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# **ASAC 1101 : FUNDAMENTALS OF SOIL SCIENCE (2+1)**

**Level : B.Sc (Ag), I semester**

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**Topic**

**Soil profile**



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# Soil Profile:

- **Five soil forming factors cause different set of layers (horizons).**
- **Each soil is characterized by a given sequence of these horizons.**
- **A vertical exposure of this sequence is termed a soil profile.**

O horizon  
(loose and partly  
decayed organic  
matter)

A horizon  
(mineral matter  
mixed with some  
humus)

E horizon  
(light colored  
zone of leaching)

B horizon  
(accumulation  
of clay from  
above)

C horizon  
(partially altered  
parent material)

unweathered  
parent material



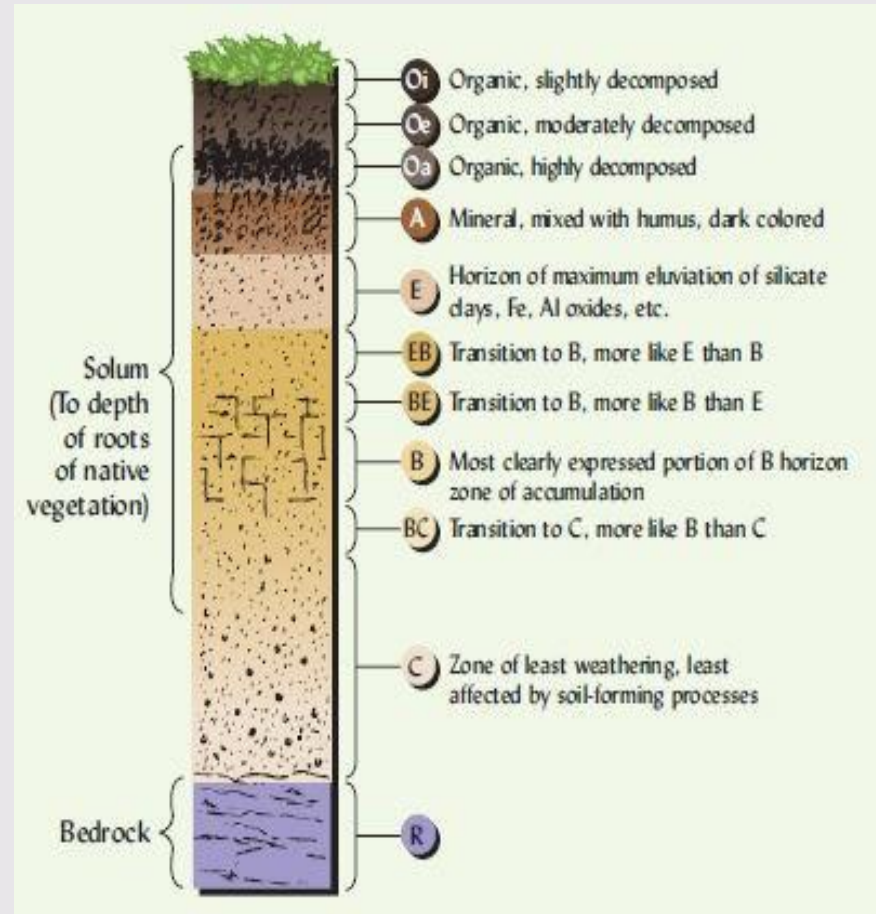


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# The Master horizons and layers:

- Six **master** soil horizons are commonly recognized and are designated using the capital letters
- O, A, E, B, C, and R.
- Subhorizon horizons may occur within a master horizon these are designated by lowercase letters following the capital master horizon letter
- e.g., Bt, Ap, or Oi





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## **O Horizon:**

- **Organic horizon.**
- **Found above the mineral soil.**
- **Occur in an organic soil profile.**
- **Commonly referred to as the forest floor.**

