

Soil Basics for Gardeners

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Soil: it's not just "dirt!"

- "Man...Despite his very real accomplishments and his artistic pretensions...Owes his existence to 10cm of topsoil and the fact that it rains!"

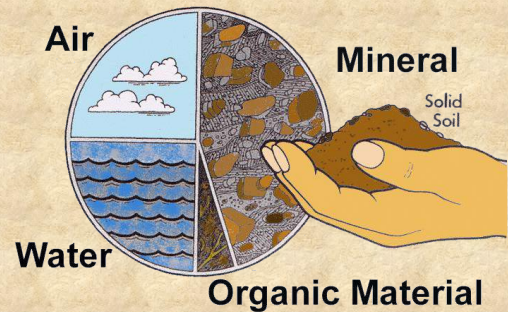
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Definition of Soil

- Soil: a *living, dynamic system* at the *interface* between air and rock. Soil forms in response to forces of *climate* and *organisms* that act on *parent material* in a specific *landscape* over a long period of *time*.

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Four Principle Components of Soil

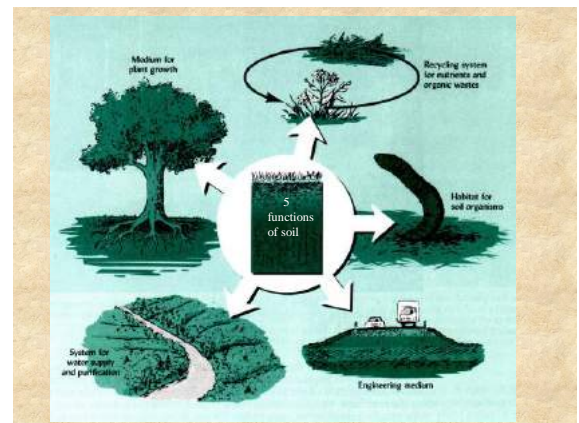


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Interface

- Earth's radius \approx 4,000 miles
- Soil's thickness \approx 10 feet
- Soil makes up less than 0.00005 % of the Earth's radius!

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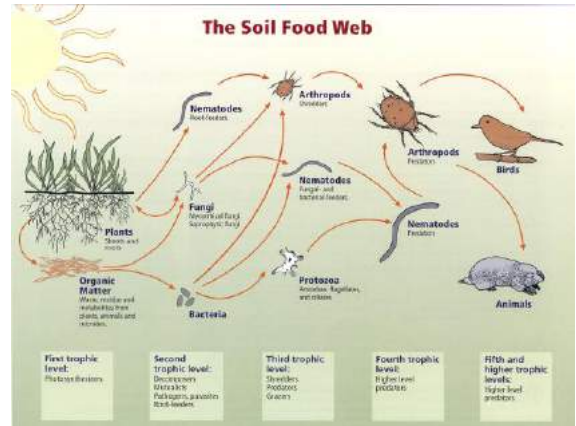


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Factors That Combine to Create Soil

- Climate- weathering
- Organisms- nutrient cycling, good structure
- Parent material- sand, silt, clay (sediments)
- Landscape- slope, exposure
- Time- physical, chemical, biological, geographical

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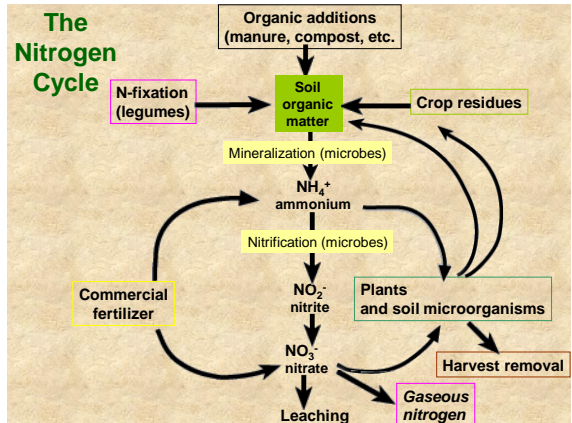
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Earthworms – (have gizzards!)



