

Soils



Dr. Kimberly Moore, PhD

University of Florida, IFAS

Fort Lauderdale Research and Education Center

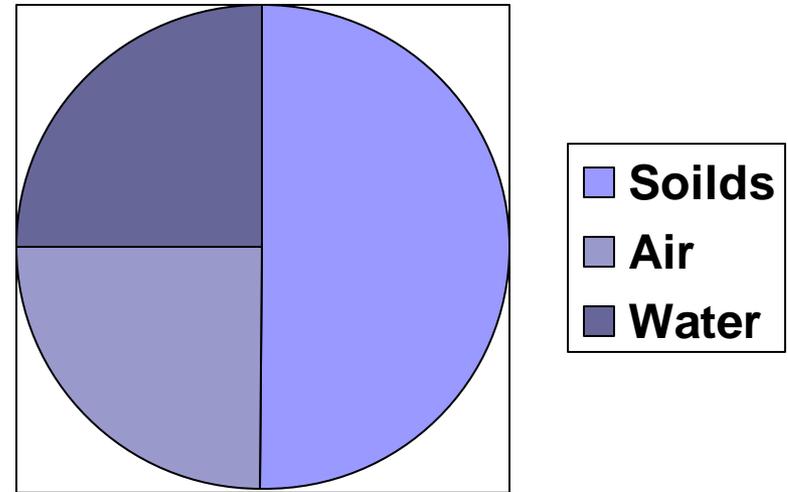
3205 College Ave.

Fort Lauderdale, FL 33314

klock@ufl.edu

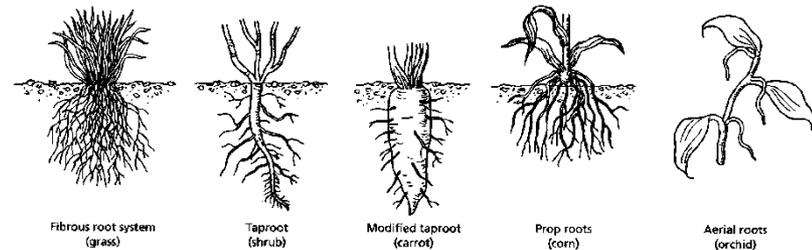
What is soil?

