Glossary of Soil-related terms

Information paper

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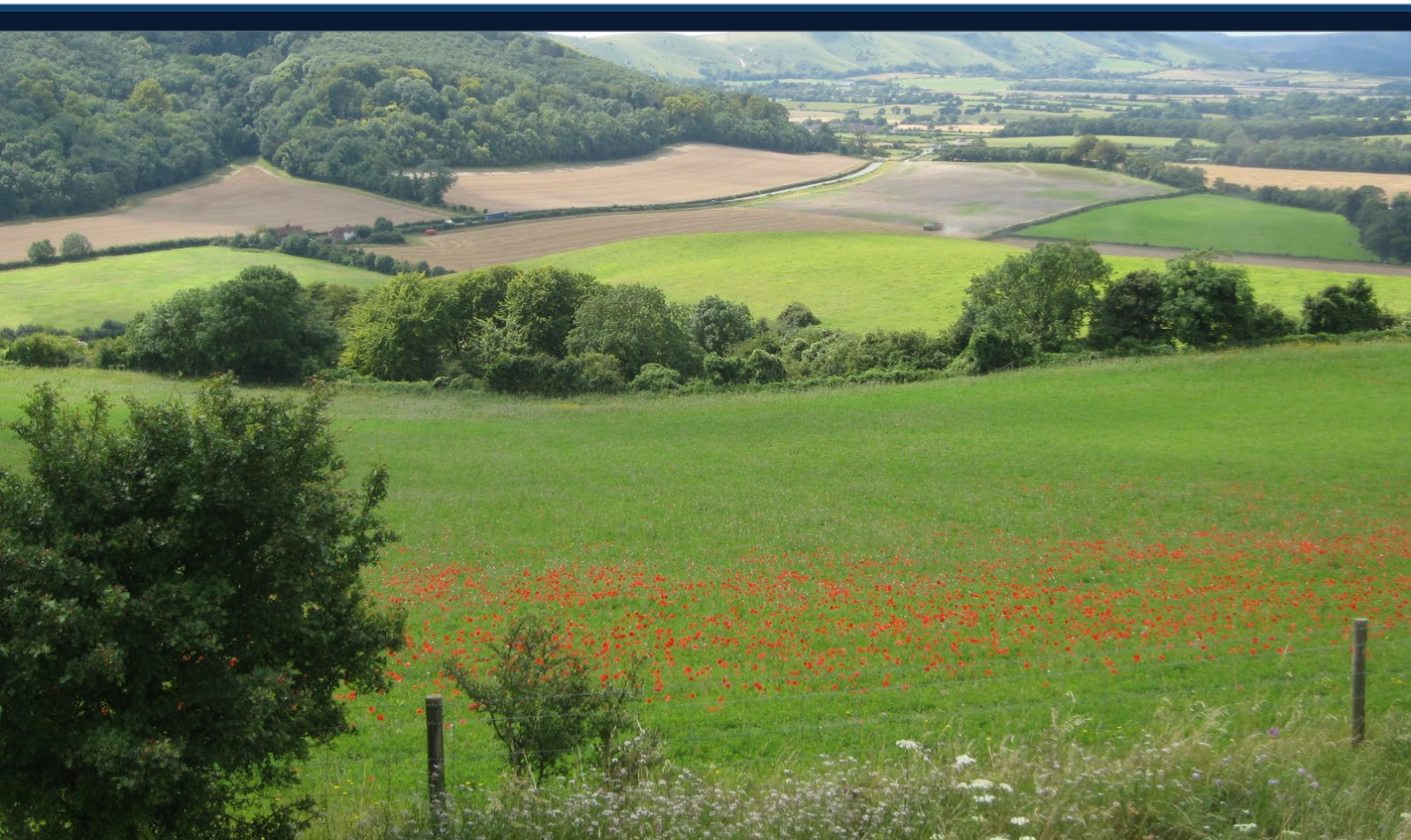

Glossary of Soil–related terms

This glossary seeks to explain in non-technical language some of the common terminology used by soil scientists.

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Aerated soil
An aerated soil is a soil with a good movement of air through the soil structure. The opposite is a wet waterlogged soil.