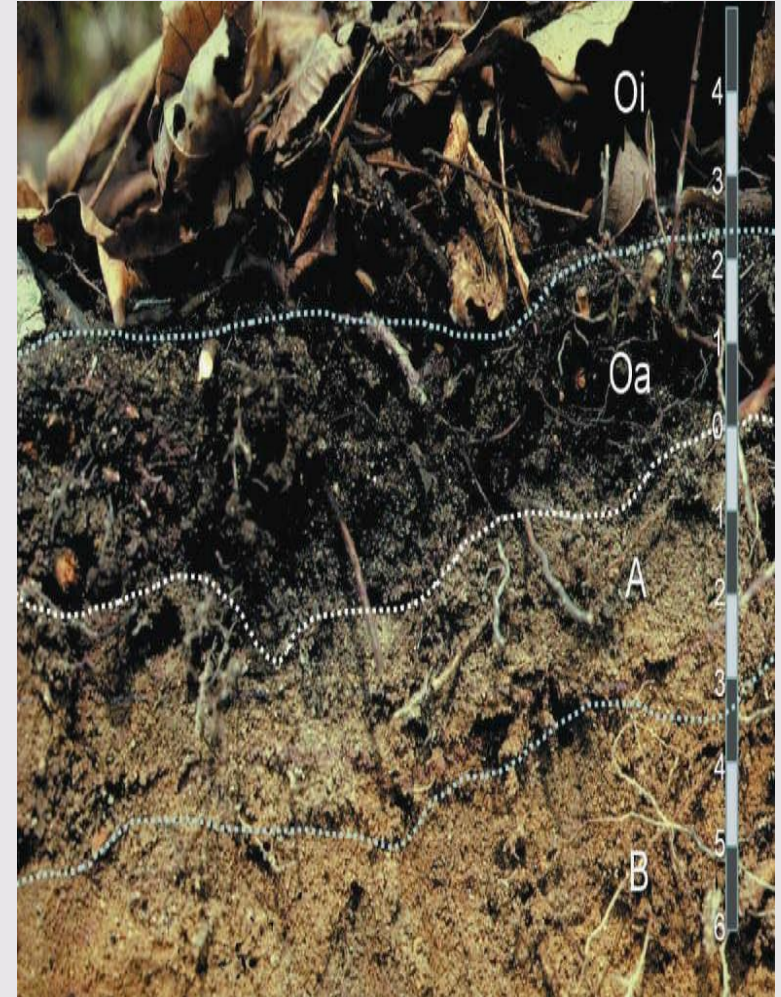


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Often has three subhorizons:

1. **Oi horizon - fibric materials— recognizable plant and animal parts.**
2. **Oe horizon - hemic materials—finely fragmented residues intermediately decomposed.**
3. **Oa horizon - sapric materials—highly decomposed, smooth, amorphous residues.**