- Minerals and rock
- Organic matter
- Water
- Air
- Microorganisms

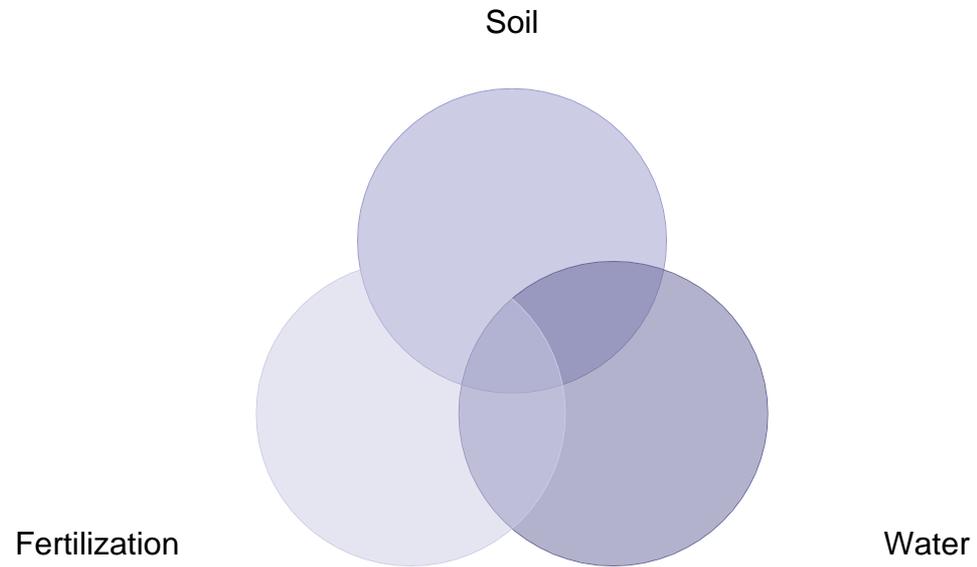


Functions of soil

- Support
- Air
- Water
- Nutrients



Balance



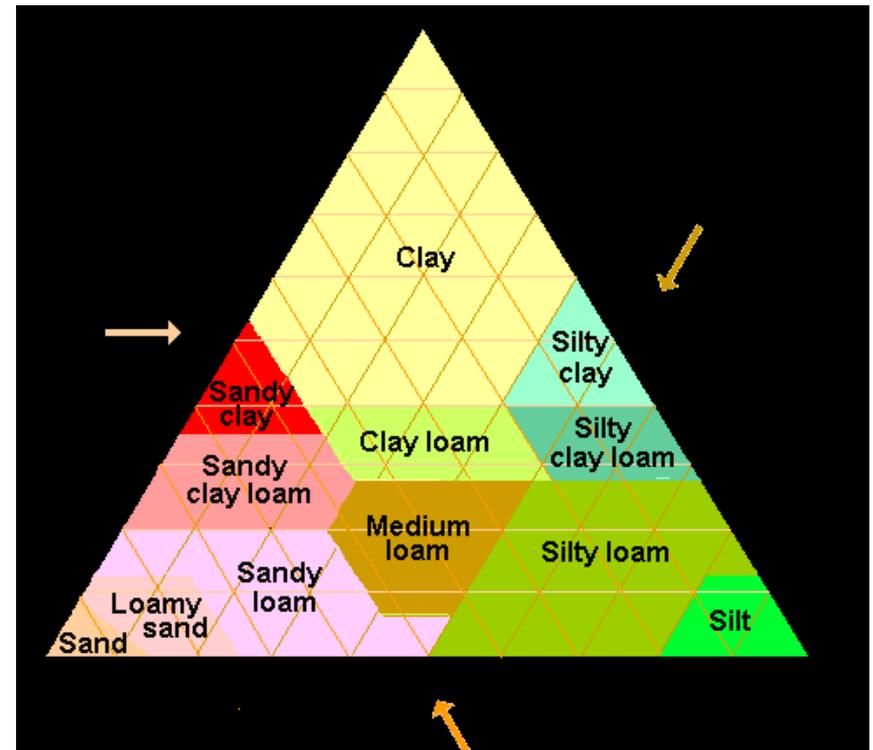


Particle size

- Gravel
 - Greater than 2.0 mm diameter
- Sand
 - 2.0 to 0.05 mm diameter
- Silt
 - 0.05 to 0.002 mm diameter
- Clay
 - Less than 0.002 mm diameter

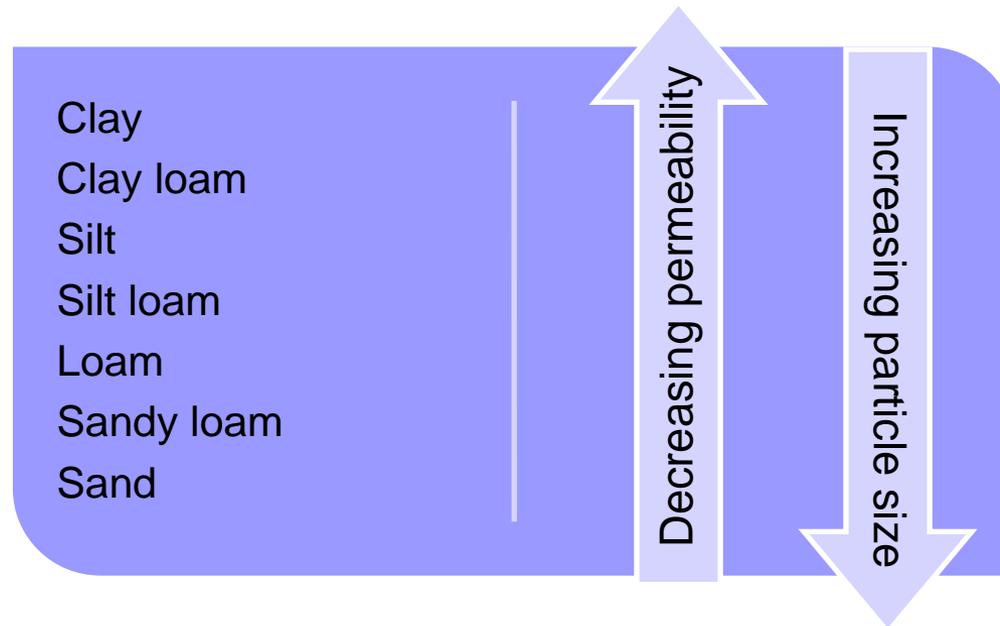
Soil definitions

- Soil texture
- Soil structure



<https://goo.gl/images/UvNQ77>

Permeability





Organic Matter (Humus)

- Peat
- Leaf litter/mold
- Compost
- Manure
- Cover crops



Microorganisms (microbes)

