SOIL HEALTH AND COMPOSTING

Southwest Indiana Homesteading Conference

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Why is soil important?

- ¾ of the earth is water
- ½ of non-water area is desert, swamp, frozen, or mountains
- ¾ of this is too rocky, wet, or not able to grow food

Soil Health and Composting

Components of Soil

Inorganic
- Air
- Water
- Weathered Rock (parent material)

Organic
- Plants (living & dead)
- Animals (living & dead)

Soil is a Living and Breathing Entity

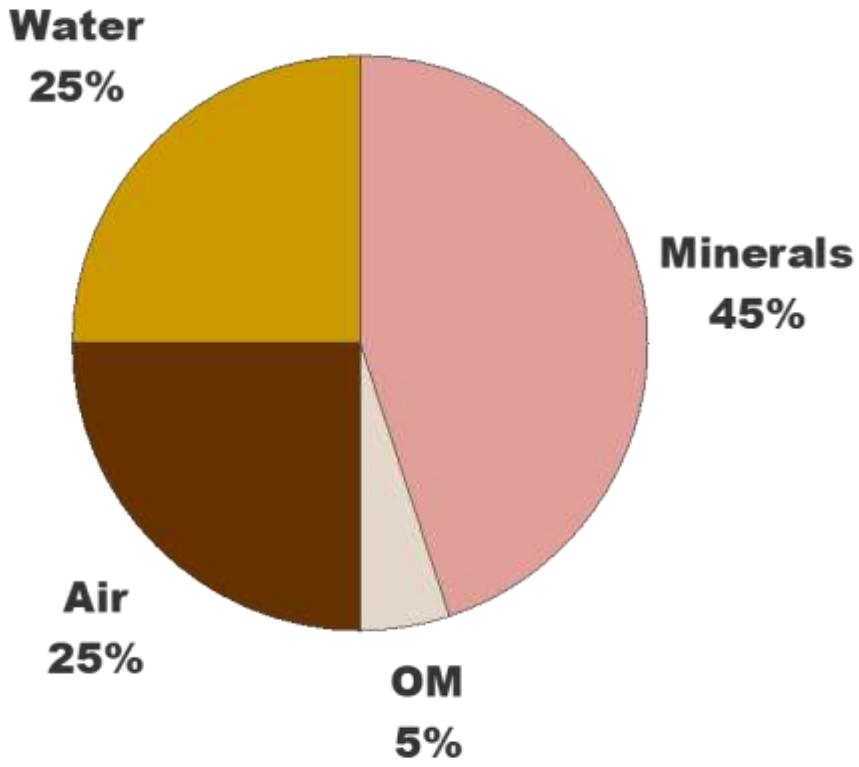

Photo: John Orick

Soil Health and Composting

Soil Horizons

- A soil horizon is a layer of soil, parallel to the soil surface, with characteristics produced by soil-forming processes.
- "A" horizon usually mineral material darkened by organic matter
- "B" horizon the subsoil
  - Usually high in clay
- "C" horizon the parent material

