NSERC Canadian Network for Aquatic Ecosystem Services

Theme 1, Project 1.4

Determining the biogeochemical and hydrological feedbacks in fen peatlands due to hydrological and treated wastewater additions

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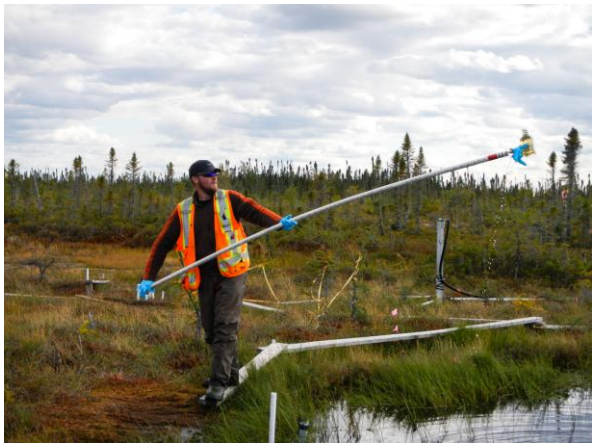

Abstract

Remote northern communities and mining operations require wastewater treatment for the discharge of residential wastewater into aquatic environments. Elevated levels of Nitrate (NO3-), Ammonium (NH4+) (Phosphate (PO33-), Sulfate (SO2-), and labile carbon are usually present in treated and untreated wastewater, typically requiring polishing before discharging into aquatic environments. Peatlands are used for wastewater polishing; however, there is limited information of the transport and transformations of these contaminants in sub-arctic peatlands and the ability of these systems to polish wastewater. Therefore the primary objective of this study is to determine the transport and retardation of these contaminants in a sub-arctic fen peatland through an ecosystem scale experiment. Initial results indicate that the solute plume traveled 49 % of the distance of the experimental site, while the water table increased across the entire site. Furthermore, differential transport of contaminants was observed due to microtopographical differences within the experimental site, yet vertical transport (downward) was limited to ~75 cm from the surface. This is the first experimental release of simulated wastewater in fen peatlands and represents a unique opportunity to determine how increased development pressures from both industrial and northern communities will alter the peatlands in the sub-arctic. Furthermore, understanding how fen peatlands transport and treat wastewater nutrients will allow for better management of human wastewater, which will provide the maximum anthropogenic benefit with minimal environmental disturbance.

Keywords: peatlands, wastewater, solute transport, advection/dispersion, retardation, dual porosity

Geographic Location: De Beers Group of Companies Victor Diamond Mine, Kenora Unorganized, Ontario, Canada

How does your project link to Canadian aquatic ecosystem services?

Remote northern communities rely on the surrounding aquatic ecosystems for sustenance, thus, understanding how to effectively manage wastewater treatment in fen peatlands can potentially decrease the risk of contamination in northern aquatic ecosystems. Furthermore, this project will directly assess the ability of these systems to treat wastewater and the associated effects on aquatic ecosystem services.