- Bacteria
- Fungi
 - Mycorrhizae
- Protozoans
- Nematodes
- Insects

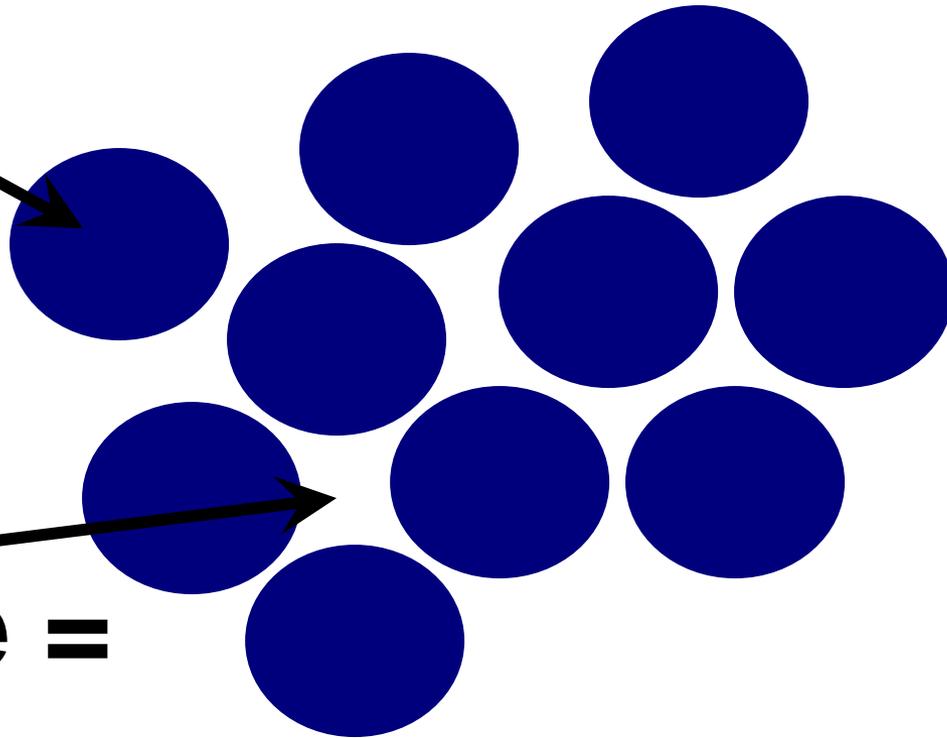
Physical Properties

Solid



Pore =

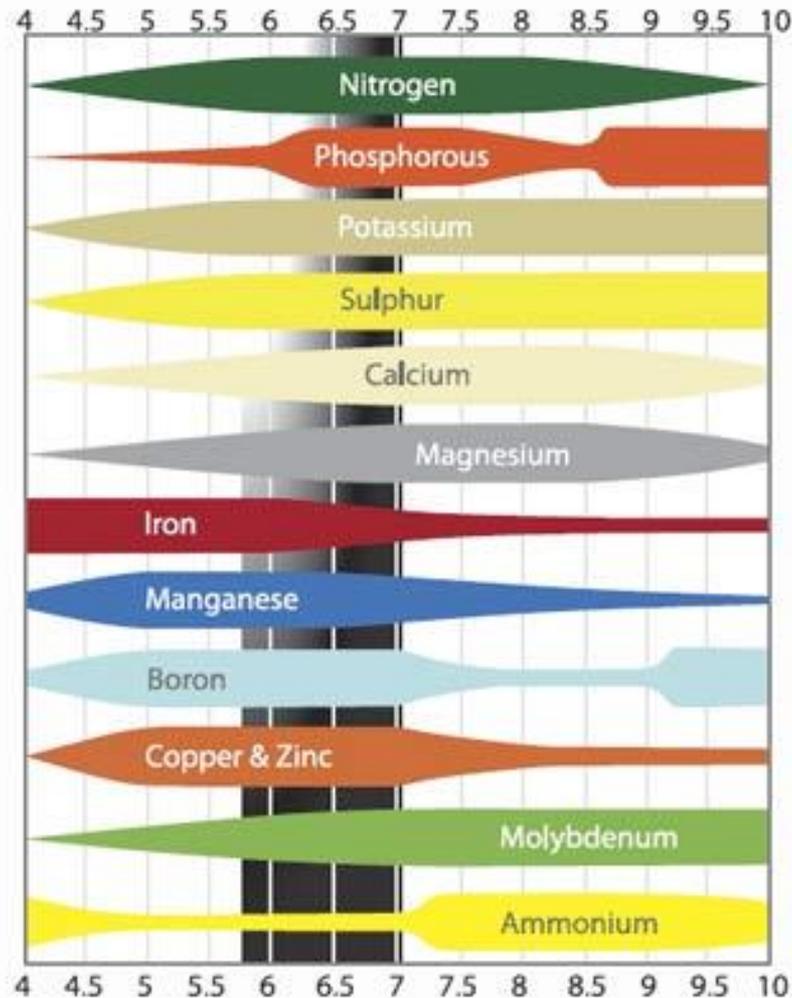
Air and Water



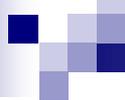


Air (%)	8	13	20
Water (%)	79	74	67
Porosity (%)	87	87	87

Soil pH



<https://goo.gl/images/Kbjwri>

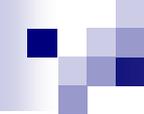


Criteria of Essentiality

- It deficiency prevents the plant from completing its life cycle
- It deficiency is specific to the element and can be corrected only by supplying the element
- The element has a nutritional role

Macro nutrients

- Carbon – C (CO_2)
