

Chapter IX

Soil Profile

The vertical section of the soil showing the various layers from the surface the unaffected parent material is known as a soil profile. Soil profile is the key for the soil classification and also forms the basis for the practical utility of soils. A soil profile is an historic record of all the soil forming factors and processes which keeps the snap shot of soil development. It forms a unit of study in pedological investigations and is an important tool for soil classification.

Horizons : The various horizontal layers observed in the soil profile are known as horizons. Soil horizons are of two types- genetic horizons and diagnostic horizons. Genetic horizons can be broadly classified in to three categories:

1. Master horizons
2. Transitional and combination horizons
3. Subordinate distinction within master horizons

1. Master horizons :- The capital letters are used to represent the master horizons. Earlier there were only six master horizons (O, A, E, B, C, R); Recently, Soil Survey Staff added one more horizons W, which means unfrozen water layer. Theses horizons may again be divided into sub horizons like A1, A2, A3 etc.

‘O’ horizon – Dominated by organic matter on the surface of mineral soil

It is called as organic horizon. It is formed in the upper part of the mineral soil, dominated by fresh or partly decomposed organic materials. The organic horizons are commonly seen in forest areas and generally absent in grassland, cultivated soils.

- **O₁or O_i (only slightly decomposition) :** Organic horizon in which the original forms of the plant and animal residues are can be recognized through naked eye.
- **O₂or O_e (intermediately decomposition) :** Organic horizon in which the original plant or animal matter cannot be recognized through naked eye.
- **O₃or O_a (highly decomposition) :** Organic horizon in which the plant or animal residues are highly decomposition.

‘A’ horizon – Accumulation of humified organic matter closely mixed with mineral fractions

The surface soil or that layer of soil at the top which is liable to leaching and from which some soil constituents have been removed is known as horizon A or the horizon of eluviation. Horizon of organic matter accumulation adjacent to surface and that has lost clay, iron and aluminium.

- **A₁** : Top most mineral horizon formed adjacent to the surface. There will be accumulation of humified organic matter associated with mineral fraction and darker in colour than that of lower horizons due to organic matter
- **A₂ or E (Eluviation)** : Horizon of maximum Eluviation of clay, iron and aluminium oxides and organic matter. Loss of these constituents generally results in accumulation of quartz and other sand and silt size resistant minerals. Generally lighter in colour and has less organic matter than horizons above and below. This horizon is also called as a horizon of eluviation.
- **A₃ (AB/EB)** : A transitional layer between A and B horizons with more dominated properties of A₁ or A₂ above than the underlying B horizon. It is sometimes absent.

‘B’ horizon – Deposition of silicate clays, Fe, Al, humus carbonate

The intermediate layer in which the materials leached from horizon A have been re-deposited is known as horizon B or the horizon of illuviation. Horizon in which the dominant features are accumulation of clay, iron, aluminium or humus alone or in combination. Coating of sesquioxides will impart darker, stronger of red Colour than overlying or underlying horizons.

- **B₁** : A transitional layer between A and B. More like A than B
- **B₂ (Illuviation)** : Zone of maximum accumulation of clay, Fe and Al oxide that may have moved down from upper horizons or may have formed in situ. The organic matter content is generally higher and Colour darker than that of A₂ horizon above
- **B₃** : Transitional horizon between B and C and with properties more similar to that of overlying B₂ than underlying C

‘C’ horizon - Mineral layered lattice affected by pedogenic process

The parent material from which the soil is formed is known as horizon C. It is the horizon below the solum (A + B), relatively less affected by soil forming processes. It is outside the zone of major biological activity. It may contain accumulation of carbonates or sulphates, calcium and magnesium.

- **C_r** : Weathered or soft bed rock
- **C_w** : Change in structure or colour
- **C_n** : Strong cementation of various materials (sodium)
- **C_y** : Accumulation of gypsum

‘R’ (Consolidated bed rock) - Underlying consolidated bed rock and it may or may not be like the parent rock from which the solum is formed. Strongly cemented to indurate bedrocks such as granite, basalt, quartzite, lime stone, sandstone.

‘W’ (Water layer) – This symbol indicates water layers within or beneath the soil. The water layer is designated as Wf, if it is permanently frozen.

