


Exercise 2



Soil and Water Interactions

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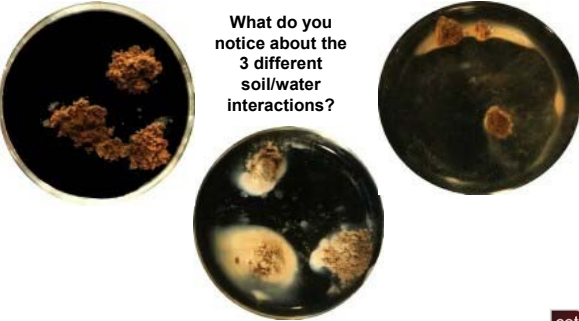
Dispersive Soils

- Structurally unstable in water, breaking down to constituent parts – sand, silt and clay
- Emerson Aggregate Test commonly used to identify problem soils
- Slaking vs. Dispersion – both problematic
- Mechanical dispersion

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Unstable Soils



What do you notice about the 3 different soil/water interactions?

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Testing Your Soils

- We have provided a Petri Dish and four air-dried 'peds' (aggregates) of natural soils
- You will need a bottle or glass of clean water
- Fill the Petri Dish to within 2-3mm of the top of the dish with clean water
- Place the peds **gently** into the dish spacing them out enough to keep them separate

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Testing Your Soils

The soils are as follows:

Soils 1 and 2 are from the same profile

1. A₁ (topsoil)
2. A₂ (subsoil)

Soils 3 and 4 are typical Port Macquarie soils

3. Thrumster soil (Thrumster)
4. Moripo soil (Glen Innes Drive)

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Testing Your Soils

- Observe what happens to the peds when they come into contact with water
- Note which soils are stable (peds do not break down)
- Note which soils slake (peds crumble and break down)
- Note which soils are dispersive (peds create a cloudy rim or turbidity)

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Dispersive Soil Problems

- Highly erodible if exposed
- Hardsetting and low permeability
- May generate turbid runoff and include attached nutrients or metals (piggy-backing)
- Severe rilling of exposed (vertical) surfaces
- High risk of tunnel erosion or piping when used for earthworks (tracks, dams etc.)

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Sodic Soils

- All sodic soils are dispersive but not all dispersive soils are sodic
- Cation Exchange Capacity (CEC) (K^+ , Na^+ , H^+ , Ca^{++} , Mg^{++} , Al^{+++}) dominated by sodium (Exchangeable Sodium Percentage - ESP)
- Fluting is a common indicator of sodic soils



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Management in Soil

- (1) Expose only by necessity
- (2) Cover with non dispersive soil or substitute before applying further treatments (erosion controls) or revegetation
- (3) Soil Amelioration:
 - Gypsum application can significantly improve soil stability (dry preferred to liquid form)
 - Blending best approach at application rates 5 – 35 t/ha

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Management in Water

- Turbid water in sediment basins etc.
- Require flocculants to enhance settling and improve water clarity:
 - Gypsum (calcium sulphate) - ~50mg/L
 - Alum (aluminium sulphate)
 - Poly Aluminium Chloride (PAC)
 - Poly Acrylamide (PAM, i.e. Zetag)
 - Other proprietary compounds (Phoslock)

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Image: Strategic Environmental and Engineering Consulting (SEEC)



Sediment pond following 4-hours flocculation with 'Ultrion'