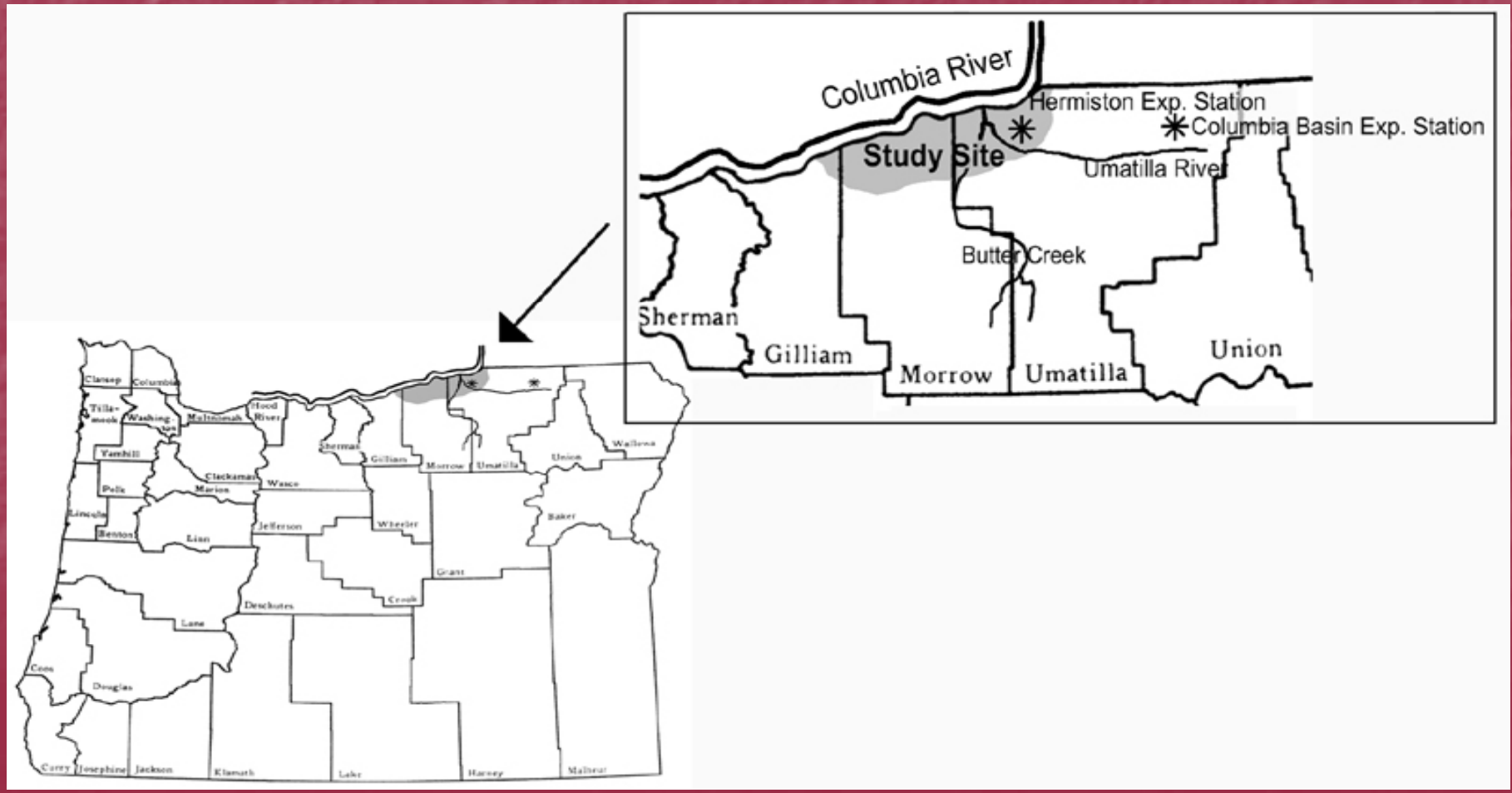
