PEATLANDS OF CANADA

Canada has the largest area of peatlands in the world, encompassing 12% of the land area or $1.1x10^6$ km^2. These peatlands are essential to the global environment because they retain, purify and deliver fresh water, store carbon, absorb pollutants and support numerous species of plants and wildlife, many of them identified as endangered.

PEAT

Peat is material consisting largely of organic residues originating under more or less water-saturated conditions through the incomplete decomposition of plant and animal constituents. It forms as a result of anaerobic conditions, low temperatures, and other complex causes.

PEATLANDS

Peatlands (formerly referred to as organic terrain or muskeg) are wetlands with massive deposits of peat that are at least 40 cm thick (National Wetlands Working Group, 1988). Each of the four classes of peatland –bog, fen, swamp or marsh –may take several to numerous forms depending on the climate, hydrology, presence or absence of permafrost, form and composition of underlying surficial materials.

PEATLAND CLASSES

BOGS are peatlands having the water table at or near the surface (National Wetlands Working Group, 1988). Since the bog surface, which may be either raised or level with the surrounding terrain, is virtually unaffected by nutrient rich groundwater from the surrounding mineral soils, it is generally acid and low in nutrients. The dominant materials are weakly to moderately decomposed sphagnum and woody peat, underlain at times by sedge peat. Bogs, which may be treed or treeless, are usually covered with Sphagnum spp. and ericaceous shrubs.

FENS are peatlands usually having the water table at or just above the surface (National Wetlands Working Group, 1988). The waters are nutrient-rich and originate from mineral soils. The dominant materials are moderately to well-decomposed sedge and/or brown moss peat of variable thickness. The vegetation consists predominately of sedges, grasses, reeds, brown mosses, with some shrubs, and, at times, a sparse tree layer.

SWAMPS are mineral wetlands or peatlands with standing water or water gently flowing through pools or channels (National Wetlands Working Group, 1988). The water table is usually at or near the surface. Pronounced internal water movement from the margin or other mineral sources results in nutrient rich waters. Peat, when present, is primarily well-decomposed wood underlain, at times, by sedge peat. Vegetation is characterized by a dense cover of deciduous or coniferous trees or shrubs, herbs and mosses.

MARSHES are mineral lands or peatlands periodically inundated by standing or slowly moving water (National Wetlands Working Group, 1988). Surface water levels may fluctuate seasonally, with declining levels exposing drawdown zones of matted vegetation or mudflats. The nutrient-rich waters vary from fresh to highly saline. The substratum usually consists of mineral material, although occasionally it consists of well-decomposed peat. Marshes characterisically show zonal or mosaic surface patterns composed of pools or channels interspersed with clumps of emergent sedges, grasses, rushes and reeds that border grassy meadows and peripheral bands of shrubs or trees. Submerged and floating aquatics flourish in areas of open water.

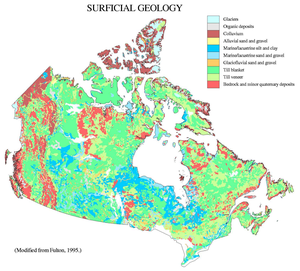
PEAT DEVELOPMENT

The distribution of peatlands is determined by the climate and by the morphology of the land surface (National Wetlands Working Group, 1988). Climate determines the amount of water received and retained while the morphology of the land influences the distribution of the water and, thus, the location of peatlands. Peatlands develop initially when areas of high water table are infilled with peat-forming vegetation such as that found in fens and bogs. Bogs are dependant upon rainfall for water (ombrotrophic), while fens can also obtain water that originates from the surrounding (adjacent) mineral terrain (minerotrophic).

