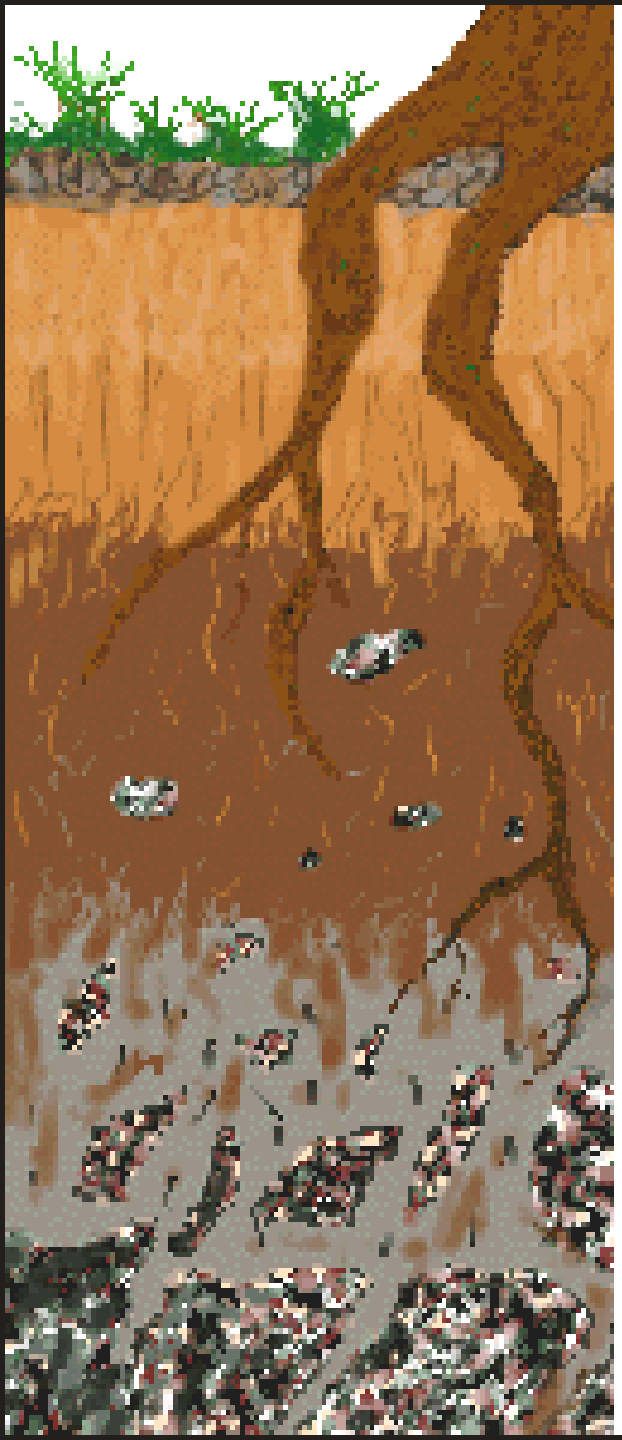
Soils

Living in the Environment, 15th Edition, Miller



SOIL STRUCTURE

O-horizon: leaf litter, organic material

A-horizon: plough zone, rich in organic matter

B-horizon: zone of accumulation