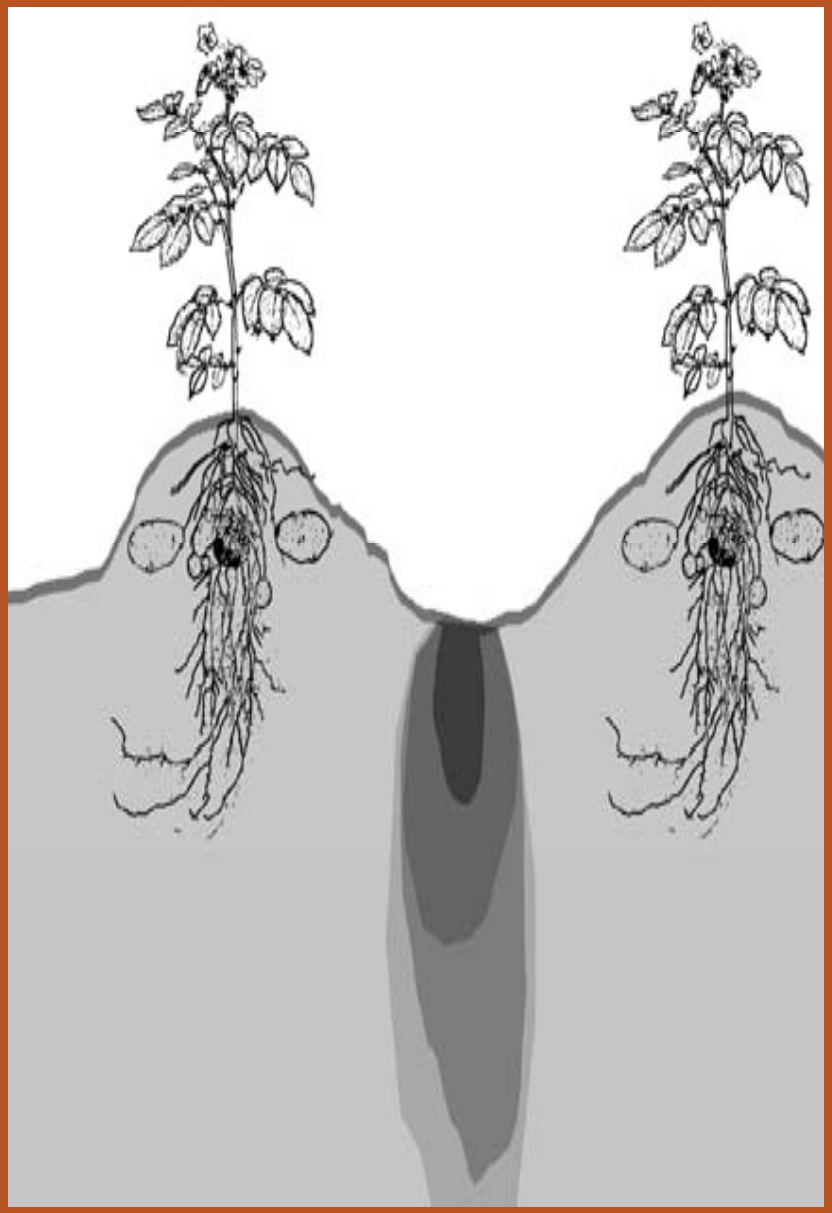
Hydrophobic Quincy Soil