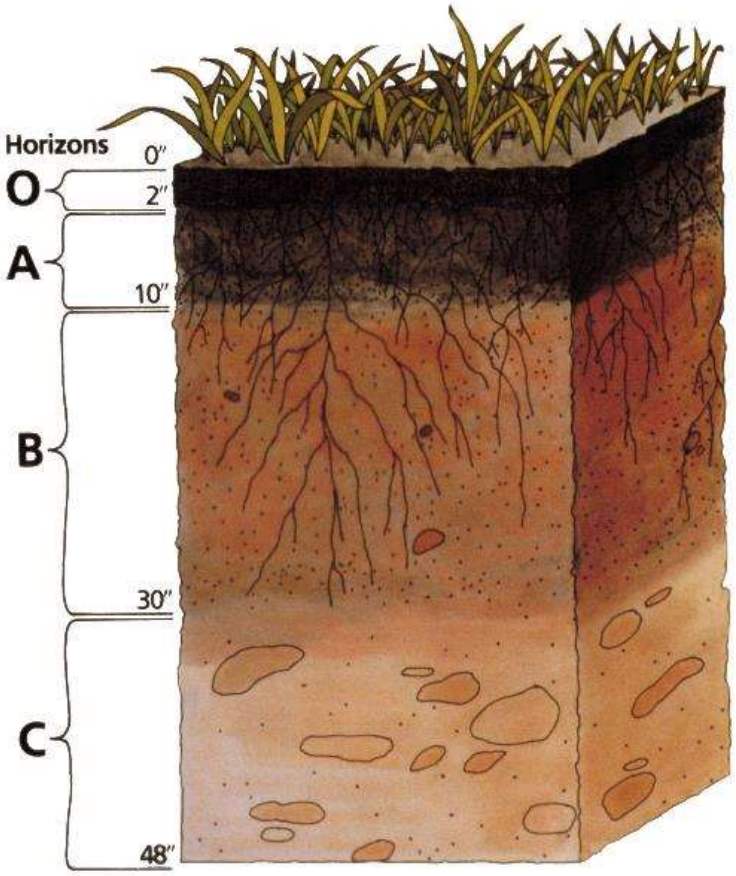

Photo: Soil Science Society of America

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Soil Color & Organic Matter

- Color indicates OM and drainage
  - Dark = high OM
  - Red = iron, tropics, warm
  - Yellow = iron, temperate, cool
  - Gray = iron, poor drainage
- Temperature influences OM content
  - Low temps = higher OM
  - High temps = lower OM

Soil Texture

- Soil texture refers to the relative proportion of sand, silt, and clay in the soil.
- Texture influences the water holding capacity, infiltration, seedbed preparation, nutrient holding capacity, ease of tillage
- Refers to the size of the soil particles:
  - Sand: 0.05 - 2.0 mm diameter Coarse
  - Silt: .002 – 0.05 mm diameter Medium
  - Clay: <0.002 mm diameter Fine

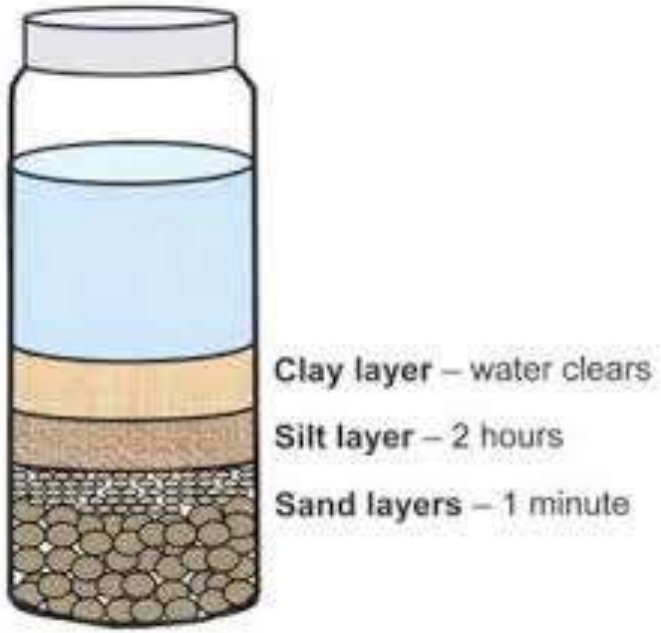

Photo: Colorado State University Extension, Colorado Master Gardener Program

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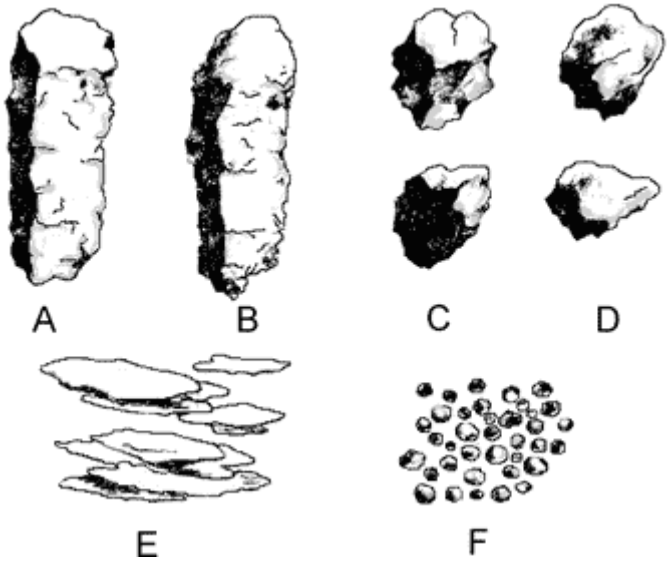
Soil Structure