- Probably the most important component of soil fauna (not in acid soils, not in very dry soils)
- Eat OM & **Did you know that worm farming is a huge industry?!** through their bodies (mixing horizons) each year
- Excreted casts higher in N, P, K, Ca, Mg, pH, and CEC **est. wt. of worms in US = 10X wt. of entire human population**
- Promote good soil structure and aeration

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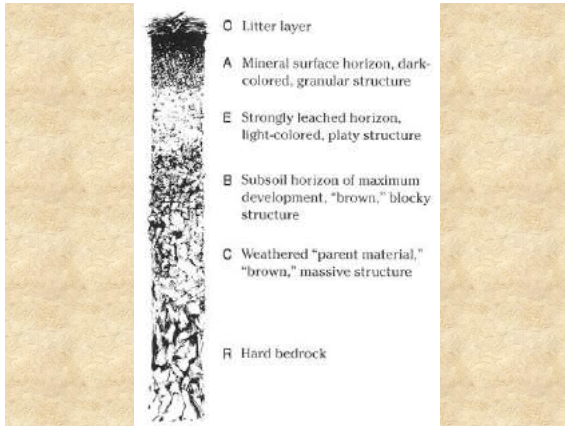
- Sedimentary Parent Material
- Alluvium?
- Loess?
- Till?
- Colluvium?

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Soil Horizons

- Soil horizons are layers of the soil, approximately parallel to Earth's surface, distinguished from one another by unique physical, chemical and/or biological characteristics.
- There are six major horizons O, A, E, B, C and R horizons.

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Soil Properties

- Four soil properties:
- **Color**
- **Texture**
- **Structure**
- **Consistency**

Describe the characteristics of a soil

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- **Black Soils**
- Usually A horizons
- Indicate high OM
- Often wet soils

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Texture

- Texture refers to the sizes and relative amounts of the constituent particles in a soil.
- For the most part, soil particles can be classified as either **sand, silt or clay**.

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Texture describes how coarse or fine a soil is

Sand
 .05 to 2mm
 feels gritty

Silt
 .002 to .005 mm
 feels smooth

Clay
 less than .002 mm
 feels sticky

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- Sandy loam texture. This soil has:
- 73% sand
- 23% silt
- 4% clay.

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- Silty clay loam texture. This soil has:
- 3% sand
- 68% silt
- 29% clay

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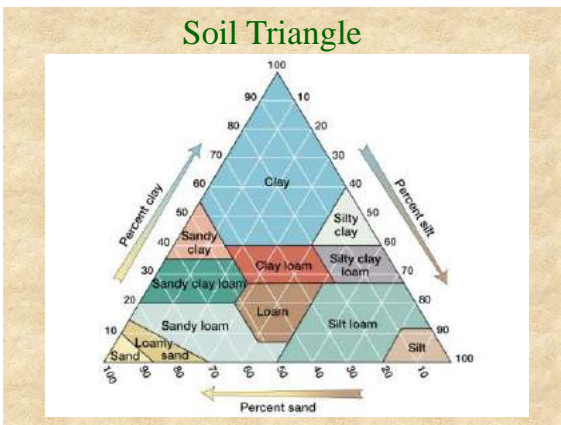
- Silty clay texture. This soil has:
- 2% sand
- 54% silt
- 44% clay
- It forms a ribbon nearly 3" long!

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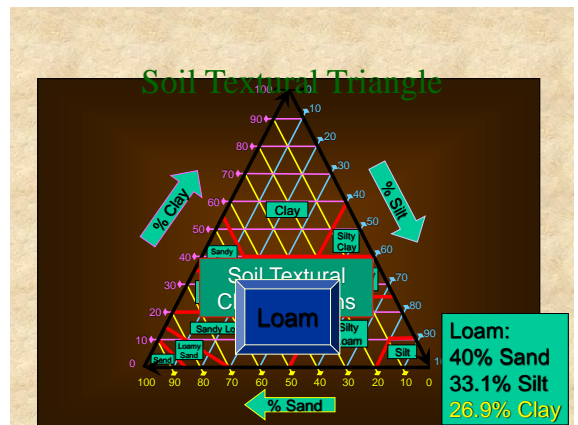
Loam is not topsoil!

