

PSES 3411L Exercise 2: Estimating Soil Texture by Feel

When estimating soil texture using the feel method, there are essentially four steps to approximate the USDA Soil Textural Triangle. The USDA Texture Triangle has 12 texture categories, or classes, as can be seen in the diagram at right. After removing organic carbon, plant roots, and particles larger than 2 mm, the soil separates are determined in the lab using the hydrometer or pipette methods after dispersing the aggregates with a chemical dispersant and agitation (stirring).

The rate the particles fall out of suspension is directly proportional to their size. (Larger particles fall faster.) The simplest method using readings at 40 seconds and 2 hours. The 40-second hydrometer reading measures the silt and clay remaining in suspension. The 2-hour hydrometer reading measures the clay remaining in suspension. More complex methods use more readings (from 30 seconds to 24 hours) to identify more points along the continuum of sand, silt, and clay particle sizes.

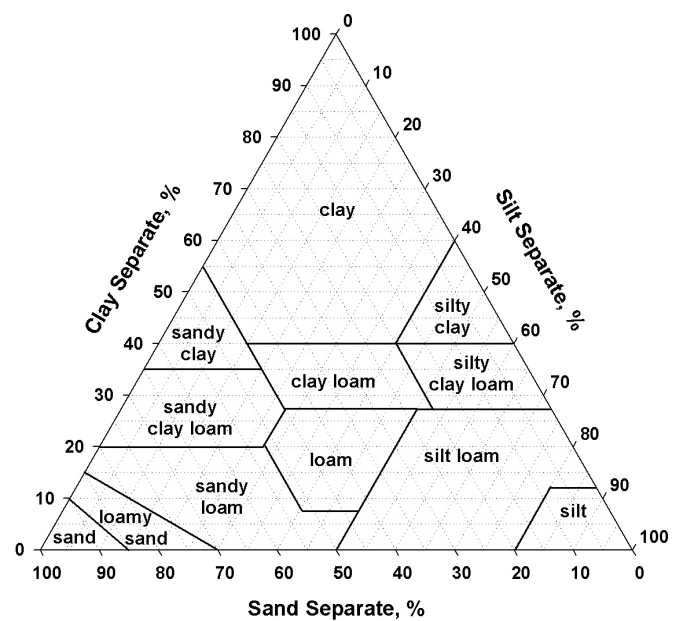
The USDA Texture Classes were originally developed with agricultural cropping practices in mind, i.e., how will the texture affect farming? Notice, though, that arbitrary categories have been forced onto a continuum, and consider, "What is the difference between a sandy clay loam with 60% sand and 21% clay, and a sandy loam with 60% sand and 19% clay?" Other texture classification systems have been developed for engineering or other purposes.

When the soil has coarse fragments, modifiers may be added to the texture class. The modifiers include gravelly, cobbly, stony, bouldery, channery, and flaggy. These terms refer to the shape of the coarse fragments (rocks), and are used when 15 to 35% of the total volume is rocks. When 35 to 60% of the volume is rocks, very is added in front of the modifier, e.g., very gravelly clay loam. When 60 to 89.99% of the volume is rocks, extremely is added in front of the modifier, e.g., extremely cobbly silt loam. If 90% or more of the volume is rocks, the coarse fragment term is used rather than the soil texture term.

When the soil is dominated by sand (sand, loamy sand, and sandy loam), modifiers are added to the texture class to identify the size of the sand grains: coarse, fine, and very fine. Most of the sandy soils in this region were deposited by wind, and are typically fine or very fine sandy loams, and occasionally loamy fine sands, and loamy very fine sands. Sediments deposited by water may be sorted to remove the fine particles, leaving coarse sands.

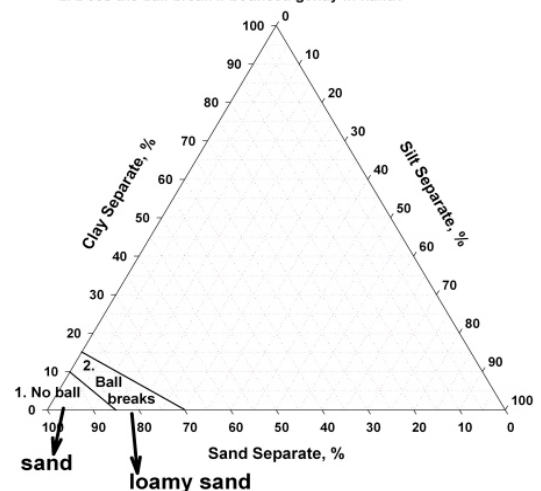
Step 1. Take a handful of soil. If the soil is dry, moisten it just enough to determine if it will form a ball when squeezed in the palm of the hand. If the moist soil will not form a ball, it is a sand.

USDA Texture Triangle



Texture Triangle: Estimating Texture by Feel, Part 1

1. Does it form a ball?
2. Does the ball break if bounced gently in hand?



Step 2. Bounce the ball. If the moist soil remains in a ball when the hand is opened, bounce the ball in the hand. If the ball breaks when it hits the hand, it is a loamy sand. Notice, these textures occupy only the bottom, left corner of the triangle. If the ball does not break, move on to Step 3.

Step 3. Determine if the moist soil will form a ribbon when extruded between the thumb and forefinger (or how long a 1/8" or 3 mm diameter ribbon will form when rolled on a flat table). The principle behind forming ribbons is related to the cohesion that exists among clay particles. Clays are sticky when moist, and so the ribbon length is proportional to the clay content.

Caution: When starting with dry clays, make sure to allow time for the clays to become moist, and make sure "gritty" particles are not aggregates.

3a. If the ribbon length is less than 2.5 cm, the general category is loam.

3b. If the ribbon length is between 2.5 cm and 5 cm, the general category is clay loam.

3c. If the ribbon length is greater than 5 cm, the general category is clay.

After determining the general category by clay content, move to Step 4.

Step 4. Are modifiers (sandy, silt, or silty) necessary? Feel and listen as the sample is worked in the hand. If grittiness dominates, then the modifier, "sandy" will be added to the general category determined in Step 3, e.g., sandy loam, sandy clay loam, or sandy clay.

If grittiness does not dominate, but smoothness does, then a form of silt will be added, e.g., silt loam, silty clay loam, or silty clay. Silt is not sticky, but is smooth like flour, foundation make-up, or talcum powder.

Notice, this method does not provide a method to identify the silt texture class.

Compare this diagram with the USDA Texture Triangle above. The lines are in similar place, but not exact. Working with this method eventually will allow you to make good estimates, but the estimates should always be confirmed with lab studies for research. Consultants often become familiar enough with the soils in a region that their "feel" estimate is good enough for the management suggestions they offer.