C-horizon: weathering soil; little organic material or life

R-horizon: unweathered parent material

Soils: Formation

- Soil horizons
- Soil profile
- Humus

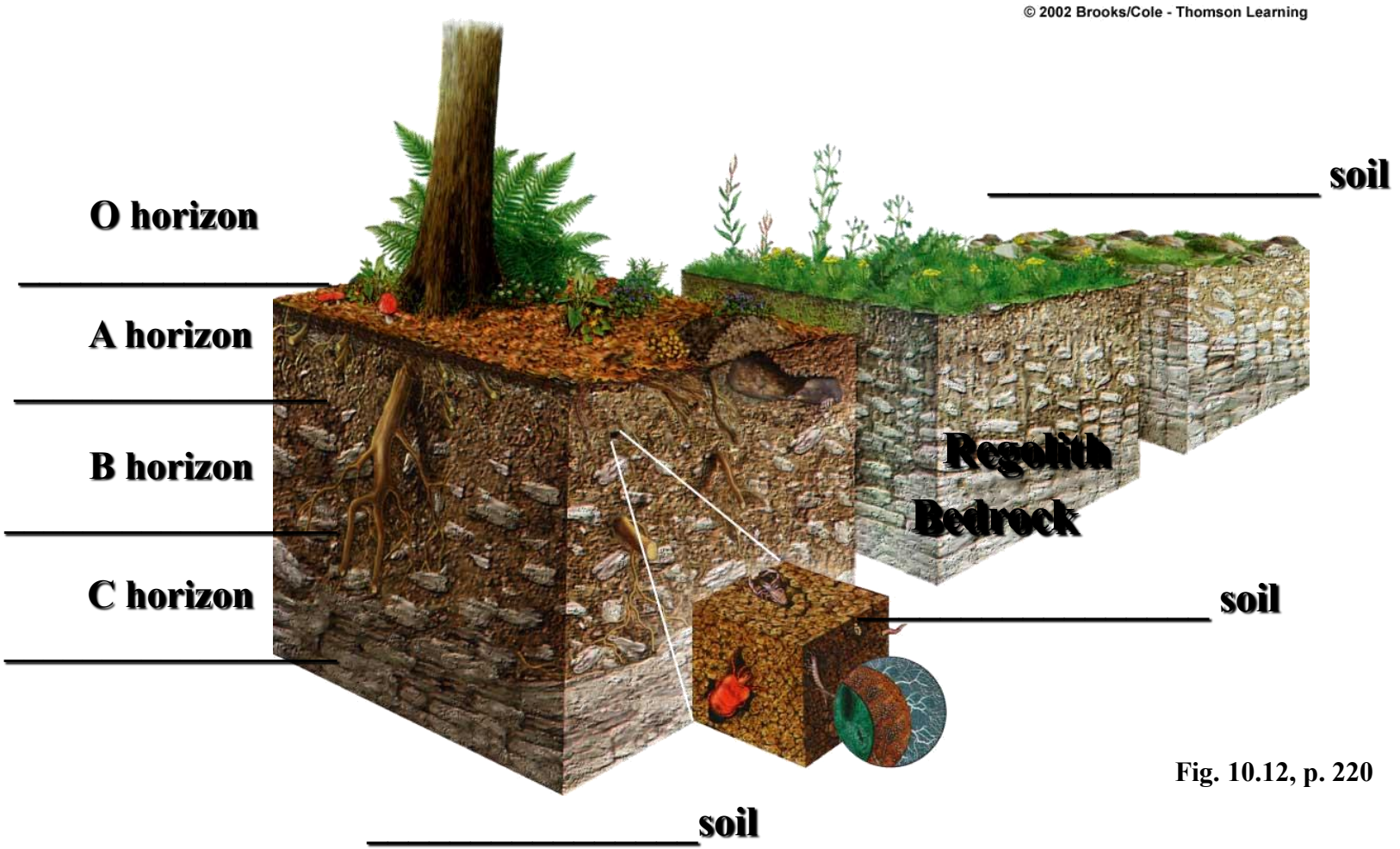
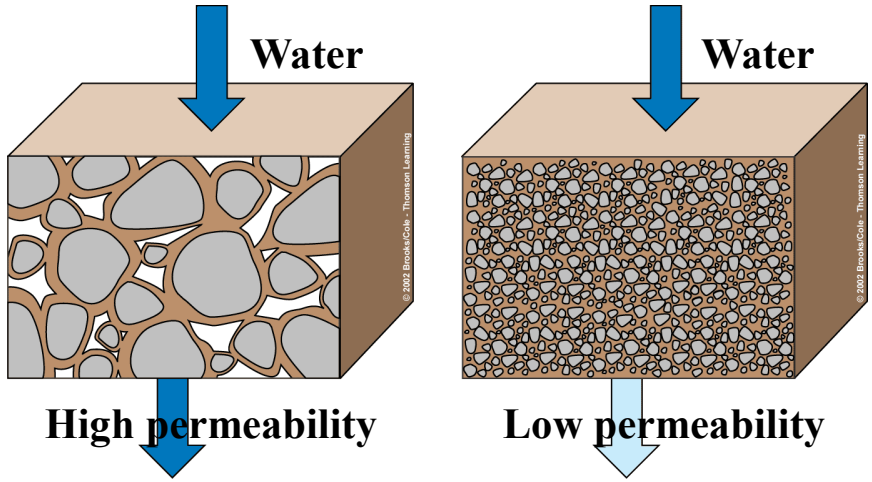


