

CMG GardenNotes #214

Estimating Soil Texture

Sandy, Loamy or Clayey?

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Note: For additional information on managing soils refer to *CMG GardenNotes* #213, **Managing Soil Tilt**.

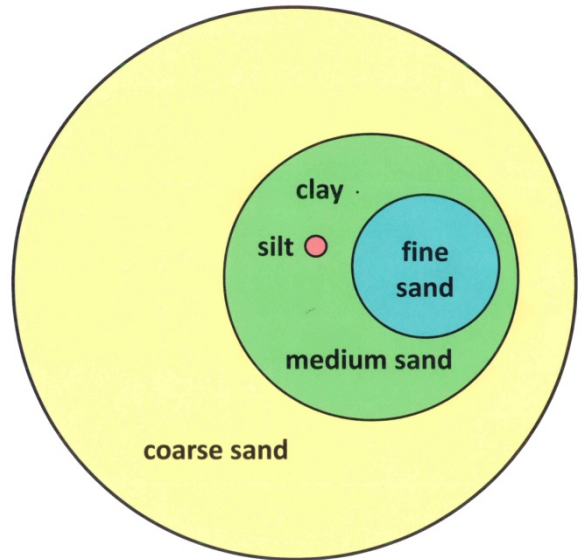
Sand, Silt and Clay

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. Silt, being moderate in size, has a smooth or floury texture. Clay, being the smaller size of particles, feels sticky. [Table 1 and Figure 1]

Table 1. The Size of Sand, Silt and Clay

| Name | particle diameter |
|------------------|---------------------------------|
| Clay | below 0.002 mm |
| Silt | 0.002 to 0.05 mm |
| Very fine sand | 0.05 to 0.10 mm |
| Fine sand | 0.10 to 0.25 mm |
| Medium sand | 0.25 to 0.5 mm |
| Coarse sand | 0.5 to 1.0 mm |
| Very coarse sand | 1.0 to 2.0 mm |
| Gravel | 2.0 to 75.0 mm |
| Rock | greater than 75.0 m (~2 inches) |

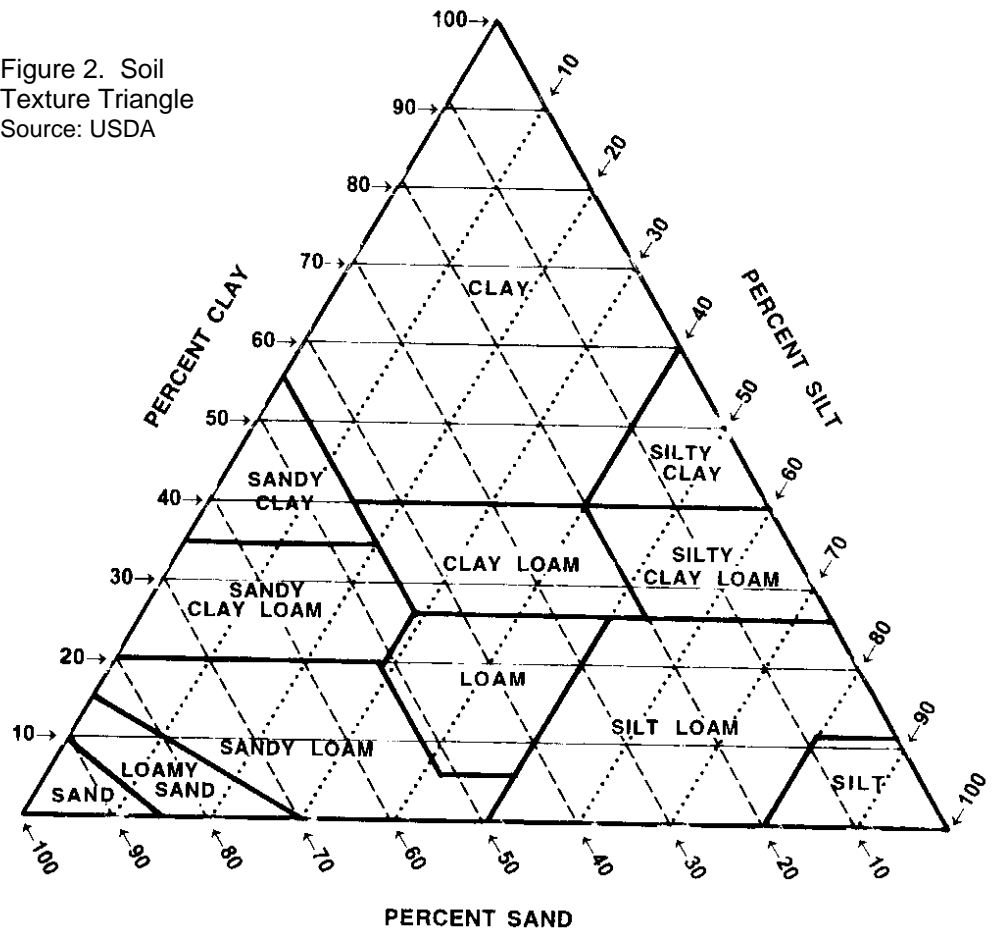
Figure 1. Comparative size of sands, silt and clay. If clay was the size of a dot on the page, silt and sands would be a comparative size.