Loss of Arable Land

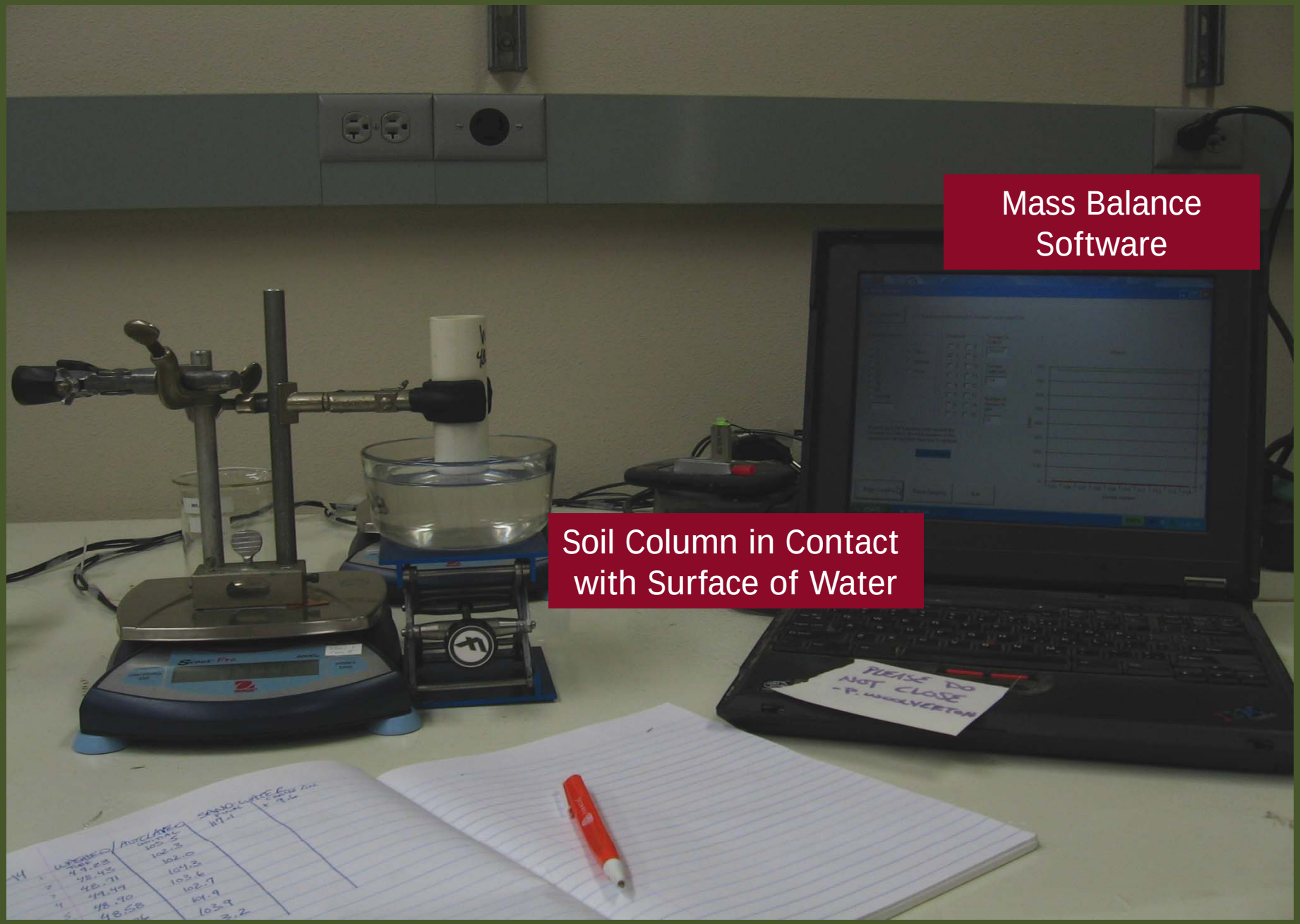
- Non-sustainable use of valuable water resource
- Water unavailable for use by plants
- Soil erosion-land degradation
- Soluble nutrient loss

Problems



Organic Matter amendments decrease Hydrophobicity of Soil

- Hydrophobic soil repels the infiltration of water. Water remains on the surface increasing runoff and decreasing plant water availability.
- Contact angle of water on Quincy soil illustrates that the cohesive forces between water molecules are greater than the adhesive forces between water molecules and soil particles.
- Soil particles are covered in organic matter layers that have polar and non-polar chains. The addition of hydrophilic organic matter layers (polar) may increase the infiltration rate of water into the soil.


