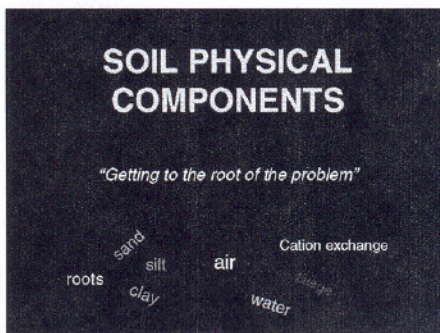


## Part 2. Soil Physical Components

Slide 1



This is the second of six slide sets on "Soils, Plant Nutrition and Fertilizer".

Each slide set is independent and does not have to be viewed in sequence.

PART 1, "Dirt is a Four-letter Word - AN INTRODUCTION TO SOILS" (24 slides with text; presentation time is approximately 30 minutes; file: *MG1-intro.ppt*)

**PART 2. "SOIL PHYSICAL COMPONENTS - Getting to the Root of the Problem" - (17 slides with text; presentation time is approximately 30 minutes; file: *MG2-components.ppt*)**

PART 3. "The Earth Beneath Our Feet - SOILS OF ALABAMA" (41 slides/no text; presentation time is approximately 60 minutes; file: *MG3-alasoils.ppt*)

PART 4. "SOIL ACIDITY AND LIMING" (15 slides with text; presentation time is approximately 20 minutes; file: *MG4-pH.ppt*)

PART 5. "The ABCs and NPKs for Healthy Plants - ESSENTIAL PLANT NUTRIENTS" (46 slides with text; presentation time is approximately 40 minutes; file: *MG5-nutrients.ppt*)

PART 6. "SOIL TESTING FOR HOME GROUNDS" (49 slides with text; presentation time is approximately 20 minutes.)

Slide 2



2. Soils provide the plant with (1) mechanical support, (2) water and (3) dissolved minerals/nutrients.

Slide 3



3. Since most plant roots are found in the topsoil or A horizon, this is the horizon that has the most effect on plant growth. Have you noticed how tree roots grow concentrated near the soil surface in the topsoil?

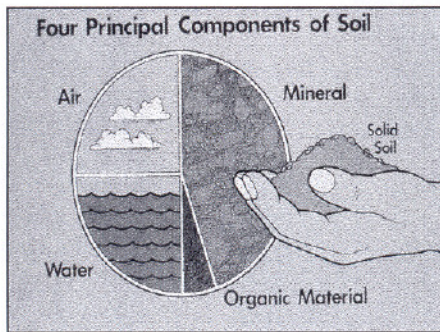
*(In case you're wondering, the creatures in this photo are my two curious pets, "Chia", a standard Schnauzer, and "Sophie", a Shetland Sheepdog. They were about 6 months old when this photo was taken. --CM)*

Slide 4



4. Let's look at the physical components of a good topsoil.

Slide 5



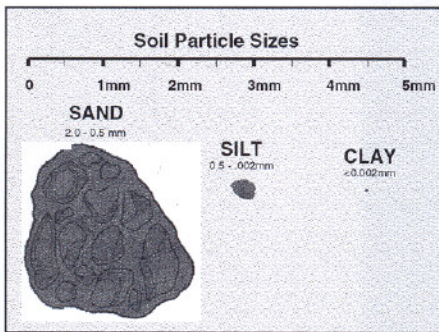
5. About half of a good topsoil is solid material, composed of (1) minerals and (2) organic matter, and the rest is (3) air and (4) water. The air and water is in the pore space between the mineral and organic particles. The volume and size of this pore space is critical to a well drained, productive soil. A compact soil low in organic matter will have very little pore space and cannot hold much air and water. Roots don't grow well under these conditions. A soil with lots of big pores drains very well, but may not hold enough water to sustain plants more than a few days.