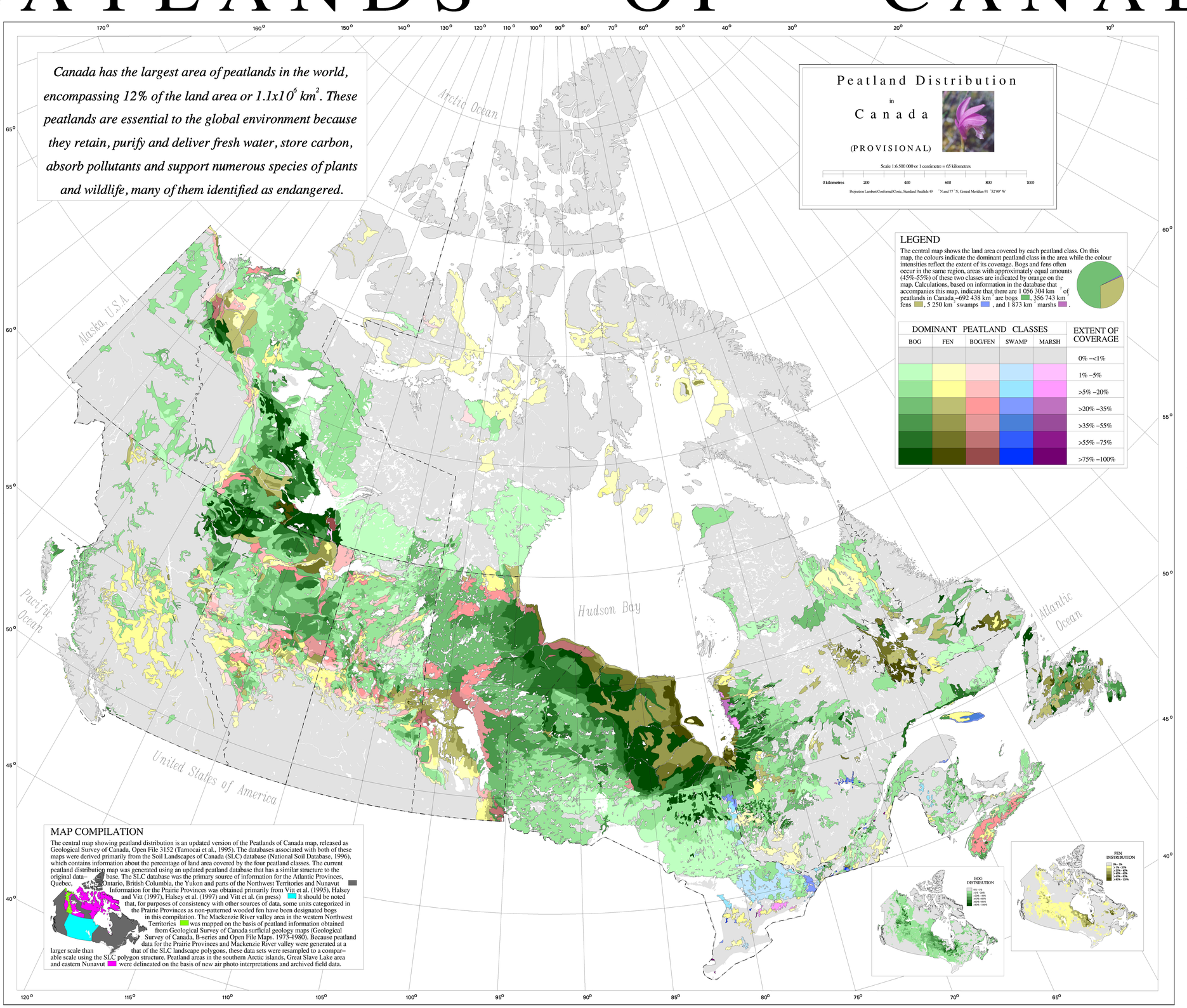
PEATLANDS AND SURFICIAL GEOLOGY

Canadian peatlands, developed during the Holocene epoch, are most extensive in poorly-drained areas of glaciomarine and glaciolacustrine silt and clay and of fine-grained tills in the Hudson Bay Lowlands, in the Mackenzie River valley region, and in northern Alberta and northern Manitoba. They are also common in topographic depressions in the rugged Precambrian Shield terrain in central Canada.

SURFICIAL GEOLOGY



(Modified from Fulton, 1995.)



Peatland Distribution in Canada (PROVISIONAL)

Scale 1:6 500 000 or 1 centimetre = 65 kilometres

0 kilometres 200 400 600 800 1000

Projection Lambert Conformal Conic, Standard Parallels 49 °N and 77 °N, Central Meridian 91 °32'00" W

LEGEND

The central map shows the land area covered by each peatland class. On this map, the colours indicate the dominant peatland class in the area while the colour intensities reflect the extent of its coverage. Bogs and fens often occur in the same region, areas with approximately equal amounts (45%–55%) of these two classes are indicated by orange on the map. Calculations, based on information in the database that accompanies this map, indicate that there are 1 056 304 km^2 of peatlands in Canada –692 438 km^2 are bogs , 356 743 km^2 fens , 5 250 km^2 swamps , and 1 873 km^2 marshs .