Aggregates
Soil aggregates are soil 'lumps' of a range of sizes.

Alluvium
Alluvium is a deposit made by a river or running water. This leads to an 'alluvial deposit' forming in the water. Alluvial soils are rich agricultural lands. Glaciers may also deposit sedimentary material, see 'glacial till'.

Anaerobic soils
Anaerobic soils have very little oxygen present - for instance the wet, waterlogged, marshy soils in a bog. While anaerobic conditions are important for some processes, such as bacterial reduction of nitrate to nitrogen, these conditions can also produce hydrogen sulphide, methane and other undesirable substances.

Available soil water
This refers to the total amount of water in the root zone that is available for evapotranspiration, usually expressed in mm.

Bearing capacity
This is effectively the weight a soil can withstand before severe damage occurs to the structure of the soil. Bearing capacity varies throughout the year, for instance a very heavy tractor that causes no damage on dry soils may cause a lot of damage to the soil structure of wetted soils.

Buffering capacity
Buffering capacity is the ability of the soil to reduce high alkalinity or acidity levels coming perhaps from pollution (e.g. acid rain). Chalky or limestone soils for instance are very alkaline and can neutralise acids more effectively than acid, peat soils.

Bulk density
The dry mass of soil per unit bulk volume of soil. Expressed as Kg/m^3 or g/cm^3.

Clay
That mineral fraction of the soil with particles smaller than 0.002 mm in diameter.

Effective rainfall (or efficient rainfall)
The rainfall useful for meeting plant water requirements. This does not include water percolating down to aquifers, or surface runoff of water.

Effective rooting depth
The soil depth from which a fully grown plant can easily extract most of the water needed for transpiration.

Erosion
Erosion is the wearing away of land or soil through one or more processes. The main causes of erosion include the actions of water (rills, inter-rill, gully, snowmelt and river and lake bank erosion), wind (dessication and wind-blow), translocation (tillage, land levelling, harvesting of root crops, trampling and burrowing animals) and geological (internal subterranean erosion by groundwater, coastal erosion and landslides). Erosion can also be increased by poor land management such as overgrazing, deforestation or inappropriate use of mechanisation (e.g. ploughing down a hill slope).

Eutrophication
Eutrophication describes the process where a waterbody, such as a lake or a soil solution, becomes loaded with dissolved nutrients. This can be natural but is often due to pollution. Algal blooms can remove oxygen in the water, harming fishlife.

Evaporation
This is the rate of water loss from liquid to vapour (gaseous) state from an open water, wet soil or plant surface, usually expressed in mm day^{-1}.

Evapotranspiration
The process by which water passes from a liquid to a vapour (gaseous) state through transpiration from vegetation, and evaporation from soil and plant surfaces. The rate of evapotranspiration is usually expressed in mm day^{-1}.

Field capacity
Field capacity describes soil when it is completely wetted (excepting free drainage), and where there is plenty of water for plant roots. This occurs after ample irrigation or rainfall, when the rate of downward movement of water has substantially decreased, usually 1-3 days after rain or irrigation. It is expressed as a mass or volume fraction of soil water or a depth of water per metre of soil or mm m^{-1}.

Geology
Solid material from which most soil is formed, characterised by the horizon symbol ‘R’ for rock. Soil may lie on top of the geology it came from – but not always, such as where ancient glaciers pushed the soil along. Geology is also a scientific field concerning the study of rock.

Glacial till
Glacial till is sediment deposited by a glacier. The till is a jumble of rocks and finely ground material which was carried and deposited by the glacier, leaving an unstratified soil of varying composition.

Gley soils
Gley (or gleyed) soils are soils developed under conditions of poor drainage, resulting in reduction of iron and other elements and also in a typical grey/blue soil colouring. There are two main types of gley soil:
- surface water gleys where water saturating the soil comes from surface drainage and
- ground water gleys where saturation is due to fluctuating groundwater levels. A third type, ‘unripened’ gley soil forms in brackish flooding conditions (tidal creeks).

