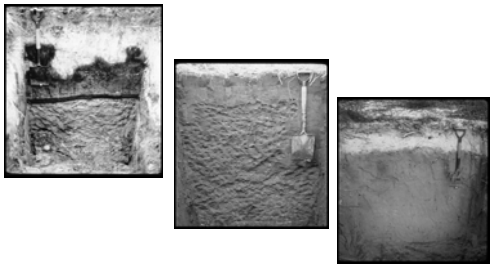
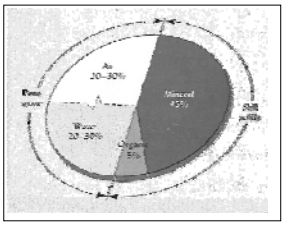
Characterizing Soil Horizons

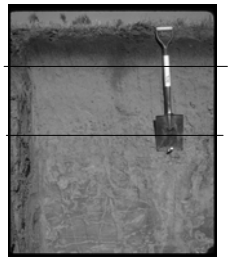


Porous Medium



50% pore space, 50% solids

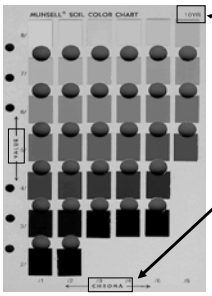
Differentiation



Physical Criteria for Characterizing Horizons

- Color
- Texture
- Structure
- Density

Soil Color



Hue

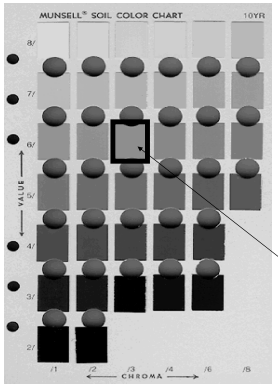
dominant spectral color; related to the wavelength of light. Related to the proportions of red to yellow. In soils we only use 1/5 of the color chips available.

Value

related to total amount of light reflected.

Chroma

measure of the strength of spectral color



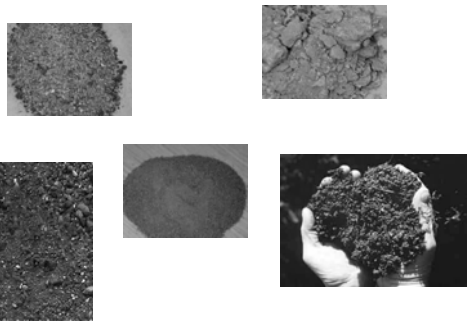
Hue = 10 YR
Value = 6
Chroma = 3

Munsell Color
10 YR 6/3

Physical Criteria for Delineating Horizons

- Color
- Texture
- Structure
- Density

The Soil Mineral Component: Texture



Soil Texture

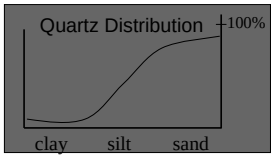
Soil texture refers to the relative amounts of three distinct size separates comprising the soil mineral component.

Sizes classes of particles

Sand Silt Clay

Soil Texture

Class	Diameter	Dominant Minerals
Sand	(2.0 – 0.05 mm)	Quartz
Silt	(0.05 – 0.002 mm)	Quartz /Feldspars/mica
Clay	(<0.002 mm)	Secondary minerals



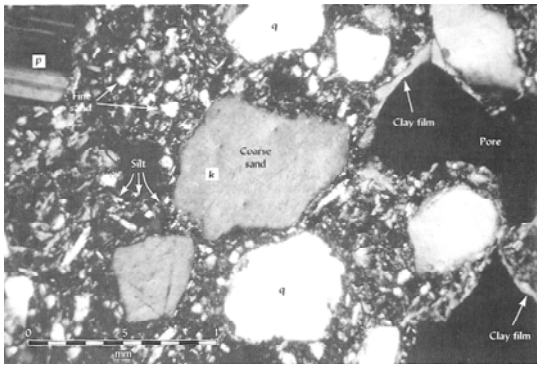


Fig. 4.3

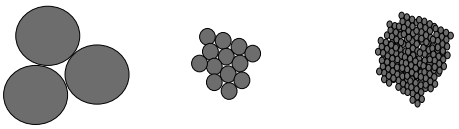
Importance of Soil Texture

(Distribution of particle sizes)

Soil Porosity
Particle Surface Area

Soil Porosity

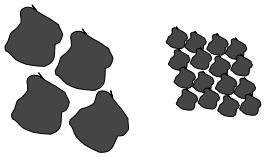
Porosity – the total volume of soil pores
- the distribution of pore sizes



