Soils

Soil Texture = %Sand, Silt & Clay in a soil.

- Soil texture is the single most important physical property of the soil. Knowing the soil texture alone will provide information about:
- 1) water flow potential,
- 2) water holding capacity,
- 3) fertility potential,
- 4) suitability for many urban uses like bearing capacity

Texture

- The Percent of sand, silt, clay in a soil sample
- Critical for understanding soil behavior and management
- Soil texture is not subject to change in the field but can be changed in potting mixes.

Particle Diameter Size

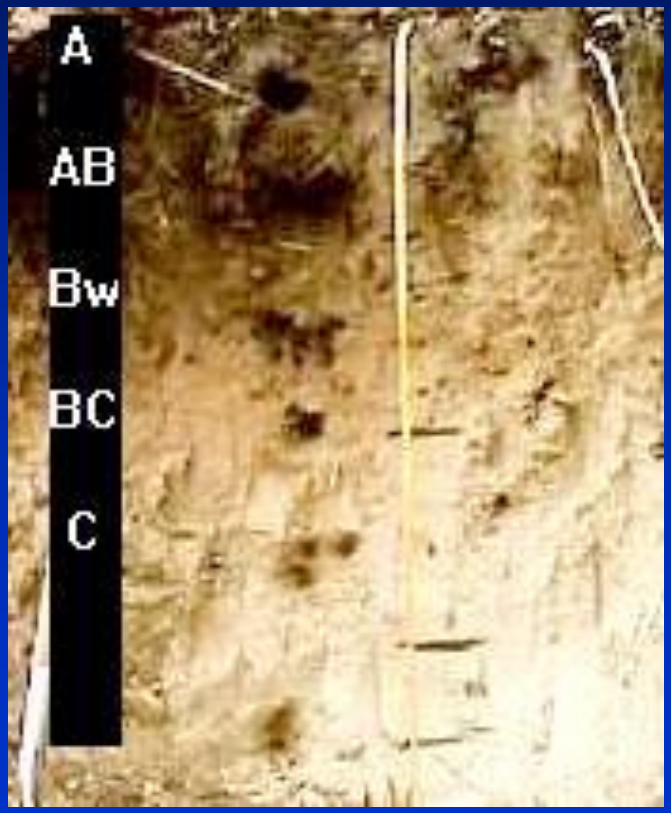
- Soil particle diameters range over 6 orders of magnitude
  - 2 m boulders
  - Coarse fragments > 2 mm
  - Sand < 2 mm to 0.05 mm
  - Silt < 0.05 mm to 0.002 mm
  - Clay < 0.002 m

Sand

- Feels gritty
- Considered non-cohesive – does not stick together in a mass unless it is very wet.

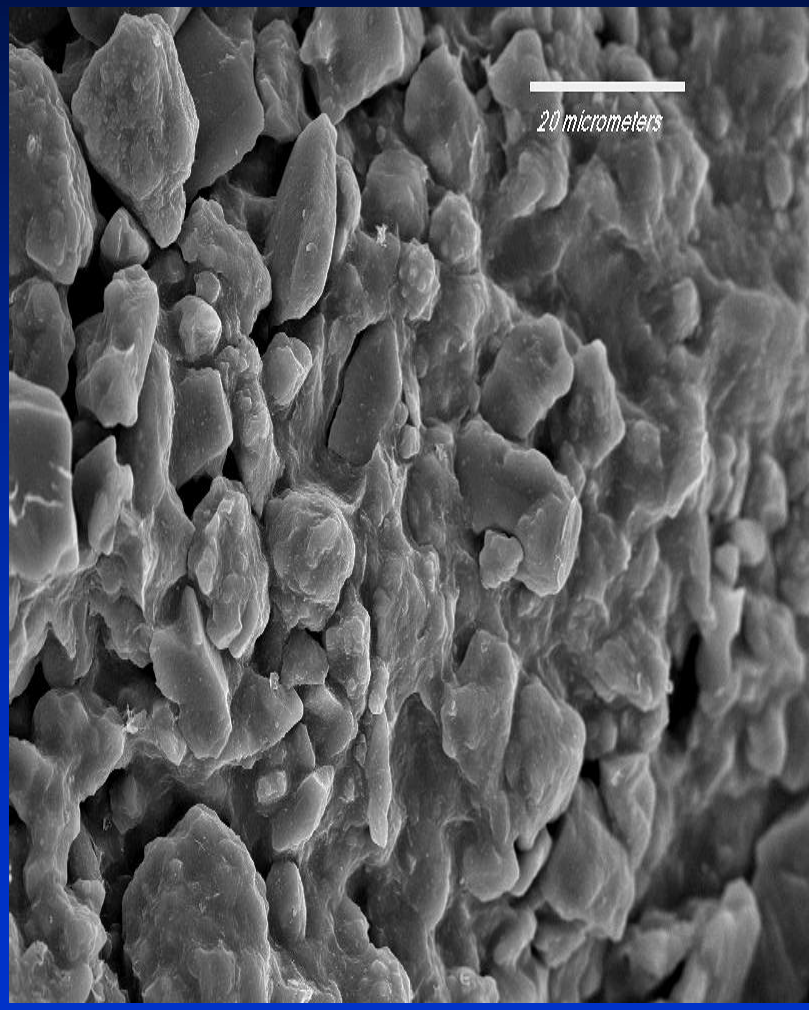
Sand

- Sand has less nutrients for plants than smaller particles
- Voids between sand particles promote free drainage and entry of air
- Holds little water and prone to drought



Silt

- < 0.05 mm to > 0.002 mm
- Not visible without microscope
- Quartz often dominant mineral in silt since other minerals have weathered away.



