

Importance of Soil Texture

Soil texture is an important soil characteristic that influences stormwater infiltration rates. The textural class of a soil is determined by the percentage of sand, silt, and clay. Soils can be classified as one of four major textural classes: (1) sands; (2) silts; (3) loams; and (4) clays. In this fact sheet, we will discuss the importance of soil texture, different methods to determine soil texture, and the importance of texture on management decisions.

A clay soil is referred to as a fine-textured soil whereas a sandy soil is a coarse textured soil. Numerous soil properties are influenced by texture including:

- Drainage
- Water holding capacity
- Aeration
- Susceptibility to erosion
- Organic matter content
- Cation exchange capacity (CEC)
- pH buffering capacity

Soil texture determines the rate at which water drains through a saturated soil; water moves more freely through sandy soils than it does through clayey soils. Once field capacity is reached, soil texture also influences how much water is available to the plant; clay soils have a greater water holding capacity than sandy soils. In addition, well drained soils typically have good soil aeration meaning that the soil contains air that is similar to atmospheric air, which is conducive to healthy root growth, and thus a healthy crop. Soils also differ in their susceptibility to erosion (erodibility) based on texture; a soil with a high percentage of silt and clay particles has a greater erodibility than a sandy soil under the same conditions. Differences in soil texture also impacts organic matter levels; organic matter breaks down faster in sandy soils than in fine-textured soils, given similar environmental conditions, tillage and fertility management, because of a higher amount of oxygen available for decomposition in the light-textured sandy soils. The cation exchange capacity of the soil increases with percent clay and organic matter and the pH buffering capacity of a soil (its ability to resist pH change upon lime addition), is also largely based on clay and organic matter content.

Soil Textural Classes

Texture refers to the size of the particles that make up the soil. The terms **sand**, **silt**, and **clay** refer to relative sizes of the soil particles. Sand, being the larger size of particles, feels gritty. Clay, being the smaller size of particles, feels sticky. It takes 12,000 clay particles lined up to measure one inch. Silt, being moderate in size, has a smooth or floury texture. The combined portions of sand, silt, and clay in a soil determine its textural classification. Sand particles range in size from 0.05–2.0 mm, silt ranges from 0.002–0.05 mm, and the clay fraction is made up of particles less than 0.002 mm in diameter. Gravel or rocks greater than 2 mm in diameter are not considered when determining texture. Once the sand, silt, and clay percentages of a soil are known, the

textural class can be read from the textural triangle (Figure 1). For example, a soil with 40% sand, 40% silt and 20% clay would be classified as a loam. Texture should not be confused with structure, which refers to how soil particles are aggregated together. It is possible to improve soil structure via best management practices such as reduced tillage. However, it is very impractical (expensive) and thus ill-advised to modify a soil's texture.

The **soil texture triangle** (figure 1. below) gives names associated with various combinations of sand, silt and clay. A **coarse-textured** or **sandy** soil is one comprised primarily of sand-sized particles. A **fine-textured** or **clayey** soil is one dominated by tiny clay particles. Due to the strong physical properties of clay, a soil with only 20% clay particles behaves as sticky, gummy clayey soil. The term **loam** refers to a soil with a combination of sand, silt, and clay sized particles. For example, a soil with 30% clay, 50% sand, and 20% silt is called a **sandy clay loam**.

The Size of Sand, Silt and Clay

| <u>Name</u> | <u>Particle Diameter</u> |
|------------------|---------------------------|
| Very coarse sand | 2.0 to 1.0 millimeters |
| Coarse sand | 1.0 to 0.5 millimeters |
| Medium sand | 0.5 to .25 millimeters |
| Fine sand | 0.25 to 0.10 millimeters |
| Very fine sand | 0.10 to 0.05 millimeters |
| Silt | 0.05 to 0.002 millimeters |
| Clay below | 0.002 millimeters |

Soil Textural Triangle

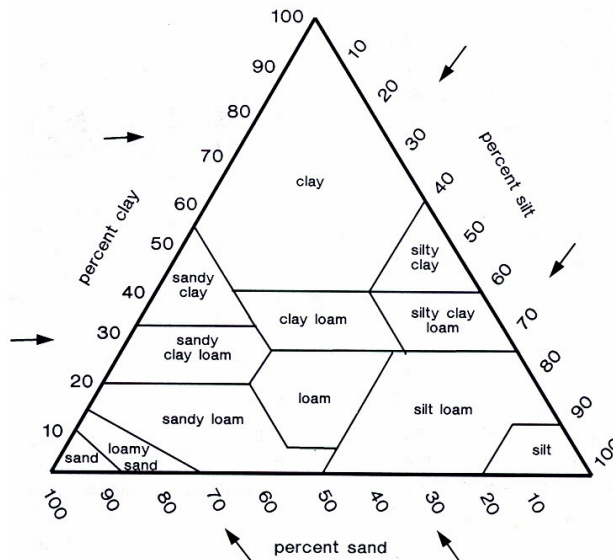


Figure 1: A soil textural triangle is used to determine soil textural class from the percentages of sand, silt, and clay in the soil.

Information adapted from Rutgers University and Cornell University