

# Functions of Soils

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# Functions of Soil

- Sustain biological activity, diversity, and productivity
- Regulate and partition water and solute flow
- Filter, buffer, degrade, immobilize, and detoxify organic and inorganic materials
- Store and cycle nutrients and other elements
- Provide support of socioeconomic structures



# Soil Properties

## Physical Properties

- horizonation
- color
- texture
- structure
- consistence
- bulk density

## Chemical Properties

- cation exchange capacity (CEC)
- reaction (pH)



# Soil Texture

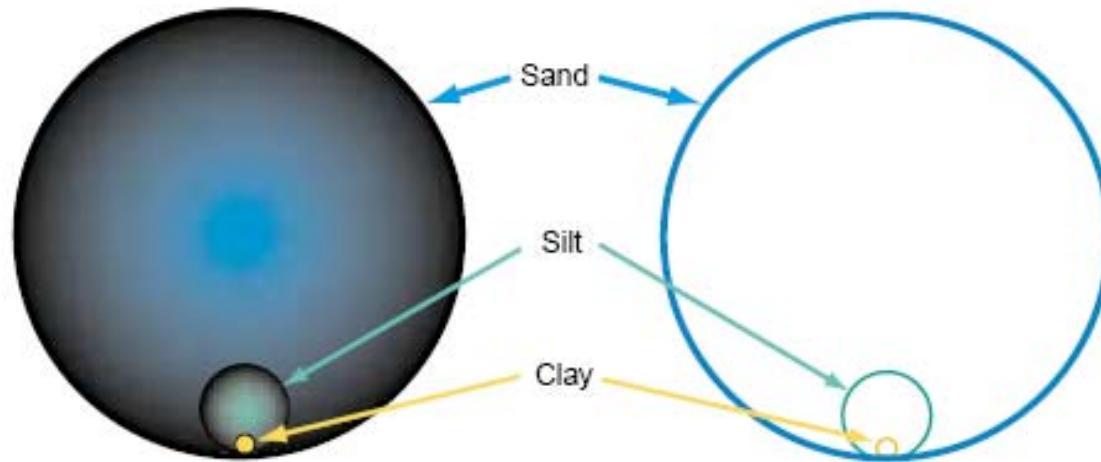


Figure 7.—The relative sizes of sand, silt, and clay.

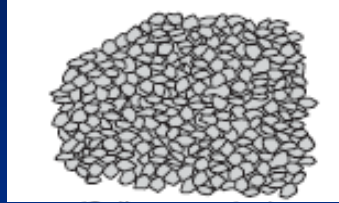
Sand: 2.0 – 0.05 mm  
Silt: 0.05 – 0.002 mm  
Clay: <0.002 mm

# Soil Structure

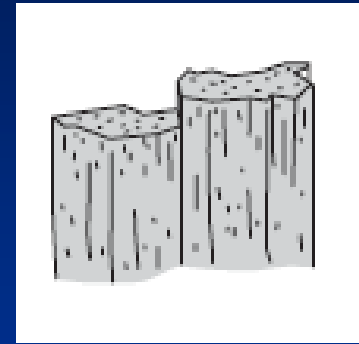
The aggregation of the three soil particles sizes (sand, silt, and clay) into structural units called “aggregates” or “peds”.



# Soil Structure - Shapes



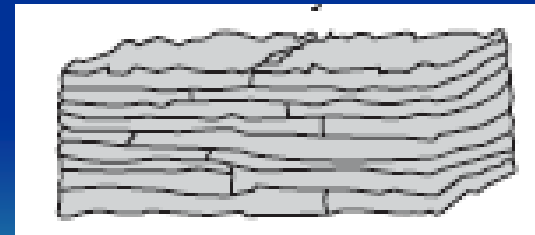
granular



prismatic



subangular (left) and angular blocky



platy

# Soil Structure

Soil structure is dependent upon “aggregate stability”.

Aggregate stability is influenced by some or all of the following:

- clay minerals
- calcium ions
- iron oxides
- organic matter
- organic compounds exuded by microorganisms



Aggregates create soil structure within a soil horizon.

The “cracks” or spaces between soil aggregates make up a soil’s “pore space”. Water applied to the soil surface uses the pore space to move into the soil (infiltration) and down through the soil profile (percolation).

Stable aggregates remain intact when subjected to water, thereby contributing to good soil structure that promotes downward water movement.

Unstable aggregates fall apart when subjected to water (or may not even maintain themselves without water being added) resulting in poor soil structure that does not allow water to move downward through the soil.



