Making sediments speak

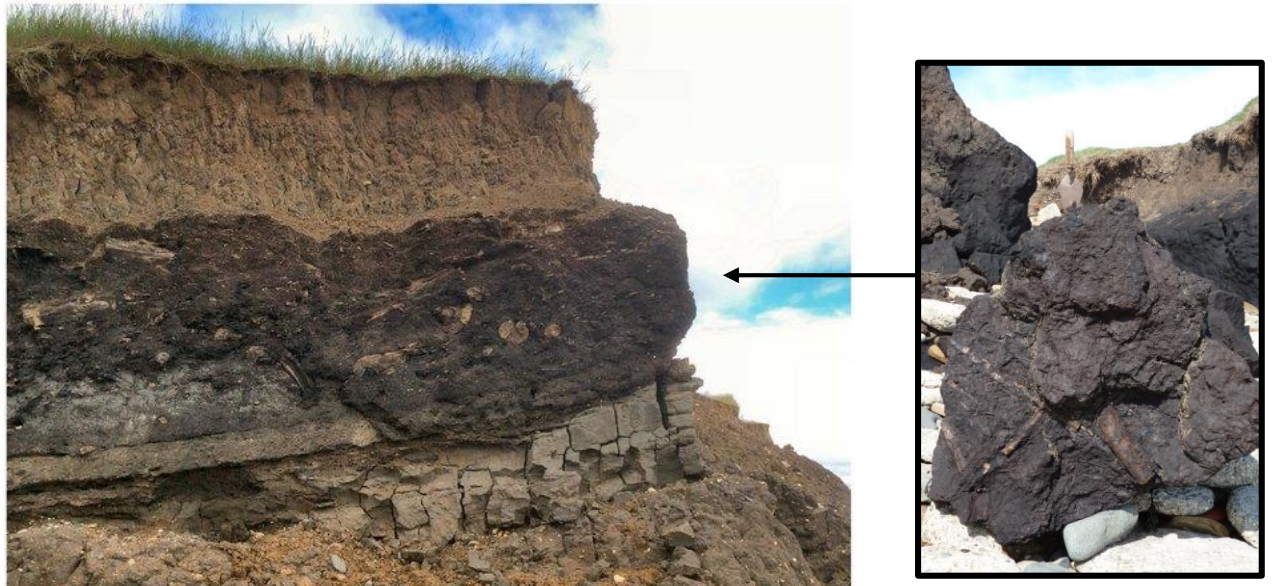
Soil core © Vale of Pickering Research Trust

Artist's reconstruction of Starr Carr © Dominic Andrews

Clue 1: Organic or mineral?

Layers of clay (grey, sticky) and peat (brown, spongy), Starr Carr, N Yorkshire

(© Vale of Pickering Research Trust)



Layers of clay (grey) and peat (brown) Skipsea Withow Mere (a former lake), E. Yorkshire
(© Cadman et al. 2018, *Yorkshire Archaeological Journal*)

Clue 2: If organic, is it well-preserved or humified?

- Different degrees of preservation allow us to 'read' the depth and duration of waterlogging

Peat bog, Lancashire ('Mosslands')

Well-preserved, fibrous peat
= has remained wet to within 20 cm of surface

Partially decomposed, amorphous peat
= has humified on exposure to air

Clue 3: If mineral, what is the texture?

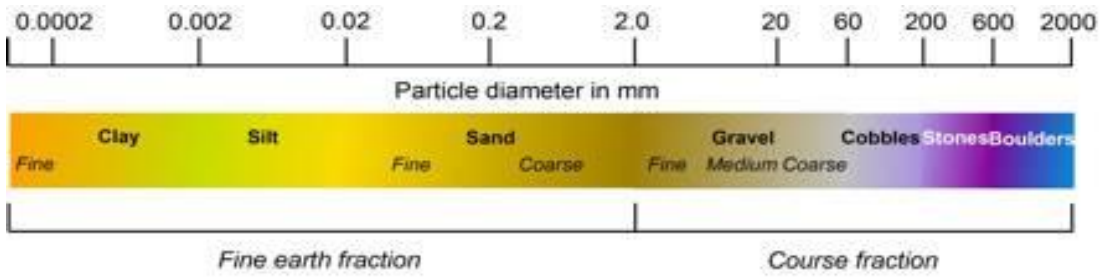
- Texture = particle-size (amount of sand, silt, and clay)
- Texture allows you to 'read' the energy of the thing that deposited the sediment

