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Methane and carbon dioxide exchange in a post-extraction, unrestored peatland in Eastern Quebec, Canada

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Peatlands, in their pristine state, are important long-term sinks of carbon. The extraction of peat for agricultural purposes or for biofuel leads to a shift in the carbon dynamics. Changes in environmental conditions post extraction may also allow for invasive species to establish and spread across the peatland. Many studies have shown the benefits and advantages of various restoration management practices, but few studies have explored the carbon exchange from unrestored peatlands. Our study reports the methane (CH_4) and carbon dioxide (CO_2) fluxes from a post-extraction, unrestored peatland in Eastern Québec at both the plant community scale using static chambers, and at the ecosystem scale using an eddy covariance flux tower, over two complete years. Extraction of the Saint-Alexandre-de-Kamouraska peatland (SAK) started in the early 1970's and was halted in 1999. No restoration efforts have been implemented and the remnant ditches remain unblocked. The site consists of sparse patches of *Eriophorum* and a vast area of bare peat. Consequently, SAK is an overall source of carbon to the atmosphere, releasing an annual total of 153 g C m^{-2} and 241 g C m^{-2} in CO_2 emissions for 2014 and 2015, respectively, and an average annual total of 1 g C $m^{-2}yr^{-1}$ in CH_4 emissions. *Phragmites* and *Typha,* both invasive species, have established themselves in the ditches and are sources of methane; partly explaining the increased emissions in carbon fluxes to the atmosphere post extraction. Results from this study will help managers assess the importance of post-extraction peatland restoration, by comparing the differences in CO_2 and CH_4 exchange between restored and unrestored peatlands.