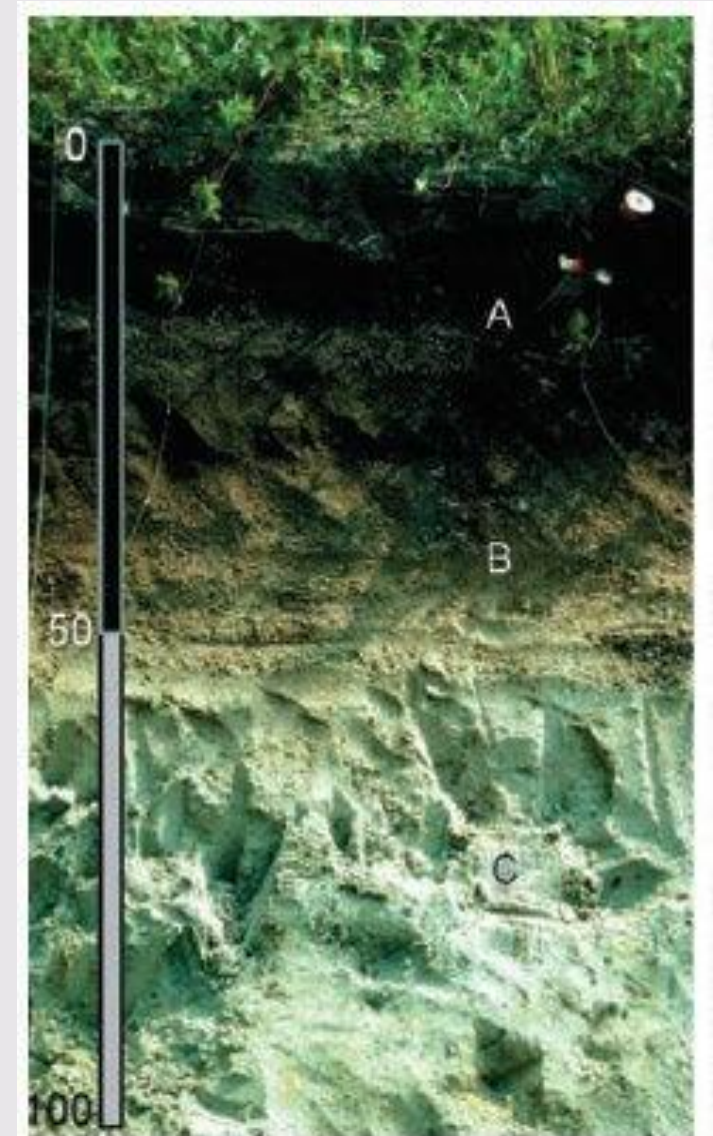


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# A Horizon:

- The topmost mineral horizons.
- Generally contain enough partially decomposed organic matter
- Soil color is darker than that of the lower horizons.



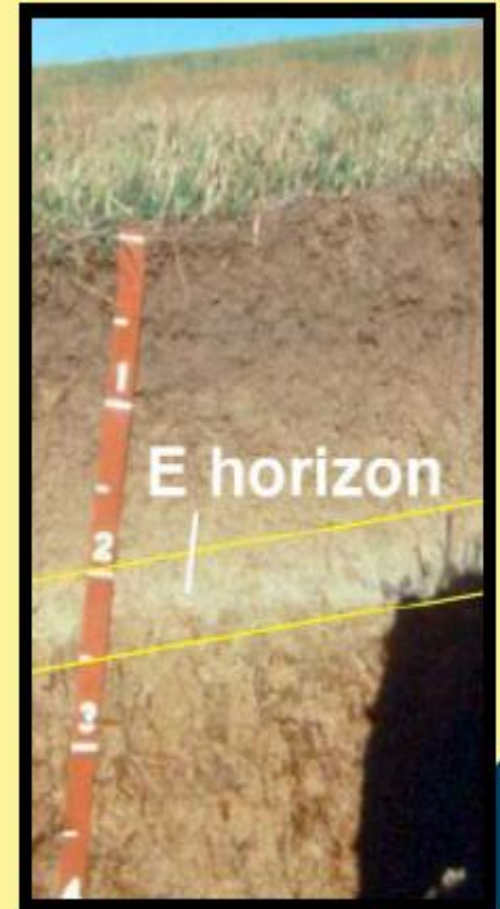


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## E horizon:

- Zones of maximum leaching or *eluviation* of clay, iron, and aluminum oxides.
- Leaves a concentration of resistant minerals, such as quartz, in the sand and silt sizes.
- Usually found underneath the A horizon and in forest soil, directly under O horizon.
- Generally lighter in color than both the A horizon above it and the horizon below.





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## B horizon:

- B horizons form below an O, A, or E horizon.
- Materials have accumulated, typically by washing *in* from the horizons above, a process termed illuviation.
- Maximum accumulation of materials such as iron and aluminum oxides and silicate clays (Bt horizons)- In humid region.
- Calcium carbonate or calcium sulfate may accumulate in the B horizon (giving Bk and By horizons, respectively)- In arid and semi-arid region.