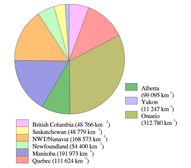
DOMINANT PEATLAND CLASSES					EXTENT OF COVERAGE
BOG	FEN	BOG/FEN	SWAMP	MARSH	
					0% –<1%
					1% –5%
					>5% –20%
					>20% –35%
					>35% –55%
					>55% –75%
					>75% –100%

MAP COMPILATION

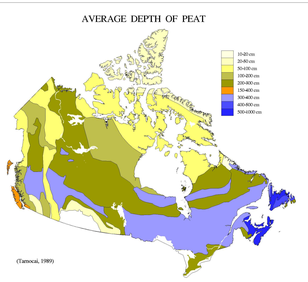
The central map showing peatland distribution is an updated version of the Peatlands of Canada map, released as Geological Survey of Canada, Open File 3152 (Tarnocai et al., 1995). The databases associated with both of these maps were derived primarily from the Soil Landscapes of Canada (SLC) database (National Soil Database, 1996), which contains information about the percentage of land area covered by the four peatland classes. The current peatland distribution map was generated using an updated peatland database that has a similar structure to the original database. The SLC database was the primary source of information for the Atlantic Provinces, Quebec, Ontario, British Columbia, the Yukon and parts of the Northwest Territories and Nunavut . Information for the Prairie Provinces was obtained primarily from Vitt et al. (1995), Halsey and Vitt (1997), Halsey et al. (1997) and Vitt et al. (in press) . It should be noted that, for purposes of consistency with other sources of data, some units categorized in the Prairie Provinces as non-patterned wooded fen have been designated bogs in this compilation. The Mackenzie River valley area in the western Northwest Territories was mapped on the basis of peatland information obtained from Geological Survey of Canada surficial geology maps (Geological Survey of Canada, B-series and Open File Maps, 1973–1980). Because peatland data for the Prairie Provinces and Mackenzie River valley were generated at a larger scale than that of the SLC landscape polygons, these data sets were resampled to a comparable scale using the SLC polygon structure. Peatland areas in the southern Arctic islands, Great Slave Lake area and eastern Nunavut were delineated on the basis of new air photo interpretations and archived field data.

PEAT RESOURCES

Peat depth (map below) and the distribution of peat (main map) are directly related to Canada's peat resources. The pie chart shows the distribution of peatlands by province or territory, with the area of peatlands given in brackets.



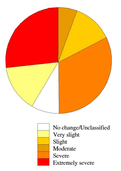
AVERAGE DEPTH OF PEAT



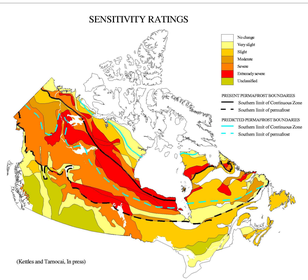
(Tarnocai, 1989)

PEATLANDS AND CLIMATE CHANGE

Under current scenarios of increasing greenhouse gases, the expected increases in global temperatures have the potential to affect peatlands in many areas. A model for estimating peatland sensitivity was developed using published information (Kettles and Tarnocai, in press). Calculations, based on this model, together with data from the Peatlands Database of Canada, show that approximately 60% of the area of Canadian peatlands, containing 53% of the 154 Gt of carbon found in organic soils, is expected to be severely to extremely severely affected by climate warming (Soil Carbon Data Base Working Group, 1993; Tarnocai, 1998). The most pronounced changes are expected to occur in the Boreal, Subarctic and Arctic ecoclimatic provinces.



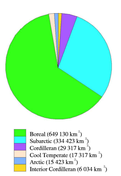
SENSITIVITY RATINGS



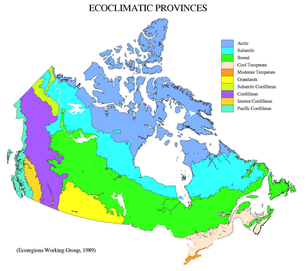
(Kettles and Tarnocai, In press)

PEATLANDS AND ECOCLIMATIC PROVINCES

Systematic spatial information on the current state of climate and vegetation in Canada is shown on the ecoclimatic provinces map below (Ecoregions Working Group, 1989). Peatlands, with characteristic types and forms, develop in locations that have similar topographies, hydrology and nutrient regimes. As a result, peatland regions (National Wetlands Working Group, 1988) correlate closely to ecoclimatic provinces. Most peatlands (93%) occur in the Boreal and Subarctic ecoclimatic provinces.



ECOCLIMATIC PROVINCES



(Ecoregions Working Group, 1989)

Natural Resources Canada / Ressources naturelles Canada

Agriculture and Agri-Food Canada / Agriculture et Agroalimentaire Canada

RECOMMENDED CITATION:

Tarnocai, C., Kettles, I.M., and Lacelle, B. 2000. Peatlands of Canada; Geological Survey of Canada, Open File 3834, scale 1:6 500 000.

ACKNOWLEDGMENTS:

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