

Field Method

Determining USDA Soil Textural Class

Developed by: Peter Fletcher

Organic soil material vs. mineral soil material: Sample preparation: crush + mix a heaping tablespoon of soil in your palm. Remove any live roots and rock fragments larger than 2 mm (), approx. size diameter lead in wooden pencil.

Tests for Organic Soil Material:

High fiber content
Weak strength, feel of mashed potatoes
When dry has dark color + light weight

Tests for Mineral Soil Material:

Gritty feel if sandy
When squeezed, solid feel
When dry has light color + retains significant weight

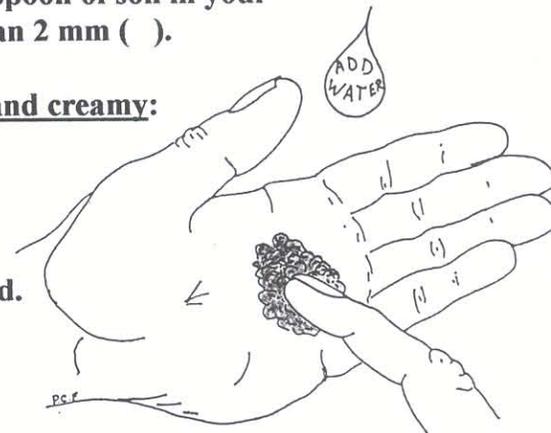


Field Tests for Determining Mineral Soil Textural Classes

STEP 1 – sample preparation: crush + mix a heaping tablespoon of soil in your palm. Remove any live roots and rock fragments larger than 2 mm ().

STEP 2 – predominantly gritty vs. predominantly smooth and creamy:

Add water until the soil sample becomes a soupy mix, not a paste. Feel for grittiness by stirring the sample with your finger. Sand size particles have a gritty feel. Consider a LOAM textural class (pg 2) only after the gritty vs. smooth + creamy determination cannot be decided.



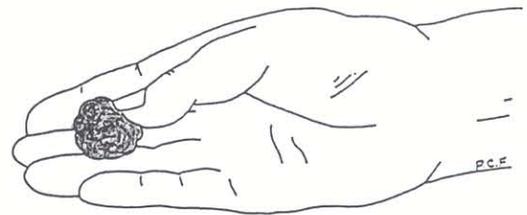
STEP 3 – predominantly gritty feel, includes sand, loamy sand, and sandy loam. If creamy and smooth, go to STEP 4.

Making a cast: Discard the wet sample and take a fresh moist sample from the side of the pit. Prepare the sample as in STEP 1. Next make a cast by squeezing the moist soil into mass.

SAND Textural Class if soil forms a very weak cast and hands are easily wiped clean.

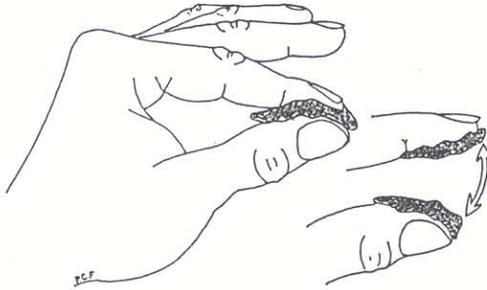
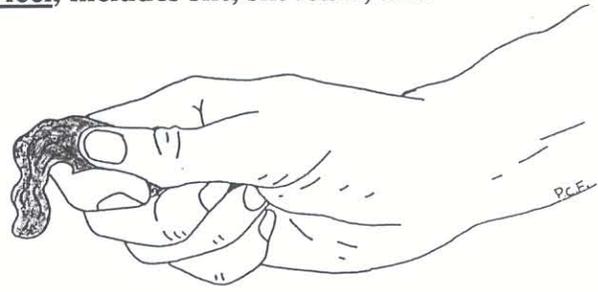
LOAMY SAND if soil forms a weak cast and, the silt and clay dirties the pores of your hand.

SANDY LOAM if soil forms a durable cast and withstands gentle tossing between one's hands.