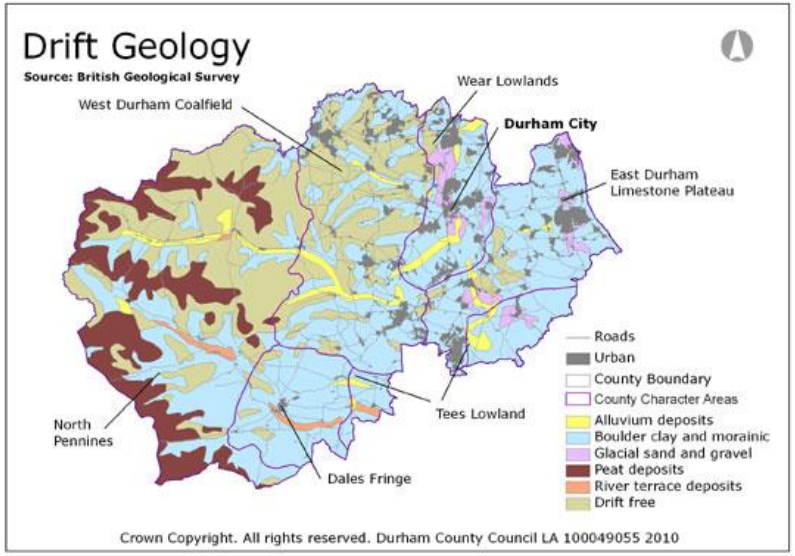
  (e.g. water. wind, gravity, glaciers, people = 'agents' of deposition)

Low energy ⟷ Moderate energy

Clayey Textures

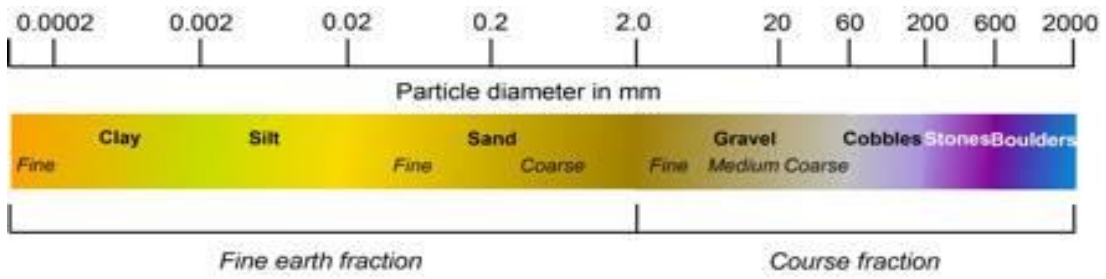
- Particle size: less than 0.002 mm in diameter
- Feels: very sticky and mouldable when wet
- Depositional environment in water: very calm water (very low energy)
- E.g. large, still basins such as lakes





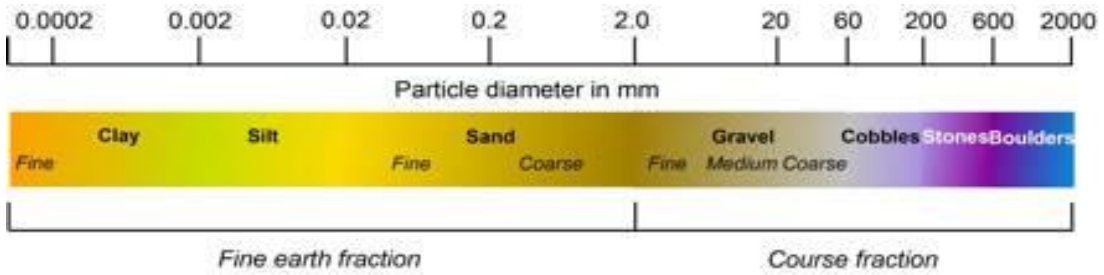
Silty Textures

- Particle size: 0.002-0.05 mm in diameter
- Feels: very slippery (soapy) when wet
- Depositional environment in water: calm water (low energy)
- E.g. Lakes, wetlands, floodplains, slow (low gradient) rivers