Horizon
One of the layers that form in the soil profile as a result of soil-forming processes. A horizon can appear as a marked visible layer, more usually horizons boundaries are more subtle. In garden soils and where there has been much soil movement these layers may be lost or harder to observe.

Humus
Organic matter, also called 'humus', forms from the decay of leaves, plants and other life.

Infiltration
Infiltration is the movement of water from the surface down into the soil before moving down to the aquifers, or out to rivers. A portion of soil water may also be lost via the process of evapotranspiration.

Infiltration rate
The infiltration rate is the speed at which water can pass into the soil. You can imagine that with wet clay, this is slower than with dry sand.

Leaching
Leaching is the process where soluble materials (including nutrients and salts) in the soil are washed down the soil profile by water.

Loam
Loam is a soil which contains clay, silt and sand as well as organic material. Keen gardeners love loam - it's the best soil for potting plants and growing seeds in the greenhouse. Loamy soils are ideal also for agricultural crops.

Marl
Marl is a calcareous clay, comprising about 30 to 65 % calcium carbonate ($CaCO_3$). Marl is most often found in old fresh water basins, swamps, or as the sediment of shallow lakes.

Organic material
Organic matter, also called 'humus', forms from the decay of leaves, plants and other life.

Overland flow
When rain falls to the ground, some evaporates away again, or is taken in by plants, and some water flows down into the soil. Some, however, will flow off across the soil surface towards the river by overland flow.

Oxidation
Oxidation is the addition of oxygen, removal of hydrogen, or the removal of electrons from an element or compound. In the environment, organic matter is oxidized to more stable substances. Oxidation is the opposite of 'reduction'. Oxidation of organic matter is termed 'burning', and that of iron 'rusting'.

Pan
A pan is a well-defined layer forming in the soil. There are two common types; a 'plough pan' which builds up in-field just below plough depth, and an 'iron pan' which forms naturally by iron oxide accumulations deposited in acid gley soils. Pans can impede the passage of water through the soil which in an agricultural context can lead to problems if uncorrected.

Parent material
Soil parent material refers to the rocks which were weathered to form the soil in the first place. Usually the parent material is below the soil, but it can be distant if glaciers translocated the soils during the ice ages. Parent material is the focus of the study of geology.

Peat
Peat is a type of soil formed in waterlogged conditions from incompletely decomposed plant material. Peat forms in wetlands or peatlands, also commonly called bogs, moors, mires, swamps and fens. Peat develops very slowly at a rate of some 1mm per year.

Pedology
The science of studying soils and their interaction with the wider environment.

pH
pH is a measure of acidity; standing for Potenz Hydrogen. It is measured from 1 (acid) through 7 (neutral) to 14 (alkaline) expressed on a logarithmic scale. Most soil is about pH 3 to 8.

Photosynthesis
Photosynthesis is a process in plant cells in which the sun's energy is used to join carbon dioxide and water to make sugar, the food of green plants.

Podsol
A Podsol, or Podzol, is a soil with a profile having distinctive horizons of a bleached lower topsoil and cemented iron oxide 'pans' in the subsoil. Podsols are common in heathland and coniferous, or boreal, forests where there are temperate to cold moist climates.

Pores
A soil pore is the hole in-between particles of soil that can become filled with air or water.

Precipitation
Precipitation means water reaching the ground from both rainfall, snow and hail.

Preferential flow
If the soil is cracked and fissured then the water can pass quicky down these 'preferential' pathways. Cracks can form in drying clay soils, or beside plant roots. When rain falls to the ground, some water evaporates away again, or is taken up by plants, and some water flows off the surface towards the river. Some, however, seeps down through the soil towards the water table. Normally this water soaks through the soil and this can be quite slow depending on the soil type.

Profile
The soil profile is a column of soil, essentially three-dimensional and large enough to be used to characterise the soil condition at a particular place.

PSC
PSC or Particle Size Class. Soil particles are divided into classes according to their size. Soils differ by having different proportions of particles in each of these classes. In the UK, these classes are expressed as clay having particle sizes of less than 0.002 mm, silt being 0.002 – 0.06 mm, fine sand being 0.06 – 0.2 mm, medium sand being 0.2 – 0.6 mm and course sand being 0.6 – 2.0 mm. Other differing classification systems are also used, such as in the USA.