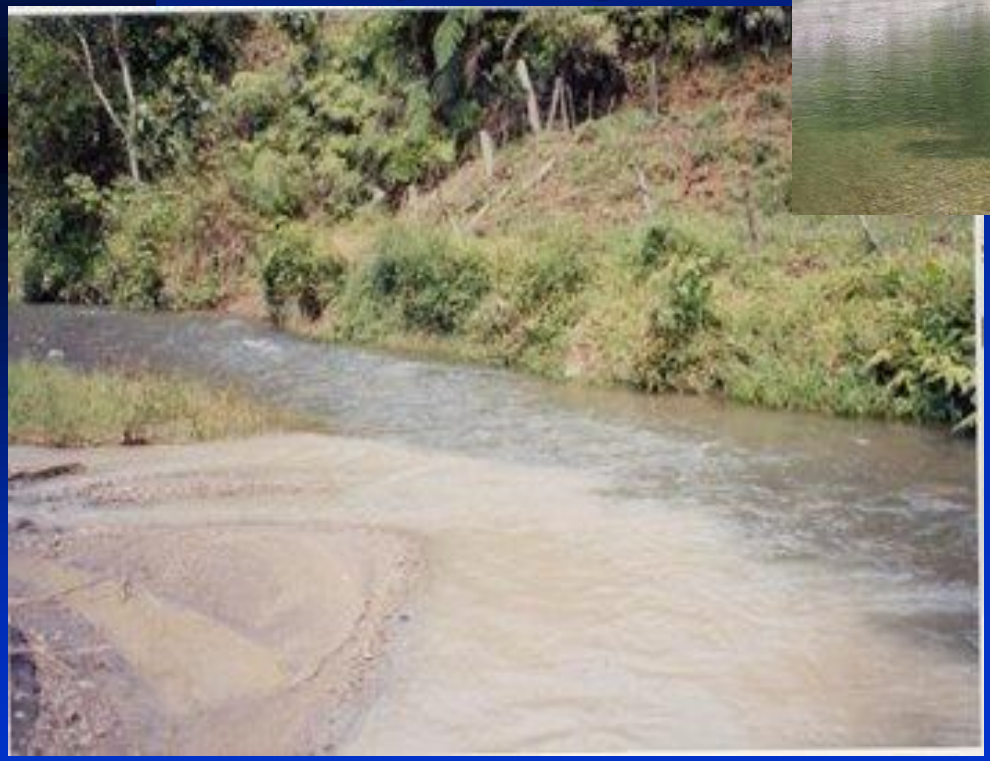
Silt

- Does not feel gritty
- Floury feel –smooth like silly putty

Silt

- Smaller particles – retains more water for plants and have slower drainage than sand.
- Easily washed away by flowing water – highly erosive.
- Holds more plant nutrients than sand.

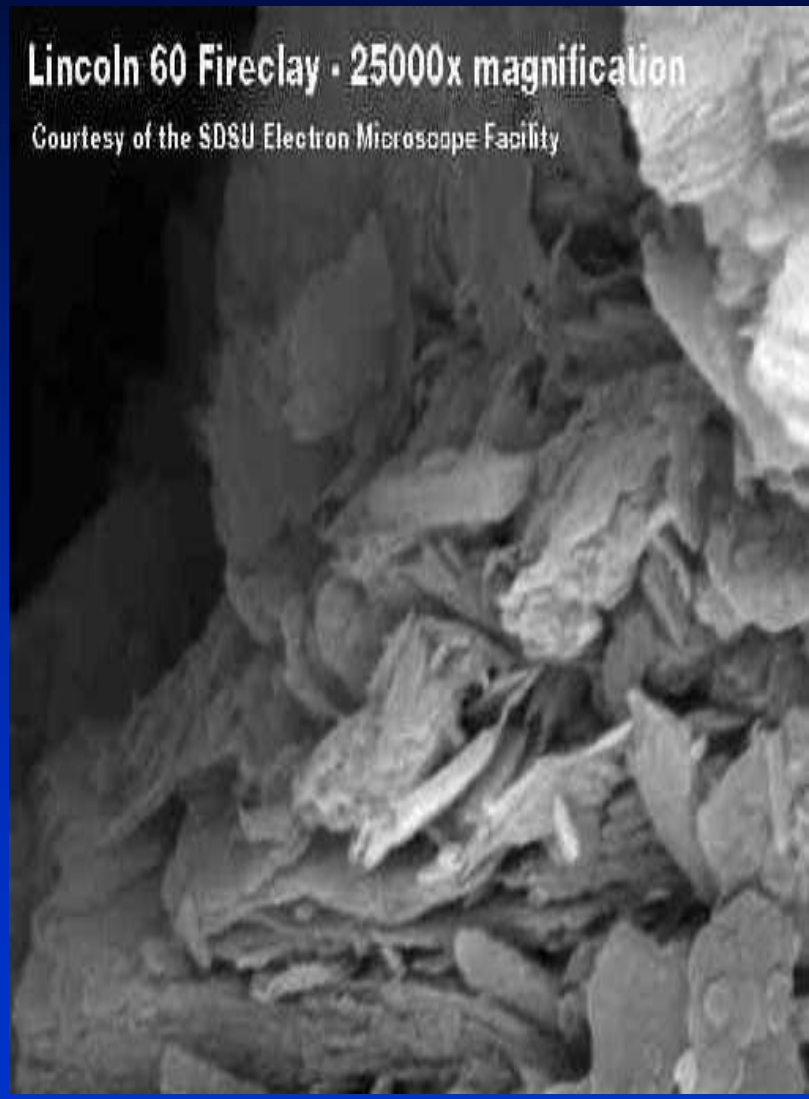
- Silt is responsible for silting over gravel beds in rivers that are needed by fish for spawning.



www.pedrocreek.org/ fishcommittee.html

Clay

- < 0.002 mm
- Flat plates or tiny flakes
- Small clay particles are colloids
  - If suspended in water will not settle



