

LECTURE 10

SOIL PROFILE

A vertical section of soil through all its horizons and extending in to the parent material.

A vertical exposure of the horizon sequence is termed as "soil profile".

Theoretical Soil Profile

	O _i : Organic, slightly decomposed
	O _e : Organic, moderately decomposed
	O _a : Organic, highly decomposed
	A: Top Mineral layer, mixed with humus, dark in color
	E: Horizon of max. eluviation of silicate clays, sesquioxides etc.,
	AB or EB: Transition to B, more like A or E than B.
	BA or BE: Transition to A or E, more like B than A /E.
	B: Illuviated B horizon, with clear expression
	BC: Transition to C, more like B than C.
	C: Zone of least weathering, accumulation of Ca, Mg carbonates, cementation, may be high bulk density
	R: Bed Rock

A soil horizon is a layer of soil, approximately parallel to the soil surface, differing in properties and characteristics from adjacent layers below or above it.

Soil profile is an historic record of all the soil forming processes and it forms the unit of study in pedological investigations. Practically, soil profile is an important tool for soil classification which is applicable for thorough understanding of the soils.

Five master horizons are recognized in soil profile and are designated using capital letters O, A, E, B and C. Sub-ordinate layers or distinctions within these master horizons are designated by lower case letter e.g., a, e, i, t, k etc.

O Horizons:(Organic) It comprises of organic horizons that form above the mineral soil. They result from litter derived from dead plants and animals. 'O' horizons usually occur in forested areas and are generally absent in grassland regions.

A - Horizon: It is the top most mineral horizon. It contains a strong mixture of decomposed (humified) organic matter, which tends to impart a darker color than that of the lower horizons.

E - Horizon: It is an eluviated horizon. Clay and sesquioxides are invariably leached out, leaving a concentration of resistant minerals such as quartz. An 'E' horizon is generally lighter in color than the 'A' horizon and is found under 'A' horizon.

"B" – Horizon : (Illuvial) The sub-surface 'B' horizons include layers in which illuviation of materials has taken place from above and even from below. In humid regions, the B horizons are the layers of maximum accumulation of materials such as sesquioxides and silicate clays. In arid and semi-arid regions Ca CO_3 , Ca SO_4 and other salts may accumulate in the B horizon.

'C' – Horizon: It is the unconsolidated material underlying the 'Solum' (A & B). It may or may not be the same as the parent material from which the solum formed. The 'C' horizon is outside the zones of major biological activities and is generally little affected by the processes that formed the horizons above it.

'R'- Layer : Underlying consolidated rock, with little evidence of weathering.

Sub – Ordinate Distinctions with in Master Horizons:

p: plough layer disturbance

h : illuvial accumulation of organic matter

n : accumulation of sodium

t : accumulation of silicate clays

s : illuvial accumulation of organic matter and sesquioxides

y : accumulation of gypsum

z : accumulation of soluble salts

Differences Between Surface and Sub -surface soils

SURFACE SOIL	SUB-SURFACE SOIL
<ol style="list-style-type: none"> 1. Soil up to a depth 30cm 2. Physically loose and granular 3 More porosity 4. More organic matter content 5. Biological activity is more 6. Mostly manipulated zone 7. Root activity is more 8. It is completely weathered 9 most of the essential nutrients are present in available form 	<p>Soil layers beyond 30cm depth</p> <p>Comparatively compact</p> <p>Less porosity</p> <p>Less organic matter content</p> <p>Microbial activity is less</p> <p>Relatively un manipulated</p> <p>Comparatively less excepting in cases of long duration / perennial crops</p> <p>It is partially weathered</p> <p>Less content of essential nutrients in available form.</p>

LECTURE 11

SOIL PHYSICS :Soil Physics is a branch of Soil Science dealing with physical properties of soil, as well as with the measurement, prediction and control of different processes taking place in and through the soil.

SOIL PHYSICAL PROPERTIES: The physical properties include texture, structure, density, porosity, consistency, temperature, colour and water content. The physical properties depend on the amount, size, shape and arrangement and mineral composition of its particles , kind and amount of organic matter and the volume and form of its pores and the way they are occupied by water, air at a particular time.

SOIL TEXTURE : Soil texture may be defined as the relative proportion of particles of various sizes (Soil separates / Mechanical fractions) such as sand, silt and clay. It is almost a permanent property of the soil and may change slowly with time.

Textural components and their properties: Soil contains various sized particles; some of which (Gravels, Stones, Cobbles and Boulders) obviously do not behave like soil, but are reported (

volume fraction and size range) if occupy enough of soil volume to influence soil physical processes significantly. Conventionally the particles smaller than 2.0 mm diameter are considered as soil material.

Soil Separates	ISSS system (mm)	USDA system (mm)
* Very Coarse Sand	--	2.00 – 1.00
* Coarse Sand	2.00 – 0.20	1.00 – 0.50
* Medium Sand	---	0.50 – 0.25
* Fine Sand	0.20 – 0.02	0.25 – 0.10
* Very Fine Sand	--	0.10 – 0.05
* Silt	0.02 – 0.002	0.05 – 0.002
* Clay	< 0.002	< 0.002

ISSS : International Society of Soil Science

USDA : United States Department of Agriculture

Gravel / Pebbles : 2.0 – 75.0 mm

Cobbles(Round) / Flags (Flat) : 75.0 – 250.0 mm

Stones: 250.0 - 600 mm: Boulders- >600mm

Nature and Properties of Soil Separates

Stones, cobbles and Gravel: Because of their sizes, function as separate particles. Stones, cobbles and gravel may be more or less rounded, irregularly angular or even flat.

Sand: Sand particles may be rounded or irregular with quite jagged surfaces depending on the abrasion they receive. These particles exhibit no plasticity and stickiness and hence less influenced by changes in moisture content. Their water holding capacity is low, percolation rate is high and facilitate good drainage and good air movement. Soils dominated by sand and other particles bigger than sand are invariably open, loose and in friable condition. As these fractions