Mass Balance Software
Soil Column in Contact with Surface of Water

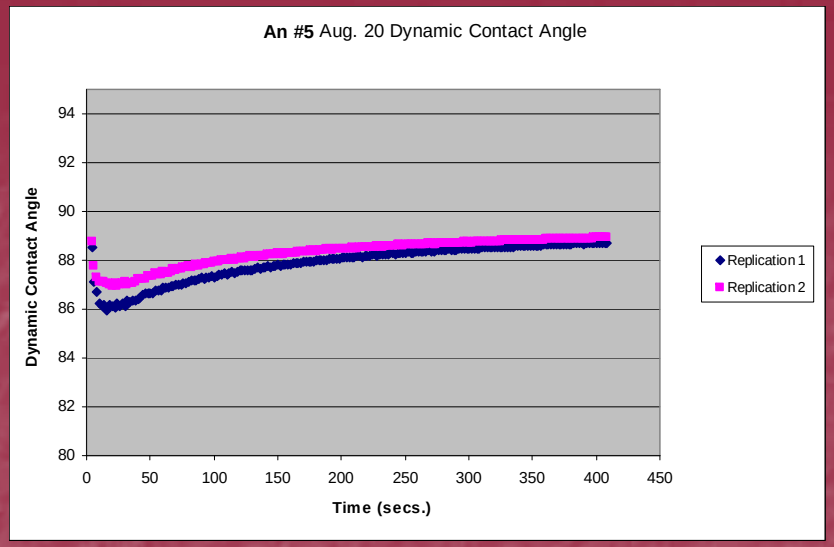
Calculate Degree of Hydrophobicity of Soils with Different OM Content

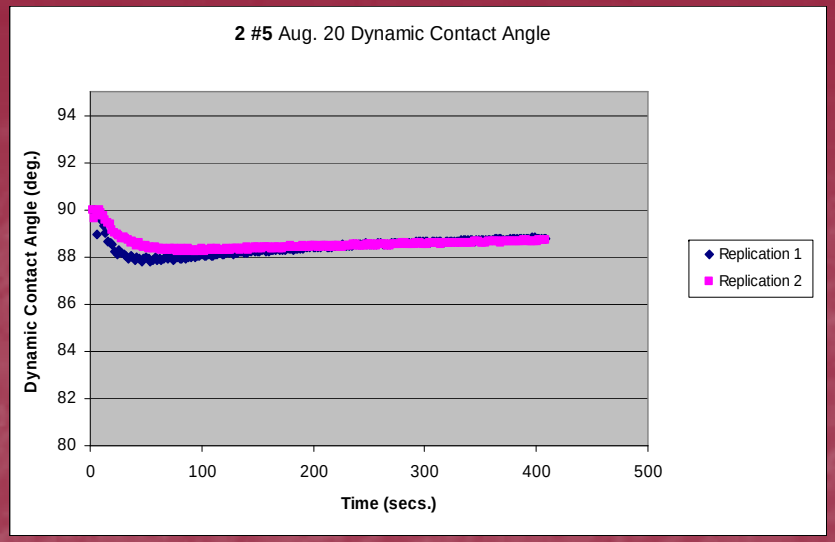
$$w^2 = \left(r f^2 \left[\pi R^2\right]^2\right)\left(\frac{\rho^2 \cos\alpha_{dynamic}}{2\mu}\right)t$$

