
Soil Structure-Friend or Foe?
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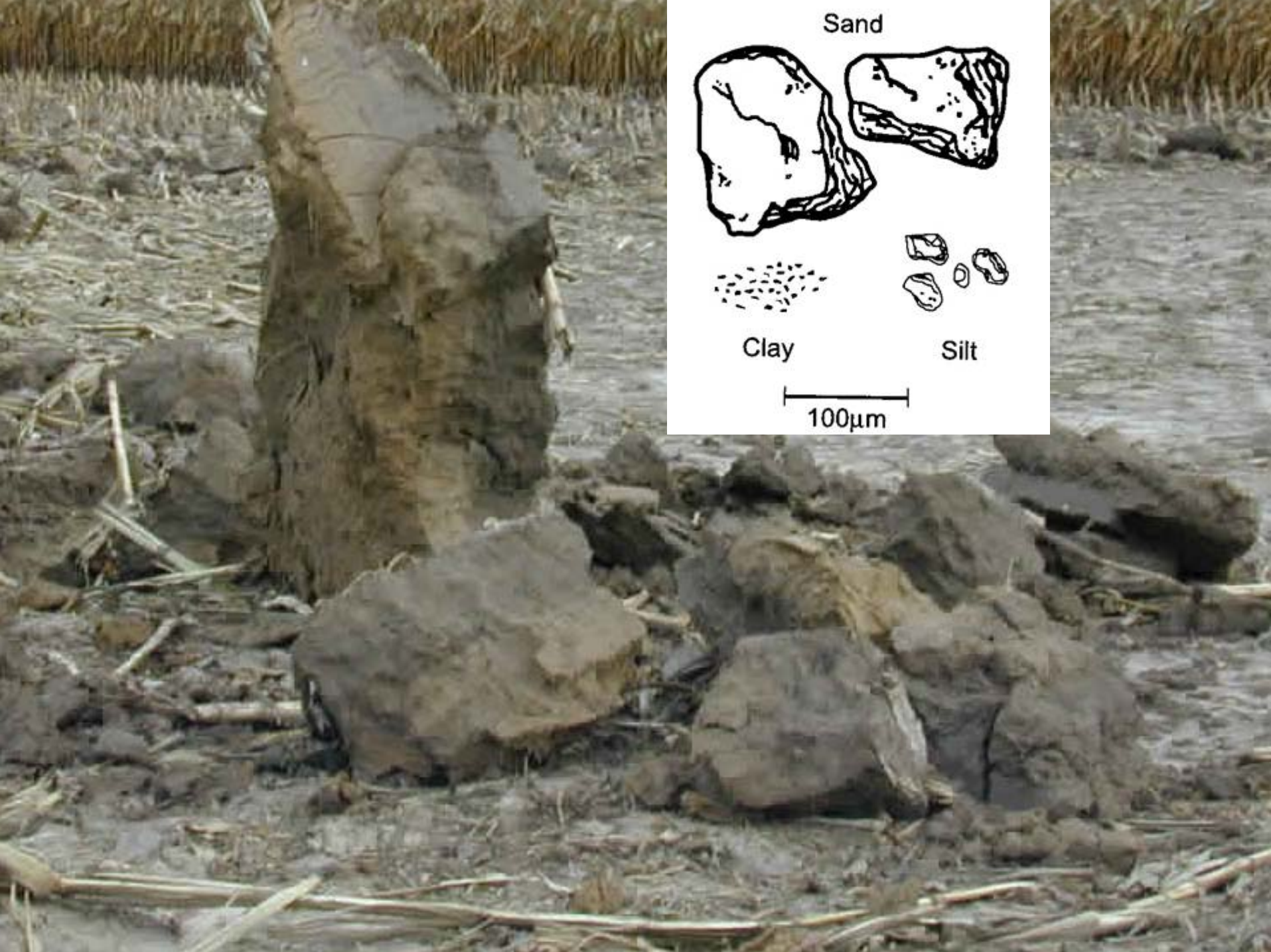
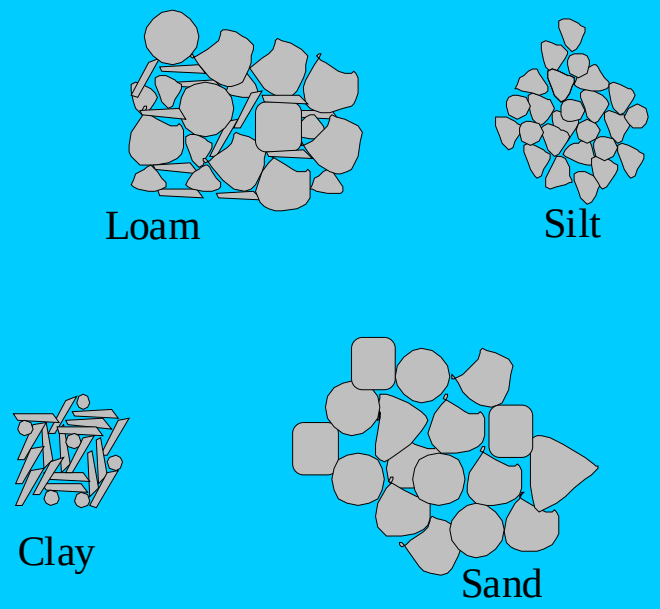

