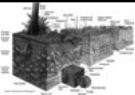


Soil Characteristics - 2

- **Permeability**
 - Rate of percolation
 - Related to porosity
- **Nutrient capacity**
 - Follows water capacity
- **Aeration**
 - Ability of air to move through soil
- **Workability**
 - How easily cultivated

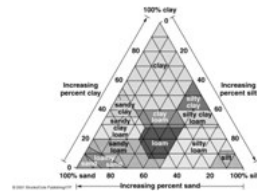
	Clay	Silt	Sand
Permeability	low	med	High
Water capacity	good	medium	poor
Nutrient capacity	good	medium	poor
Aeration	poor	medium	good
Workability	poor	medium	good
Porosity	high	medium	low



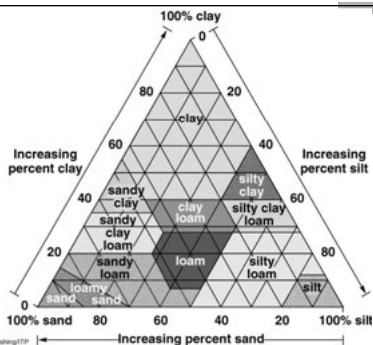
- Mostly sandy soils >>> BAD
 - Easy to work, very permeable, BUT...
 - Holds very little water & nutrients
 - Okay for plants that require little water
- Mostly clay soils >>> BAD
 - High water capacity good, BUT...
 - Not very permeable
 - May hold water too tight for roots to absorb

The best of all worlds...

- Loams
 - Relatively equal portions of sand, silt, clay
 - USDA:
 - 40% silt
 - 40% sand
 - 20% clay



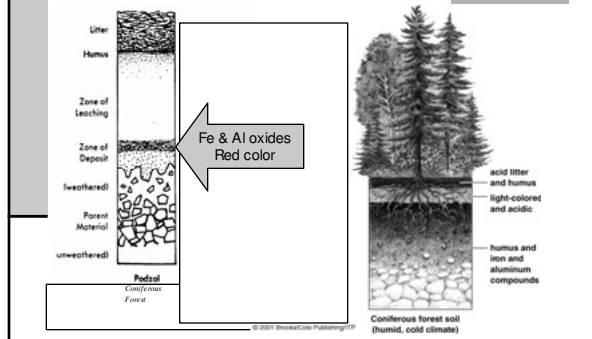
Determining Soil Texture



Cation Exchange Capacity

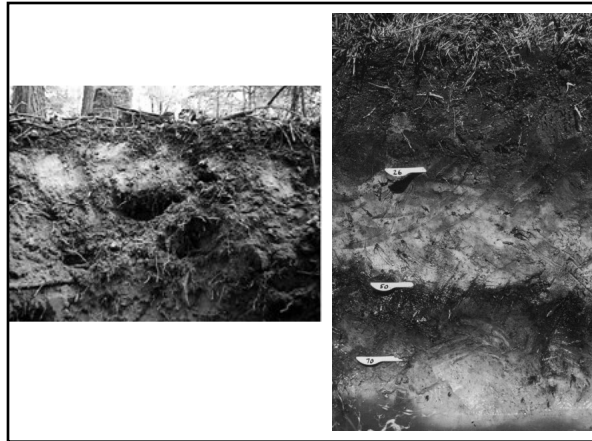
- Soil particles have negatively charged surface
- Plants get nutrients in ionic form
 - Those not used by plants will leach if not stuck to surface of soil particles
 - Examples: K^+ , Ca^{+2} , Mg^{+2} , NH_4^+
- **Cation Exchange Capacity**
 - Number of attachment sites for cations
- Weak attachment of cations
- pH affects nutrient capacity of soil
 - H^+ displaces cations, leached from soil
- Long term fertility of soil depends on clay content
 - Clay has good cation exchange capacity