Slide 6



6. We notice the mineral portion of the soil. It's that part that we see and feel. And, we can't do much to change it.

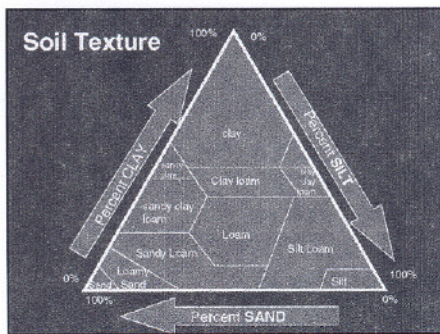
Slide 7



7. The mineral portion is a mixture of different size particles. The largest particles which you can see and feel is called "sand". (Note: Anything above 2mm is rocks or gravel; these have no effect on the water or nutrient holding capacity of soils and are not considered part of the soil itself.) The very smallest particle is called "clay". A single clay particle is so small that it takes an electron microscope to see one. Clay particles tend to develop electrical charges, bind with other soil particles, and hold minerals. Clay actually coat silt and clay particles and bind them together. Particles of intermediate size are called "silt".

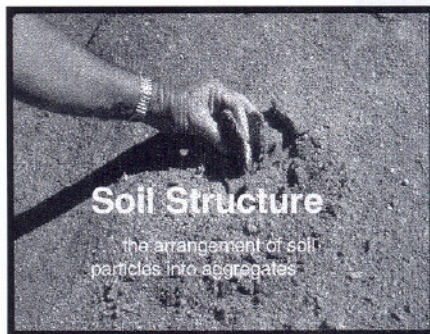
Therefore, the terms, sand, silt, and clay, are used only to describe the size of soil particles.

Slide 8



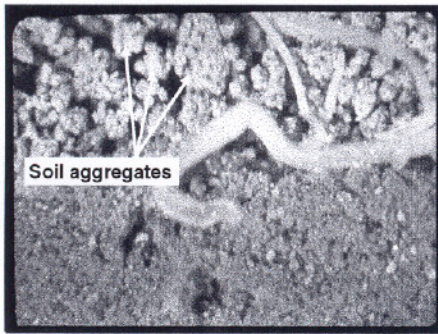
8. The proportion of sand, silt and clay in your topsoil gives your soil a distinct texture - or how your soil feels. This soil textural triangle help us to describe soils based upon the mixture of sand, silt, and clay in them. For example, a soil that's nearly 100 percent sand is called sand. You have to go to a stream bank, the beach, or a construction company to find pure sand. As the percentage of clay increases, we call a soil a loamy sand, sandy loam, sandy clay loam, sandy clay, and finally (if it contains more than about 50% clay) clay. If a soil is mostly silt, we'd call it silt. These are extremely rare. However, silt loams and silty clay loams, and silty clays are common in valleys of North Alabama. The term, "loam", is used to describe a soil that is a mixture of sand, silt, and clay. *(Explain how a loam with a little more sand is a sandy loam, a little more clay is a clay loam, etc. Point out that no one soil is more desirable than another. Each has its own desirable characteristics and problems.)*

Slide 9



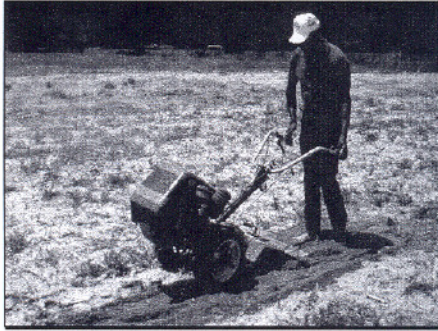
9. After construction, we may be faced with a subsoil or even a topsoil that looks something like this. It could be a loam or a silt loam or a sandy loam. Water can't move into this soil. The surface is crusty with very little pore space. Certainly, roots will have a difficult time growing. We say that this soil has poor structure. Soil structure refers to the arrangement of soil particles into aggregates

Slide 10



10. An aggregate is a tiny crumb of sand, silt, and clay held together by humus. Good soil structure opens up channels for water to drain and roots to grow. Poor structure impedes root growth and air and water movement. Sometimes, as in this slide, the poor structure can be in the subsoil and not in the topsoil.

