Surface layer erodibility (K factor)

The erodibility of a soil is an expression of its inherent resistance to particle detachment (degradation) and transport by rainfall (erosion). It is determined by the cohesive force between the soil particles, and may vary depending on the presence or absence of plant cover, the soil's water content and the development of its structure. In computing the K factor in the Universal Soil Loss Equation (USLE), Wishmeier and Smith (1978) take into account silt content, very fine sand content, clay content and organic matter content, as well as the structure of the surface layer and the permeability of the profile. This equation is used here to generate the five erodibility classes (Table 1):

$$K = (27.66 \times m^{1.14} \times 10^{-8} \times (12\text{-}a)) + (0.0043 \times (b\text{-}2)) + (0.0033 \times (c\text{-}3))$$

in which

- K = soil erodibility factor ($t \cdot ha \cdot MJ^{-1} \cdot mm^{-1}$)
- m = (silt (%) + very fine sand (%))(100-clay (%))
- a = organic matter (%)
- b = structure code: (1) very structured or particulate, (2) fairly structured, (3) slightly structured and (4) solid (Adapted from Drolet et al. 1989)
- c = profile permeability code: (1) rapid, (2) moderate to rapid, (3) moderate, (4) moderate to slow, (5) slow and (6) very slow.

Table 1. Definition of erodibility classes

	Class	K factor (t∗ha/MJ∗mm)	Percentage area
1	Negligible	<0.020	45.6
2	Low	0.020 - 0.039	46.3
3	Moderate	0.039 - 0.053	5.2
4	High	0.053 - 0.066	2.9
5	Very high	≥0.066	nil

Adapted from Presant and Acton (1984)

Where data on percentage silt, very fine sand or clay were lacking, an average value was calculated on the basis of all similar-textured soils in the southeastern part of the Montreal plain. Where data on structure were lacking, the structure codes were deduced from the texture of the surface layer (Cook *et al*. 1985). The erodibility of organic soils was assumed to be negligible.

The surface layer erodibility map affords a means of identifying more vulnerable areas where soil conservation measures would be desirable. The results indicate that soils with negligible to low erodibility account for 91.9% of the study area. Moderately erodible soils (*e.g.* Sainte-Rose series) account for 5.2% of the total and are dispersed throughout the area. The most erodible soils account for 2.9% of the total area, and occur mainly in Saint-Hyacinthe County. These are soils with a surface layer that is rich in silt and very fine sand and poor in organic matter (e.g. Saint-Hyacinthe series).