Canadian Peatlands & Climate Change

Patterned peatland area in Saskatchewan with flarks (water bodies with long axis perpendicular to the waterflow)

Canadian Peatlands: Globally Important Carbon Stores

Peatlands cover approximately 3% of the earth's land area and are estimated to contain 350-535 Gt of carbon, or between 20 to 25% of the world's soil organic carbon stock (Gorham 1991). In Canada, the vast majority of peatlands occur in the Boreal Wetland Region and the Subarctic Wetland Region. It is estimated that Canadian peatlands store approximately 147 Gt of carbon, or roughly 56% of Canadian soil organic carbon (Natural Resources Canada 2007).

In general carbon accumulation in wetlands is determined by the difference between primary production and the decomposition of organic material. Although peatlands are relatively un-productive compared to other types of wetlands, the cool and anoxic nature of these systems causes production to exceed decomposition and leads to a net accumulation of carbon. As a result of these conditions, peatlands represent a significant stock of C and therefore play an important role in the global carbon cycle (Strack and Waddington 2007).

Influence on atmospheric concentrations of GHGs

Though peatlands are large C stores and can sequester significant amounts of CO_2 , they can lose CO_2 through plant respiration and aerobic peat decomposition; and as methane from the anaerobic decomposition of peat (Clair et al. 2002). In Canada and globally, peatlands are a significant source of methane. This is of particular concern as methane is 21 times more effective at trapping radiation than CO_2. However, the net radiative forcing attributed to northern peatlands is estimated to have offset approximately one-third of the radiative forcing due to increased atmospheric CO2 over the last 150 years (Frolking and Roulet, 2007).

Emissions of CO_2 and methane from natural sources such as peatlands are strongly influenced by environmental variables that are likely to be exacerbated by future climate change. For example, the drier conditions that are predicted for areas of northern Canada will lower the water table in peatlands potentially switching these systems from net sinks to large sources of CO_2 by exposing previously flooded peat to aerobic conditions and facilitating decomposition (Glenn et al. 2006). Furthermore exposed peat is more susceptible to fire, which could release enormous amounts of C. This is of significance as the oxidation of 1% of the organic C stored in Canadian peatlands would release the equivalent of 10 times Canada's anthropogenic CO_2 emissions in the year 2000 (Glenn et al. 2006). Conversely, lowering of the water table could result in a shift from a net release of methane to a net uptake from the atmosphere (Harriss et al. 1988, Strack et al. 2006).

Facts about peatlands

- *Globally, peatlands account for approximately 20% of soil carbon stores*
- *Peatland carbon stores are roughly equivalent to half of the amount of carbon contained in the earth's atmosphere*
- *Peatlands in Canada cover 1.14 million km² ,or 12% of the landbase*
- *Roughly 147Gt of carbon are stored in Canadian peatlands, equivalent to about 56% of Canadian soil carbon stores*
- *The oxidation of 1% of the organic C stored in Canadian peatlands would release the equivalent of 10 times Canada's 2000 anthropogenic CO_2 emissions*
- *It is estimated that 60% of Canadian peatlands will be severely affected by climate change*

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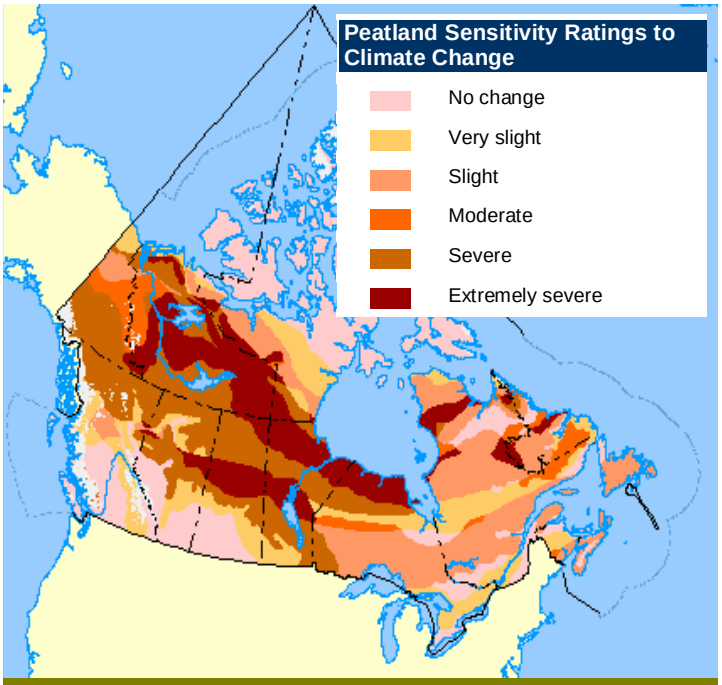
Sensity of Canadian peatlands to climate change

Approximately 60% of peatlands in Canada are expected to be severely affected by climate change (see Canadian Peatland Sensitivity Map, Natural Resources Canada 2007). It is particularly the peatlands situated in the boreal and subarctic regions, which are most likely to be impacted. As the vast areas of permafrost in these regions begin to melt, GHG emissions to the atmosphere will increase rapidly due to the greatly enhanced decomposition of peat. This will potentially result in the loss of one of the planet's most important carbon stores.

Anthropogenic threats to Canadian peatlands

Activities which have impacted Canadian peatlands historically are the harvesting of peat for horticultural purposes, the production of cranberries, and forestry. As a result of their concentration in the northern half of the country the majority of Canadian peatlands have been left largely untouched. However, development in northern Canada is increasing rapidly and as a result the loss of peatlands will also increase dramatically. For example, in the oil sands region of Alberta the current approved mining area is in excess of 100,000 ha, of which approximately 40,000 ha are wetlands (Pembina Institute/Simon Dyer personal communication). Wetlands in this region are dominated by peatlands and therefore a substantial amount of carbon will be lost to the atmosphere through their destruction or degradation.



Canadian Peatland Sensitivity Map (Natural Resources Canada 2007)

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