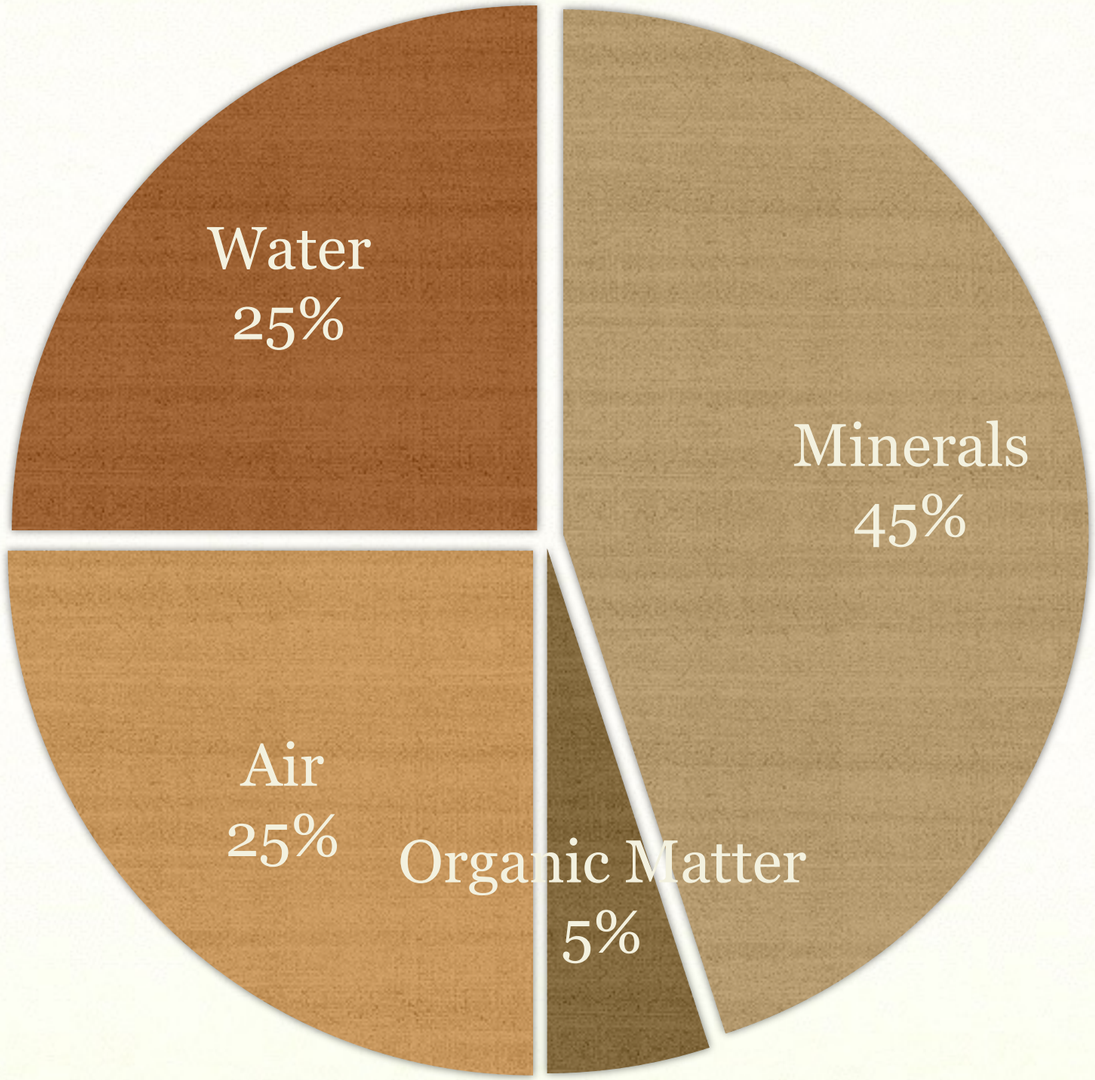
Soil And Soil Improvement

Soil Composition Chart



1. Soil Formation: Texture

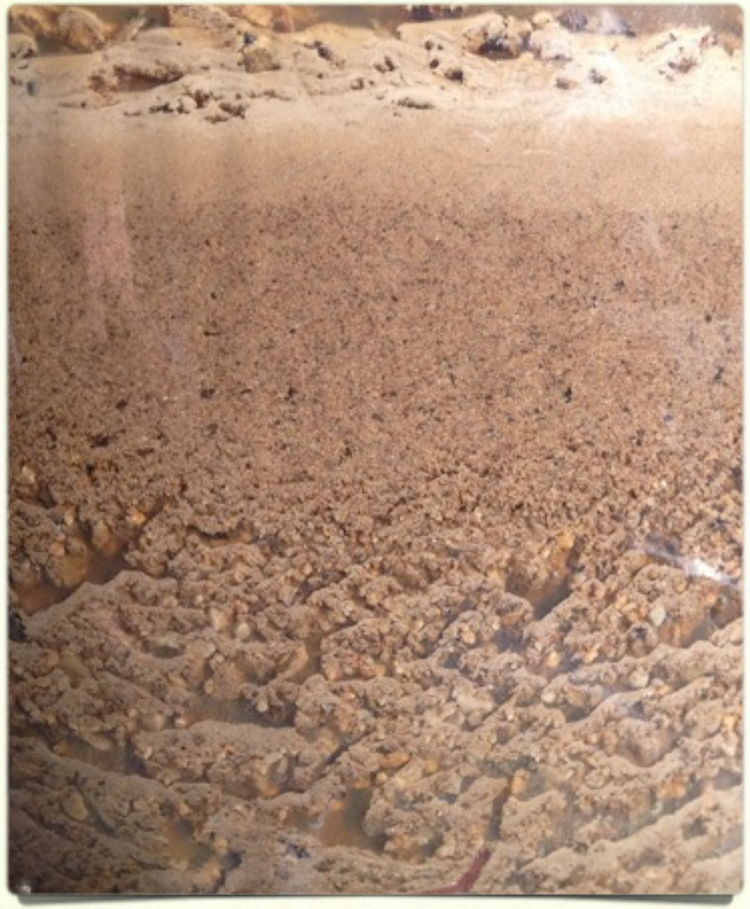
- Soil particles can be divided into three main sizes
  A. Sand
  B. Silt
  C. Clay

1. Soil Formation: Sand

A. Sand

- Sand is what makes up the largest particles in soil
- Sand does not hold water very well leaving lots of air and almost no capillary water
- Sand quickly settles in water and is “gritty” when rubbed between your

1. Soil Formation: Silt



B. Silt

- Silt is enough smaller than sand that you will need to use a microscope to see the individual particles
- Silt holds water (and especially capillary water) much better than sand
- Silt is small enough that it feels more

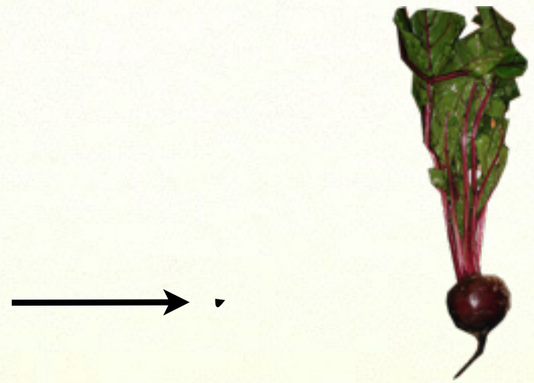
1. Soil Formation: Clay

C. Clay

- Clay particles are the smallest in the soil and electron microscopes are actually needed to view them
- Clay can hold lots of water and is “slippery” when handled because the particles are so

1. Soil Formation

- Let’s compare sizes for fun
  - If clay were the size of a beet seed
  - Silt would be about the size of a beet
  - Sand would be a wheelbarrow



1. Soil Formation

- Or: a teaspoon of sand spread one particle deep would cover about the space of silver dollar whereas clay could cover a tennis court and possibly more

