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Development of tools to assess and mitigate the impacts of peat harvesting on aquatic ecosystems

André St-Hilaire, Sophie Duchesne, Claude Fortin, Sabiha Hafdi, Hermine Bettis, and Moez Khadri
INRS, INRS, Eau, terre et environnement, Quebec City, Canada (andre.st-hilaire@ete.inrs.ca)

Peat harvesting in an important industry in northern Europe and in North America. In Canada peat is harvested to be used as a horticulture substrate. The harvesting is generally done by vacuuming the thin dried upper layer of peat found below the acrotelm, after removing the latter and draining the water. Drained water is typically routed to settling basins prior to being released in neighbouring natural water courses. This communication summarizes our research efforts to develop tools to optimize settling pond design and minimize suspended sediment loads and to provide the industry with means to assess the health of aquatic ecosystems that receive the drained water.

Current settling pond designs are based on simple rules of thumb (e.g. 25 m^3/ha of harvested peatland). In our study, a hydraulic model was used to test different basin configurations (basins with and without weirs at the outlet, basins in series, basins equipped with a geotextile curtain). It was found that while the trapping efficiency was not significantly improved by adding a second basin compared to a single one, adding a geotextile curtain improved the trapping of coarser sediments. Our results moreover showed that fine sediments deposited during low flow periods, in the downstream end of the basins, could be easily resuspended during and after rainfall events, thus showing the importance of frequent maintenance. There are also some strong indications that wind erosion could be a major source of sediments in the drainage water.

Different indicators of stream ecosystem health were compared to quantify the impact of peat harvesting on the receiving water bodies. They included 1) using fish abundance and species richness; 2) quantifying sediment deposition and its organic content; 3) determining ionic composition of effluents and receiving waters; and 4) developing a water quality index (WQI) based on multiple physico-chemical measurements (ammonia, conductivity, pH and suspended sediment concentrations). The developed WQI was shown to be the most promising indicator of ecosystem health and allows for a simple classification of water quality downstream of the confluence between the drain outlet and the receiving stream.