

chresard (available water).

Gravitational water: Water percolates deep into the soil due to the gravitational force of the Earth that constitutes groundwater. It is not available to plants.

Chemically bound water: Water present in the form of hydrated oxides of iron, aluminium, silicon, etc. is described as chemically bound water and is not available to plants.

Soil profile

Over time, the localized physical, chemical and biological processes in the **regolith** (the layer of unconsolidated solid material above the bedrock) lead to the development of observable layers in the soil, called **horizons**. Each horizon differs in physical, chemical and biological characteristics. Together, the horizons in a particular location give each soil a **distinctive soil profile** (i.e. **sequence of horizons from the surface down**). It is evident when a vertical cut is made through the soil. Since the separations between each horizon are rarely distinct, these horizons described actually form a continuum in the soil profile.

A typical soil profile usually has four horizons. Each main horizon is denoted by a **capital letter** (O, A, B, C). Although there is some variation exists between different classification systems, the widely accepted horizon classification of the soil profile is given below. The following horizons are listed by their position from top to bottom within the soil profile. A typical soil profile which is made up of four major horizons – **one is the organic (O horizon)**, and **three are mineral horizons (A, B and C horizons)**. The **O horizon lies at the soil surface; where organic matter accumulates**.

- O (O stands for organic matter), made up of large amounts of organic material in varying stages of decomposition.
- A (referred as *topsoil*), the topmost mineral horizons, rich in humus and dark in color. In older, well-developed soils, an E (being short for *eluviated*) horizon occur between the A and B horizons. It is used to label a horizon that has been significantly leached of its mineral and/or organic content, leaving a pale layer largely composed of silicates (zone of maximum leaching of minerals or **eluviation**).
- B (referred as *subsoil*) little organic material and chemical composition are largely that of the underlying rock; also referred to as *illuviated* horizon or the *zone of accumulation* since minerals from above tend to concentrate here. The B horizon may be divided into B1, B2 and B3 types
- C (referred as *parent rock*), made up of weakly weathered parent material sit on unaltered **bedrock (R)**.

Figure 1.1 The soil profile is a vertical section of the soil that depicts distinct observable layers called horizons. The soil profile extends from the soil surface to the parent rock material i.e. bedrock. A typical soil profile usually has four horizons. Each main horizon is denoted by a capital letter (O, A, B, C).

O horizon
Loose and partly decomposed organic matter

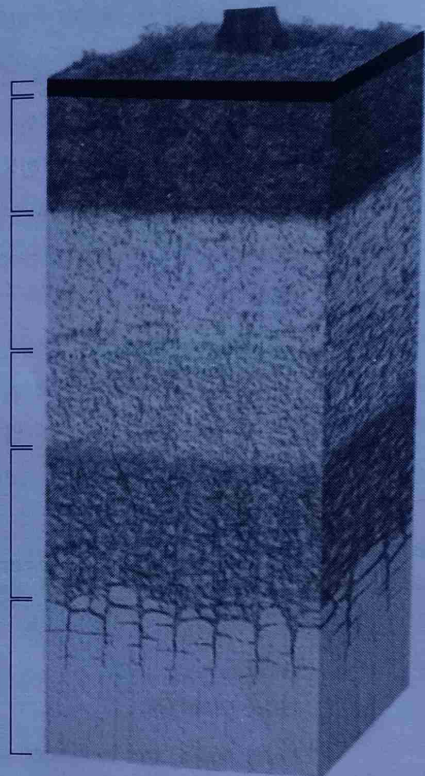
A horizon
Mineral matter mixed with humus

E horizon
Light colored mineral particles, zone of eluviation

B horizon
Accumulation of mineral transported from above

C horizon
Partially altered parent material

R horizon
(Bedrock)



The soil profile and the relative thickness of the horizons are generally characteristic for different climate, the type of vegetative cover and different topographical situations. For example, in grassland soil humification is rapid, but mineralization is slow. In forest soil litter and root decay slowly. Hence humus layer is narrow, but mineralization is rapid so B horizon is broad.

Soil erosion

Soil erosion is a process of detachment of soil particles, their transportation from one place to another and deposition elsewhere through water, wind, gravity, snow and other forces. Soil erosion involves three steps:

1. Detachment of soil particles from the main soil body.
2. Their transportation.
3. Their deposition at another places.

The major factors which cause soil erosion are rainfall, vegetation destruction, freezing and thawing, water flow and wind velocity. Numerous factors affect soil erosion depending upon the local conditions with regard to physical, chemical and biological nature of the soil. The major factors affecting the soil erosion are climate, topography, physical, chemical and biological characteristics of the soil, vegetation cover and land use.

Air and Atmosphere

Air is a mixture of gases that make the atmosphere. The

Figure 1.

Atmosphere
Based on
Earth's atmosphere is divided into layers - troposphere, stratosphere and thermosphere moving up from Earth's surface. The region of the atmosphere from the Earth's surface to an altitude of 8 to 18 km is the troposphere. The troposphere is the sphere (up to an altitude of ~85 km) a