- Topsoil is another name for the A horizon, where the bulk of biological activity in the soil occurs.
- Loam is a near-equal mixture of sand, silt and clay.
 - Thus sandy loam, silt loam and clay loam are all loam, each with a slightly different composition.

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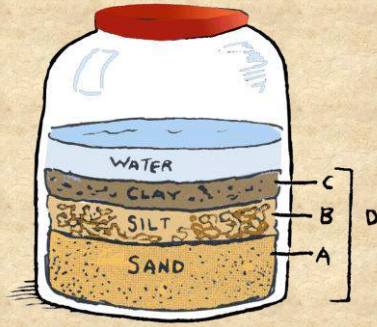


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Soil Fractional Analysis

A= 20 min.
B= 2 hrs.
C= 24 hrs.
D= total

Quart jar
2/3 full water
1 cup dry soil
2 tsp calgon



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Altering soil textural properties

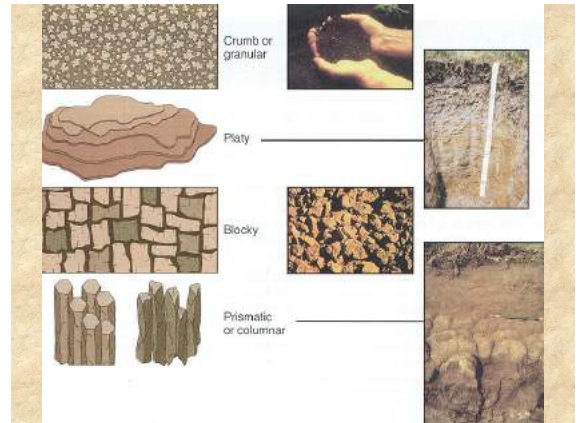
- Just accept it...this is virtually impossible!
- One acre of soil just 1 mm thick can weigh over five tons!
- Many clays, when combined with sand, form a low-grade concrete!
- **OM is the closest thing to a cure-all you'll ever find!**

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Structure

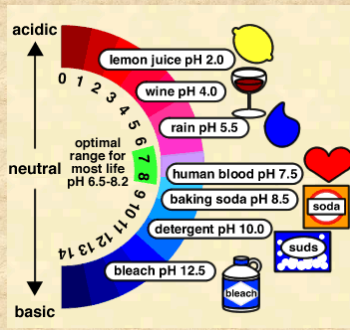
- Soil structure refers to the way individual particles of sand, silt and clay are bound together into larger units called **peds**.
- Binding agents are provided by soil organisms such as bacteria and plant roots (exudates), OM (humus) and clay particles.

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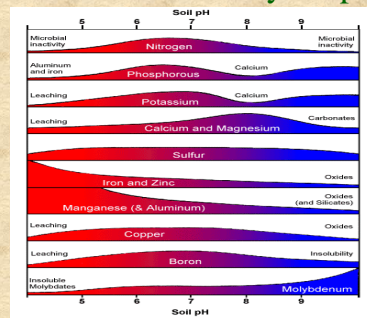
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Power of Hydrogen



