Outreach
Warnell School of Forestry & Natural Resources
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Soils Terms and Definitions

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Particle size classes – The word "loam" has two meanings. In common use, loam describes friable, dark-colored topsoil that is ideal for plant growth. In contrast, a soil scientist defines "loam" as a soil that contains the quantity of the sand-, silt- and clay-sized particles that provides the optimal balance among water holding, nutrient retention and tillage characteristics (about 20% clay, 30% silt and 50% sand-size particles). We are concerned then with the size of particles and how much of each major kind there is in a soil horizon.

Sand – can be considered to be the skeleton of the soil. It is mostly inert and resistant to weathering, especially since most sand-sized particles are composed of the mineral quartz. Size 0.002 to 0.08 inches (0.05 to 2 mm) in diameter.

Silt – is an intermediate size particle that contributes to nutrient exchange but is particularly important for water retention and release. Silt-sized can particles fill in the spaces between sand particles and soils with high silt contents retain the greatest amount of plant available water. Silt also affects engineering properties of soils, particularly, its erosivity. Size is 0.00008 to 0.002 inches (0.05 to 2 mm) in diameter.

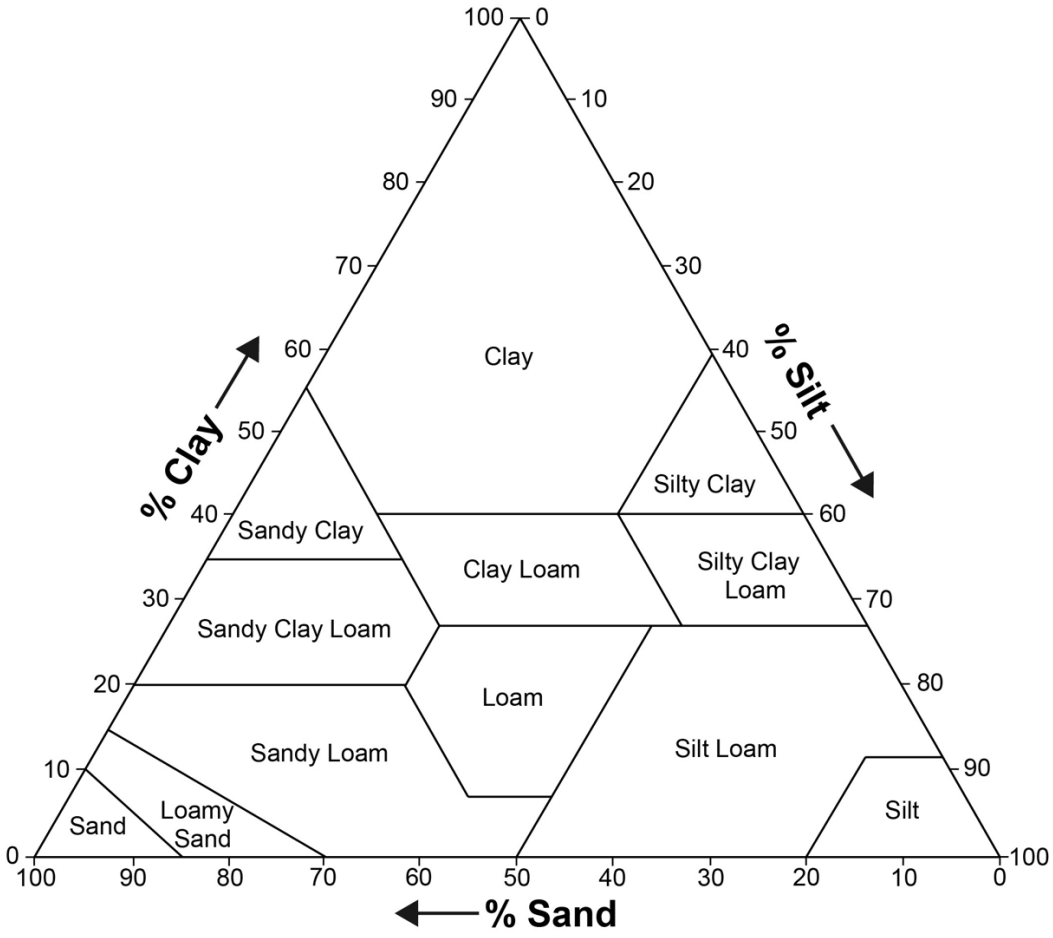
Clay – is the active part of the soil. Like loam, it has two meanings. "Clay" can mean a specific *type* of mineral, such as kaolinite clay used in pottery or to coat paper, or it can refer to the *size* of the soil particle. When we discuss clay-sized particles in the context of soil texture, we are referring to particles that are less than 0.0008 inches (0.002 mm) in size. Because of its very fine particle size and other properties, clay-sized particles possess many surface sites with negative electrical charge that largely determine the Cation Exchange Capacity.

Cation Exchange Capacity – Cation Ion Exchange Capacity (CEC) of soil is the ability to attract and hold positively charged nutrient cations, such as potassium (K^+), calcium (Ca^{++}), magnesium ($M\ g^{++}$) and ammonium ions (NH_4^+), for plant growth. Cation exchange capacity also holds hydrogen (H^+), and aluminum (Al^{+++}), which determine soil pH. Several different types of minerals occur as clay-sized particles such as kaolinite, illite, vermiculite and montmorillonite. These clay minerals are listed in order of the increasing CEC, so kaolinite has the lowest CEC and montmorillinite the highest CEC. Thus, it is not only the quantity of clay-sized particles, but also the kind of clay in a soil that determines its properties.

Soil Texture – The variable combinations of different amounts of sand, silt and clay gives rise to soil texture. So we talk of sandy, loamy and clayey soils in the broad sense and then

more specifically speak of loamy sand, sandy loam, loam, silt loam, etc., which have certain minimum and maximum amounts of each particle size component (Figure 1).

In determining soil texture, any particle coarser than about 1/8 inch (2 mm) in diameter is excluded from analysis. However, these coarse fragments can modify the soil texture name. For example, we can have a gravelly loam when more than 15% of the soil volume is comprised of gravel fragments (gravel refers to rounded fragments greater than 0.2 inches and less than 3" in diameter). If there are from 35% to 60% gravel fragments then the term very gravelly loam is used and if the soil volume is from >60% to 90% gravel, then the term extremely gravelly loam is used. Other texture modifiers are also used, and they depend on both the size and shape of the coarse fragments.



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