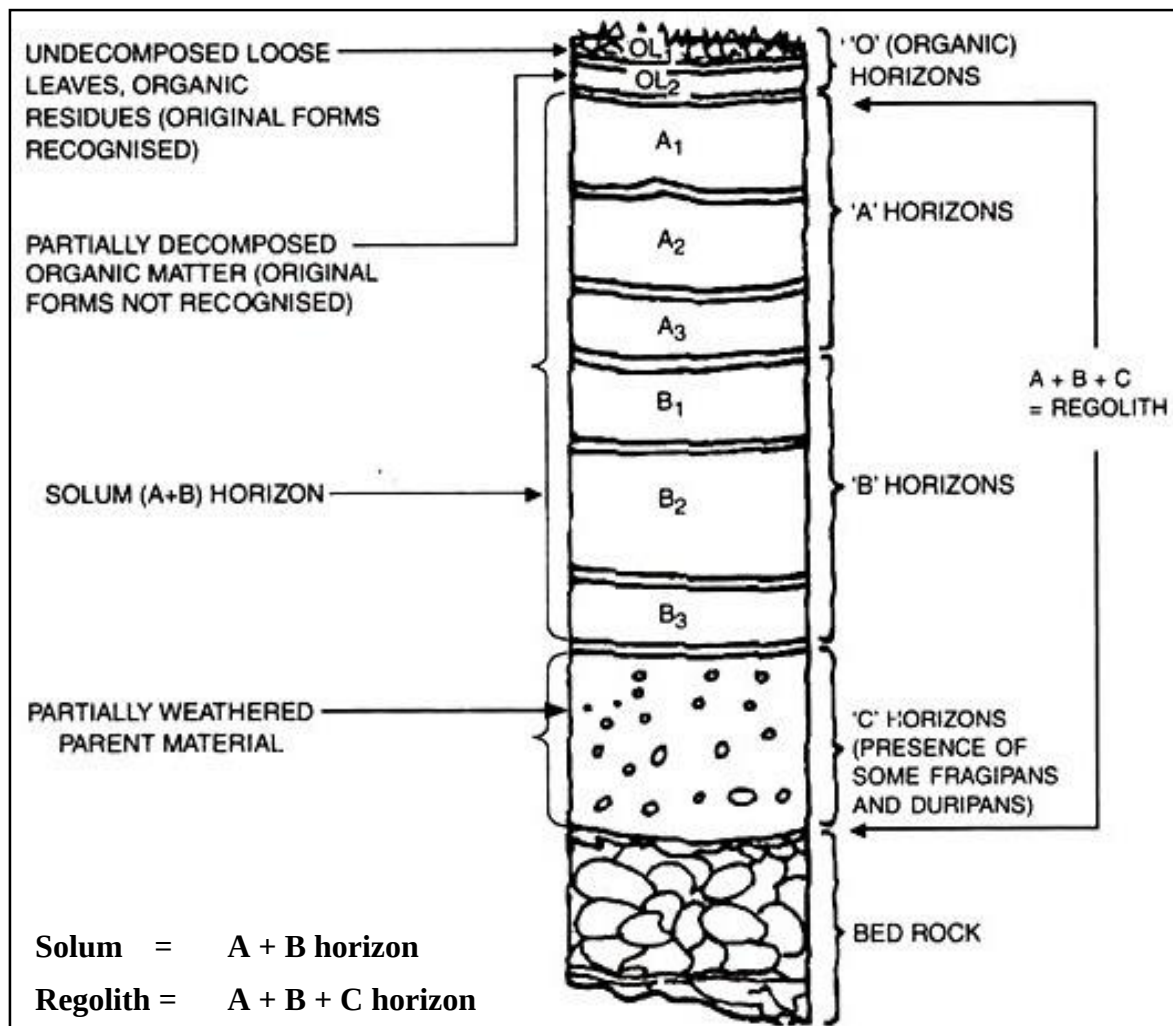


Figure : Hypothetical diagram of soil profile

- Transitional and combination horizons** :- Horizon dominated by properties of one master horizon but having subordinate properties of another e.g. AB, EB, BE etc is called a transitional horizon. For example, an AB horizon has characteristics of both A and B horizons, but it is more like the A horizon than the B horizon.

Combination horizon is comprised of two distinct parts that have recognizable properties of the two kinds of master horizons e.g. A/B, B/E, B/C etc. The first symbol indicates horizon with the greater volume than another.

- Subordinate distinction within master horizons** :- Lower case letters are used as suffixes to designate specific kind of master horizons and layers. The term “accumulation” is used in many of the definitions of such horizons to indicate that these horizons must contain more of the material in question than is presumed to have been present in the parent material. The suffix symbols and their meaning are as follows:

- a : highly decomposed organic material
- b : buried genetic horizons
- c : concretions or nodules
- d : physical root restriction
- e : organic material of intermediate decomposition
- f : frozen soil or water
- ff : dry permafrost
- g : strong gleying
- h : illuvial accumulation of organic material and sesquioxide
- i : slightly decomposed organic material
- j : accumulation of jarosite
- jj : evidence of cryoturbation
- k : accumulation of carbonates
- m : cementation or indurations
- n : accumulation of sodium
- p : tillage or other disturbances
- q : accumulation of silica
- r : weathered or soft bed rock
- s : illuvial accumulation of sesquioxide and organic matter
- ss : presence of slickensides
- t : accumulation of silicate clay
- v : plinthite
- w : development of colour and structure
- x : fragipan characteristics
- y : accumulation of gypsum
- z : accumulation of salts more soluble than gypsum