Slide 11

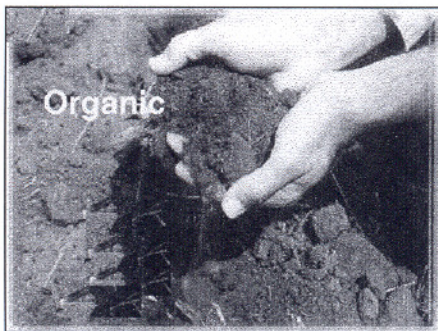


11. Tillers, particularly these fast spinning, rear-tined tillers that are so popular today, can be a gardener's best friend - particularly if you need to break up soil that is already hard and compact or you need to mix organic material, lime, or fertilizers in the soil.

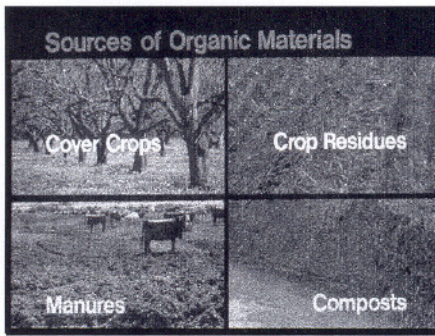
But they can also be the soil's worst enemy if you till the soil when it is too wet. How do you tell if the soil is too wet to till? (*Pause for a reaction. If you squeeze a handful of soil and drop it, it should crumble. If it sticks together, it's too wet to till.*)

The fast spinning tines crush soil aggregates. Soil structure is destroyed the same way a potter works wet clay before making a clay pot. After tilling a soil that is too wet, it may appear fluffy but just wait until it rains! Most likely it will set up like concrete.

Slide 12



Slide 13



13. Organic matter can be added in the form of green cover crops, crop residues left on the soil surface, manures and composts. We also add pine bark, straw, leaves, etc. as mulch. Winter cover crops such as clover, vetch, or winter rye can be left on a garden or incorporated into the soil to add organic matter. But here in the South, it's an on-going effort. We're fighting nature to build and maintain organic matter as high as possible.

Slide 14



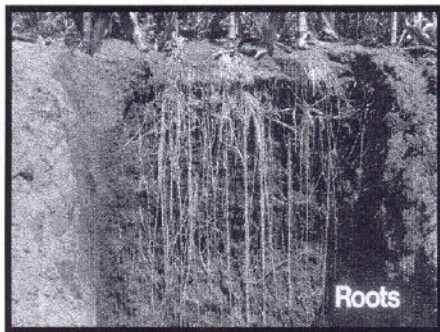
14. Nevertheless, adding organic matter to our garden soils on a regular basis helps to increase the pore space, improve drainage in compact soils, and increase the water-holding capacity of sandy soils.

Slide 15



14. Mulches are used to control weeds so gardeners won't have to till as much. The mulches provide a great home for earthworms which gradually mix the humus with the topsoil and help form soil aggregates. More and more gardeners, like farmers, are discovering the benefits of reduced tillage gardening. They are using cover crops and crop residue to reduce erosion, prevent crusting, and add organic matter to soils.

Slide 16




15. We can't do a lot about the texture of our soil, but we can increase soil organic matter, improve soil structure, prevent compaction by using mulches and less tillage, and promote a deep and healthy root system. This results in healthier plants, abundant flowers, and higher yields.

Slide 17

End of PART 2.  
"Soil Physical Components"

Slide set developed by:  
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for use in the Extension Master Gardener  
Volunteer Training Program



Proceed to PART 3. THE EARTH BENEATH OUR FEET - SOILS OF ALABAMA (MG3-  
alasoils.ppt)  
or to  
PART 4. SOIL ACIDITY AND LIMING (MG4-  
pH.ppt)