

# Soil Formation and Morphology Basics

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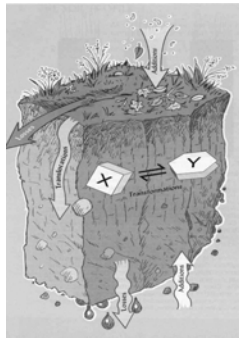
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## Processes

- Additions
- Losses
- Translocations
- Transformations



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## Pedogenesis:

The process of soil formation as the result of the combination of soil forming factors leading to addition, loss, transformation and translocation of materials

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Soil Forming Factors

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Soil Forming Factors

Climate  
Organisms  
Relief  
Parent Material  
Time

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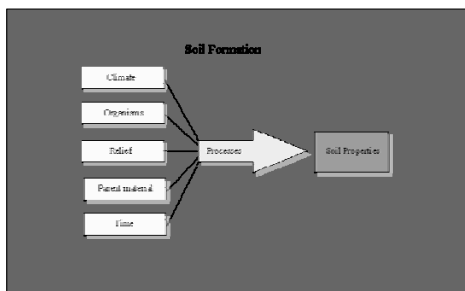
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**Climate**

Climate involves both local (microclimatic) and global (macroclimatic) considerations. The key components of climate in soil formation are moisture and temperature.

Temperature speeds reactions  
Water promotes translocation

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**Organisms**

The soil and the organisms living on and in it comprise an ecosystem. The active components of the soil ecosystem are the vegetation, fauna, including microorganisms, and man.

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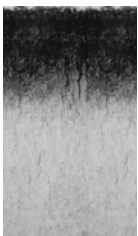
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**Organisms: Vegetation**

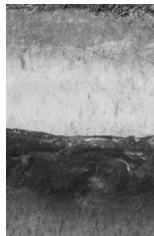
Grassland



Forest



Pineland



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Organisms: Meso-/Macrofauna

- Earthworms
- Termites
- Ants
- Beetles
- Arthropods
- Rabbits
- Moles

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Organisms: microorganisms

- Bacteria
- Virus
- Algae
- Fungi
- Actinomycetes
- protozoa

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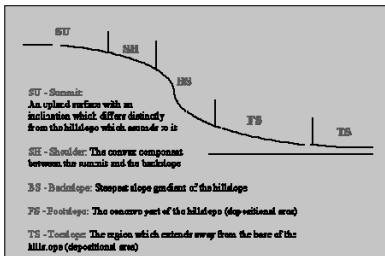
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Relief/Topography

Altitude elevation climate, vegetation type, potential energy  
slope gradient overland and subsurface flow, velocity and runoff rate  
aspect slope direction solar radiation



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### Parent Material

*in situ* weathering of consolidated rock

superficial deposits, which may have been transported by ice, water, wind or gravity

organic sediments

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### Time

Time acts on soil formation in two ways:

- The value of a soil forming factor may change with time (e.g. climatic change, new parent material).
- The extent of a pedogenetic reaction depends on the time for which it has operated.

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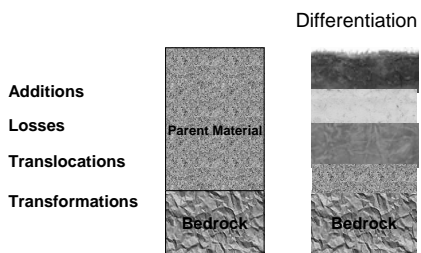
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### Soil as a Natural Body



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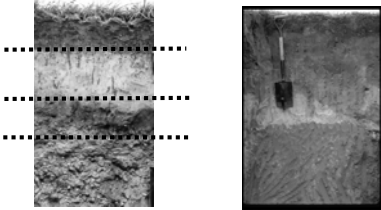
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**Soil Horizons**

Roughly parallel layers in the soil with varying composition and properties



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**The Essentials of Soils**

Soil Profile – 2D representation of a vertical section of soil from the surface to its deepest layers or horizons.



Soil Profile

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**Soil Horizons**

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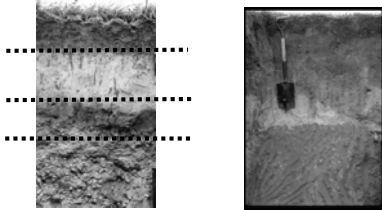
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**Soil Horizons**

Roughly parallel layers in the soil with varying composition and properties



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**Definitions:**

Eluviation: the loss of materials including clays, organic matter, oxides of Fe and Al.

Illuviation: accumulation of materials resulting from eluvial horizons.

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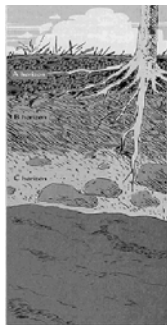
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**Master Horizons**

A horizon [



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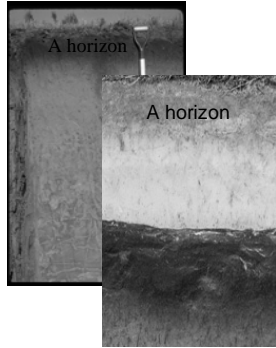
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## The A Horizon

- topsoil/plow layer.
- Accumulates organic material
- Often darker than soil below.
- high in plant roots, biotic activity
- Zone of gas and water exchange



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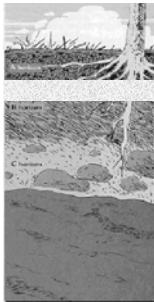
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## Master Horizons

A horizon



E horizon

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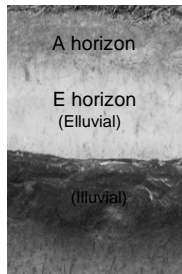
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## The E horizon

