

Soil vulnerability to upward migration of coarse fragments to the surface as a result of human action aimed at drainage improvement

The digging and cleaning of ditches, the straightening of watercourses or the installation of subsurface drainage pipes may cause coarse fragments (i.e. fragments > 0.2 cm in diameter: gravel, pebbles, stones, blocks or bits of debris such as stumps, branches, etc.) to migrate upward to the soil surface. The extent of this phenomenon is directly proportional to the presence, abundance and size of coarse fragments in the soil profile.

The upward migration of coarse fragments may entail a decline in soil productivity. A very gravelly soil, for example, has an adverse impact on plant emergence and water availability, while the presence of stones on the surface may affect ploughing and harvesting.

The soil descriptors used to determine this kind of vulnerability are depth to rock and texture of the subsoil (B horizon) and substratum (C horizon) (Table 1).

Table 1. Model for assessing soil vulnerability to upward migration of coarse fragments as a result of human action aimed at drainage improvement

Depth to rock	Texture of subsoil (B horizon)	Texture of substratum (C horizon)*			
		Other	Gravelly	Very gravelly	Pebbly to very stony
≥100 cm	Other	Nil to low	Nil to low	Moderate	High
	Gravelly	Nil to low	Moderate	High	High
	Very gravelly	Moderate	High	High	High
	Pebbly to very stony	High	High	High	High
<100 cm	High				

*Gravelly (20-50% gravels), Very gravelly (≥50% gravels), Pebbly to very stony (≥20% pebbles or stones)

Adapted from Martin and Nolin 1991

The information supplied by this map is useful to designers and land-use specialists in planning excavation, cleaning and drainage operations, not only in the case of farmland but also within municipalities and along roads. It affords a means of identifying soils that are vulnerable to the upward migration of coarse fragments as a result of human activity, and assessing corrective measures such as removing coarse fragments or adding a layer of topsoil in the case of a landscaping operation.

In view of the nature of the soils in this region, 96.7% of the study area is characterized by low or negligible vulnerability. Highly vulnerable soils account for barely 3.3% of the total. These soils occur mainly in Chambly and Verchères Counties, where they are found in association with soils of glacial origin (tills and glaciofluvial deposits) (e.g. Saint-Hubert series), glacial deposits with skeletal particle size distribution (e.g. Rougemont series), or shallow clay soil materials over rock (e.g. Longueuil series).