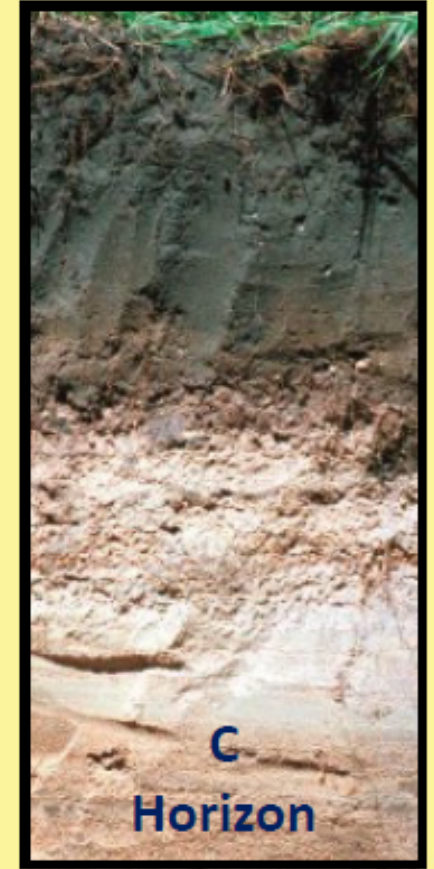


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## C horizon:

- **Unconsolidated material underlying the solum (A and B horizons).**
- **May or may not be the same as the parent material from which the solum formed.**
- **C horizon material that retains some of the structural features of the parent rock or geologic deposits from which it formed is termed saprolite**



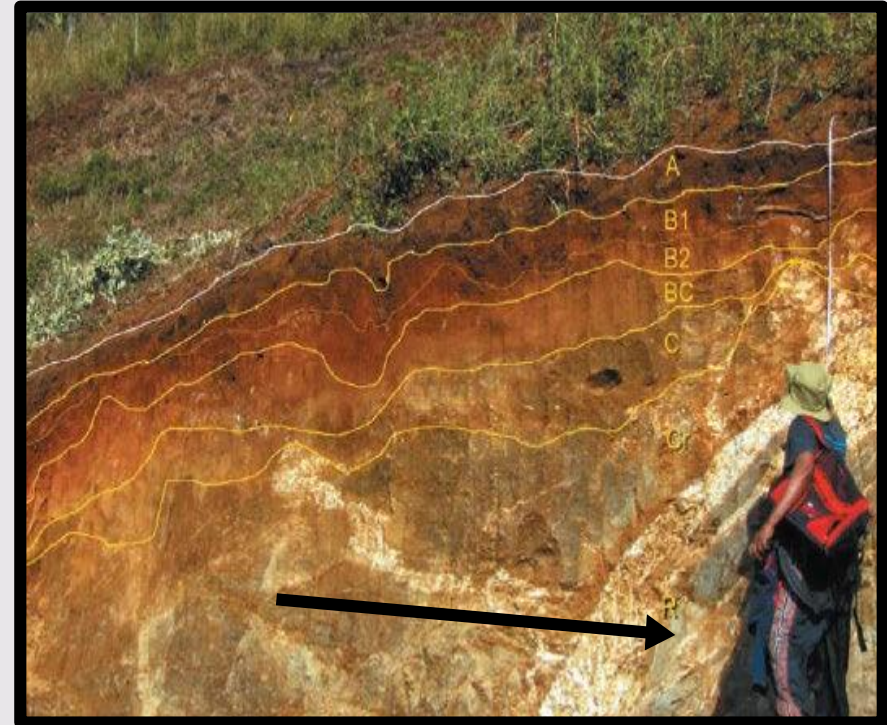


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## R horizon:

