You should have read Chapter 1 and 2 and be reading Chapter 3

We know how rocks are weathered, now...

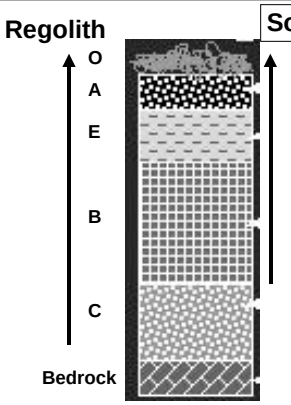
How soil is formed

Factors of soil formation

Different scenerios

For soil formation: Soil Science Taxonomy

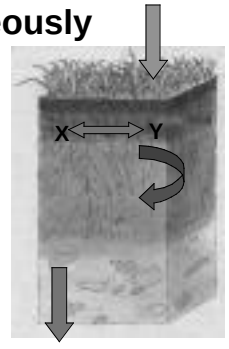
- Soil as a natural body
- Each soil as a unique individual
  - Developed as a result of the 5 factors of soil formation



First some definitions:
Regolith- weathered rock and soil that overlays bedrock
Solum - portion of the regolith that shows the development of layers called soil horizons

Soil formation is, simultaneously

- Breakdown of old
- Synthesis of new
- Losses
- Additions
- Translocations



(1)Parent materials + 4 other factors of soil formation

- Climate
- Topography
- Time
- Biota

Can be interrelated and interact

Climate

- Moisture
  - Quantity
  - Intensity
  - distribution
- Temperature

Role of water

- Essential for chemical weathering
- Transport materials through horizons
- Determine type of plant cover

Rainfall: Intensity and duration

Effective precipitation

- Water has to go into the soil
  - Infiltration - not overland flow
  - Rainfall exceeds evaporation

Temperature

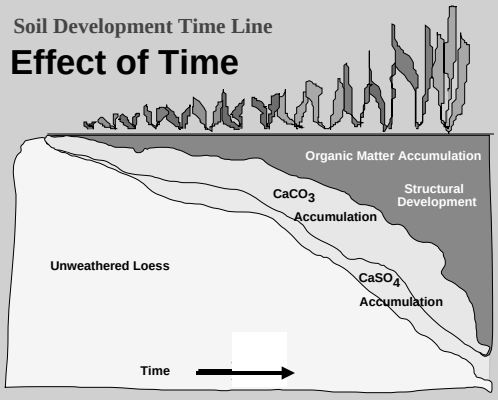
- Rate of biological activity
  Rate of chemical reactions

Topography

Same parent material, same climate

Soil Development Time Line

Effect of Time



Biota - plants

Type of plant : Grass

- Dense root system
- Above ground foliage will die annually
- Grows where moisture < trees
- Thick A horizon

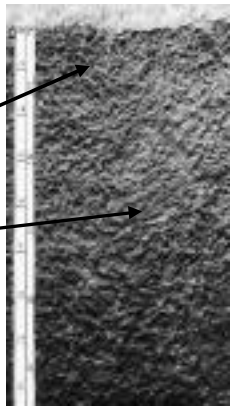
Soil Profile

Tree - deciduous

- Leaves high in cations (Ca, Mg, Fe..)
- Annual leaf fall
- Well developed A horizon
  - Decomposed OM
  - High nutrients

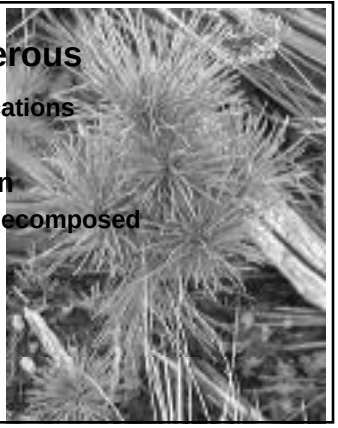
Deciduous -

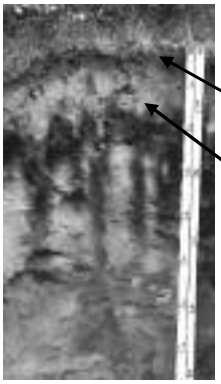
- Larger A horizon
- More cations
- Less acidic
- More clay translocation



Tree - coniferous

- Leaves low in cations
- Little leaf fall
- Thin A horizon
  - Oi - slightly decomposed
- E horizon
  - eluviation





Coniferous Acidic

Thin A

E (eluviation)

Animals

- Pedoturbation
  - Animal burrows effectively mix soil from different horizons

Animals

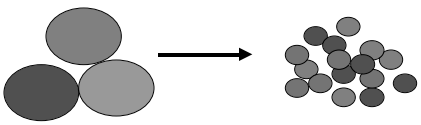
- Earthworms
  - Soil mixing
  - Soil structure
  - Soil aeration

Animals

- Humans
  - Agricultural practices
  - Accelerate soil loss
  - Accelerate soil formation

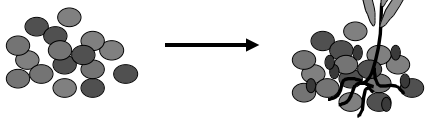
Start with a pile of rocks

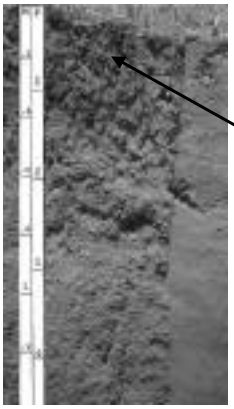
- Physical and chemical weathering
  - Breakdown particles
  - Change mineral structure



Plant starts growing

- Organic matter is added to soil surface
- Root exudates further break down minerals



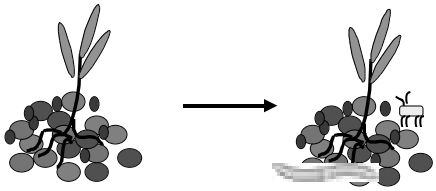


First stage of soil formation

- Increased organic matter in A horizon

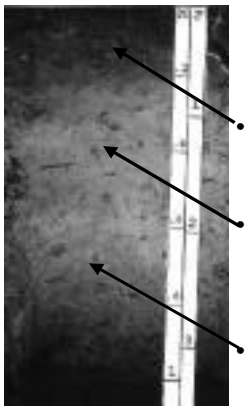
When a plant starts growing

- Organic matter from plants is a nutrient source for other organisms



Next stage will involve development of a B horizon

- Cations that have been solubilized by plant exudates, microbial activity,and acidification will start moving lower into the soil
- Secondary clays have been formed in A and are also moving down the profile



Beginning of a B horizon

- Dark A horizon
  - Organic matter
  - Clays
- Something below the A that looks different from the parent material
- Parent material