

Lecture 4

# Soil Genesis

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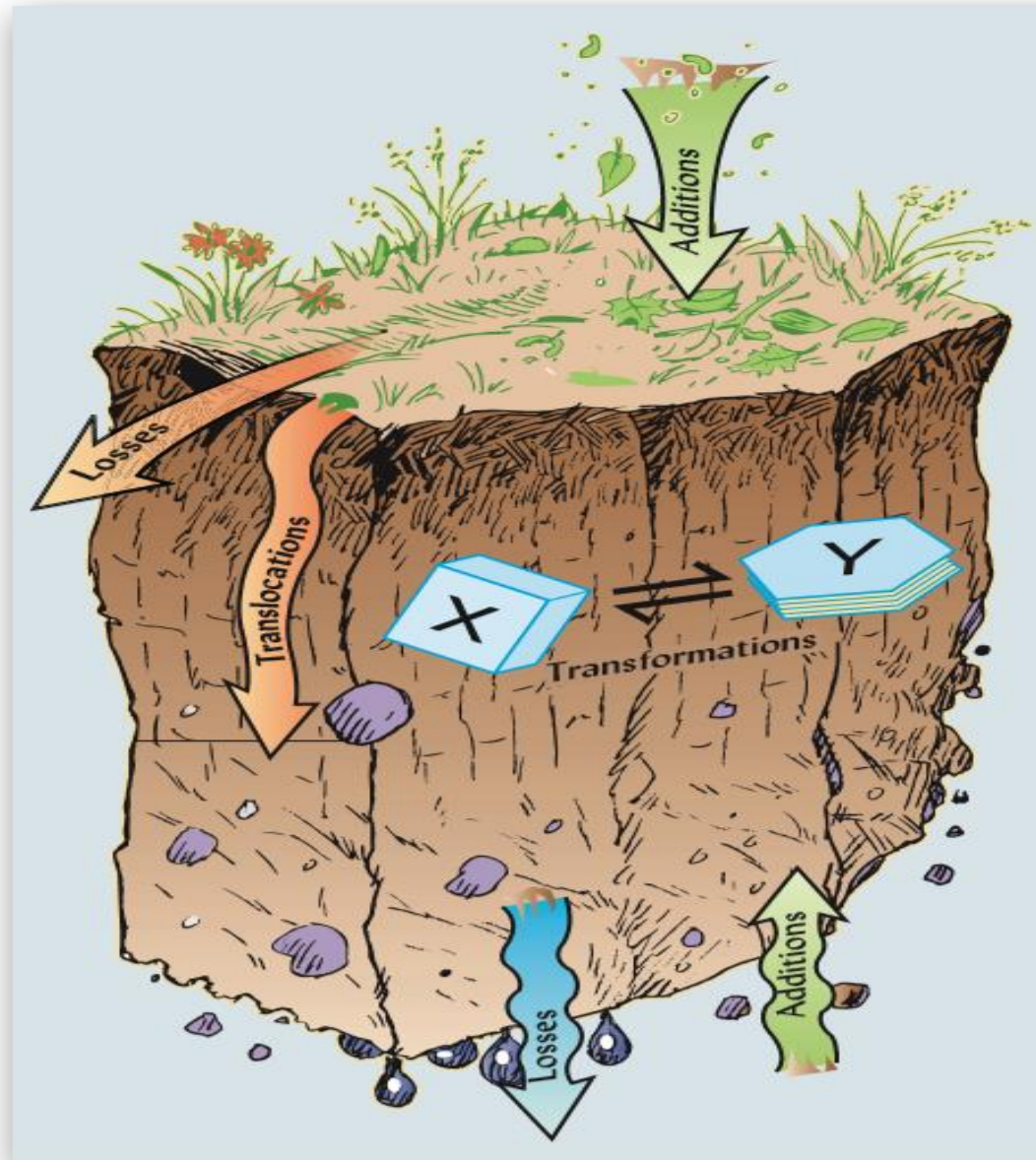
# Soil Forming Process

Transformations

Translocations

Additions

Losses



# Soil Forming Process

## Transformations:

- Chemically and/or physically modification of soil materials.
- Many transformations involve weathering of **primary minerals**, altering some to form various kinds of silicate clays.
- The **decomposition** products recombine into new minerals that include silicate clays and oxides of iron and aluminum.
- Other important transformations involve the **decomposition** of plant root and **litter** to form soil organic matter.
- Transformations may include **change the size** (e.g., physical weathering to smaller particles) and/or **arrangement** (e.g., aggregation) of mineral particles.

# Soil Forming Process

## Translocations:

- Translocations involve the movement of inorganic and organic materials **laterally** within a horizon or **vertically** from one horizon up or down to another.
- Water, either percolating down with gravity or rising up by capillary action, is the **most common translocation agent**.
- The materials moved within the profile include **fine clay particles, dissolved salts, and dissolved organic substances**.
- Translocations of materials by **soil organisms** also have a major influence on soil genesis.
- Important examples include mixing of surface organic litter into the A and B horizons by certain **earthworms**, transport of B and C horizon material to the surface by **termites** and the **rodents**.

# Soil Forming Process

## **Additions:**

- Inputs of materials to the developing soil profile from outside sources are considered additions.
- A very common example is the input of **organic matter** from **fallen plant leaves** and roots.
- Another addition is **dust particles** falling on the surface of the soil.
- In **arid** regions, is the addition of **salts or silica** dissolved in the groundwater and deposited near or at the soil surface when the rising water evaporates.
- **Animals** and **people** can also contribute additions, such as **manure** and **fertilizers**.

# Soil Forming Process

## Losses:

- Materials are lost from the soil profile by **leaching** to **groundwater**, **erosion** of surface materials, and **volatilization** of gases.
- **Evaporation** and **plant use** cause losses of **water**.
- **Leaching** and **drainage** cause the loss of water, dissolved substances such as salts or silica weathered from parent minerals, or loss of organic acids produced by microorganisms or plant roots.
- **Fire** and **biochemical reactions** cause the loss of carbon, nitrogen, and sulfur as gases
- **Erosion**, a major loss agent, often removes the finer particles (humus, clay, and silt), leaving the surface horizon relatively sandier and less rich in organic matter than before.
- **Grazing** by animals or **harvest** by people can remove large amounts of both organic matter and nutrient elements.

# homework

- Which one comes first:
  - Soil forming factors or soil forming processes?  
Explain it why?

Questions??