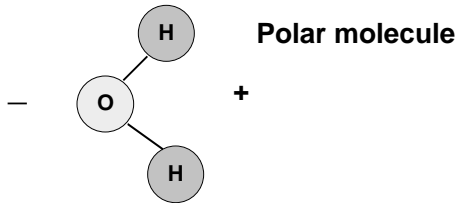
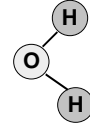


Soil water- First water

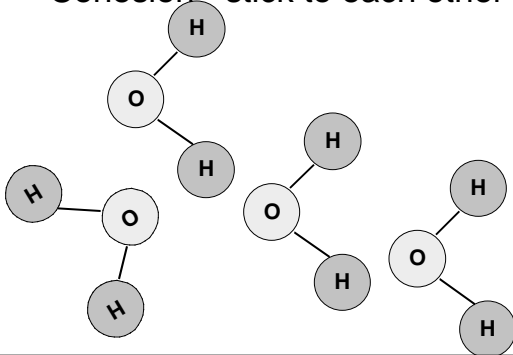


This means

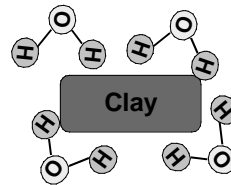
- It will be attracted to things with charges
 - Ions
 - Clays
 - Certain organic matter
 - Certain herbicides
- Itself



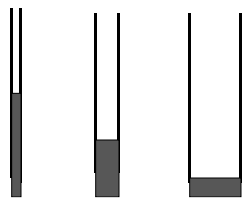
Cohesion - stick to each other



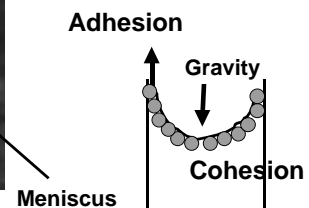
Adhesion - stick to other materials



Capillary Rise



Water will rise due to adhesion to surface and cohesion to itself
 $H = 0.15/r$



How do these things work in soils

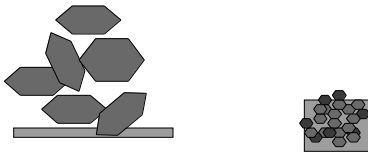


Different forces acting on water in soil

- **Matric force - matrix**
 - Attraction of water for solids/ particle surfaces
- **Osmotic force - osmosis**
 - Tendency of solutions to come into equilibrium
 - Water in soils is never pure water
- **Gravity**
 - Downward flow

Matric potential

- Same principal as capillary rise
- No straight glass tubes in the soil
- **Macropores** and **Micropores**



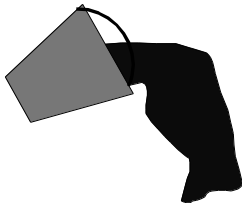
Salty Soils Osmotic potential

- Can happen in arid environments
- House plants
- Excess salts in solution draw water out of root tissue and kill plants



Gravity

- Pressure to move down



Goal of water is to achieve lowest energy level

- What the water will do will be a function of the factors acting upon it and the tendency to move to the lowest energy state



Energy level

- More freedom of movement > energy level
- More restrictions on movement < energy level

In other words -

- The water that is in a very wet soil has high potential
 - It is most likely surrounded by other water molecules
 - Matric and osmotic potentials are low

Dry soil

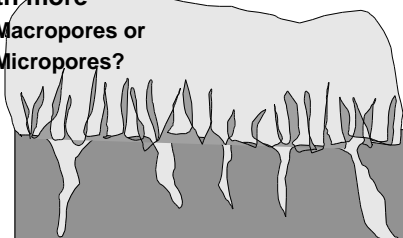
- The water in a dry soil has low potential
 - It is most likely surrounded by solids and solutes
 - Matric and osmotic potentials are high
 - It has very little freedom of movement

- Matric and osmotic potentials are always negative
- When water responds to these potentials it goes to a lower (more negative) energy state



From what you know

- Would potential be higher in a soil with more
 - Macropores or
 - Micropores?



Units for water (Potential, energy)

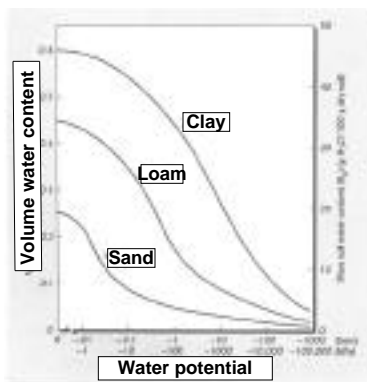
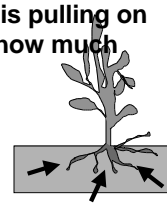
- Units for energy
 - Mass (joules/kg)
 - Volume (newtons/m²)
- 1 pascal (SI) = newton/ 1 m²

In soil potential energy =

- Related to pressure of a column of water (cm)
- Bars 0 - -100
- kPa 0 - - 10,000
- 1 kPa = 0.01 bars

Matric and osmotic forces

- Are pulling on the water
- Creating tension
- How much tension there is pulling on the water will determine how much water there is for plants



“Water, water everywhere,
but not a drop to drink”