- Hydrogen – H (H_2O)
- Oxygen – O (O_2)
- Nitrogen – N (NO_3 and NH_4)
- Phosphorus - P (PO_4)
- Potassium – K (K^+)
- Calcium – Ca (Ca^{2+})
- Magnesium – Mg (Mg^{2+})
- Sulfur – S (SO_4)



Micro nutrients

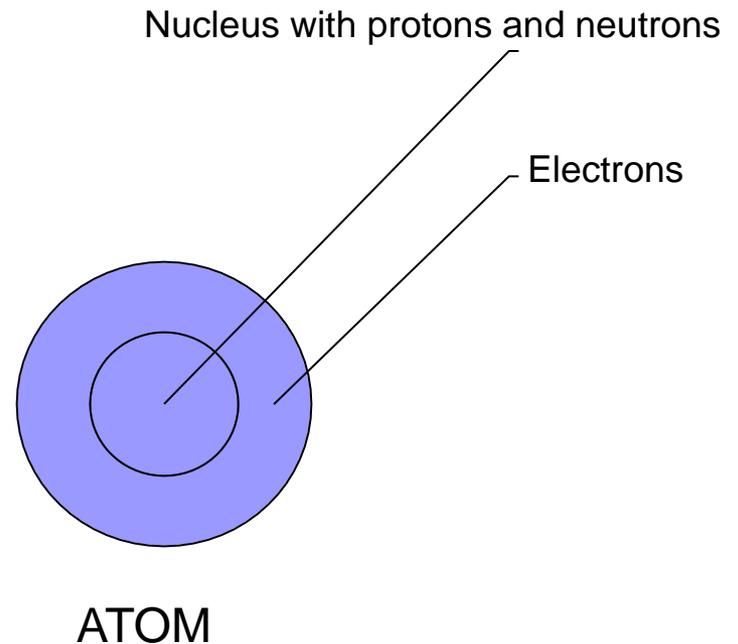
- Iron – Fe
- Manganese – Mn
- Copper – Cu
- Boron – B
- Zinc – Zn
- Molybdenum – Mo
- Chloride - Cl

Source of nutrients

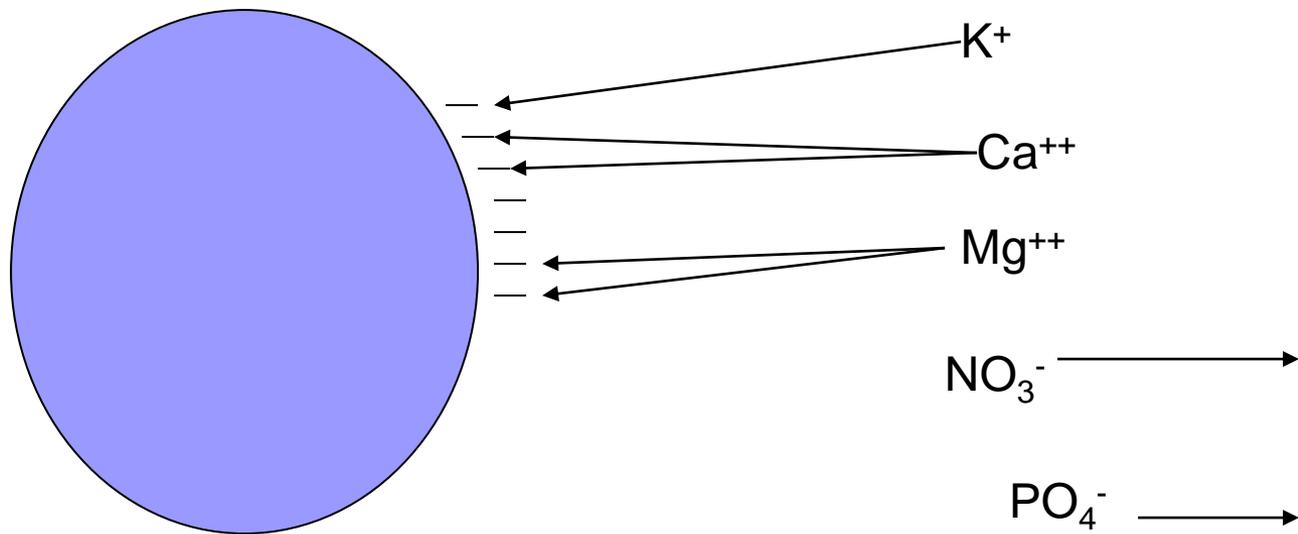
- Atmosphere
- Inorganic minerals (rocks)
 - Gypsum, lime, Epsom salts
- Organic matter
 - Manure, compost, bonemeal, bloodmeal
- Synthetic fertilizers (inorganic salts)
 - Controlled-release
 - Water soluble
 - Complete
 - Chelates