Sand
Clay
Silt
100µm

SOIL STRUCTURE AND AGGREGATION

Definition:
The combination or arrangement of primary (individual) soil particles into secondary particles. The aggregation of primary soil particles, which are separated from adjoining aggregates by surfaces of weakness.

Soil Structure is the result of primary soil particles (individual sand, silt and clay) aggregating. They are held together by cementing agents such as Ca, Fe, Al, other cations, clay and organic matter.

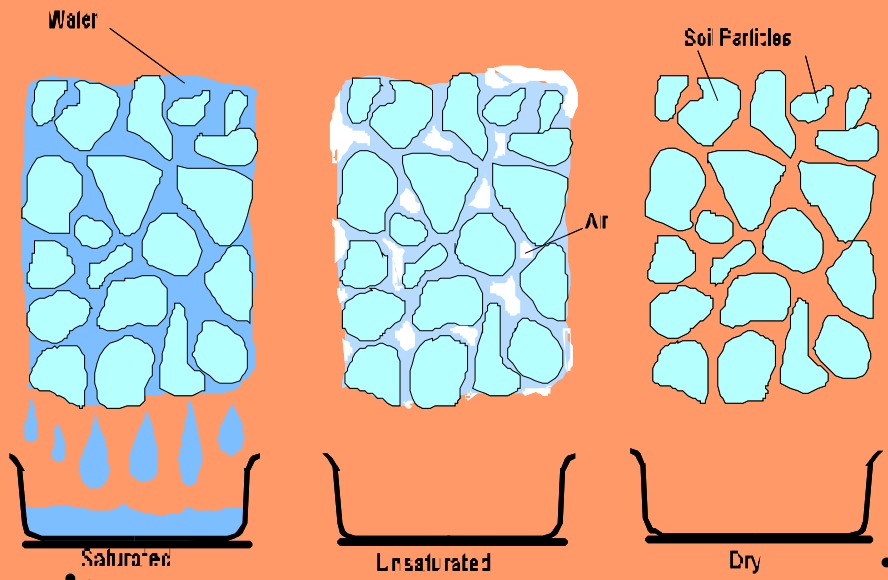


Soil Aggregates

Classification of Soil Structure

For soil classification purposes — based on size, shape, and degree of distinctiveness, i.e., strong, coarse crumb structure.