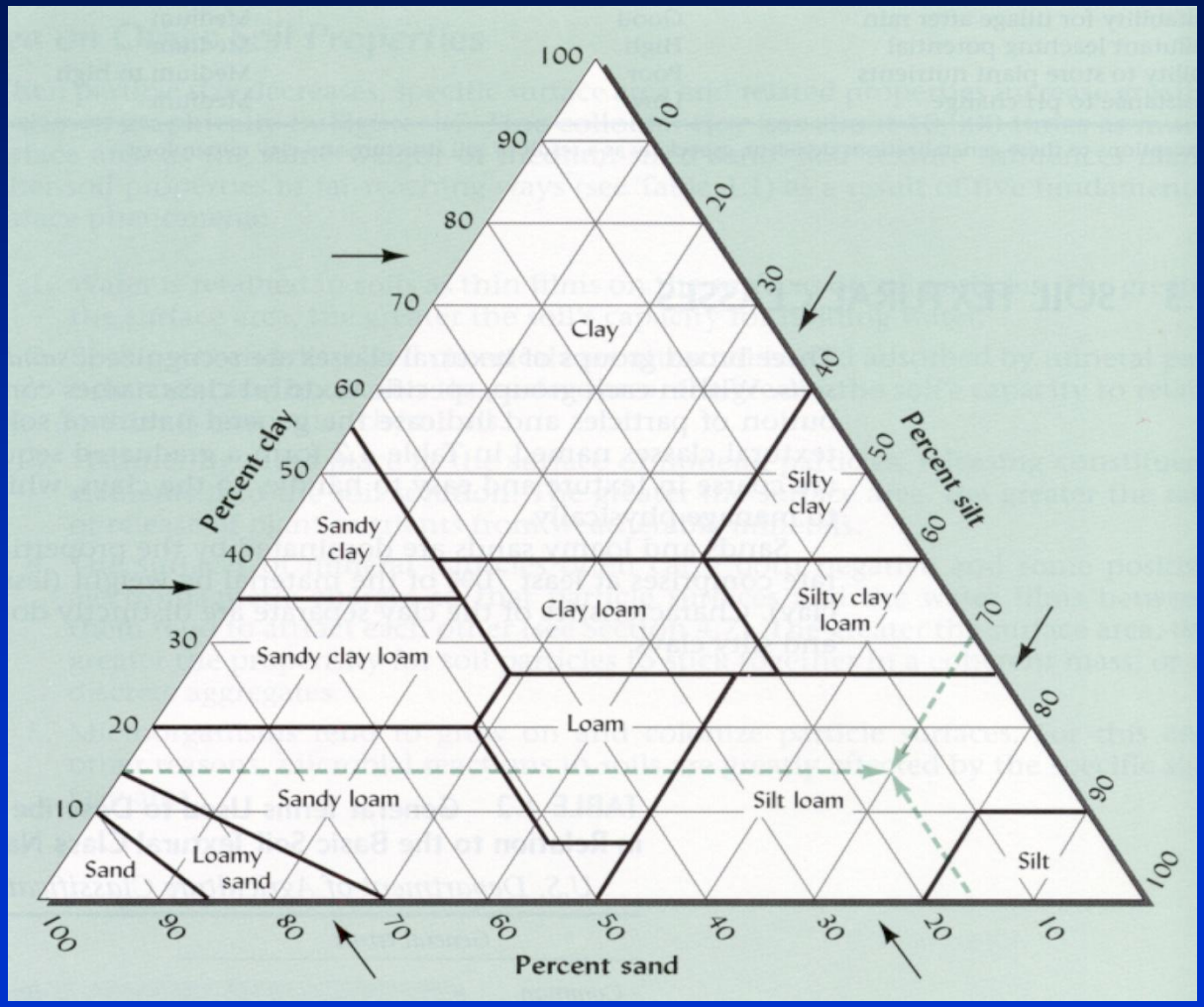
Clay

- Wet clay is very sticky and is plastic or it can be molded readily into a shape or rod.
- Easily formed into long ribbons

Clay

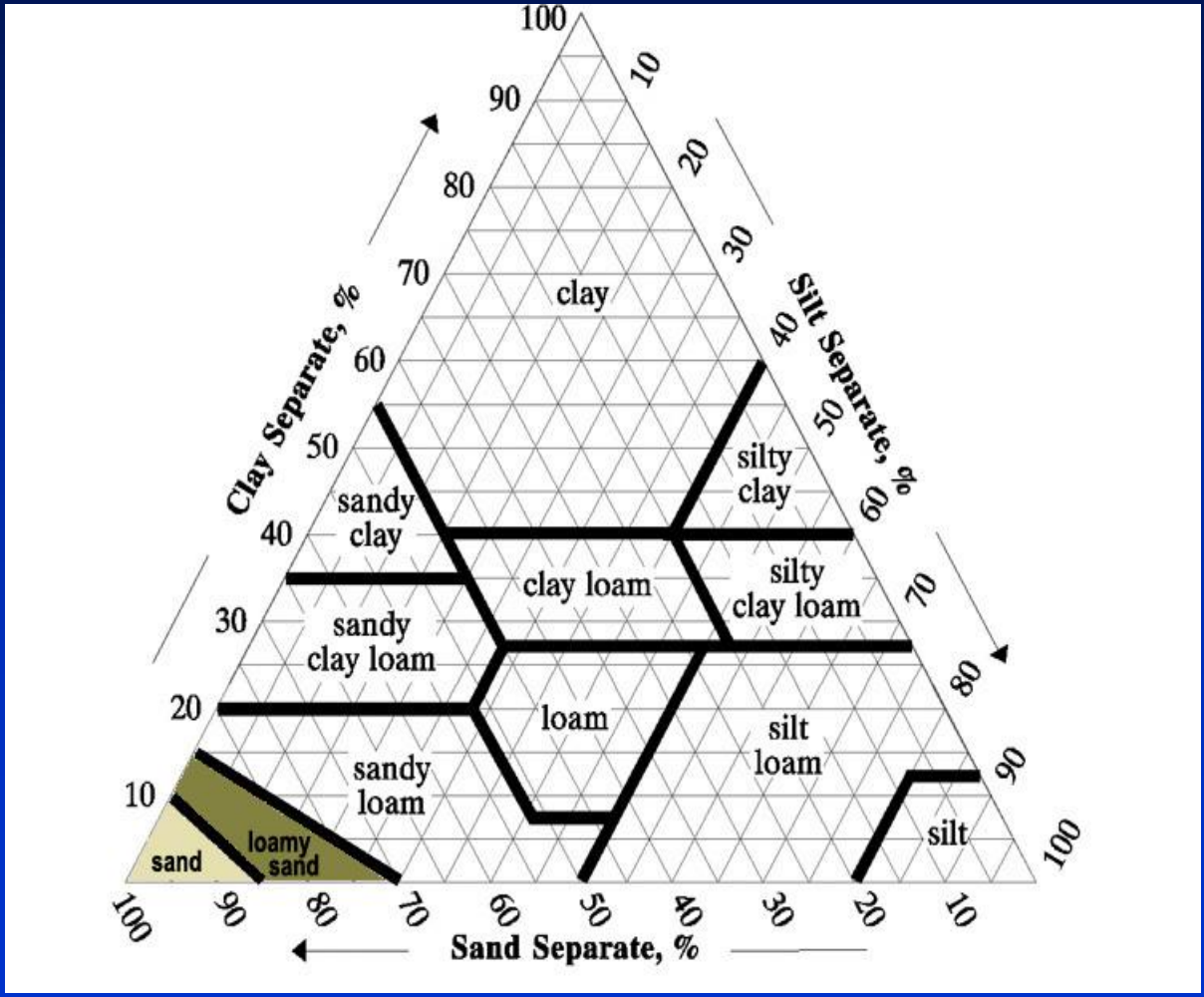
- Pores spaces are very small and convoluted
  - Movement of water and air very slow
- Water holding capacity
  - Tremendous capacity to adsorb water- not all available for plants.
- Chemical adsorption is large