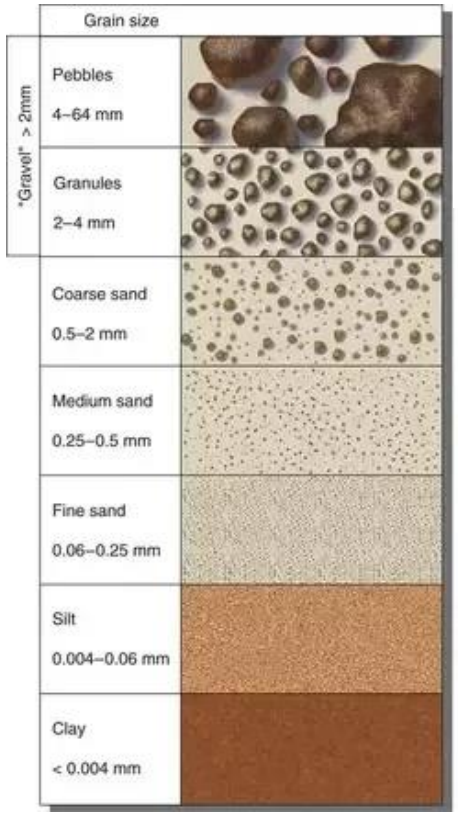
Sandy Textures

- Particle size: 0.05-2 mm in diameter
- Feels: gritty (like sugar)
- Depositional environment in water: flowing water (moderate energy)
- E.g. Gently flowing rivers

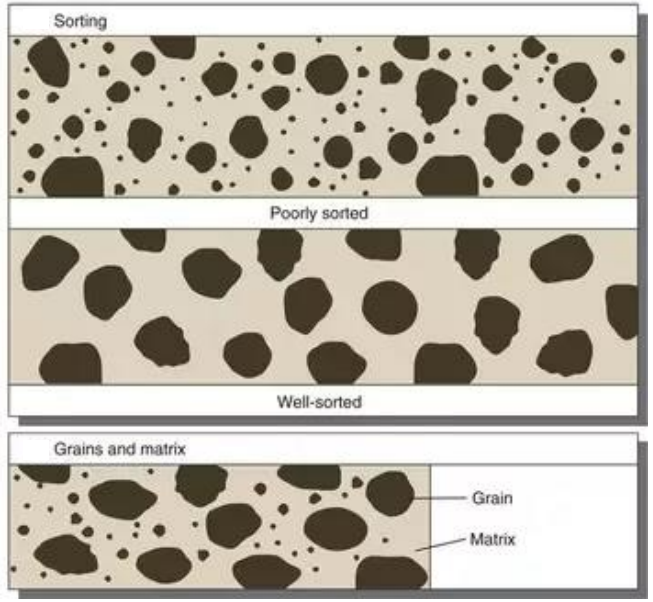


Loamy Textures

- Particle size: mixture of sand, silt, and less than 40% clay
- Feels: crumbly but forms a ball or ribbon when wet
- Poorly sorted, so is not deposited by water
- A common texture for soils

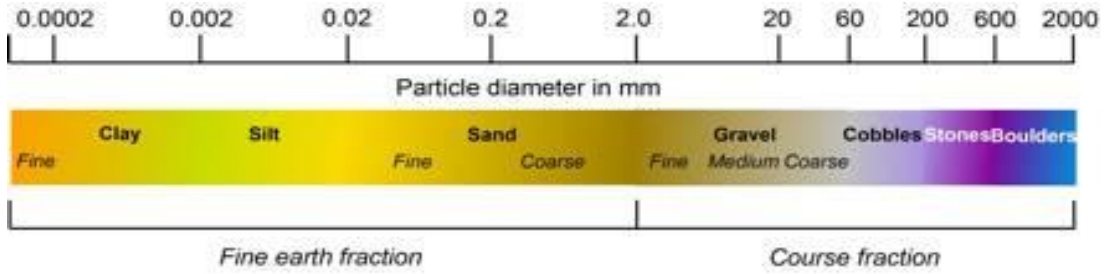


Degree of 'sorting'