From a soil-water-air viewpoint — soil structure is very important. Structure affects water retention and transmission; also infiltration and aeration.



a) Liquid Phase (soil solution)

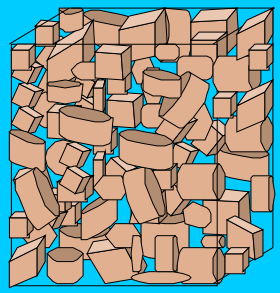
1) Porosity (f); $f = V_f / V_{total}$

2) Soil Water Content (2_v); $2_v = V_{water} / V_{total}$

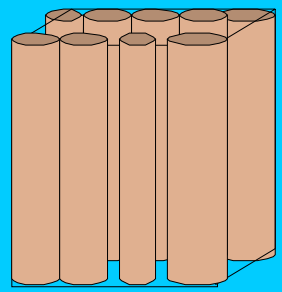
$2_g = M_{water} / M_{soil}$

3) Air filled porosity (f_a); $f_a = f - 2_v$

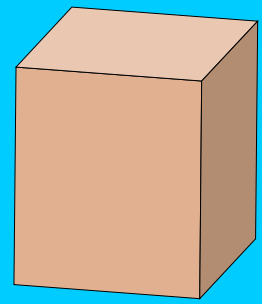
Granular



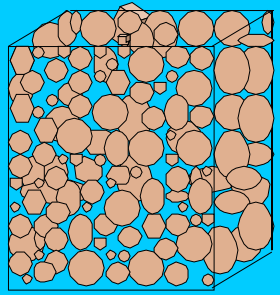
Prismatic



Massive

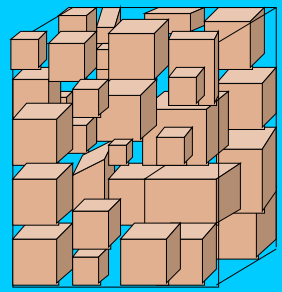


Single grain



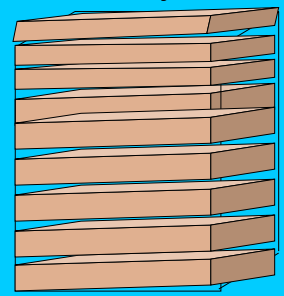
RAPID DRAINAGE

Blocky



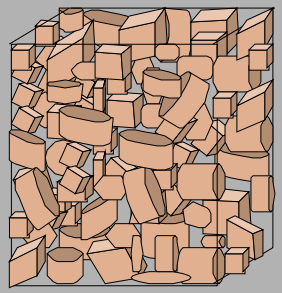
MODERATE DRAINAGE

Platy

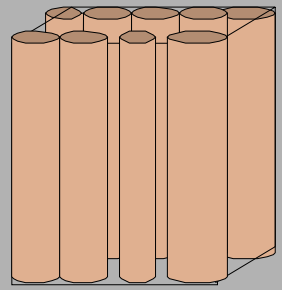


SLOW DRAINAGE

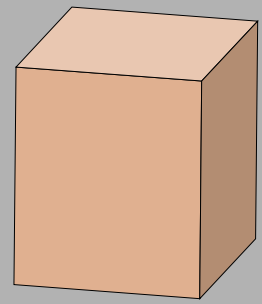
Granular



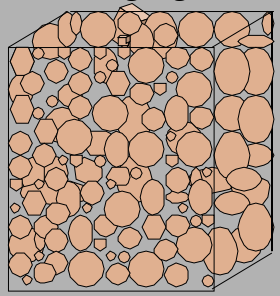
Prismatic



Massive



Single grain



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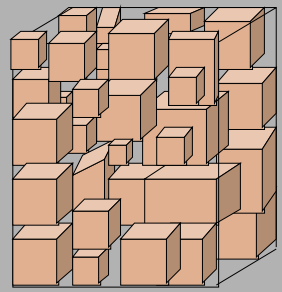
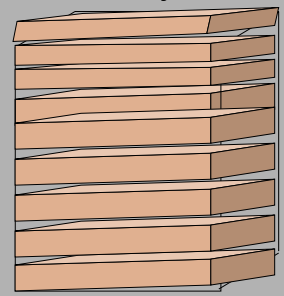


