

Soil wind erosion vulnerability

Wind erosion is the detachment and transport of fine soil particles by wind action. The extent of wind erosion depends on the texture and organic matter content of the surface layer, soil moisture, relief, and wind velocity. Exposure to wind, length of field, surface unevenness and vegetation cover are other factors that affect the process. Wind erosion results in reduced soil fertility and damages seedlings and young plants.

Organic soils are particularly vulnerable because of their absence of structure and because the particles are so light (Gosselin et al. 1986). In addition, in soils of this kind, it is important to control the height of the water table in order to enhance soil consistency, especially in the case of soil with a humic surface layer (Oh horizon) that has recently been tilled and has become dried out. Light mineral soils (sandy soils) or soils containing dry aggregates that are under 0.5 mm in diameter are also vulnerable to wind erosion, as are soils with a humic surface layer (containing 9-17% organic C). The criteria selected for the general assessment model are drainage class, organic matter content and percentage medium, fine and very fine sand in the surface layer, or surface layer texture where data are not available (Table 1).

Table 1. Soil wind erosion vulnerability assessment model

Drainage	Surface layer texture class*	Organic matter content of surface layer				
		Low <1.7% org. C	Moderate 1.7-4% org. C	High 4-9% org. C	Very high 9-17% org. C	Extremely high ≥17% org. C
Very rapidly drained to well drained	1	High	High	High	High	-
	2 - 3	High	Moderate	Moderate	High	-
	4 - 5	Moderate	Nil to low	Nil to low	Moderate	-
	P	-	-	-	-	High
Moderately well drained to imperfectly drained	1	High	Moderate	Moderate	High	-
	2 - 3	Moderate	Moderate	Moderate	Moderate	-
	4 - 5	Moderate	Nil to low	Nil to low	Nil to low	-
	P	-	-	-	-	High
Poorly drained	1	Moderate	Nil to low	Nil to low	Moderate	-
	2 - 3	Nil to low	Nil to low	Nil to low	Nil to low	-
	4 - 5	Nil to low	Moderate	Moderate	Nil to low	-
	P	-	-	-	-	Moderate
Very poorly drained		Nil to low	Nil to low	Nil to low	Nil to low	Nil to low

See definition of classes in Table 2

Adapted from Martin and Nolin 1991, Preston and Acton 1984

Table 1. Definition of texture classes

Class	Texture	Definition
1	Coarse	Coarse sand (CS), medium sand (S), fine sand (FS), very fine sand (VFS) and loamy sand (CLS, LS, FLS) (e.g. La Présentation series)
2	Medium coarse	Very fine loamy sand (VFSL) and coarse to fine loamy sand (CLS, LS, FLS) (e.g. Rougemont series)
3	Medium	Very fine sandy loam (VFSL), loam (L) and silty loam (SiL) (e.g. Ste-Rose series)
4	Medium fine	Sandy clay loam (SCL), clay loam (CL) and silty clay loam (SiCL) (e.g. Du Jour series)
5	Fine	Sandy clay (SC), clay (C), silty clay (SiC) and heavy clay (HC) (e.g. Providence series)
P	Peaty	Peaty surface layer ($\geq 17\%$ organic C) (e.g. Nobel series)

Agriculture Canada 1976, Day and McMenamin 1983

The map applies to soils with subsurface drainage (see improved drainage). It draws attention to vulnerable areas where soil conservation and water management measures would be desirable (windbreaks, maintenance of vegetation cover, especially during periods of drought, control of water table height). Soils that are highly vulnerable to wind erosion (7.5% of the total) occur in areas of well-drained soils of coarse to medium texture with low organic-matter content (e.g. Saint-Thomas series). Soils that are moderately vulnerable to wind erosion (e.g. Saint-Aimé series) account for 50.6% of the total area, and soils with low to nil wind erosion vulnerability 41.9% (e.g. Saint-Urbain series). The soils of Richelieu and Saint-Hyacinthe Counties are more vulnerable than those of Chambly and Verchères Counties, with the exception of the sandy soils of the terraces of the Bois de Verchères. According to our interpretation model, soils with no subsurface drainage are less vulnerable to wind erosion because they are wetter. Undrained soils with low to nil wind erosion vulnerability account for 89.6% of the study area, moderately vulnerable soils 7.8%, and highly vulnerable soils 2.6%. This shows the importance of improving the drainage and practising careful soil water management thereafter, especially in periods of drought.