Reduction
Reduction is the addition of hydrogen, removal of oxygen, or the addition of electrons to an element or compound. Under anaerobic conditions (where there is no dissolved oxygen present) such as in 'gley' soils, sulphur compounds are reduced to odour-producing hydrogen sulphide (H_2S) and other compounds. Reduction is the opposite of oxidation.

Runoff
Runoff occurs as water falling as precipitation does not soak deep into the soil, but passes across the surface and through the near-surface towards the rivers.

Saline soil
Soil containing sufficient soluble salts to interfere with plant growth.

Sand
That mineral fraction of the soil with particles from 0.063 - 2.0 mm in diameter
- fine sand: 0.063 - 0.212 mm in diameter
- medium sand: 0.212 - 0.6 mm in diameter
- coarse sand: 0.6 - 2.0 mm in diameter

Sediment
Sediment is a deposit of 'alluvium' laid down in water (such as lakes or the sea). Sediments can, over time, form rocks such as chalk and limestone.

Silt
That mineral fraction of the soil with particles from 0.002 - 0.063 mm in diameter
- fine silt: 0.002 - 0.006 mm in diameter
- medium silt: 0.006 - 0.02 mm in diameter
- coarse silt: 0.02 - 0.063 mm in diameter

Smectites
Smectites are mineral particles in clay soils. Smectites are disc-like in shape and can slide across one-another. Smectitic clays are associated with shrinking and swelling that can cause foundation subsidence to buildings.

Sodic soil
A soil with sufficient exchangeable sodium (alkali) to interfere with plant growth and cause dispersion and swelling of clay minerals.

Soil
Soil is a combination of four constituents: mineral material (sand, silt, clay and rock particles), organic material, air and water. Soil is made from the breaking down of rocks and organic matter by physical, chemical and biological processes.

Soils Acidity
Most soils are of a pH from about 5.5 to 8, this is a large range but some soils can be pH 3 (see pH), which is very acidic.

Soil minerals
These refer to the trace elements found in soil - also called nutrients.

Soil sealing
Soil sealing occurs through the destruction or covering of soil by buildings, or types of artificial material which may be very slowly permeable to water (e.g. asphalt or concrete). Soil sealing can cause rapid overland flow after precipitation where water cannot soak away leading to potential flooding.

Specific Heat Capacity
A substance's Specific Heat Capacity (or SHC) refers to the amount of heat which is required in order to increase its temperature. Measured in 'joules per kilogram kelvin', or J/(kg·K), it is specifically the amount of heat energy in joules needed to increase the temperature of one kilogram of the substance by one kelvin.

Structure
Soil structure is the 'architecture' of soil - how it is constructed and made up. The structure is the aggregation of primary soil particles into units separated from each other by surfaces of weakness. An individual natural soil aggregate is called a ped, in contrast to a clod caused by disturbance, or a concretion caused by cementation.

Substrate
An inclusive term for the soil used when describing, for instance, the portion in which plant roots exist.

Texture
The description of the balance in the soil between the constituents including sand, silt and clay as well as organic matter. With experience, texture can be established by touch.

Topsoil
Topsoil is the surface layer of soil containing partly decomposed organic debris, and which is usually high in nutrients, containing many seeds, and is rich in fungal mycorrhizae. Topsoil is usually a dark colour due to the 'organic matter' present. In arable land, 'topsoil' refers to the soil down to plough depth.

Transpiration
The process whereby plants lose water by evaporation of liquid water at the surface of the stomatal cells, the water vapour diffusing out through the leaf via the stomata openings.

Water holding capacity
Can the soil hold lots of water like a sponge? If so it has a large 'water holding capacity'. Soil organic matter increases the water holding capacity. Pure running sand has a low water holding capacity.

Waterlogged soil
A waterlogged soil is wet, with lots of water in the pores of the soil structure. The opposite is a aerated soil.

Weathering
The process by which materials are broken down into smaller parts and ultimately their constituents. An example is 'freeze thaw' expansion and cracking. There are physical, chemical and biological weathering processes.

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