STEP 4 – predominantly smooth and creamy feel, includes silt, silt loam, and textural classes with clay in the name.

Making a ribbon: Add moist soil to the wet sample and work it until it has the feel of putty. Next using a combined action of squeezing and pushing with your thumb make a ribbon of soil that extends over your index finger. Eventually the ribbon will crack and break from its own weight.



Stickiness Test: Add water to the soil sample until it is at its stickiest feel. Stickiness is gauged by pressing a wet soil between one's thumb and index finger, and then pulling them apart. The degree of suction and the tendency for the soil to stick to either or both the thumb and index finger, are used to gage the stickiness of a soil.

SILT Textural Class if soil forms a weak ribbon and is non-sticky.

SILT LOAM if soil forms a weak to moderate ribbon and is non-sticky to moderately sticky. Silt loams often have a slightly gritty feel.

Clay in the name of the textural class (sandy clay loam, sandy clay, clay loam, silty clay loam, silty clay, or clay), if soil forms a strong to very strong ribbon and is moderately to very sticky.

Next, add water until the soil sample becomes a soupy mix, not a paste. Feel for grittiness by stirring the sample with your finger. Sand size particles have a gritty feel.

Sandy clay loam, sandy clay and clay loam have a slight to moderate gritty feel. These textures are rarely found in Southern New England.

Silty clay loam, silty clay, and clay textural classes have a creamy smooth feel.

SILTY CLAY LOAM if the soil forms a strong ribbon and is moderately sticky.

SILTY CLAY or CLAY if the soil forms a very strong ribbon and is very sticky. Clay textural classes uncommon in Southern New England.

LOAM Textural Class has a significant amount of each particle size making it feel gritty while having a creamy feel and, in some instances, slightly sticky with a weak ribbon. Contrary to common belief, loam textures are not very common in Southern New England and should only be considered as a last choice after serious consideration has been given to both a sandy loam and silt loam textures.

USDA Classification System

Mineral Soil Particle Sizes, Soil Texture, Textural Classes, and Modifiers

Mineral soil material is divided into two broad groupings, the fine earth fraction and rock fragments. The fine earth fraction is soil particles that are 2 mm (about the size of the diameter of the lead in a wooden pencil) or less in diameter and includes clay, silt and sand.

Clay size particles (< 0.002 mm) are so fine that they do not have a gritty feel and you need an electron microscope to see them. When dry they are typically very hard and often cannot be crushed between your fingers. When wet they have a greasy, sticky feel. When working with clay it can lodge within the pores of your hands and they cannot be wiped clean.

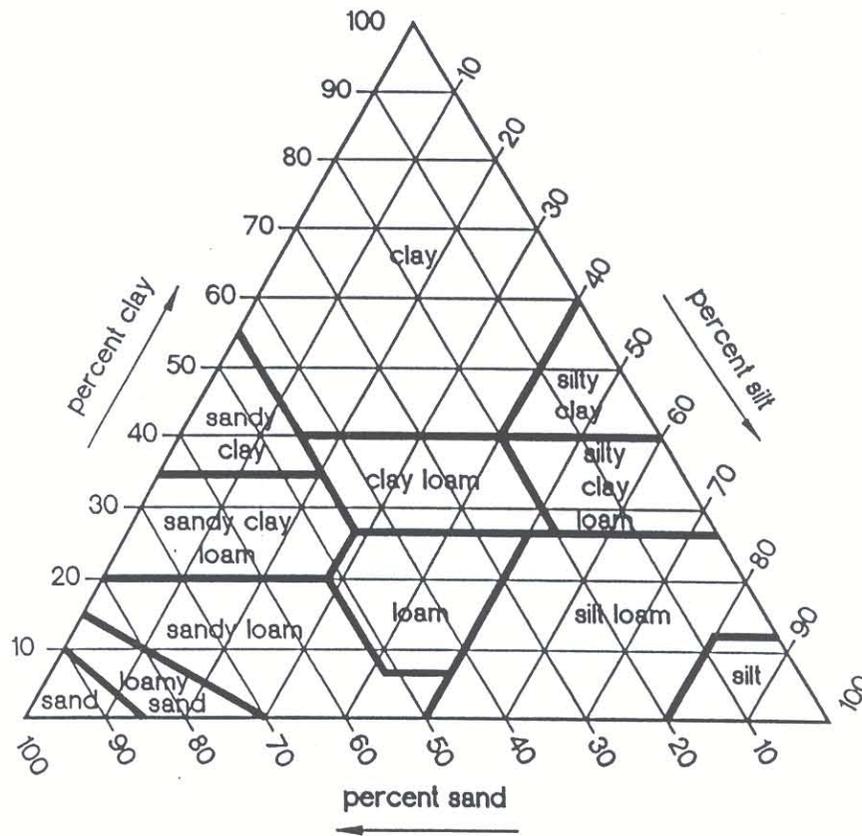
Silt size particles (0.05-0.002 mm) are so fine that they do not have a gritty feel and you need a light microscope to see them. When dry they can be crushed between your fingers with moderate to strong pressure and have a smooth, velvety feel. When wet they have creamy, buttery feel. When working with silt it can lodge within the pores of your hands and they cannot be wiped clean.