Fig. 10.12, p. 220

Soil Properties



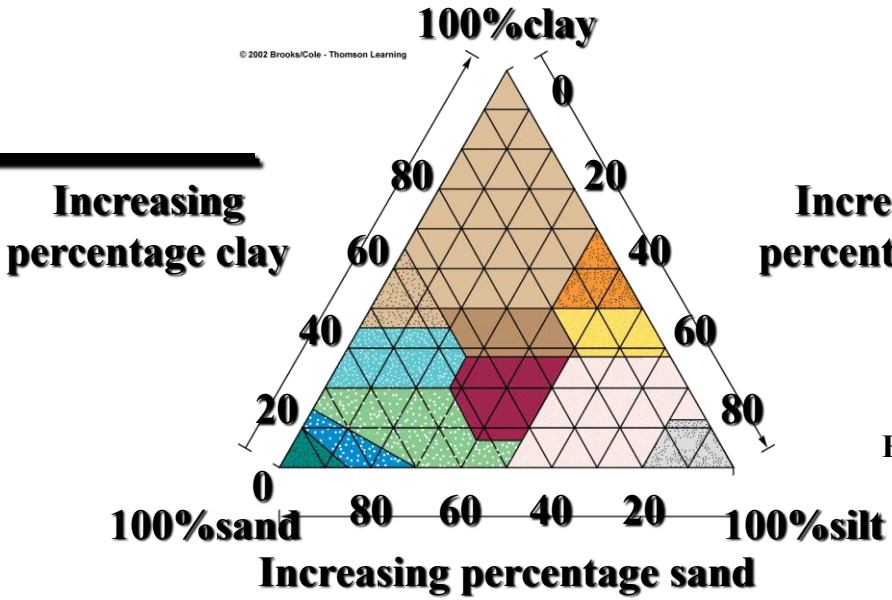


Fig. 10.16, p. 224

Soil Quality

Texture	Nutrient Capacity	Infiltration	Water-Holding Capacity	Aeration	Tilth
_____	Good	Poor	_____	Poor	Poor
_____	Medium	Medium	_____	Medium	Medium
_____	Poor	Good	_____	Good	Good
_____	Medium	Medium	_____	Medium	Medium

Fig. 10.15b, p. 223

Soil Chemistry

- Acidity / Alkalinity – _____
- Major Nutrients
  - _____
  - _____ (phosphates)
  - _____ (potash)

Acidity / Alkalinity – pH

- Proper pH directly affects the _____ of plant food _____
- Soil is best if between pH _____(except for certain _____ loving plants)
  - ‘Sour’ if too _____
  - ‘Sweet’ if too _____

Acidity / Alkalinity – pH

- Too acidic or basic will _____:
  - Allow compounds to _____
  - Allow presence of _____ _____
- If soil is too acidic, add ground _____
- If soil is too basic, add _____ _____like steer _____.

Nitrogen Content

- Importance:
  - Stimulates above ground _____
  - Produces rich _____ _____
  - Influences _____ and _____ content of fruit
  - A plant's use of _____ _____ is stimulated by presence of N
- Taken up by plant as _____ and ____
- Replenished naturally by _____ on legume ____
- Fertilizer from manure or _____ reaction.

Phosphorus for Growth

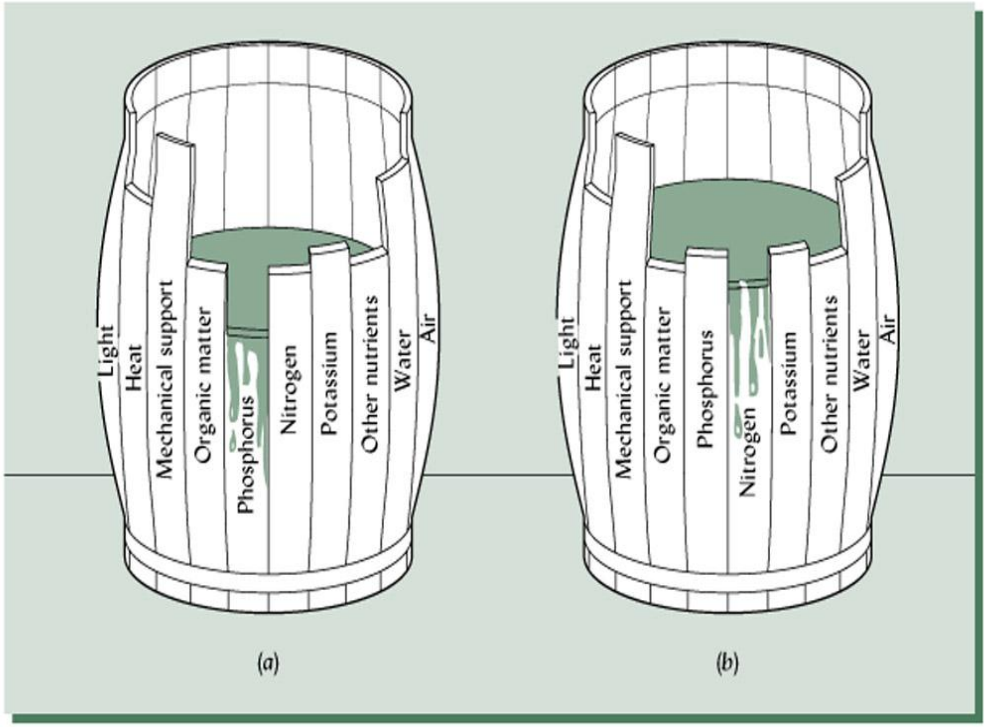
- Abundant in:
  - Strong _____ _____
  - Increases _____ yield and _____ development
  - Parts of _____ involved in _____ uptake (hair)
- Major role in _____ of _____
- Taken up by _____ as $H_2PO_4^-$ and HPO_4^{-2}
- _____ is made from rock phosphate