Textural Triangle



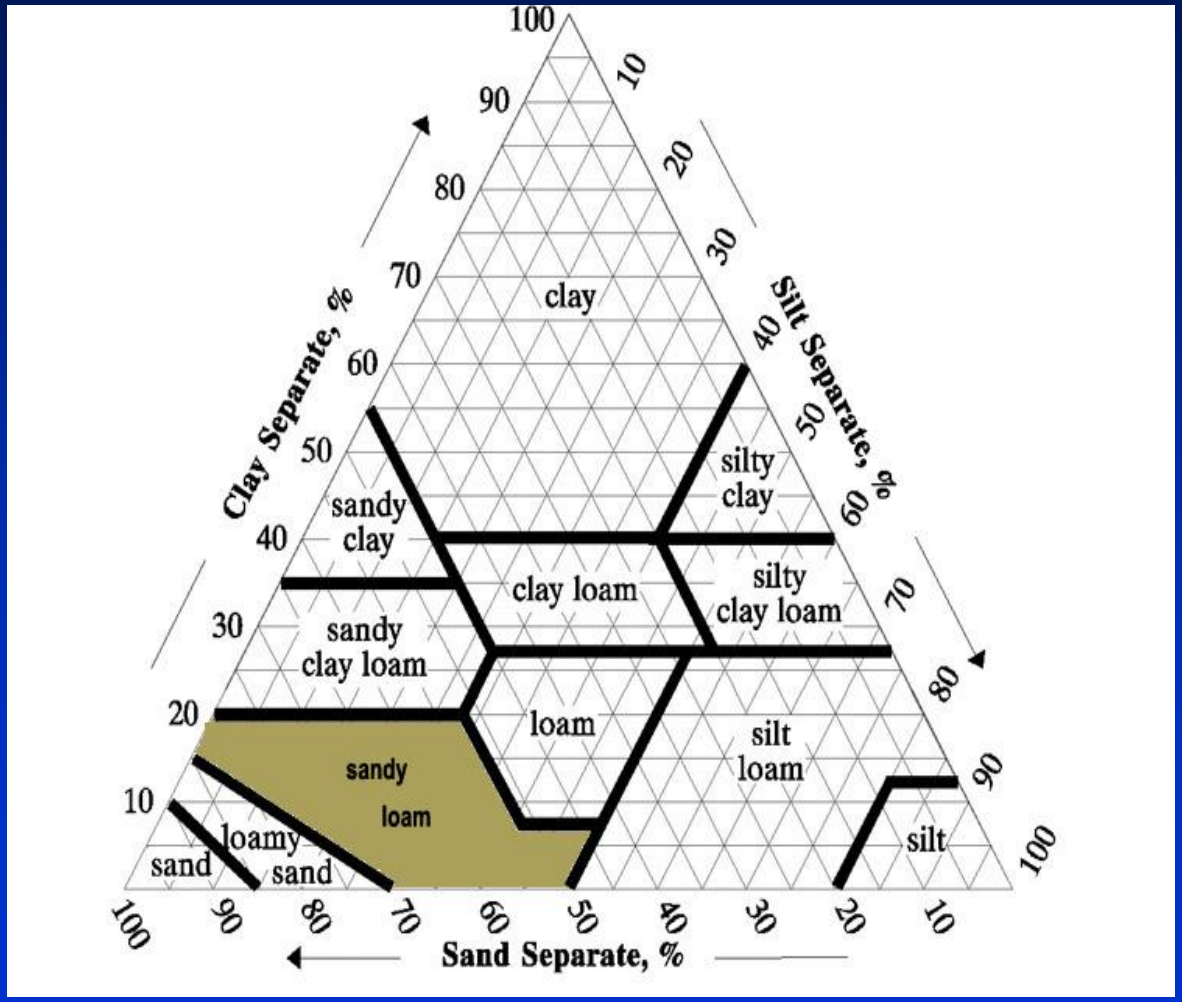
Sandy Soils

- Coarse texture
  - Sands
  - Loamy sands



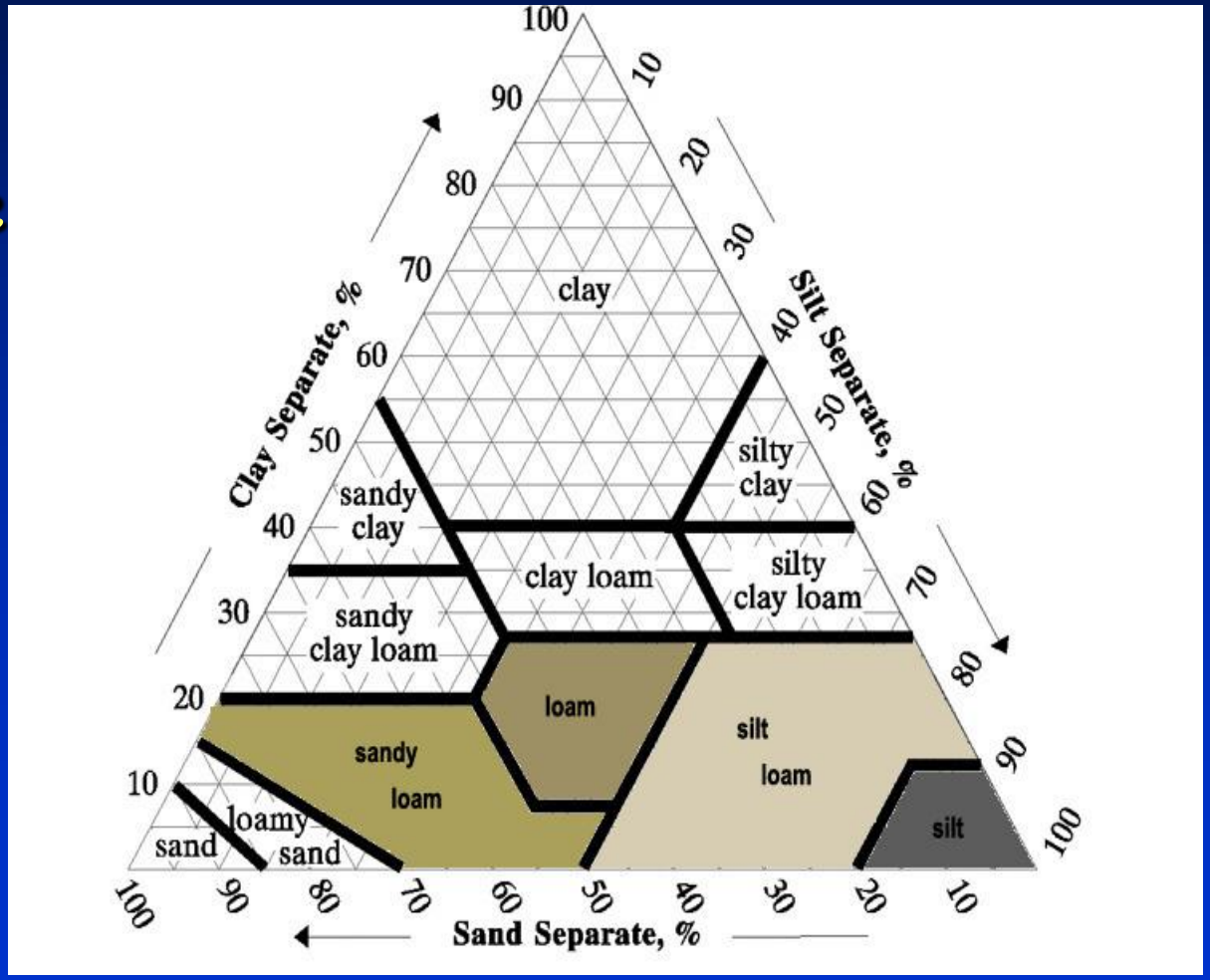
Loamy Soils

- Moderately coarse texture
  - Sandy loam
  - Fine sandy loam



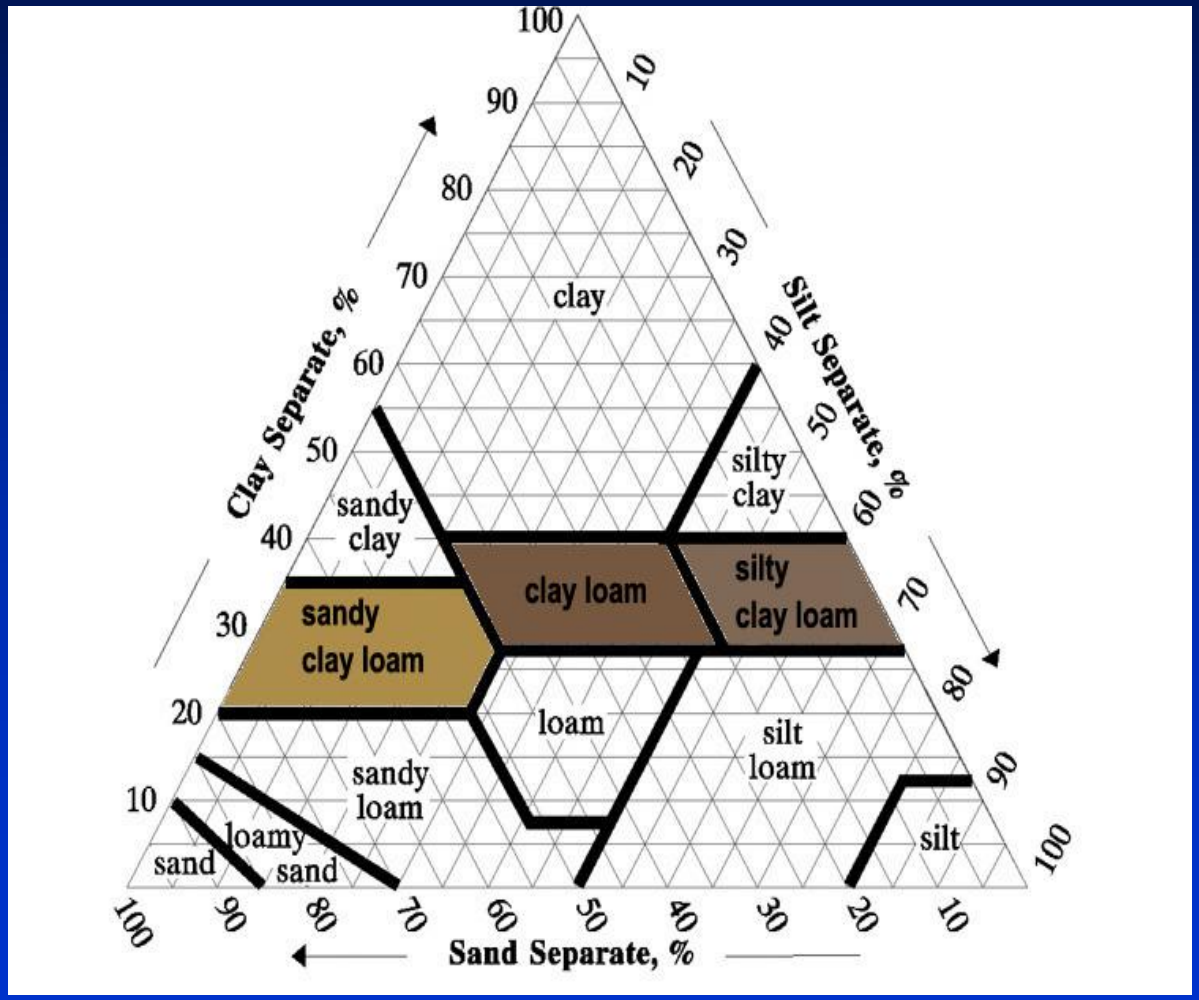
Loamy Soils- Coarse

- Medium texture
  - Very fine sandy loam
  - Loam
  - Silt loam
  - Silt



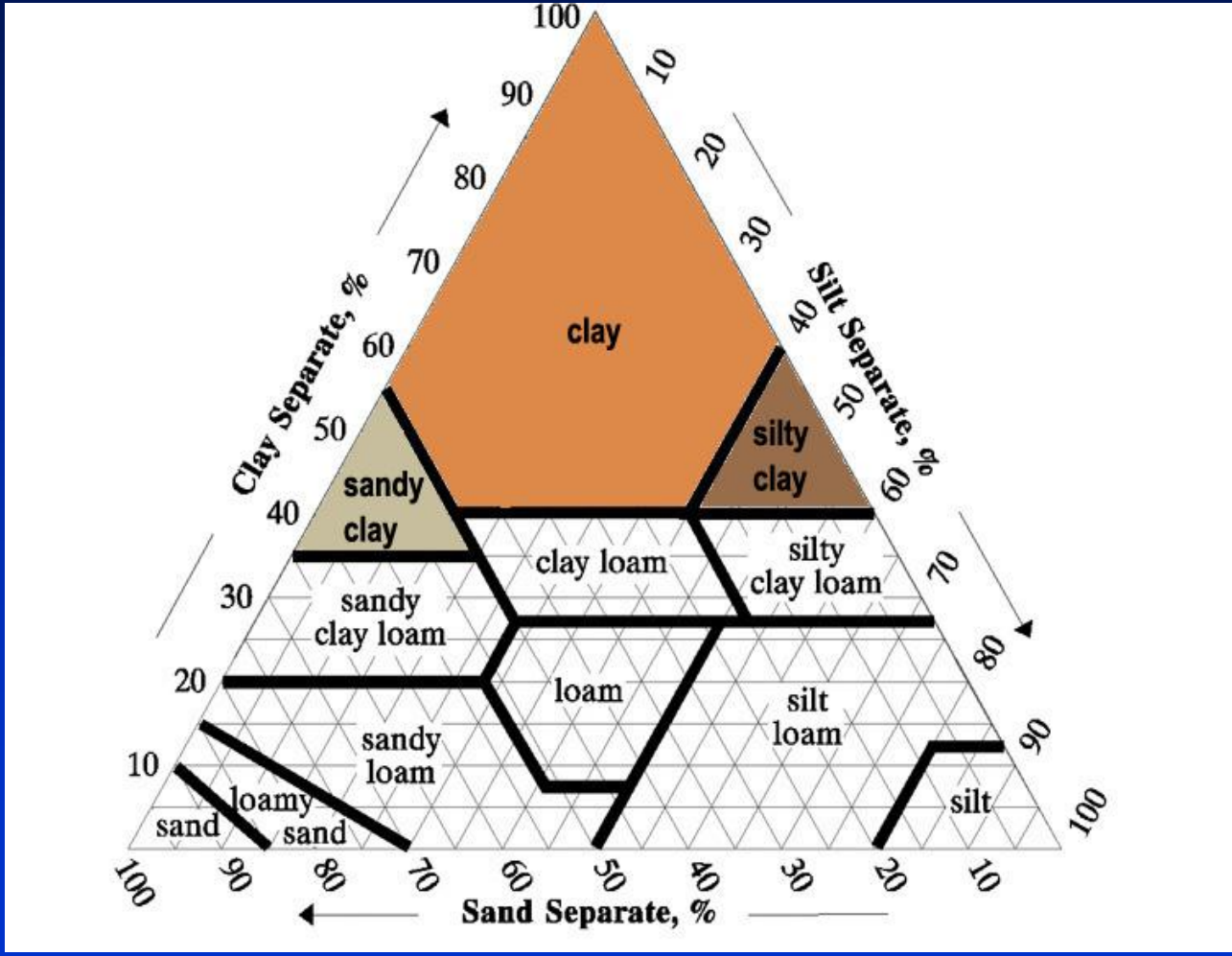