- Consolidated rock.
- Little evidence of weathering



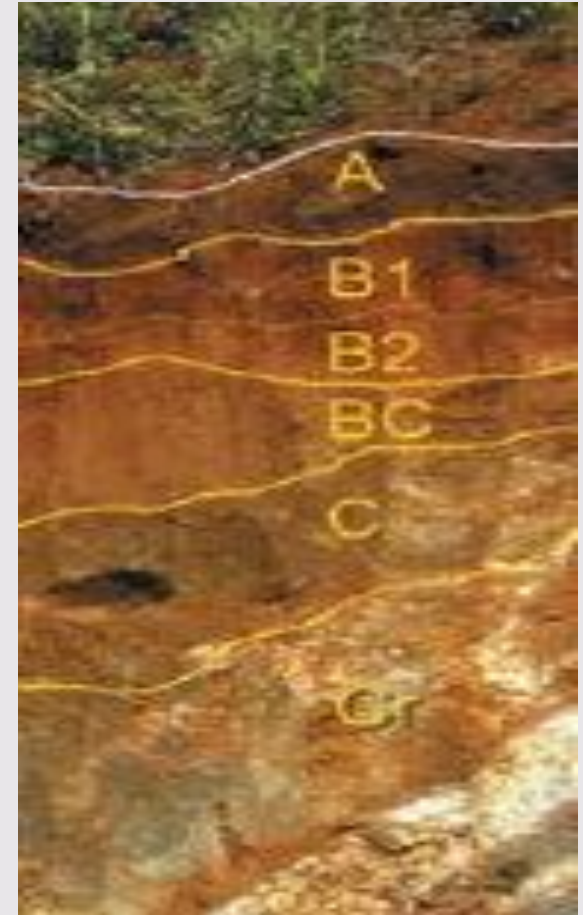


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# Subdivisions Within Master Horizons

- Often distinctive layers exist *within* a given master horizon.
- These are indicated by a numeral *following* the letter designation.
- Three different combinations of structure and colors can be seen in the B horizon, then the profile may include a sequence such as B1–B2–B3





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# Transition Horizons:

- **Transitional layers between the master horizons (O, A, E, B, and C) may be dominated by properties of one horizon but also have characteristics of another.**
- **Written as AE, EB, BE.**
- **E/B when distinct parts of the horizon have properties of E while other parts have properties of B.**



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## **Subhorizon Distinctions:**

- **Since the capital letter designates the nature of a master horizon in only a very general way, specific horizon characteristics may be indicated by a lowercase letter following the master horizon designation.**
- **E.g., Oi – O horizon with slightly decomposed organic matter.**



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## SOME COMMON SUBHORIZON DISTINCTIONS WITHIN MASTER HORIZONS<sup>a</sup>

Lower Case Symbol	Distinction	Lower Case Symbol	Distinction
a	Highly decomposed organic matter	n	Accumulation of sodium
b	Buried soil horizon	o	Accumulation of iron and aluminum oxides
c	Concretions or nodules	p	Plowing or other disturbance
co	Coprogenous earth	q	Accumulation of silica
d	Dense unconsolidated materials	r	Weathered or soft bedrock
di	Diatomaceous earth	s	Illuvial organic matter and iron, aluminum oxides
e	Intermediately decomposed organic matter	se	Presence of sulfides
f	Frozen soil	ss	Slickensides (shiny clay wedges)
ff	Dry permafrost	t	Accumulation of silicate clays
g	Strong gleying (mottling)	u	Human-manufactured artifacts
h	Illuvial accumulation of organic matter	v	Plinthite (high iron, red material)
i	Slightly decomposed organic matter	w	Distinctive color or structure without clay accumulation
j	Jarosite (yellow sulfate mineral)	x	Fragipan (high bulk density, brittle)
jj	Cryoturbation (frost churning)	y	Accumulation of gypsum
k	Accumulation of carbonates	yy	Gypsum >50% of soil by mass
kk	Engulfment of carbonates, >50% of soil by mass	z	Accumulation of soluble salts
m	Cementation or induration		

<sup>a</sup>Based on information in Soil Survey Staff (2014)



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# End of Module I