Podzol Profile

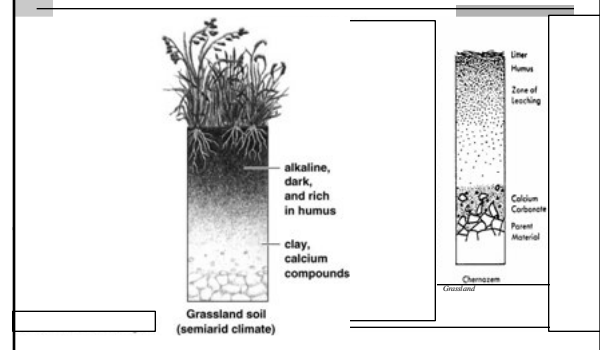


Podzols (podsolization)

- Cold, moist climates
- Coniferous trees dominate
 - Slow decomposition of litter produces organic acids
 - Constant movement of water down
 - Little water movement up from weathered bedrock
- Acidic soil
 - Clay in A breaks down & soluble ions deposit in lower horizons
 - Reduces ion exchange capacity & fertility



Chernozem Profile

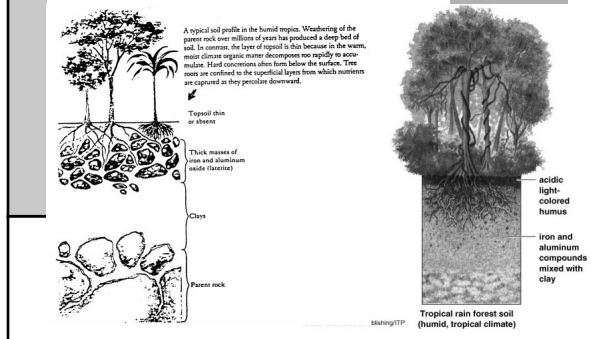


Chernozem

- Black, zonal soil
- Deep, rich humus layer
- Very little litter
 - WHY?
- Temperate, cool climate
- Low humidity



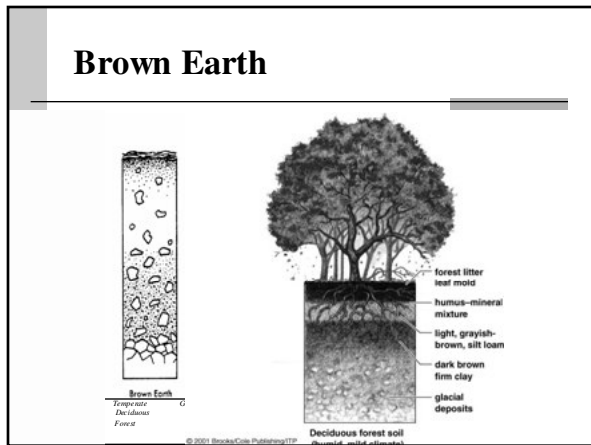
Lateritic Soil Profile



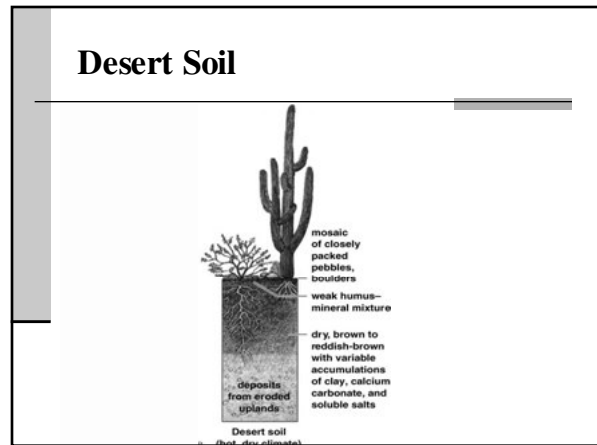
Lateritic Soils (laterization)

- Warm, wet tropical climate
- Weathering at depth creates deep soil
 - BUT all those nutrients are DEEP and not available
 - Nutrient poor surface
- Constant downward movement of water leaches out nutrients
- Most nutrients immediately used by plants
 - Most nutrients are in the plant life, not in soil
- Rich in Fe & Mg → Typical RED color (iron oxide)
- No Si and little clay

Brown Earth



Desert Soil



Biosphere 2

- What was it?
- What was the goal?