Loamy Soils - Fine

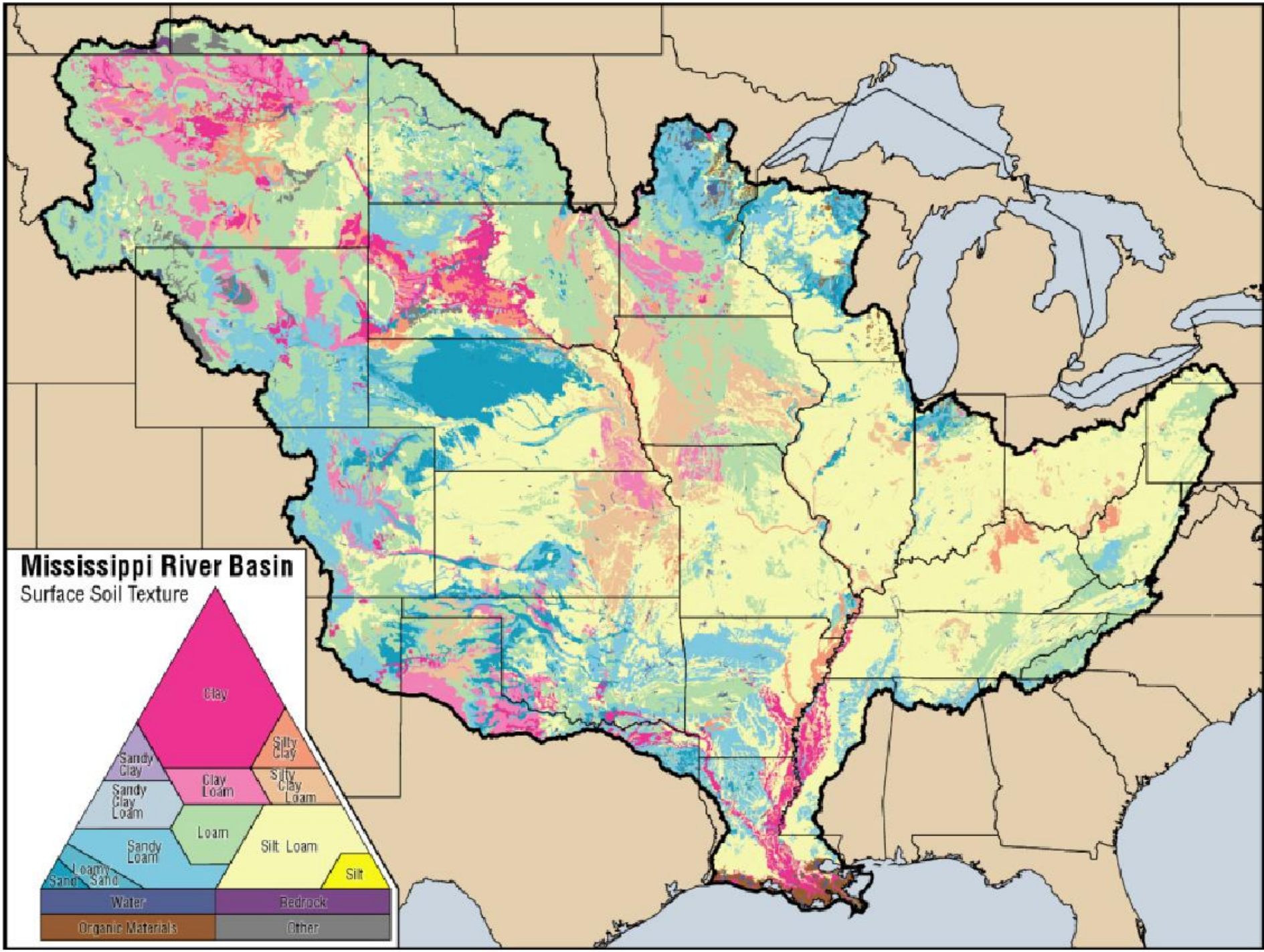
- Moderately fine texture
  - Sandy clay loam
  - Clay loam
  - Silty clay loam



Clayey Soils

- Fine texture
  - Silty clay
  - Clay
  - Sandy clay




Mississippi River Basin
Surface Soil Texture
Clay
Silty Clay
Sandy Clay
Clay Loam
Silty Clay Loam
Sandy Clay Loam
Loam
Silt Loam
Sandy Loam
Silt
Loamy Sand
Sand
Water
Bedrock
Organic Materials
Other

Changing Soil Texture

- Soil texture can be changed only by mixing with another soil with a different textural class in small quantities

Changing Soil Texture

- Adding sand to a clay soil creates a cement like substance
- Adding peat or compost to a mineral soil is not considered changing the texture – since it only adds organic matter not sand, silt or clay.