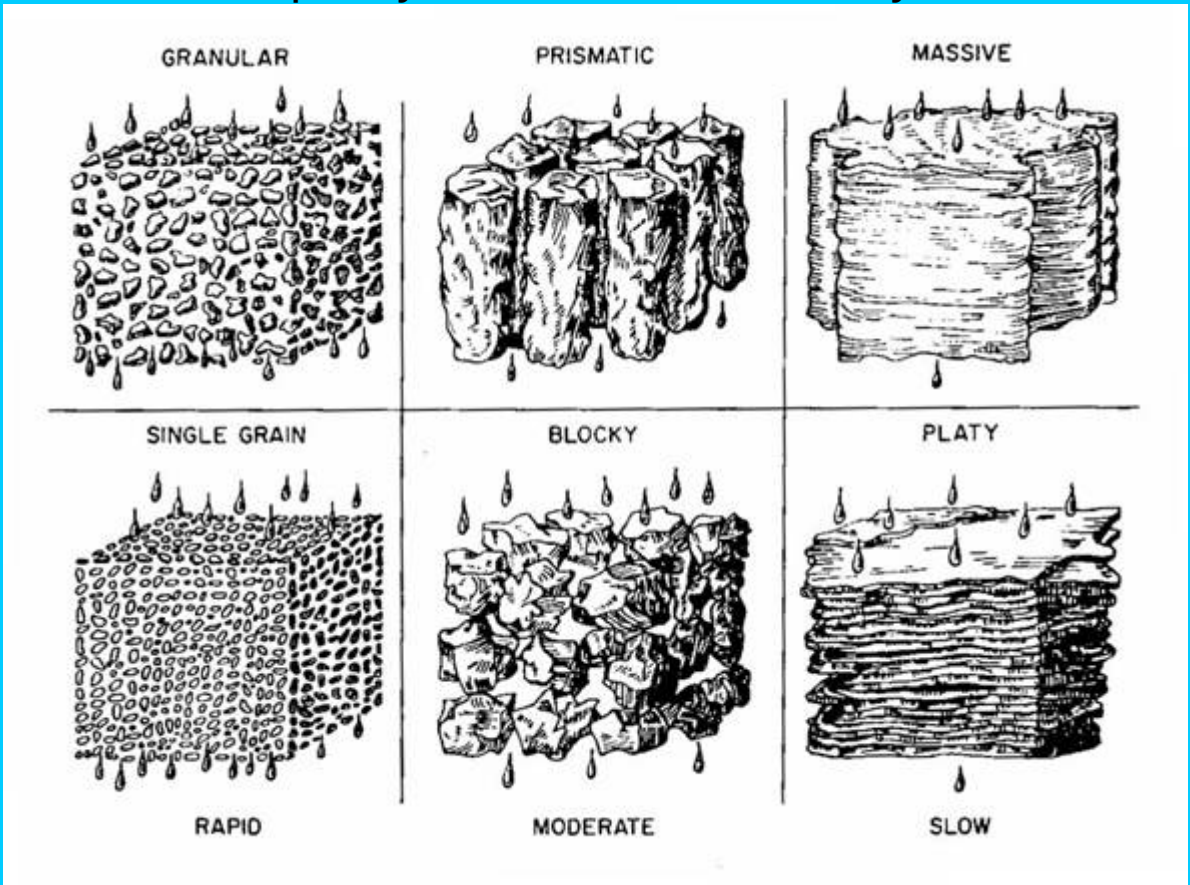
MODERATE DRAINAGE

Platy



SLOW DRAINAGE

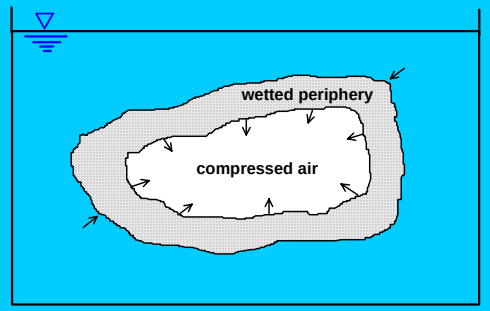
- Types of structure: single grained, massive, aggregated
- Soil structure implicitly includes some stability factor