Structure: clusters or aggregates formed by soil particles

- Affect air and water movement
- Examples
  - Granular – crumbly (F)
  - Prismatic (A)
  - Platy – good for pond bottoms (E)
  - Blocky (C-D)
  - Sandy
  - Massive



The common types of soil structure: A-prismatic, B-columnar, C-angular blocky, D-subangular blocky, E-platy, F-grandular (from USDA Soil Survey Manual, 1951)

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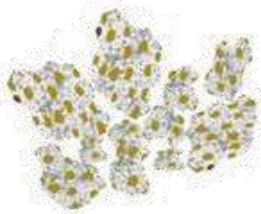
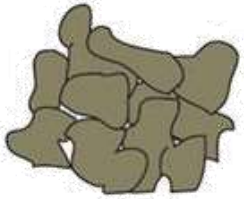
Granular (high permeability)

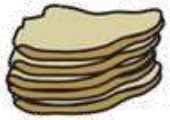


Aggregated (high permeability)



Blocky (moderate permeability)

Columnar/prismatic (moderate permeability)



Platey (low permeability)

Massive (low permeability)

Soil Health and Composting

Change soil structure through tillage/practice choices, soil amendments or via cover crops.

Why?

- Increases soil water-holding capacity
- Provides pore space for both water and air
- Prevents tiny clay particles from cementing themselves into solid masses
- Fills in sandy pore space, slowing drainage
- Regulates soil temperature
- Source of nutrients
- Increases Cation Exchange Capacity (CEC)
- Promotes microorganism growth