- So why add peat or compost?

Changes in soil texture

- Over long periods (1000's yrs) pedologic processes alter soil horizon textures.
- As soils get older sand weathers to silt and silt weathers to clay….therefore old soils have more clay.

Soil Texture

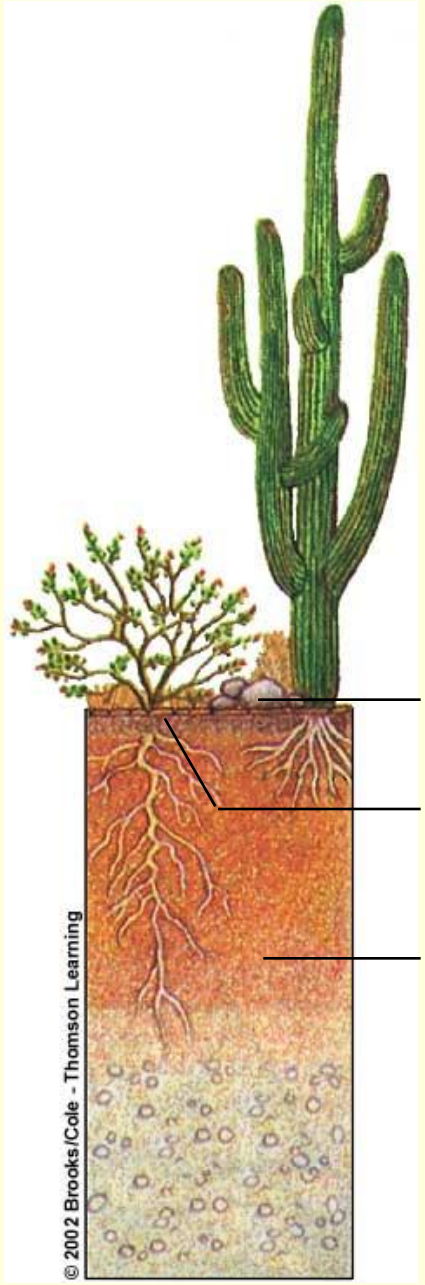
- Soil texture can also be determined by feeling the soil.
- This procedure takes practice but eventually a person can become very proficient and will be able to estimate the % clay within 3% of the actual value.

Determining Soil Texture - Feel Method

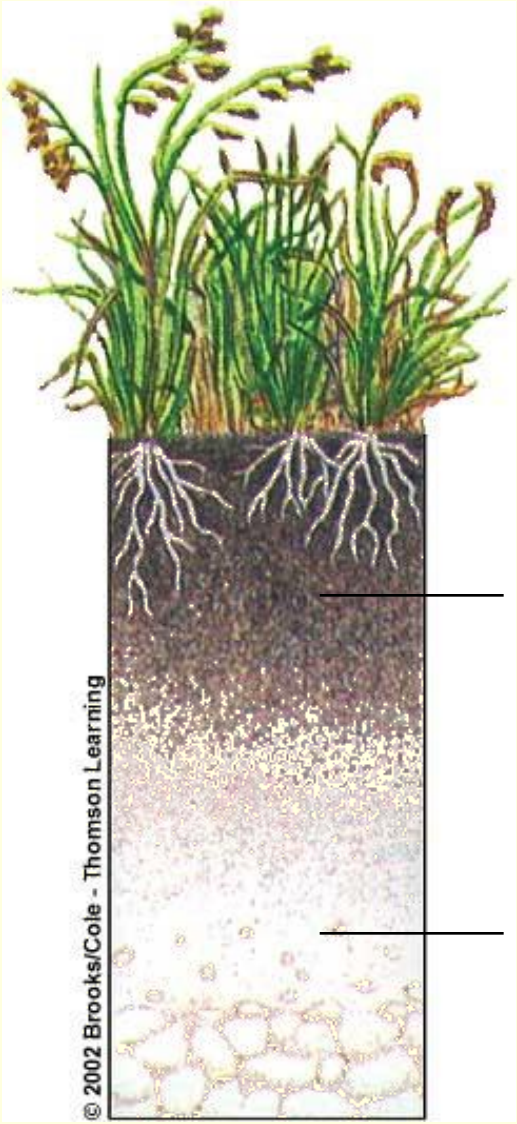
- Wet soil in hand
- Make ribbon
- Length of ribbon indicates clay content
- Grit or lack of grit indicates sand or silt
- Smoothness indicates silt

Soil Profiles in different biomes

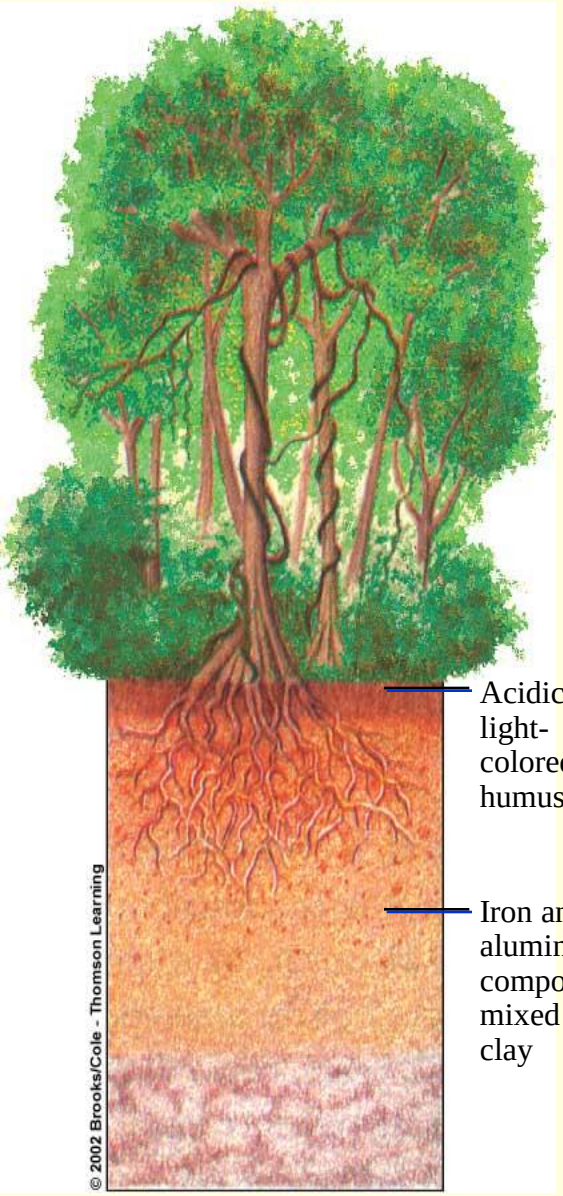
You should now know plants, animals and soils in the different biomes.