Sand size particles (2.0-0.05 mm) can be seen with the naked eye and have a gritty feel. There are five classes of sand size particles: very fine sand (0.10-0.05 mm), fine sand (0.25- 0.10 mm), medium sand (0.5-0.25 mm), coarse sand (1.0-0.5 mm), and very coarse sand (1.0-2.0 mm). The degree of grittiness is dependent upon the sand size with very coarse sand having the grittiest feel and very fine sand having a very slight gritty feel. When dry sand is loose and single grained. When moist sand forms a very weak cast that falls apart when handled. Sand size particles cannot lodge within the pores of your hands and they can be easily wiped clean.

Soil texture is the relative proportions (by weight) of clay, silt and sand size particles within a soil. The volume of rock fragments within a soil is calculated after determining the soil texture and is described using an adjective (e.g. very gravelly sand). Typically when determining the texture of a mineral soil, the organic matter content is ignored and only the percent clay, silt, and sand are considered. An exception to this is when the organic matter content is significantly high (5 to 18 percent organic carbon

depending upon the clay content) and a mucky modifier is used to describe the soil texture (e.g. mucky sand).

Typically in nature soils are comprised of a mix of different particle sizes rather than a single size (i.e. clay, silt, or sand). The different mixes of clay, silt, and sand are referred to as **soil textural classes**. There are twelve different soil textural classes within the USDA Classification System, each having a specific range of clay, silt, and sand size particles. A Soil Textural Triangle has been developed to show the different percentages of clay, silt, and clay within each of the textural classes.



Soil Textural Triangle

Rock fragments are pieces of rock that are greater than 2 mm in diameter. Rock fragments are divided into four different classes base on size: gravel (2.0 mm-3 inches), cobbles (3-10 inches), stones (10 inches-2 feet), and boulders (> 2 feet in diameter). Different terminology and size criteria are used for to describe rock fragments that are thin and flat: channers (2mm-6 inches, and flagstones (6-15 inches), and stones 15-2 feet). Modifies are used to describe the soil texture when the volume of rock fragments fall within specified amounts. When the volume of rock fragments is less than

15 percent no modifier is used. When the volume of rock fragments is 15 to 35 percent the dominant kind of rock fragment is added to the soil textural class (e.g. gravelly sand). When the volume of rock fragments is 35 to 60 percent the dominant kind of rock fragment plus “very” is added to the soil textural class (e.g. very gravelly sand). When the volume of rock fragments is 60 to 90 percent the dominant kind of rock fragment plus “extremely” is added to the soil textural class (e.g. extremely gravelly sand). When the volume of rock fragments exceeds 90 percent just the dominant size rock fragment is named and there is no soil textural class (e.g. gravel).