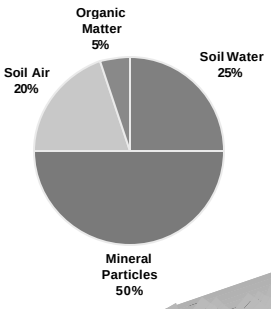
Wetland Soils

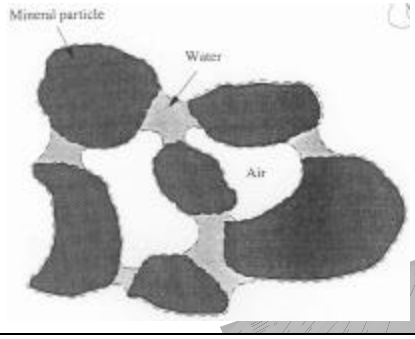
Soil Components



Soil Components

- Mineral Matter
  - Solid Framework of soil
  - Inorganic material
  - Derived from rocks
- Organic Matter
  - Carbonaceous substances
    - Living organisms
    - Remains of living organisms
    - Organic compounds produced by current/past metabolism in soil
- Air
  - CO_2/O_2 Exchange
- Water

Diagram of Soil



Reduction/Oxidation

- Redox Potential
- Reduction – giving up oxygen, gaining hydrogen or gaining an electron
- Oxidation – uptake of oxygen, removal of hydrogen or loss of electron
- Oxidized Species $\xrightleftharpoons{e^- + H^+}$ Reduced Species

Redox Potentials

Element	Oxidized	Reduced	Redox
Oxygen	O_2	H_2O	400
Nitrogen	NO_3^-	N_2O, N_2, NH_4^+	250
Manganese	Mn^{+4}	Mn^{++}	225
Iron	Fe^{+++}	Fe^{++}	120
Sulfur	$SO_4^=$	$S^=$	-75 to -150
Carbon	CO_2	CH_4	-250 to -350

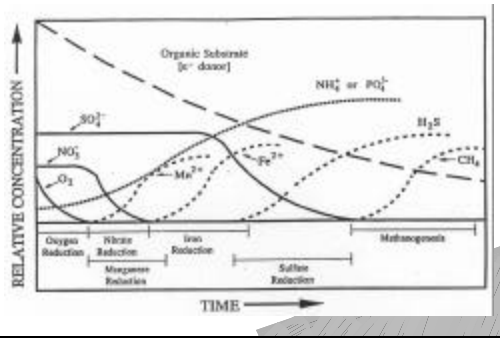
Metabolism Fuels Oxidation/Reduction

- Electron Rich Substrate (organic compounds)

$[CH_2O]_n + {}_nH_2O - {}_nCO_2 + 4ne^- + 4nH^+$

- >5°C – biological zero

Sequence of Reductions



Redoximorphic Features

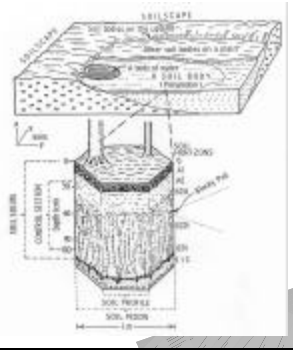
- In mineral soil
  - Dependent on
    - Anaerobic conditions
    - Temperature >5 °C
    - Organic matter
  - Soil Color
  - Mottles
  - Oxidized Rhizosphere
- Organic Soils

Soil Colors

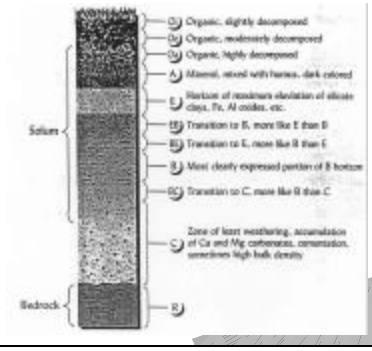
- Derived from iron and manganese
- Depends on oxidized state
- Colors Evaluated
  - Hue
  - Value
  - Chroma

Color Chart

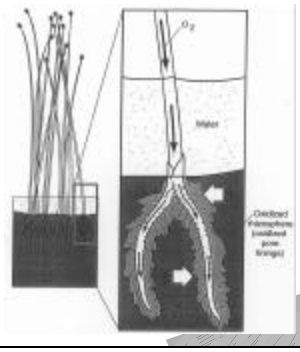
Soil Pedon



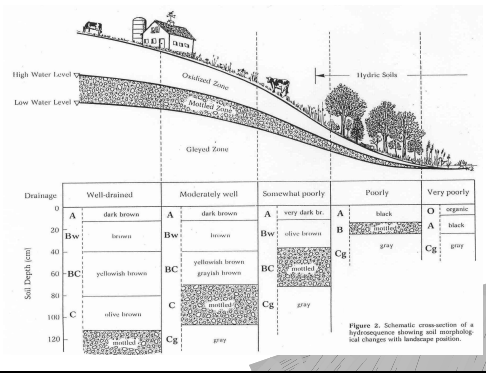
Soil Profile



Oxidized Rhizosphere



Schematic Cross-section



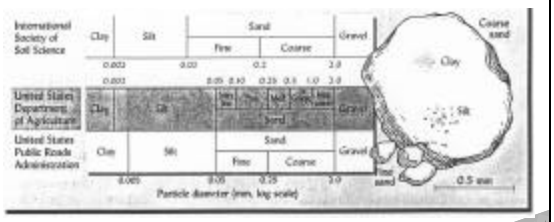
Wetland Soils

- Hydric Soil – defined by US Soil Conservation Service
  - A soil that is saturated, flooded or ponded long enough in the growing season to develop anaerobic conditions in its upper part.
- Mineral Soils
  - <20-35% organic material
  - Gleyed – semipermanently or permanently flooded
  - Mottled – seasonally flooded

Wetland Soils (cont.)

- Organic Soils (Histosols) >20-35% organic material
  - Saprists (muck) >2/3 decomposed material, <1/3 plant parts
  - Fibrists (peat) <1/3 decomposed material, >2/3 plant parts
  - Hemists (muck/peat) conditions between saprists and fibrists

Soil Particle Size



Soil Texture