Soils and Processes of Soil Development (Chapter 12)

Soil is dynamic natural body capable of supporting a vegetative cover.

Pedosphere: subsystem of the soil

Principal Soil Components

1) Inorganic Materials: made of soluble and insoluble minerals
    *Most common elements: Si, Al, O, Fe
    *Other Important Ones: C, H, N, Na, K, Zn, Cu, I, and compounds of these elements
    *Sources: rocks, sediments, solutions with water, organic activities
    *All of the elements mentioned are important in some way

2) Soil Water: supplies the moisture necessary for chemical reactions that sustain life, and also provides nutrients in a form that can be extracted and used by vegetation.
    *Solution bearing soluble nutrients
    *Original Source: Precipitation
    *Types
        a) Gravitational Water: percolates downward through the soil, pulled by the force of gravity, until it reaches the water table
            1) Removes fines from upper layers: eluviation
            2) Deposits them below: illuviation
            (This results in coarsening of upper layers and a thickening of fines in lower layers, forming a hardpan.)

Leaching: the process of depleting nutrients in the upper soil by the flow through of water.
    *Common in areas of extensive rainfall.
    *This process strongly influences stratification.
        b) Capillary Water: soil water that adheres to soil particles and soil clumps by surface tension.
            *Can form caliche: carbonate layer that has leached upward
        c) Hygroscopic Water: a thin film that is bound to the surface of soil particles by strong electrical forces.

3) Soil Air: void space
    *Can be as much as 50%
    *Air is similar to the composition of the atmosphere, although it tends to have less oxygen and more carbon dioxide, and higher humidity due to the water mentioned above

4) Organic Matter, called humus: decayed remains of plant and animal material, partially transformed by bacterial action.
    *catalyst in chemical reactions by which plants extract nutrients from the soil and for its role in restoring minerals to the soil.
    *Provides food

Characteristics of Soil

1) Color: most easily visible
    *Black: organics
    *Red: Iron
    *Gray: Leached
    *Munzell Color Chart

2) Texture: refers to the size of distribution of sizes of particles that make up the soil.
    Clay: less than 0.002 mm
    Silt: 0.002-0.05 mm
    Sand: 0.05-2mm
    *Soil Grade Chart: Figure 12.
    *Loam: no size is dominant-best for plant life
    *Texture is important due to aeration properties

3) Structure: how the soil clumps (Peds)
    *Influences Permeablility (greatest in sandy soils) and Porosity (greatest in clayey soils)
    *Can be affected by weather and human activities
        >Certain fertilizers and lime can clump a soil
        >Na and Mg can muckup a soil
        >absence of fines hinders the development of soils (beaches)
    *Classify soil structures according to their form: columns, prisms, plates, crumbs, and granules: Figure 12.9

4) Acidity and Alkalinity-pH scale
    *Rainfall generally decreases pH, thus arid zones are alkaline and tropics tend to be acidic
    *Fertilizers balance the pH

Soil Profile Development

Starts with parent Material

Soils are broken down into horizons: Figure 12. 12
(Soil Profile)

<u>Factors Influencing Soil Formation</u>

1) Parent Material
    a) Residual: accumulates in place
    b) Transported PM: rock frags from which soil is formed have been carried to the site and deposited by streams, waves, winds or glaciers
2) Organic Activity
3) Climate
4) Land Surface Configuration
5) Time

Soil Forming Regimes

1) Laterization

2) Podzolization

3) Calcification

4) Locally Important Regimes

    a) Salinization

    b) Gleization

Classification of Soils

1) Aridisols

2) Mollisols

3) Vertisols

4) Alfisols

5) Spodosols

6) Ultisols

7) Oxisols

8) Entisols

9) Inceptisols

10) Histosols

11) Andisols