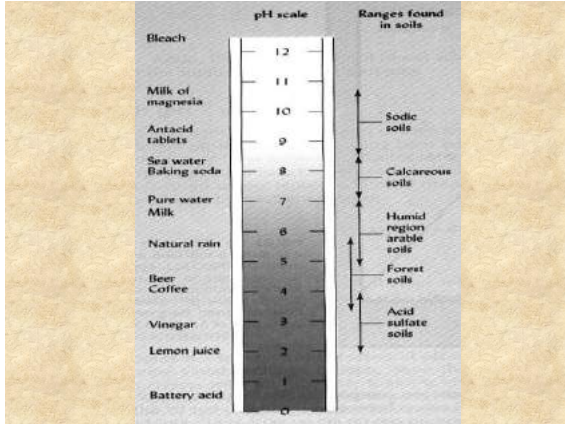
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Nutrient availability vs. pH



Know reasons for low levels of some nutrients at both high and low pH

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Soil and Water

Soil structure

- Aggregation is a natural process caused largely by biological activity.
- Soil organic matter is an important binding agent for soil structure

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What Gardening Problems are Caused by Poor Soil Quality?

- Soil dried and cracked in summer
- Digging is difficult, summer or winter
- Rhodies, hydrangeas and other shrubs wilting in hot weather even after watering
- Leaves yellowing on plants
- Water tends to pool on soil surface, drain slowly or runoff

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Good Porosity & Permeability Resolve Many Garden Problems

- **Porosity:** amount of space (pore space) between particles in a soil.
- **Permeability:** ability of water to move through that pore space.
- Good structure is associated with large pores (**macropores**).
- OM is essential to the formation and maintenance of good soil structure (tilth).

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Soil and Water

A productive soil is permeable to water and is able to supply water to plants.

Two diagrams show water (blue droplets) falling on soil. The left diagram, labeled 'Poor infiltration', shows water pooling on the surface of a compacted soil. The right diagram, labeled 'Good infiltration', shows water soaking into a loose, porous soil.

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Available Water Capacity

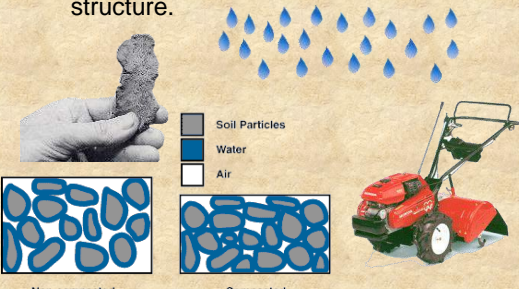
A 2x3 grid of diagrams. The top row shows soil cross-sections with water (blue) and air (green) spaces. The bottom row shows corresponding soil particle arrangements. The columns are labeled: Saturation Percentage (top and bottom), Field Capacity (top and bottom), and Permanent Wilting Percentage (top and bottom). The bottom row diagrams are also labeled 'Saturation', 'Field Capacity', and 'Wilting Point'.

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Soil and Water

Compaction and loss of structure

- Tilling when soil is too wet damages soil structure.



Non-compacted Compacted

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Minimize Tillage to Soil

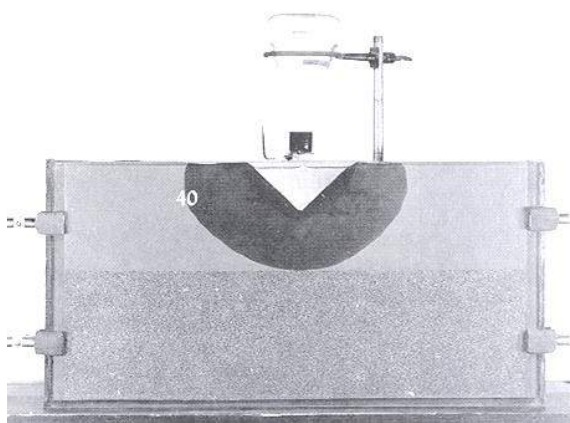


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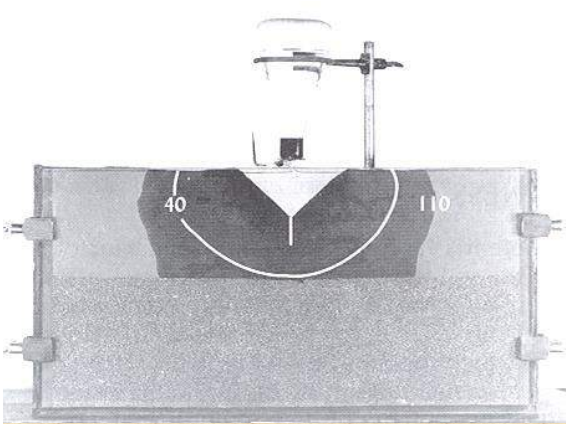
Soil Water