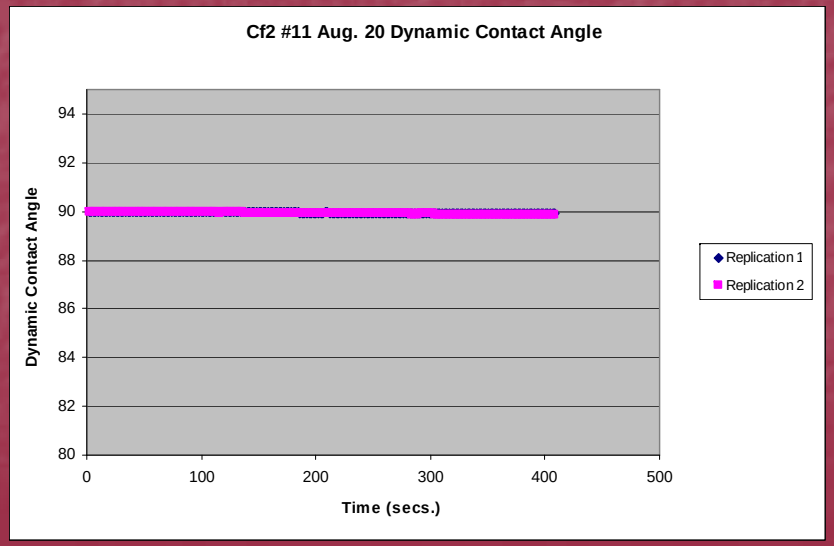
$$c = m\left(\frac{\rho^2 \gamma \cos\alpha_{dynamic}}{\mu}\right)^{-1} = m/A$$

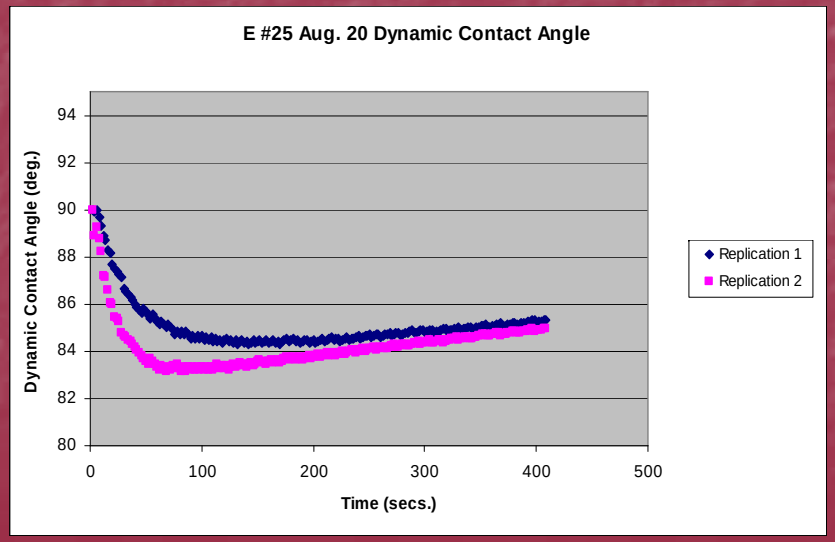
$$w^2 = c\left(\frac{\rho^2 \gamma \cos\alpha_{dynamic}}{\mu}\right)t \longrightarrow \cos\alpha = \frac{\mu_{water}}{ct\rho_{water}\gamma_{water}}w^2$$

Washburn's Equation


An #5 Aug. 20 Dynamic Contact Angle
Dynamic Contact Angle
94
92
90
88
86
84
82
80
0
50
100
150
200
250
300
350
400
450
Time (secs.)
Replication 1
Replication 2


2 #5 Aug. 20 Dynamic Contact Angle
Dynamic Contact Angle (deg.)
94
92
90
88
86
84
82
80
0
100
200
300
400
500
Time (secs.)
Replication 1
Replication 2


Cf2 #11 Aug. 20 Dynamic Contact Angle
Dynamic Contact Angle
94
92
90
88
86
84
82
80
0
100
200
300
400
500
Time (secs.)
Replication 1
Replication 2


E #25 Aug. 20 Dynamic Contact Angle
Dynamic Contact Angle (deg.)
94
92
90
88
86
84
82
80
0
100
200
300
400
500
Time (secs.)
Replication 1
Replication 2