boreal Plain, Alberta, Canada

Construction and long-term maintenance of wetlands within the Western Boreal Plain requires adequate connection to headwater sources, where soil layering and vegetation type can regulate evapotranspiration losses resulting in higher water contents (Devito *et al.*, 2005). This project will investigate the hydrological conveyers (ephemeral draws) that are thought to generate such water surplus and deliver them to wetlands and forestland at differing periods during the climate cycle (Devito *et al.*, 2012). It will examine whether these water pathways provide intermittent runoff to support larger wetlands and the extent to which they are essential sources of water to adjacent forestlands, maximising productivity. This research will enhance our understanding of the ecohydrological function of Boreal landscapes and will inform future landscape design within the oil sands region. Working within an interdisciplinary project, you will develop knowledge within hydrology, micrometeorology and ecology and develop important skills in modelling, laboratory and field based research. This will occur within in a large and active graduate research school within the School of Geography Earth and Environmental Sciences at the University of Birmingham).

References:

Devito, K., Mendoza, C., Qualizza, C. (2012). *Conceptualizing water movement in the Boreal Plains. Implications for watershed reconstruction*. Synthesis report prepared for the Canadian Oil Sands Network for Research and Development, Environmental and Reclamation Research Group. 164 pp. <http://hdl.handle.net/10402/era.30206>

Devito KJ, I Creed, T Gan, C Mendoza, R Petrone, U Silins, B Smerdon (2005). *A framework for broad scale classification of hydrologic response units on the Boreal Plain: Is topography the last thing to consider?* Invited Commentaries, *HP Today, Hydrol. Process.*, 19:1705-1714.

Applicants should apply via <http://www.birmingham.ac.uk/postgraduate/courses/research/gees/geog-environ-sciences.aspx> where they should click on 'Apply now' and choose the option 'PhD in Department of Geography and Environmental Science (Physical Geography)' and give the PhD title in the 'Funding details' section of the online application.