Soil Texture Triangle

The *soil texture triangle* gives names associated with various combinations of sand, silt and clay. A *coarse-textured* or *sandy* soil is one comprised primarily of medium to coarse size sand 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*. [Figure 2]

Figure 2. Soil Texture Triangle
Source: USDA



Identifying Soil Texture by Measurement

1. Spread soil on a newspaper to dry. Remove all rocks, trash, roots, etc. Crush lumps and clods.
2. Finely pulverize the soil.
3. Fill a tall, slender jar (like a quart jar) a one-quarter full of soil.
4. Add water until the jar is three-quarters full.
5. Add a teaspoon of powdered, non-foaming dishwasher detergent.
6. Put on a tight fitting lid and shake hard for 10 to 15 minutes. This shaking breaks apart the soil aggregates and separates the soil into individual mineral particles.
7. Set the jar where it will not be disturbed for 2 to 3 days.
8. Soil particles will settle out according to size. **After 1 minute**, mark on the jar the depth of the sand.
9. **After 2 hours**, mark on the jar the depth of the silt.
10. **When the water clears** mark on the jar the clay level. This typically takes 1 to 3 days, but with some soils it may take weeks.
11. Measure the thickness of the sand, silt, and clay layers.
 - a. Thickness of sand deposit ____
 - b. Thickness of silt deposit ____
 - c. Thickness of clay deposit ____
 - d. Thickness of total deposit ____
12. Calculate the percentage of sand, silt, and clay.

$$\frac{[\text{clay thickness}]}{[\text{total thickness}]} = \text{___ percent clay}$$

$$\frac{[\text{silt thickness}]}{[\text{total thickness}]} = \text{___ percent silt}$$

$$\frac{[\text{sand thickness}]}{[\text{total thickness}]} = \text{___ percent sand}$$

13. Turn to the soil texture triangle and look up the soil texture class.

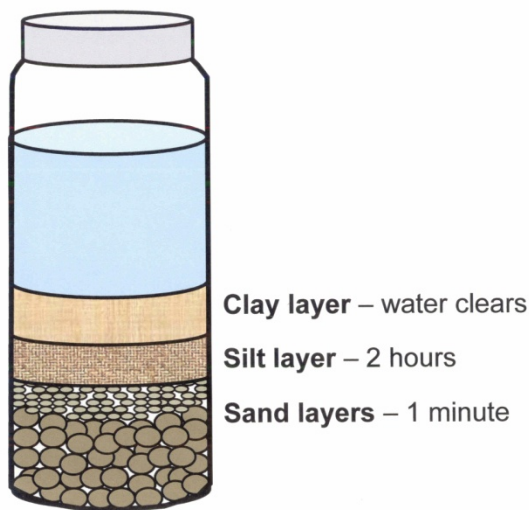


Figure 3. Measuring Soil Texture

Identifying Soil Texture by Feel [Figure 4]

Feel test – Rub some moist soil between fingers.