Sand Silt Clay

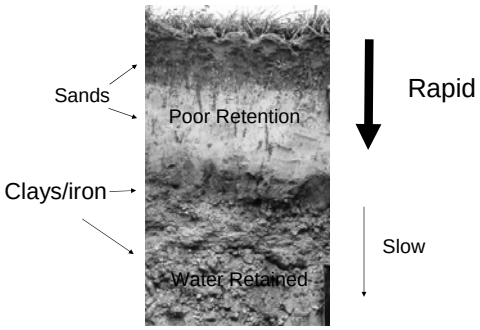
Texture, Pore Sizes, and Water

Large particles yield large pore spaces
Small particles yield small pore spaces

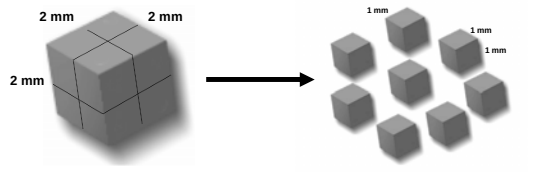


Water moves rapidly and is poorly retained in Coarse-textured sandy soils.

Water moves slowly and is strongly retained in Fine-textured, clayey soils.



Surface Area



Each face is 4 mm^2
6 faces x 4 mm^2 = 24 mm^2

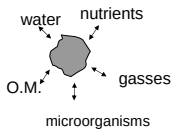
Each face is 1 mm^2
6 faces x 1mm^2 x 8 cubes = 48 mm^2

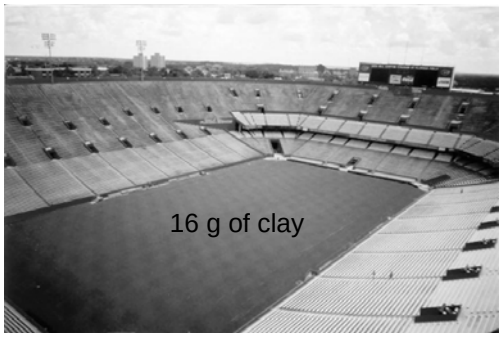
If each of the resulting cubes was divided similarly, the surface area would increase 16 times more

Surface Area

$$\text{Specific Surface Area} = \frac{\text{Surface Area}}{\text{mass}} \qquad \frac{\text{units}}{\frac{cm^2}{g}}$$

Interface with the environment



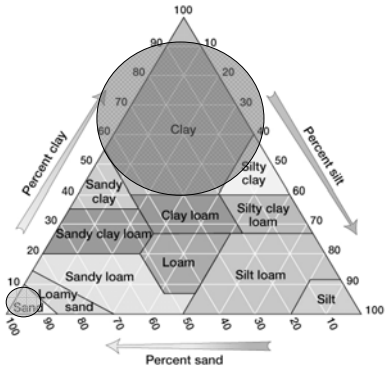


100 g soil

Soil A	Soil B
95 g sand	90 g sand
4 g silt	2 g silt
1 g clay	8 g clay
95 g sand x 30 g/cm^2 = 2850 cm^2	90 g sand x 30 g/cm^2 = 2700 cm^2
4 g silt x 1500 g/cm^2 = 6000 cm^2	2 g silt x 1500 g/cm^2 = 3000 cm^2
1 g clay x 3 M g/cm^2 = 3 M cm^2	8 g clay x 3 M g/cm^2 = 24 M cm^2
Total = 3,008,850 cm^2	**Total = 24,005,700 cm^2**

Soil Textural Classes

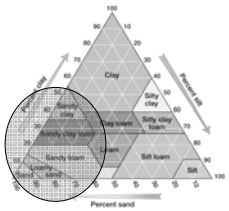
Soil Textural Triangle



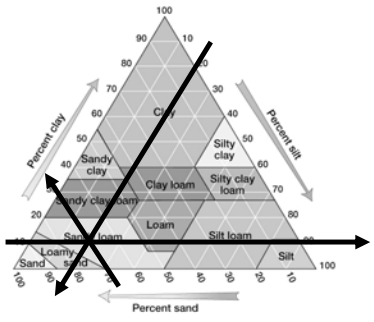
Increasing clay

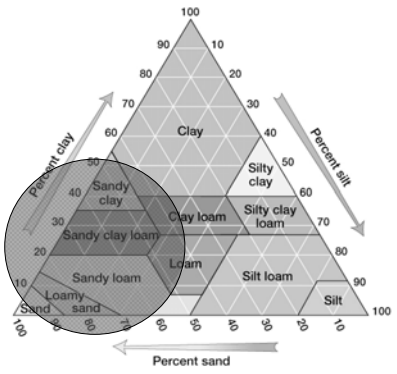
Sand
Loamy sand
Sandy loam
Sandy clay loam
Sandy clay
Clay

Florida Soils



70% sand, 20% silt, 10% clay





Measuring Soil Texture

Texture-by-Feel

Relative amounts of 3 soil separates:

Sand, Silt, and Clay

Gritty smooth plastic

Texture-by-Feel

Field Analysis