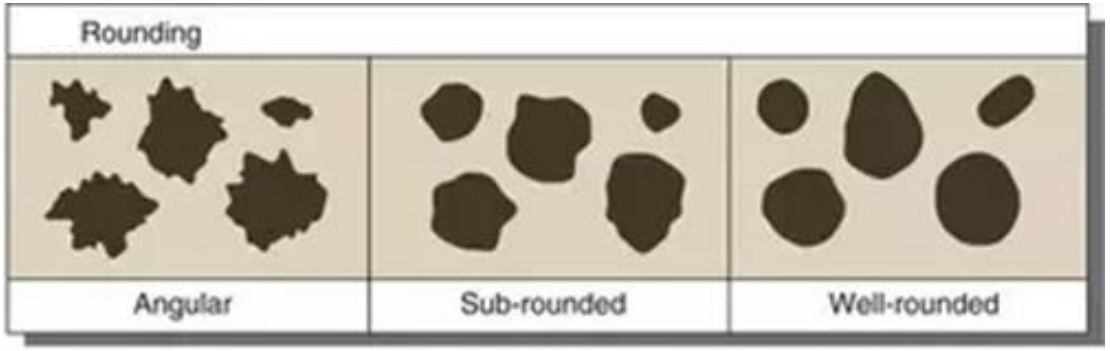
Gravel (Pebbles)

- Particle size: 2-60 mm in diameter
- Depositional environment in water: flowing water (high energy)
- E.g. Swiftly flowing rivers



Clue 4: Particle shape

- Degree of rounding allows us to 'read' how the particles were deposited (the 'agent' of deposition), or what has affected them later (e.g. ploughing)



Glaciers, gravity, people ⟷ Water

Clue 5: Colour

- Colour allows us to 'read' aspects of composition (e.g. how much organic matter or iron) and how wet or dry the environment was

Brown-Black hues

= organic matter

Reddish hues

= iron oxides

Grey-blue hues

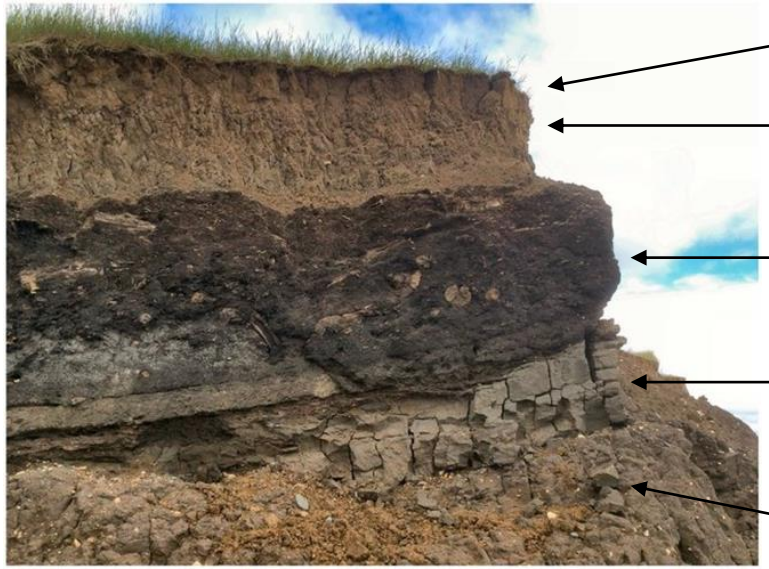
= waterlogging (gleying)

Mottled grey/red

= fluctuating wet /dry

Clue 6: Sediment layers and soil horizons

- Sequences of soils and sediments allow us to 'read' how environments changed over time



Profile through Skipsea Withow Mere, E. Yorkshire, caused by coastal erosion

Organo-mineral loam = topsoil (stable)

Minerogenic loam with a sharp lower interface = soil erosion (colluvium)

Peat containing wood = forests on fluctuating lake margins

3300-3080 cal BC

9400-9200 cal BC

Silty clay = lake bed (lacustrine mud)

Boulder clay = glacial till deposited when ice sheets melted at the end of the last Ice Age

Small-group discussion activity 1: Be a mud detective

The borehole challenge

Depth BGL	Description
0.00-0.10	Grass, roots, dark brown sandy silty clay
0.10-0.55	Mid grey brown silt sand loam
0.55-0.85	Light to mid buff grey brown soft sandy clays
0.85-0.90	Mid yellow orange fine soft silty sandy clays
0.90-1.50	Mid orange grey brown soft silty sandy clays. Ground water encountered at 1.20 m
1.50-2.20	Light to mid blue grey silty organic clays with pale banding
2.20-2.70	Mid grey buff soft to moderate clay sands with pea gravel inclusions
2.70-2.80	Mid orange heavily compacted rounded sands and gravels, well sorted
2.80-3.70+	Mid grey brown hard clays with small stone and coal inclusions

Decipher the six clues you have learned about to 'read' this borehole sequence and determine how the landscape has changed over time