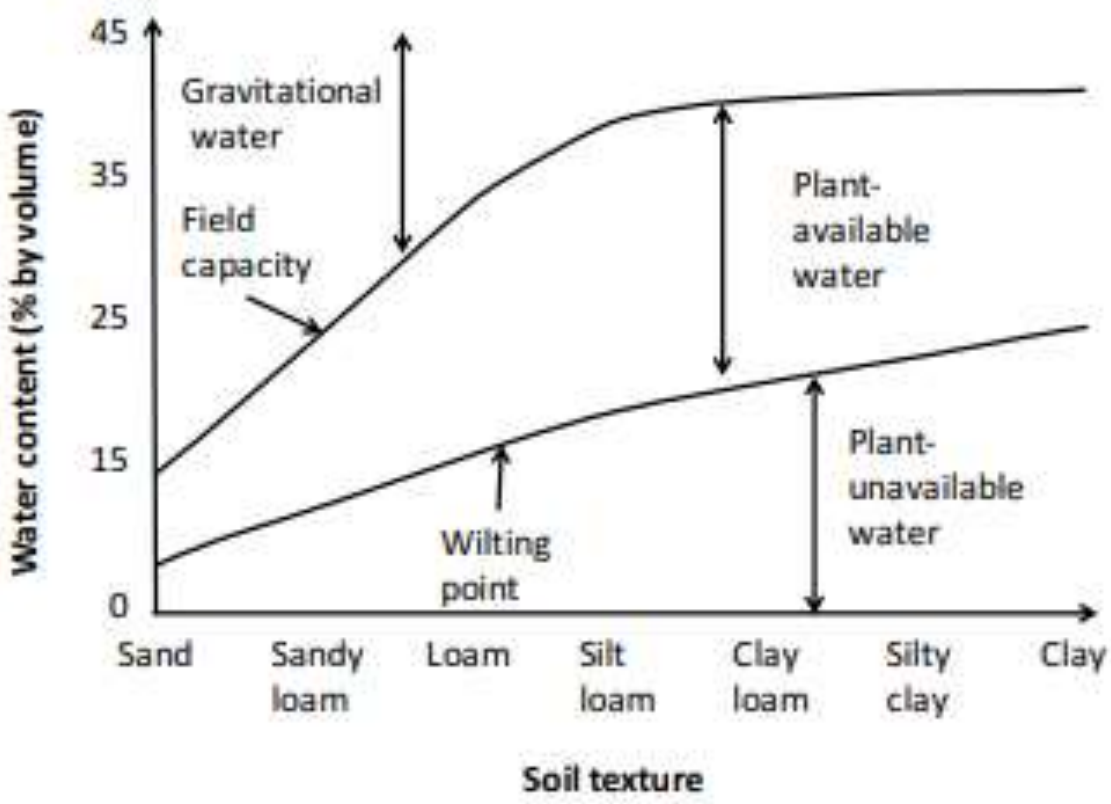
Soil Health and Composting

- How can we improve poor soil structure?
- Incorporating organic matter over time is the only reliable way to improve soil structure
  - Improves soil structure
  - Water holding capacity
    - Nutrient source
    - Soil organisms

Soil Health and Composting

Soil Water (Soil Solution)

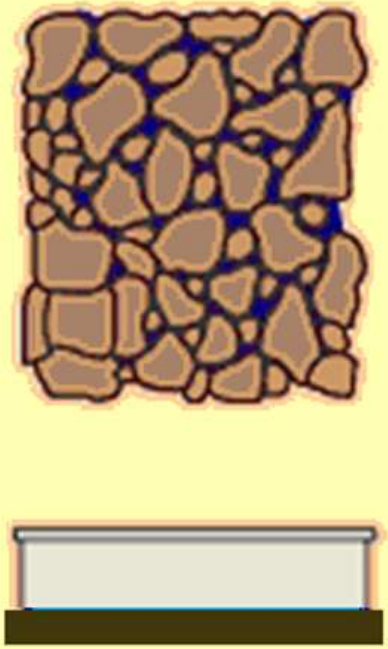
- Important to soil formation
- Solvent for nutrients in soil solution
- Necessary for plant processes
- Helps decomposition



Soil Health and Composting

SATURATION

Pores are full of water.
Gravitational water is lost.



FIELD CAPACITY

Available water for plant growth.

Wilting Point

No more water is available to plants.

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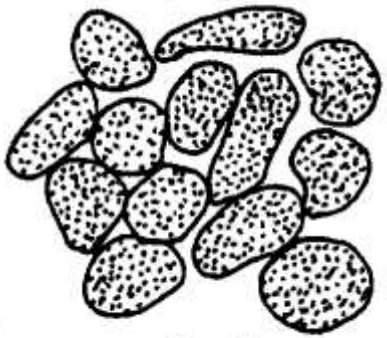
Soil Pores

- Macropores are large pores
  - Earth warm tunnels and root channels
    - Water moves through them rapidly

- Micropores are smaller pores
  - Responsible for water holding capacity
  - Hold water against the force of gravity
    - Mainly in clay and silt soil types

- Clay particles have small pores and sand particles have large pores.

Clay



Sand

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Soil Biology

- There are three main groups of organisms that are important:
  - Fungi
  - Protozoa
  - Bacteria (largest group by numbers)
- Higher overall microbial biomass can indicate healthy soils.

- Fungi are the decomposers, capable of breaking down complex molecules. Fungi helps soil aggregation and structure. Mycorrhizal fungi forms a symbiotic relationship with crop roots.
- Protozoa play a key role in nutrient cycling. Protozoa release extra nitrogen into the soil when feeding on bacteria.
- Bacteria (largest group by numbers) help to break down residue.

Soil Health and Composting

How do we encourage microbial action?

- The key is how we treat our soils.
- Create the environment they thrive in (minimal disturbance)
- Feed them (organic matter – compost)

THANK YOU

Questions before we move to composting?

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