- Zone of Eluviation

Eluviation = exit  
Illuviation = into

- Organic matter
- Clay
- Carbonates
- Fe, Al oxides
- color



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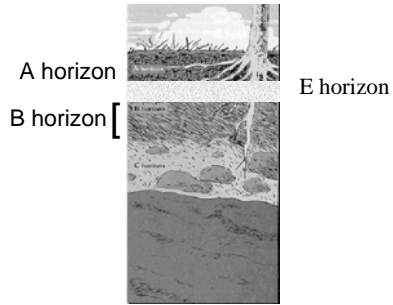
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## Master Horizons



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## The B Horizon

- Accumulates material lost from above, or forms in place. (translocation, transformation)
- Zone of Illuviation (translocation).
- Maximum expression of soil development.
  - clays, O.M., Fe/Al
  - soil structure
  - Strong color development
  - Potentially high reactivity



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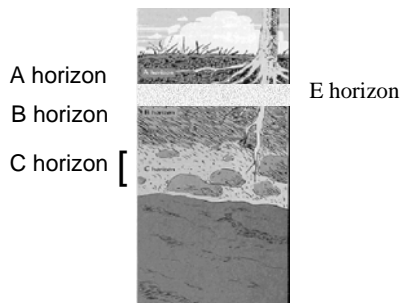
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## Master Horizons



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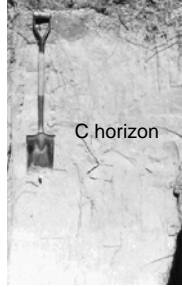
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## The C horizon

- Weakly altered by soil forming processes.
- Closely resembles parent material



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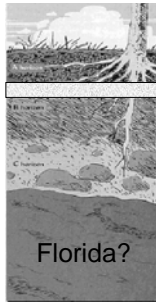
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## Master Horizons

- A horizon
- B horizon
- C horizon
- R Horizon



E horizon

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## The R Horizon

limestone →



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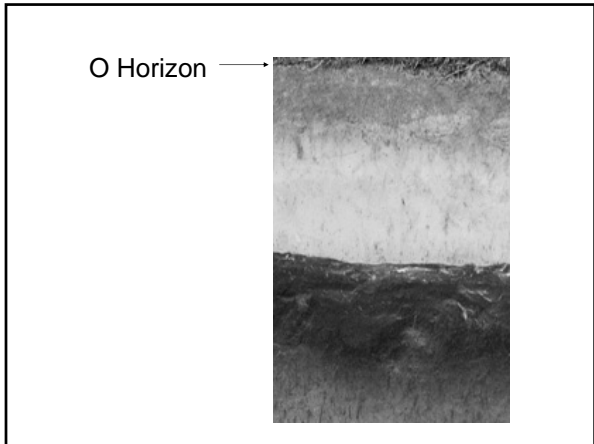
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### The O Horizon

- Surface Horizon
- Organic horizon  
Very high in organic matter  
Usually dark-colored
- Often called peat, muck
- Some are very fertile, valuable
- In some countries, O horizon used as fuel.

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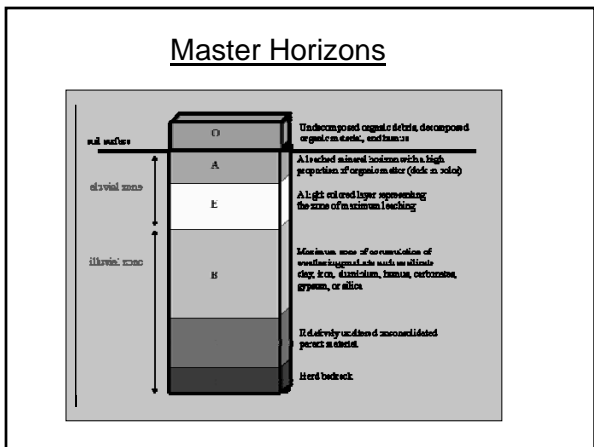
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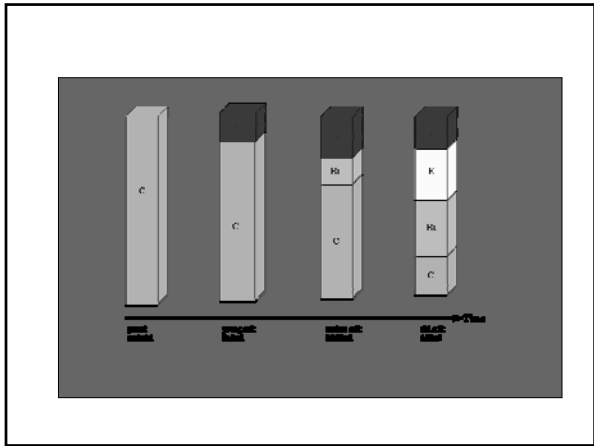
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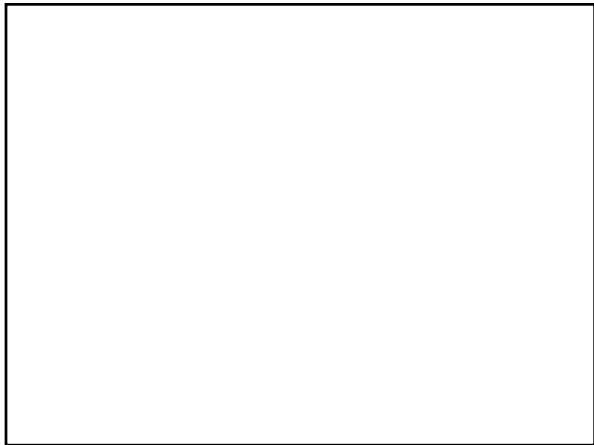
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