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Multidisciplinary approach to identify aquifer-peatland connectivity

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In southern Quebec (Canada), wetlands sustain increasing pressures from agriculture, urban development, and peat exploitation. To protect both groundwater and ecosystems, it is important to be able to identify how, where, and to what extent shallow aquifers and wetlands are connected. This study focuses on peatlands which are especially abundant in Quebec. The objective of this research was to better understand aquifer-peatland connectivity and to identify easily measured indicators of this connectivity. Geomorphology, hydrogeochemistry, and vegetation were selected as key indicators of connectivity. Twelve peatland transects were instrumented and monitored in the Abitibi (slope peatlands associated with eskers) and Centre-du-Quebec (depression peatlands) regions of Quebec (Canada). Geomorphology, geology, water levels, water chemistry, and vegetation species were identified/measured on all transects. Flow conditions were simulated numerically on two typical transects. Results show that a majority of peatland transects receives groundwater from a shallow aquifer. In slope peatlands, groundwater flows through the organic deposits towards the peatland center. In depression peatlands, groundwater flows only 100-200 m within the peatland before being redirected through surface routes towards the outlet. Flow modeling and sensitivity analysis have identified that the thickness and hydraulic conductivity of permeable deposits close to the peatland and beneath the organic deposits influence flow directions within the peatland. Geochemical data have confirmed the usefulness of total dissolved solids (TDS) exceeding 14 mg/L as an indicator of the presence of groundwater within the peatland. Vegetation surveys have allowed the identification of species and groups of species that occur mostly when groundwater is present, for instance *Carex limosa* and *Sphagnum russowii*. Geomorphological conditions (slope or depression peatland), TDS, and vegetation can be measured/observed with limited effort in the field. Results from this study have the potential to help water managers and decision makers better understand and characterize aquifer-peatland interactions.