Potassium Content

- Potash
- Important in _____ and _____ of plant
  - Carries _____ through the plant
  - Improves _____ of _____
  - Improves _____ of _____
  - Promotes vigorous _____ _____
  - Offsets too much _____
- Found naturally in feldspar and _____

Justus von Liebig's Law of _____

Plant production can be no greater than that level allowed by the growth factor present in the lowest amount relative to the optimum amount for that factor



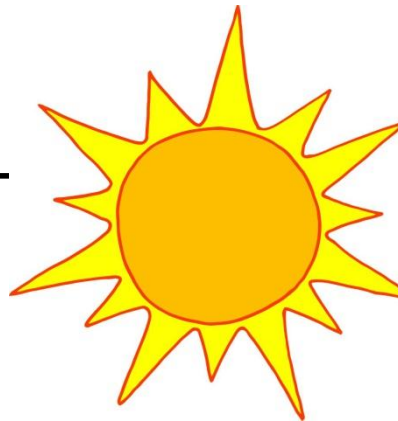
Soil Formation

Soils develop in response to:

- _____
- _____ _____
- _____ _____
- _____
- _____

Climate

- Two most important factors that determine climate are _____ and _____ and they affect:
  - _____ processes
  - Microenvironmental conditions for soil _____
  - _____ _____
  - _____ _____
  - Soil _____
  - _____ _____ in the soil



Parent Material

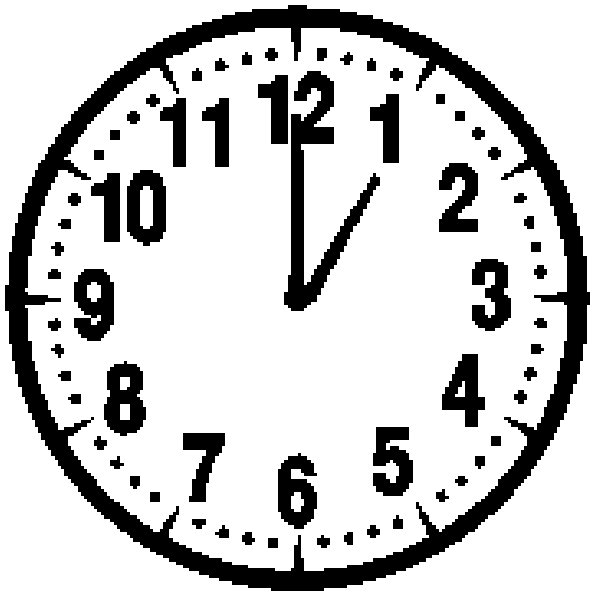
- Refers to the _____ and _____ from which the soil _____(comes from).
- The nature of the _____ _____ has a direct effect on the soil _____, _____ and cycling pathways.
- Parent material may be _____ or transported to area by _____ , _____ or glacier.

Topography

- Physical characteristics of location where soil is formed:
  - _____
  - _____ direction
  - _____
  - _____ exposure

- Viewed on Macro-scale (_____) or microscale (_____)

Time



- After enough time, the soil may reach _____.
  - Depends on _____ _____
  - Feedback of _____ and _____ factors may _____ or _____ mature profile.

Destructional -Weathering

Landscapes broken down by chemical & physical processes & erosion

Physical

- includes temperature changes (freezing and thawing, thermal expansion), crystal growth, pressure, plant roots, burrowing animals
- causes disintegration of parent material and facilitates chemical weathering

Chemical

- always in water
- includes hydration, hydrolysis, oxidation, reduction, carbonation and exchange
- examples :
  - oxidation of Fe to form limonite, deposited in joints, inhibits groundwater flow
  - hydrolysis of feldspars to form clay (kaolin) - forms infill for joints

Destructional - Mass wasting

- Gravitational _____ of weathered _____ down _____ without aid of water or wind (landslips)
- transported material is called _____
- often set off by man's _____
- can involve very small to immense volumes of _____
- sliding, toppling, unravelling, _____
- controlled by discontinuities (joints, bedding, schistocity, _____ etc)
- (picture on next slide….)

Destructional - Erosion

most significantly by:

_____ _____

- Sheet erosion
  - by _____ flowing down _____ sides
  - severe when _____ (plants) removed and _____ materials uncemented

- Stream erosion
  - materials brought downslope by mass wasting and sheet erosion are transported by _____
  - _____ by the streams - meanders etc
  - (picture on next slide…)

Destructional - Karsts

- Forms by dissolution of _____ - limestone is only common rock _____ in water - dissolved carbon dioxide in rain water
- form highly variable _____ conditions
- formation of _____ _____- when buried leads to surface subsidence
- (picture on next slide…)