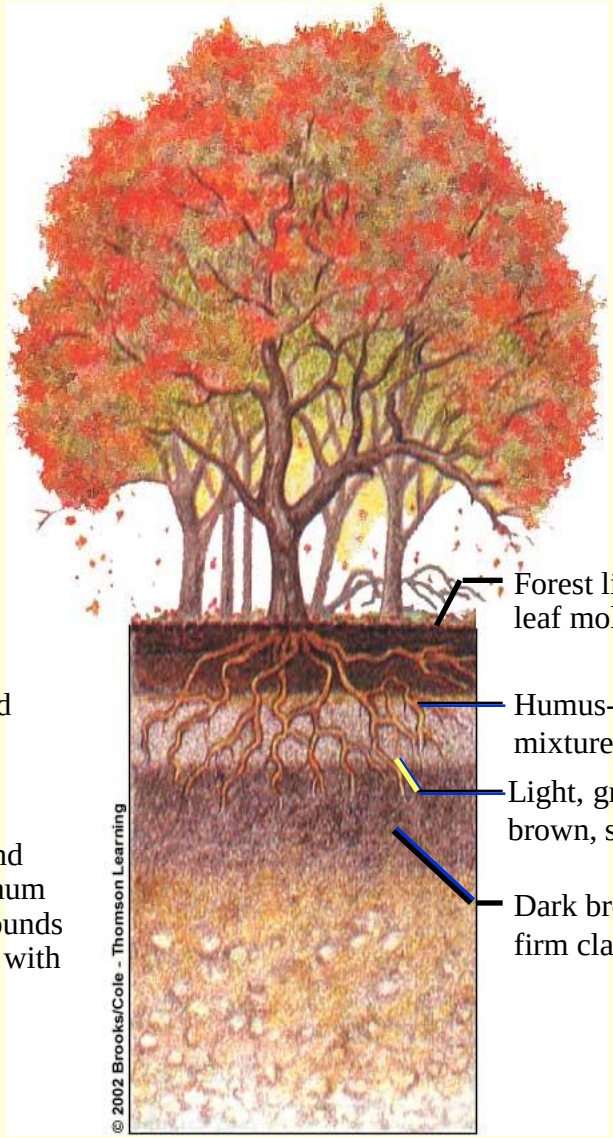
Desert Soil
(hot, dry climate)



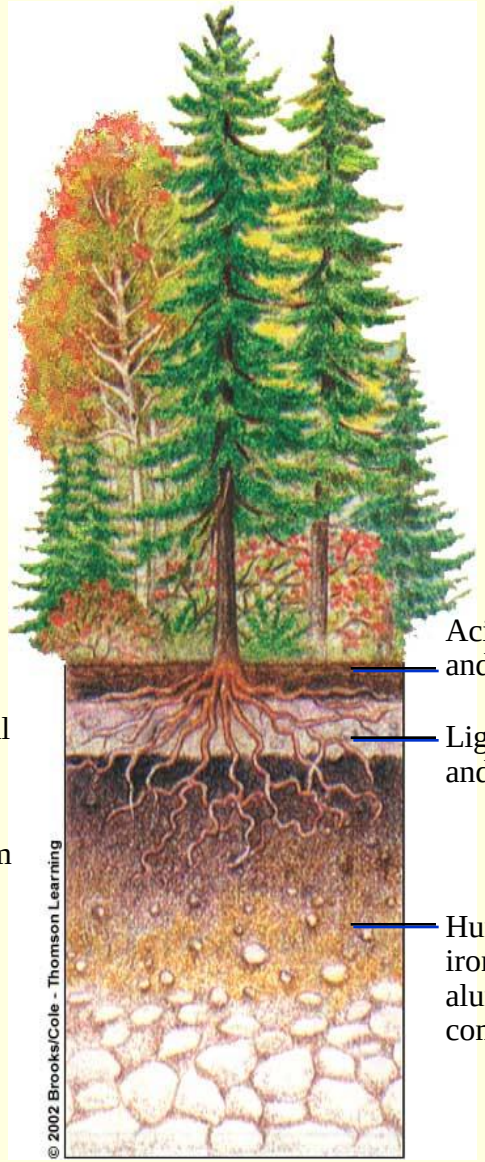
Grassland Soil
(semiarid climate)



Tropical Rain Forest Soil
(humid, tropical climate)



Deciduous Forest Soil
(humid, mild climate)



Coniferous Forest Soil
(humid, cold climate)

O horizon

- Topmost layer
- High % of dead organic matter.
  - Ie: leaves, stems, fruits, seeds, pine needles
- Formed from decomposition of organic matter. (humus)

A horizon

- Known as topsoil
- Mixture of soil from below and the humus above.

E horizon

- mineral horizon
- upper part of the soil (also called zone of eluviation)
- Typically present only in forested areas it underlies an O or A horizon.
- It is a light colored, leached horizon

B horizon

- Subsoil
- Clay and many minerals
  - Iron
  - Aluminum
  - Calcium
- Leached from layers above

C horizon

- Parent Rock
- Can be saturated in groundwater

Soil Types

Mollisols

- Fertile dark soils
- Found: Temperate grassland biome
- Best agriculture soils

Oxisols

- Found: Tropical, Subtropical rain forests
  - Most organic material is found in living plants
- Infertile soil

Alfisols

- Moderately weathered forest soils
- Found: Moist temperate forest biomes
  - Most organic material is found in living plants
- Adequate for agriculture if suppplemented with ferilizeror organic material

Aridisols

- Thin ligh colored and contain a lot of sand.
- Found: Dry lands and deserts
- Susceptible to salinization

Be sure to review as these all tie together as we move towards May.

- Soil degradation
  - Erosion
  - Desertification
  - Overgrazing
  - Salinization
- Soil conservation
  - Sustainable agriculture
  - Fertilizers & Pesticides
  - Subsidies
- Rock Cycle