Chemistry Review

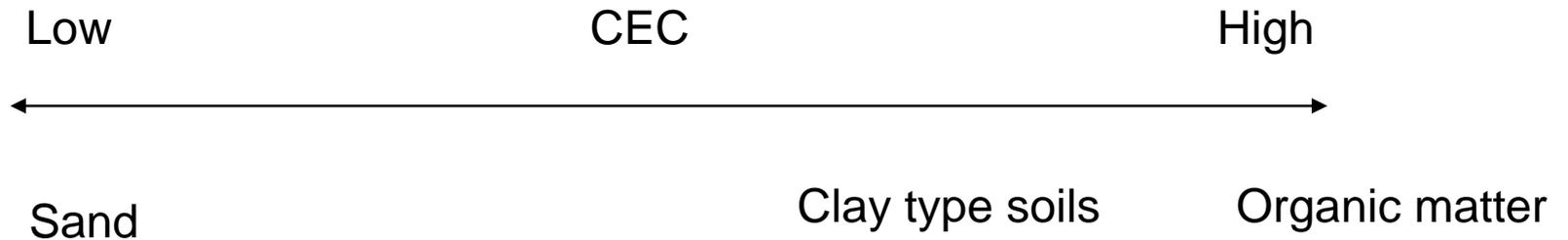
- Elements on the periodic table are called ions
- Positive ions are cations
- Negative ions are anions



Cation Exchange Capacity (CEC)



Where is our soil?



Soiless substrate components

- Organic

- *Peat, bark, coir, manure, compost*

- Inorganic

- *Sand, perlite, vermiculite, Styrofoam, rock wool, calcined clay*

Peat Moss and Peats



<https://goo.gl/images/w1stqA>

- Different types
- High water-holding capacity
- Low pH
- CEC: 7 to 13 me/100cc

Bark



- Partially composted and screened
- Neutral pH
- CEC: 12 me/100 cc

<https://goo.gl/images/5m9EVi>

Coir



- Coconut fibers
- High water holding capacity
- pH of 4.9 to 6.8
- CEC: 6.1 me/100 cc
- Low decomposition rate

Compost and Manure



- High water-holding capacity
- High CEC
- Varied nutrient content

<https://goo.gl/images/rn18jX>

Sand



<https://goo.gl/images/vofP7B>

- Low water-holding capacity
- Low to no CEC
- Added for aeration and drainage
- Heavy

Perlite



<https://goo.gl/images/YDgeSY>

- Siliceous volcanic rock that is crushed and heated to 1800°F
- Neutral pH
- Low to no CEC
- Aeration
- Light

Vermiculite

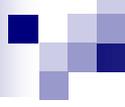


<https://goo.gl/images/cmBjzc>

- Mica like silicate expanded by heating
- High water-holding capacity
- CEC: 1.9 to 2.7 me/100cc

Comparison

Component	Water	Nutrients	Air
<i>Sphagnum peat</i>	X	X	
<i>Composted bark</i>	X	X	X
<i>Manure</i>	X	X	
<i>Vermiculite</i>	X	X	
<i>Perlite</i>			X
<i>Sand</i>			X
<i>Styrofoam</i>			X



Rule of Thumb

- One to three components
- Choice of components vary with availability and cost
- Crop being grown