- Water will fill like soils before moving into new soil types, regardless of soil texture!
 - This is the principle of dissimilar soils.
 - Plant roots will often do the same thing!

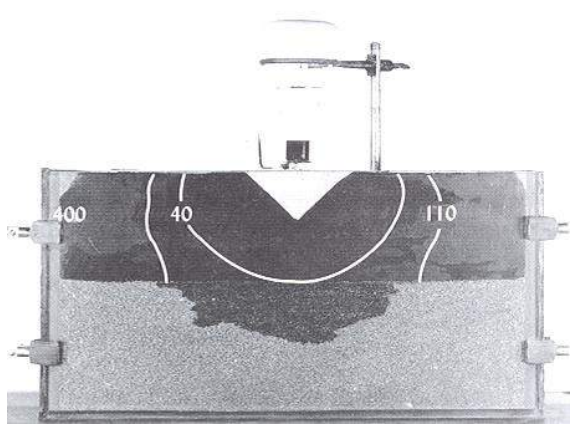
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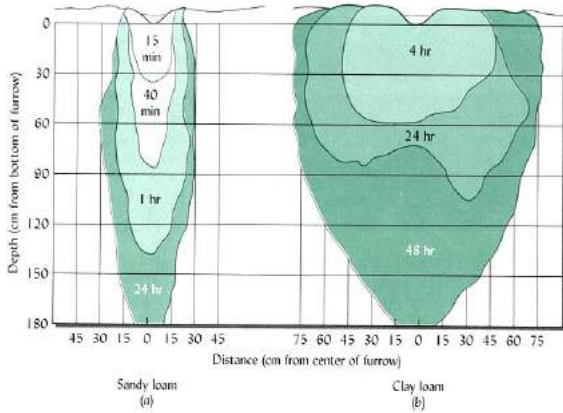
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Oregon Soil Survey Reports - National Internet Edition

NRCS National Resources Conservation Service

Oregon Soils
 About, Soil Survey Basics, Interactive Maps, US Data, Maps, Soils, Technical Information, Contacts, News, Links

Oregon Soil Survey Reports
 The links below will open new browser windows to view either the maps or the text and tables for each survey. [Read More?](#)

Please be patient. Depending on the speed of your connection to the internet, it may take **several minutes** for the maps to appear. The text and tables will load and appear approximately 300 and 1500 pages (single a doc) so they can take quite awhile to appear as well.

Soil Survey boundaries do not always coincide with county boundaries. A soil survey may be one county, multiple counties, or parts of various counties.

You might want to open both the Maps and the Text and Tables at the same time. This would allow you alternate between the Maps window and the Text and Tables window. For example, you could locate a soil map and on the Maps window and then jump to the Text and Tables window to read information about that soil map unit.

| County | Survey | Maps | Legend | HTML | PDF - slow to load |
|--------------------|-------------------------|------|--------|-----------------|--------------------|
| Baker | OR604 Baker County Area | Maps | Legend | Text and Tables | Text and Tables |
| Benton/Linn/B. Co. | OR601 Alsea Area | Maps | Legend | Text and Tables | Text and Tables |
| Blaine | OR606 Blaine County | Maps | Legend | Text and Tables | Text and Tables |

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What Can Be Learned From Soil Surveys

- Location of soil types in the county
- Characteristics of a soil
- Depth of each soil type
- Water infiltration rate
- Water holding capacity
- pH
- Susceptibility to erosion

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