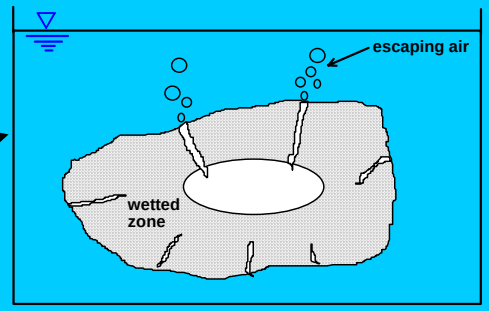


Disruptive forces

Application of energy by:

- Raindrop impact
- Running water (especially with suspended particles)
- Wind (especially with suspended particles)
- Tillage
- Livestock, human and vehicular traffic
- Freezing and thawing
- Expansion on wetting
- Explosion from air entrapment on wetting
- Compaction by equipment

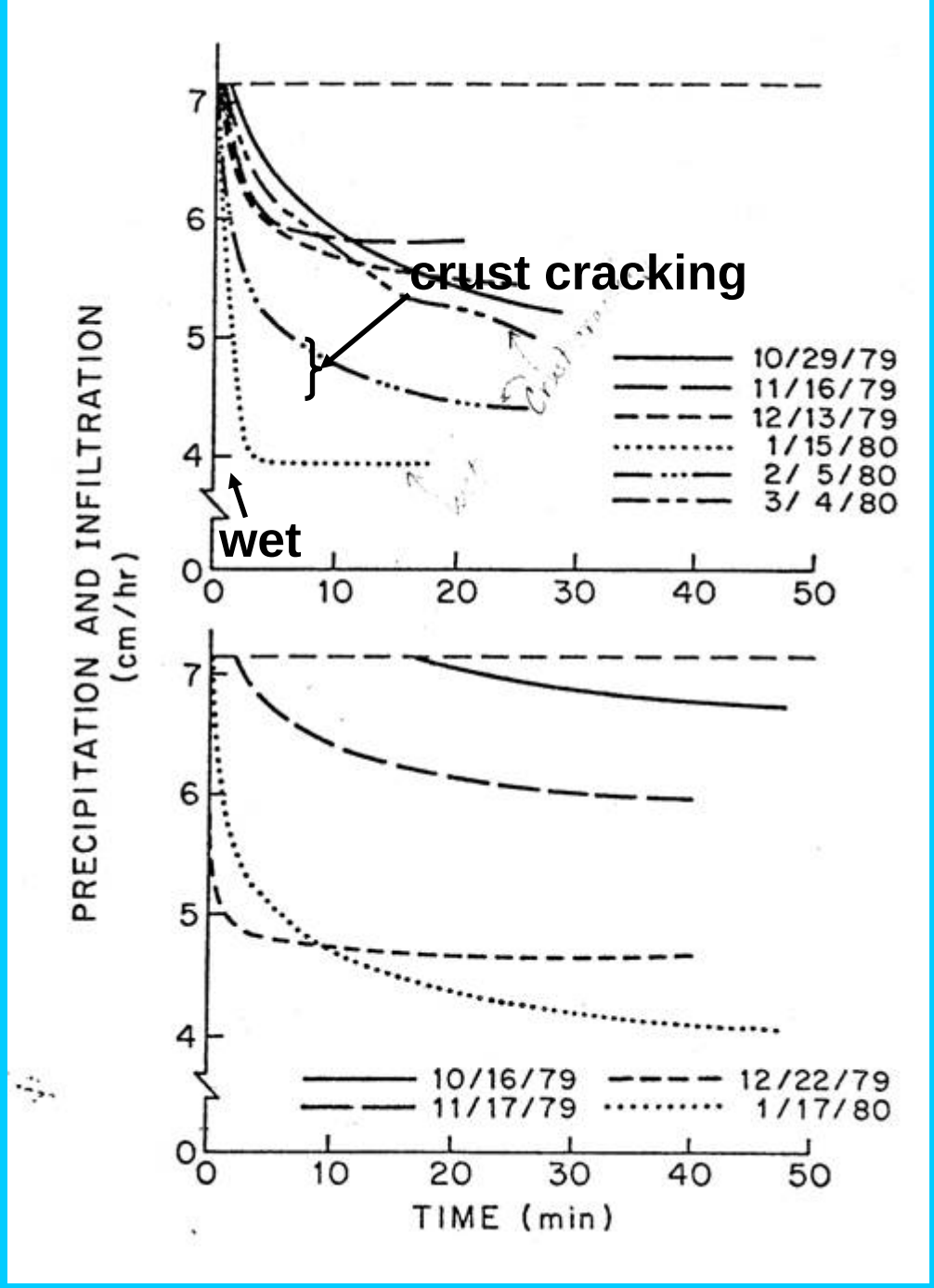


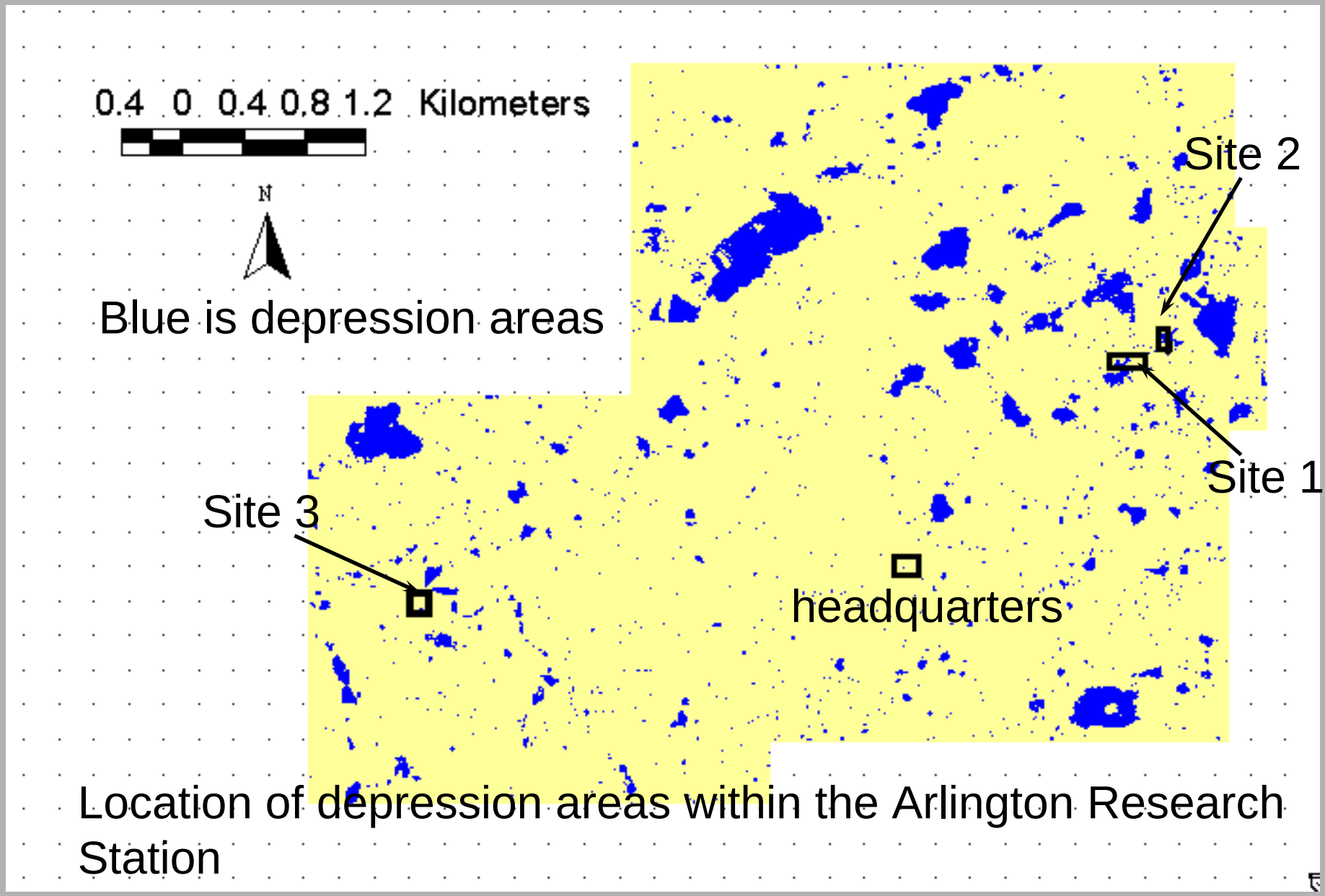


Decomposition of cements

tillage which introduces air

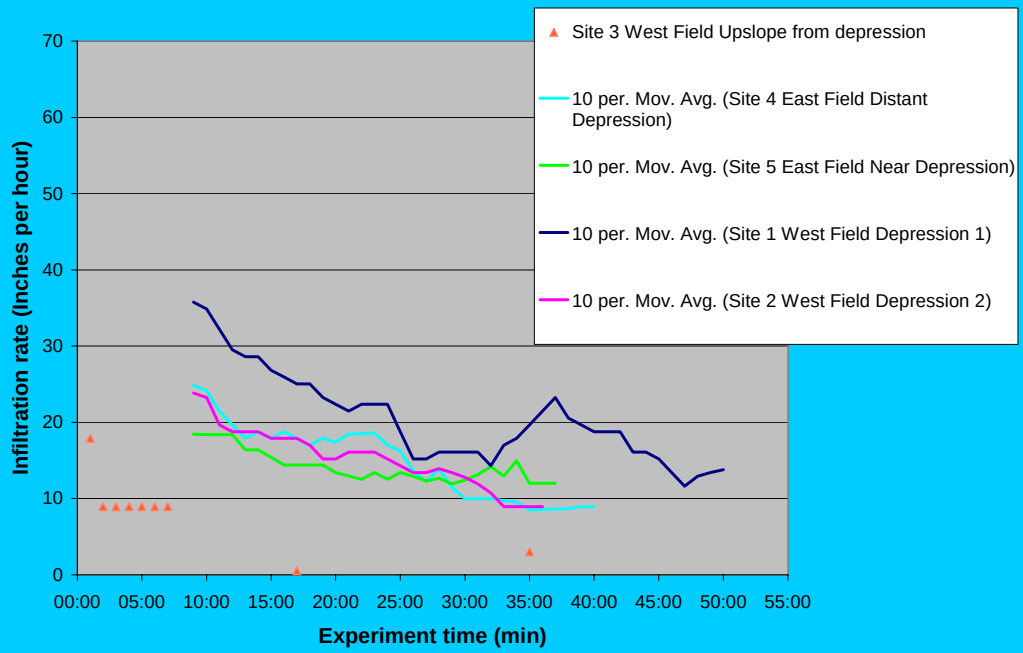
PENTAX

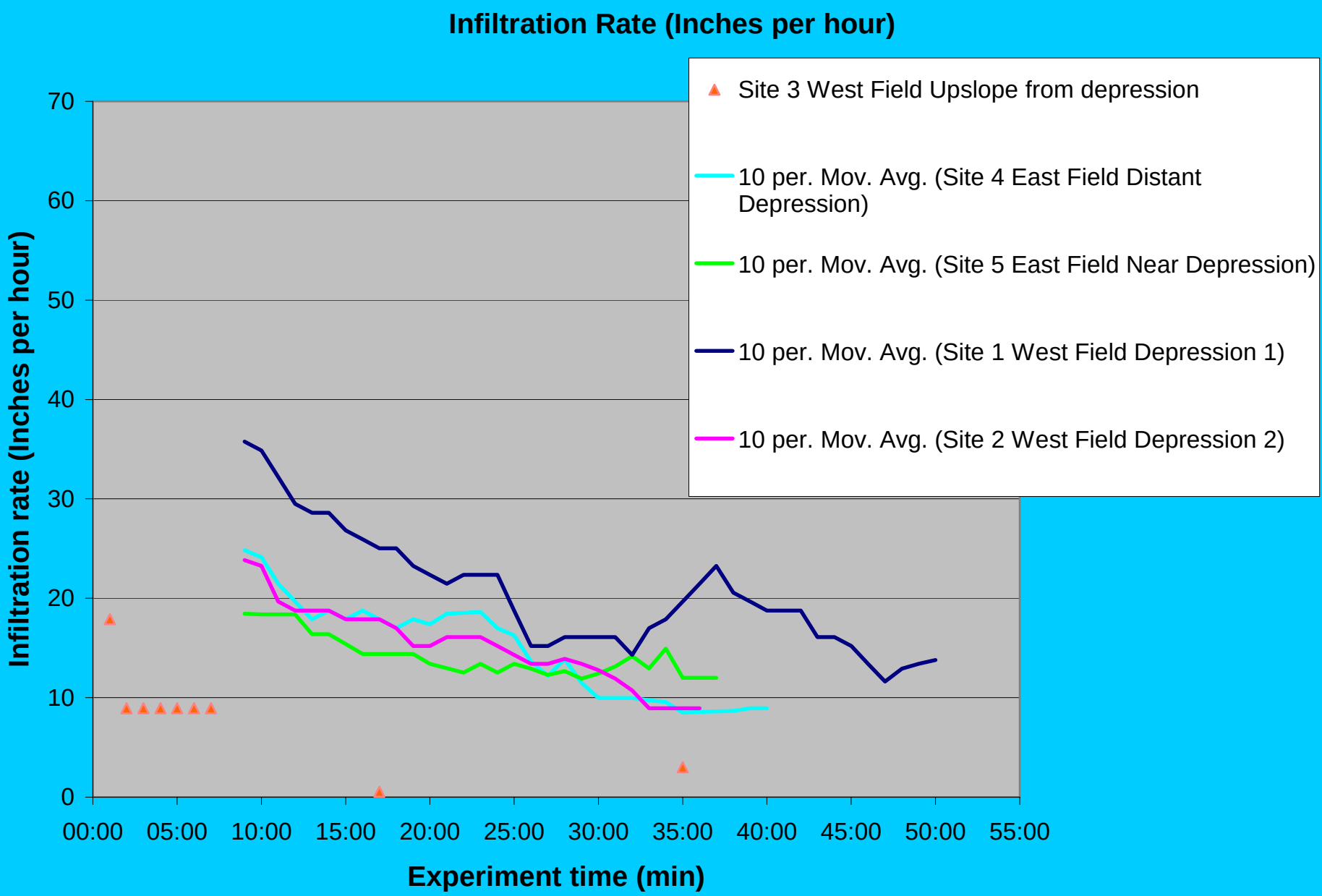

crust cracking
wet
PRECIPITATION AND INFILTRATION (cm/hr)
TIME (min)
10/29/79
11/16/79
12/13/79
1/15/80
2/ 5/80
3/ 4/80
10/16/79
11/17/79
12/22/79
1/17/80



Location of depression areas within the Arlington Research Station

Infiltration Rate (Inches per hour)




Infiltration Rate (Inches per hour)
Site 3 West Field Upslope from depression
10 per. Mov. Avg. (Site 4 East Field Distant Depression)
10 per. Mov. Avg. (Site 5 East Field Near Depression)
10 per. Mov. Avg. (Site 1 West Field Depression 1)
10 per. Mov. Avg. (Site 2 West Field Depression 2)
Infiltration rate (Inches per hour)
70
60
50
40
30
20
10
0
00:00
05:00
10:00
15:00
20:00
25:00
30:00
35:00
40:00
45:00
50:00
55:00
Experiment time (min)