

Smearing vulnerability

Smearing results from the impact of rainfall on the soil surface, causing the destruction of the soil structure and the formation of a crust on the surface. Smearing occurs only on bare soil subjected to precipitation that is too heavy for the water to seep into the soil (Hénin et al. 1969). Periods of water saturation accentuate the deterioration of the structure by reducing cohesion between colloids and fine soil particles (Gosselin 1986). The destruction of the soil structure results in a loss of productivity.

The texture of the surface layer determines the size and characteristics of the pores, and these affect the soil's sensitivity to smearing and compaction, and also its workability. Other useful indicators of structural stability are organic matter content, CEC, plasticity index and liquid limit. The interpretation model (Table 1) estimates soil smearing vulnerability on the basis of the organic matter content and the sand, silt and clay content of the surface layer (A horizon). The most sensitive soils contain little clay or humus and a high proportion of silt and fine and very fine sand.

Table 1. Soil smearing vulnerability assessment model

Texture class of the A horizon	Vulnerability		
	Low (<1.7%)	Moderate (1.7-4%)	High (4-9%) and Very high (9-17%)
Peaty (fibric and mésic)		Nil to low	
Peaty (humic)		Moderate	
	Organic carbon content of the A horizon*		
S and LS (coarse and medium), SC, C, HC, SiC	Moderate	Nil to low	Nil to low
S and LS (fine and very fine), SL (coarse and medium), L, SCL, CL, SiCL	High	Moderate	Moderate
Si, SiL, SL (fine and very fine)	High	High	Moderate

*% organic matter = Organic carbon x 1.724
Adapted from Rivest (1988)

The smearing vulnerability map provides a means of identifying soils on which organic matter management and appropriate farming practices are essential for the maintenance of soil productivity (crop rotation, minimum tillage, cover crops, use of farm machinery of moderate weight and driving it over the land as little as possible, etc.).

Soils with nil to low vulnerability (e.g. Saint-Urbain series) account for 27.3% of the study area. The corresponding figure for moderately vulnerable soils (e.g. Saint-Aimé series) is 51.5%. These soils occur in all four counties, but predominantly in Saint-Hyacinthe and Richelieu. Highly vulnerable soils (e.g. Joseph series) account for 21.2% of the total area and occur mainly along the Yamaska River.