

Soil Science Background from Urban Soils Workshop

Presented by: Michelle Catania (mcatania@mortonarb.org) and Allyson Salisbury (asalisbury@mortonarb.org) The Morton Arboretum

WHAT IS SOIL?

- Dynamic natural body composed of mineral and organic solids, gases, liquids and living organisms which serve as a medium for plant growth.
- Unconsolidated, weathered, thick (cm's to m's thick), variable zone of mineral and organic material, biologically active, that covers most of the Earth's land surfaces.
- Intensely weathered geologic material.

$$\text{Soil} = f(\text{Climate} + \text{Organism} + \text{Relief} + \text{Parent Material} + \text{Time})$$

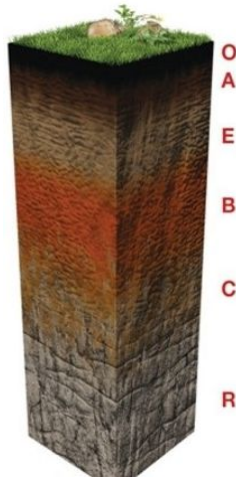
IDEALIZED 'A' HORIZON (top Soil)

AIR
25%

MINERAL
45%

WATER
25%

ORGANIC MATTER
5%



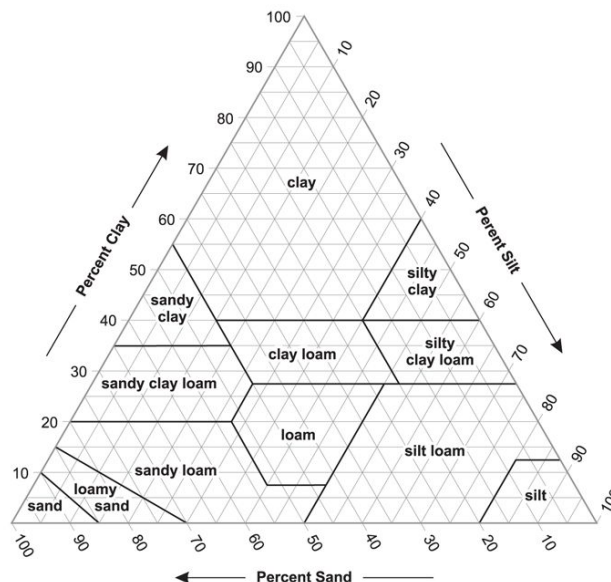
SOIL HORIZONS (all possibilities)

- O - Organic – typical of deciduous forests
- A - Mineral – dark color due to organic matter
- E - Mineral – white horizon = minerals lost
- B - Mineral – strong soil structure
- C - Transitional from rock to soil
- R - Bedrock

SOIL TEXTURE

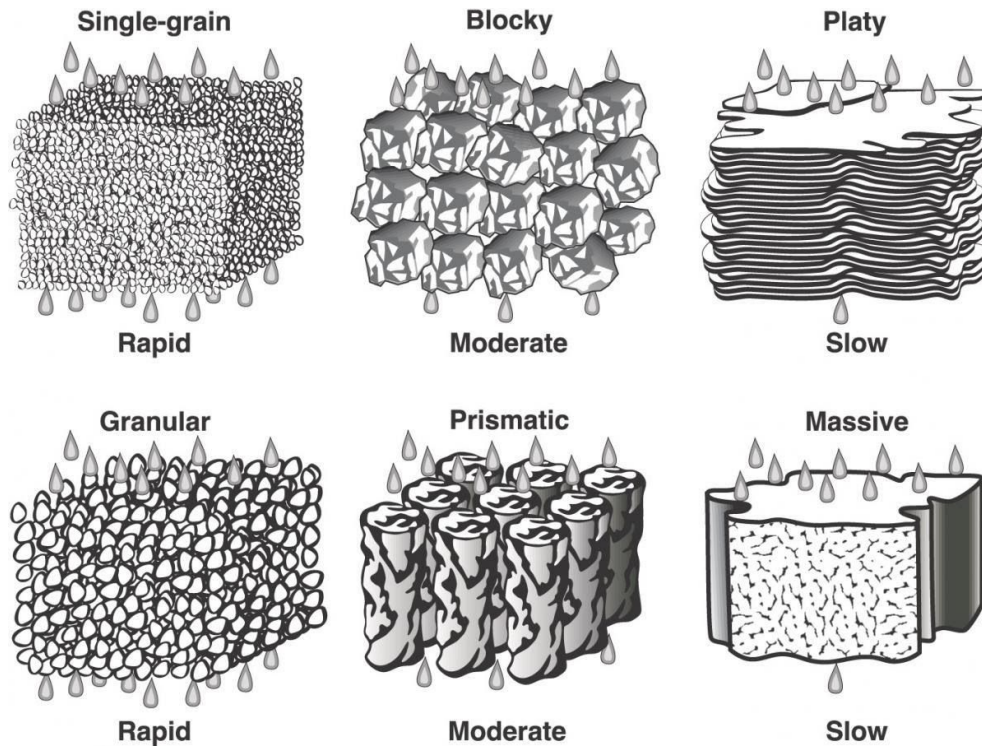
Fine Earth Fraction

% Sand }
% Silt } < 2mm
% Clay }



SOIL STRUCTURE

Displayed with water drops to indicated water **infiltration** (into) and **permeability** (within)



<https://ohioline.osu.edu/factsheet/aex-742>

SOIL COLOR

3 main influences on soil color:

1. Organic matter
 - a. OM tends to be black
2. Water content
 - a. Moist soils are generally darker than dry soils
 - b. Influences oxygen levels → determines oxidative states (#3)
3. Presence and oxidation states of iron and manganese oxides
 - a. Red or brown in well-drained soils → presence of oxidized iron
 - b. Gray and blue in poorly-drained soils (gleyed colors) → presence of reduced iron

OTHER PHYSICAL FACTORS THAT INFLUENCE SOIL

Landscape position

- hill tops have thinner soils and are less wet than valley bottoms with thicker, wetter soils
- degree of slope will determine depth of soils → gradual slopes > steep slopes for soil development

Parent material → imagine the different time required to weather single-grained materials like sand (beach terrace) vs. glacially deposited till (large to small loose particles) vs. granite (Canadian shield)

Soil Texture by Feel Method

