Organic matter content of the surface layer (0 - 25 cm)

Organic matter originates from biological activity, both plant and animal, in and on the soil. Furthermore, it conditions the way such activity evolves. Organic matter acts at three main levels: (a) it serves (as in the case of clay) to store water and nutrients, enhancing the soil's water-holding capacity, (b) it maintains the soil's structural stability by clumping mineral particles together into aggregates, thereby contributing to soil permeability, and (c) it promotes biological and microbial activity that makes mineral elements suitable for uptake by plants (Magny and Baur 1962, Mathur and Wang 1991).

In view of organic matter's effects on the physical and chemical properties of soils, the organic matter content of the surface layer is an indicator of a soil's fertility and structural stability. Its nutritive value can be replaced by fertilizers, but its biophysical benefits cannot. Intensive farming practices tend to deplete the soil's organic matter. Intensive tillage leaving little residue, for example, expedites losses of topsoil from wind and water erosion and increases organic matter oxidation and mineralization rates (Gosselin et al. 1986 and Mathur and Wang 1991). In this atlas, the organic matter content of the surface layer is used as a criterion in assessing the vulnerability of soils to various types of degradation, such as erodibility, wind erosion, smearing and compaction.

Table 1. Definition of organic matter content classes

Class	Organic matter (%)	Texture
Very low	<3	-
Low	3 - 4	-
Moderately low	4 - 5	-
Moderate	5 - 7.5	-
Moderately high	7.5 - 9	-
High	9 - 15	-
Very high	15 - 30	Humic
Extremely high	≥30	Peaty

After Martin and Nolin (1991) and Quebec Fertilizer Manufacturers' Association (1990)

Soils are distributed among seven organic matter content classes (Table 1). The map illustrates organic matter content on the assumption that all the delimited areas represent land under cultivation, but this is not invariably the case in reality (e.g. abandoned former farmland, woodlots, etc.). Soils with very low organic matter content (11.4%) occur mainly in Richelieu and Saint-Hyacinthe Counties. As a rule, they belong to mapping units that have been subjected to water erosion (water erosion phase (w)) and medium-textured silt-rich soils (e.g. Saint-Hyacinthe and Saint-Aimé series). Soils with an organic matter content of between 3 and 5% occur throughout the area (76.9%) and on soils in various texture classes (e.g. Aston and Providence series). Soils with an organic matter content of between 5 and 7.5% (7.2%) are medium fine to fine in texture for the most part (e.g. Saint-Urbain series) (see Table 5 for the definition of textures). Lastly, organic soils (1.2%) and mineral soils with a humic or peaty surface layer (3.1%) occur in depressions (peat bogs, marshes and channels) throughout the study area. Series that are entirely forest-covered (Du Mont and Montarville) are not represented (0.2%).

The map reveals the importance of good organic matter management in the study area, as most of the soils have less than 5% organic matter in the A horizon (0 - 25 cm). Gosselin et al. (1986) showed that declining organic matter content levels in the region of the Montreal plain were due to the abandonment of livestock production in favour of intensive industrial monoculture operations. This shift put an end to organic matter input in the form of manure and forage crops (grasses and legumes). Frequent ploughing displaces the surface horizons and mixes them with the underlying horizons; this dilutes the organic matter through 30 cm of soil, promoting oxidation and expediting mineralization of the humus. The result is that intensive farming, with no crop rotation, causes more rapid destruction of humus. We may note here that Tabi et al. (1990) found reduced organic matter content levels in nearly 65% of all land under monoculture in the Richelieu-Saint-Hyacinthe agricultural region.