- Sand feels gritty.
- Silt feels smooth.
- Clays feel sticky.

Ball squeeze test – Squeeze a moistened ball of soil in the hand.

- Coarse texture soils (sand or loamy sands) break with slight pressure.
- Medium texture soils (sandy loams and silt loams) stay together but change shape easily.
- Fine textured soils (clayey or clayey loam) resist breaking.

Ribbon test – Squeeze a moistened ball of soil out between thumb and fingers.

- Ribbons less than 1 inch
 - Feels gritty = coarse texture (sandy) soil
 - Not gritty feeling = medium texture soil high in silt
- Ribbons 1 to 2 inches
 - Feels gritty = medium texture soil
 - Not gritty feeling = fine texture soil
- Ribbons greater than 2 inches = fine texture (clayey) soil

Note: A soil with as little as 20% clay will behave as a clayey soil. A soil needs 45% to over 60% medium to coarse sand to behave as a sandy soil. In a soil with 20% clay and 80% sand, the soil will behave as a clayey soil.

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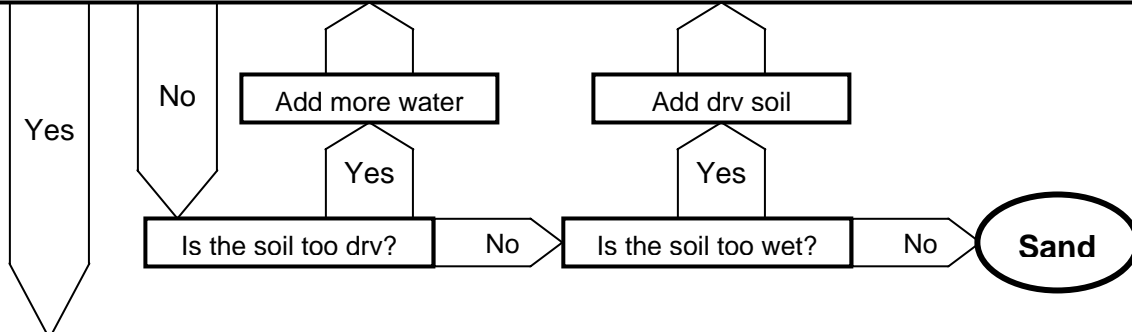
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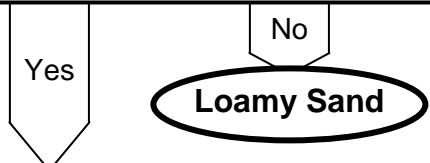


Figure 4. Soil Texture by Feel

Start: Place soil in palm of hand. Add water drop-wise and knead the soil into a smooth and plastic consistency, like moist putty.
Does the soil remain in a ball when squeezed?



Place ball of soil in the hand, gently pushing the soil out between the thumb and forefinger, squeezing it upward into a ribbon. Form a ribbon of uniform thickness and width. Allow ribbon to emerge and extend over the forefinger, breaking from its own weight.
Does the soil form a ribbon?



What kind of ribbon does it form?

| | | Forms a weak ribbon less than 1" before breaking | Forms a ribbon 1-2" before breaking | Forms a ribbon 2" or longer before breaking |
|---|-----|--|-------------------------------------|---|
| Moisten a pinch of soil in palm and rub with forefinger | | LOAM | CLAY LOAM | CLAY |
| Does it feel very gritty? | Yes | Sandy Loam | Sandy Clay Loam | Sandy Clay |
| Does it feel equally gritty and smooth? | Yes | Loam | Clay Loam | Clay |
| Does it feel very smooth? | Yes | Silt Loam | Silty Clay Loam | Silty Clay |