# Soil Structure Effects on Water Movement

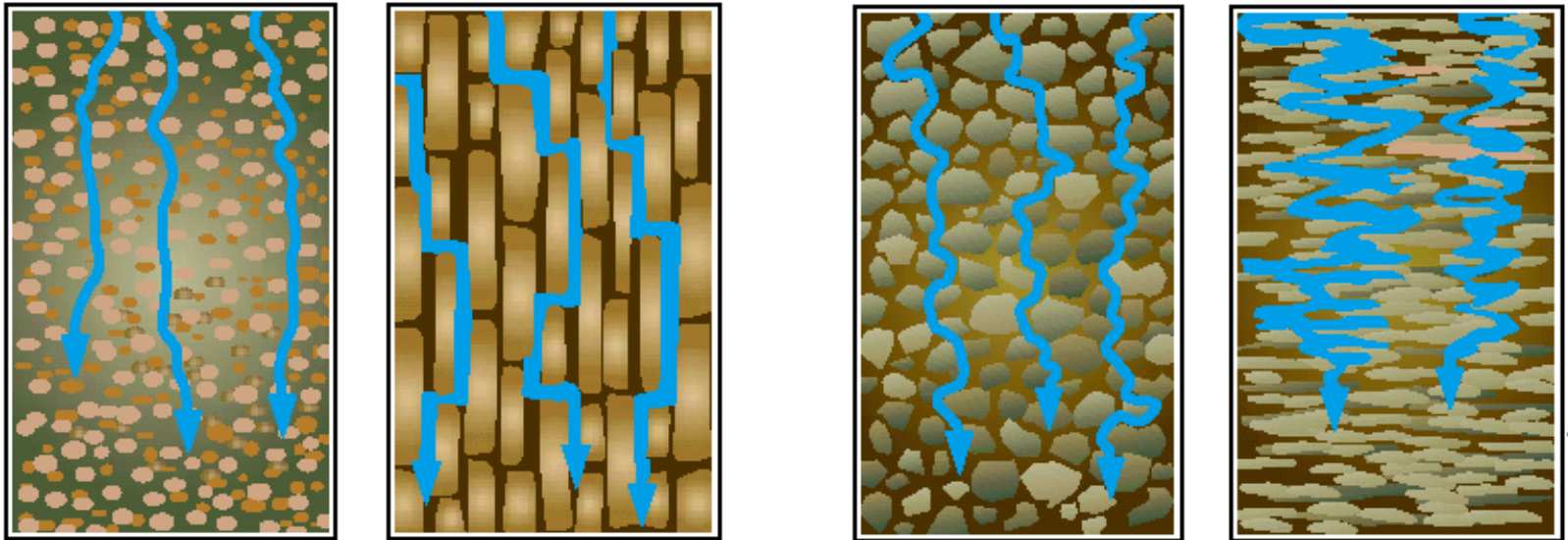
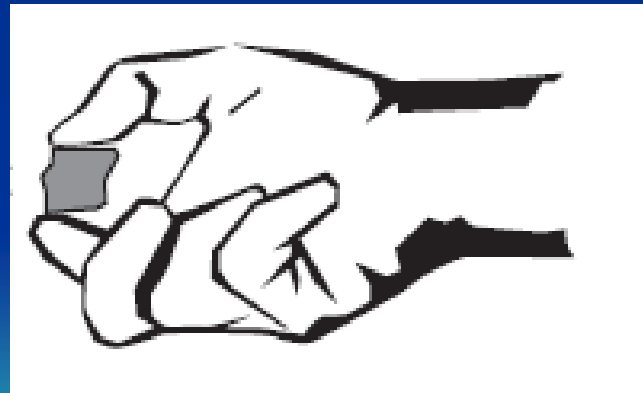


Figure 4.—Water movement through granular, prismatic, subangular blocky, and platy soils, respectively.

# Soil Consistence

- the ease with which an individual “ped”, or aggregate, can be crushed by the fingers
- a measure of the degree of cohesion and adhesion of the soil particles making up the ped or aggregate



# Bulk Density

- the proportion of the weight of a soil relative to its volume; commonly measured in units of grams/cubic centimeters (g/cc)

Bulk density = weight/volume

- an indicator of the amount of pore space available within individual soil horizons
- in general, the higher the bulk density, the lower the amount of pore space



# Organic Matter

- is the source of organic “glues” that promote aggregate stability
- enhances CEC to improve soil fertility
- provides “food” source for soil microbes (cellulose)



# Functions of Soils in Relation to Soil Properties

- Sustain biological activity, diversity, and productivity  
(structure, texture, CEC, pH, organic matter)
- Regulate and partition water and solute flow  
(structure, texture, organic matter)
- Filter, buffer, degrade, immobilize, and detoxify organic and inorganic materials  
(structure, texture, CEC, pH, organic matter)
- Store and cycle nutrients and other elements  
(structure, texture, CEC, pH, organic matter)
- Provide support of socioeconomic structures  
(structure, texture, pH)



# Soil Quality is Not an End in Itself

- The ultimate purpose of researching and assessing soil quality is not to achieve high aggregate stability, biological activity, or some other soil property.
- The purpose is to protect and improve long-term agricultural productivity, water quality, and habitats of all organisms including people.
- We use soil characteristics as indicators of soil quality, but in the end, soil quality must be identified by how it performs its functions.