1. Soil Formation: Rock Particles

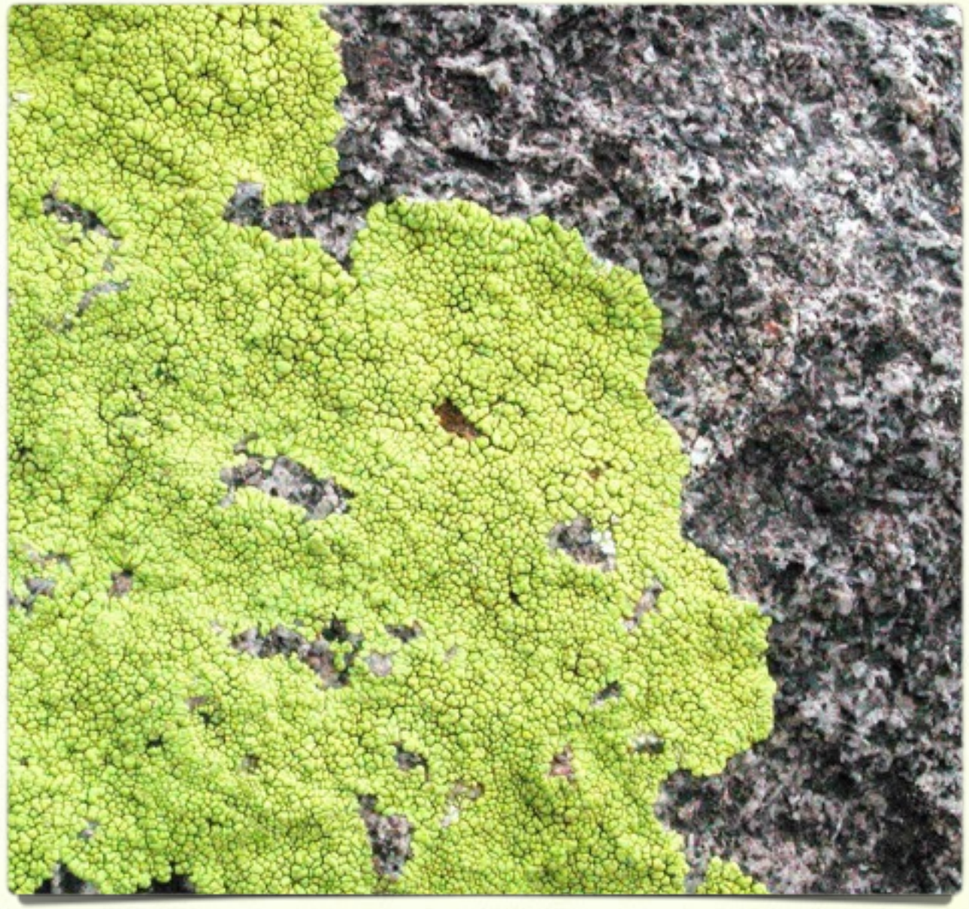
A. Rock Particles

- Sun, snow, rain, wind, freezing and thawing all add to the slow breakdown of rocks into small particle size minerals
- Rocks grinding against other ones, rolling down river beds, avalanching down mountains and so on also add to the process
- Chemical processes from environmental and biological sources also break down rocks, and minerals are dissolved in water solutions

1. Soil Formation: Rock Particles

A. Rock Particles (cont.)

- Mosses and lichens will produce acids that break down little pieces of rocks to use as nutrients



1. Soil Formation: Organic Matter

B. Organic Matter

- In order to support life, soil must include more than just minerals
- Organic matter is formed when any living thing dies and decays
- The end product is a rich dark-brown soil material called humus
- Humus electrically attracts mineral particles and provides a home for soil microbes

1. Soil Formation: Organic Matter

- **Life in the soil**
  - In fact there are 5,000 to 20,000 pounds of bacteria, fungi, worms, and other living organisms living in the top six inches of soil on an acre of land alone!
  - These organisms play a critical role in making the soil a place where plants can live, grow, and thrive

1. Soil Formation: Air And Water

C. Air and Water

- While soil is very important for plant life, water and air are just as essential
- The little empty pockets between soil particles are filled with water, air, or both
- Large spaces allow water to drain easily with gravity
- Small spaces allow capillary water to rise up through the ground from lower water tables to reach the plant roots

1. Soil Formation: Air And Water

C. Air and Water (cont.)

- The ideal is to have about half of the spaces in the soil filled with water and half filled with air
- Then as more water is added to the soil it can pull fresh air behind it into the spaces it passes through

1. Soil Formation: Texture

- **Soil Texture**
  - Soil texture is also a key aspect of a good soil and is determined by what size the particles are that make up the soil

2. Soil Structure

- While individual particle size is an important characteristic of soil, how these particles are grouped together creates the actual soil structure

2. Soil Structure

- Good garden soil contains a good mix of sand, silt, clay, and organic matter in about the following ratio
  - 30-50% Sand
  - 30-50% Silt
  - 20-30% Clay
  - 5-10% Organic matter

2. Soil Structure

- These individual soil particles are bound together into what is called aggregates
- The life or biology in the soil creates the glue that hold these aggregates together

2. Soil Structure

- Good soil structure is the key factor for good growing conditions
  - Good soil structure provides enough drainage between the particle aggregates while at the same time allowing plenty of capillary water to reach the plant roots
  - Good air circulation is available in a good soil structure
  - This good structure also provides ample room for soil biology to live and thrive

2. Soil Structure

- In short – good soil structure holds water, air, and nutrients well: helping life to thrive

A. Texture

- **Texture**
  - Determining the texture of your soil will help you understand how well you're soil can hold water and nutrients
  - Remember that soil is made up of three different sized particles – sand, silt, and clay
  - The texture of your soil is determined by the ratios of these three particle sizes
  - Easiest way to determine the general texture of your soil is to press some moist soil into a ball in your hands

A. Texture

- Now open your hand and if your soil falls apart you have a sandy soil
- If your ball stays together then try to stretch it out by squeezing it between your fingers

A. Texture

- If you can only stretch it an inch or so then you have a loamy soil which means its probably fairly well balanced but could have more silt or sand in it – not extra clay
- If you can stretch it out a couple inches then you're looking at a

A. Texture

- If you can stretch it out a few inches or more then you probably have a pretty high clay content
- To get a much clearer idea of what ratios you have – check out the simple soil texture test

B.Counting The Big Critters

- **Counting the Big Critters**
  - One of the best ways to see if you have a healthy population of microorganisms is to do a worm count
  - Remember that we're dealing with a "food web" and so if worms are present then so will be the bacteria, fungi, protozoa and more that they feed off of
  - Here's how to do your worm count:

B.Counting The Big Critters

- Dig out a square foot of soil and put it all in a container or onto a tarp
- Next sift through the soil and count how many worms you find (you can also count all the other little insects, centipedes, millipedes, pill bugs, and more that you find just for fun – the more diverse the better)

B.Counting The Big Critters

- If your soil is healthy you should find around 10-30 earthworms besides all the other critters

3. The Successful Compost Pile

- **Succesful Compost Pile**
  - Organic matter (OM) itself is mainly composed of two elements – carbon and nitrogen
  - The composting process requires a proper ratio of carbon (browns – old and dry ingredients) to nitrogen (greens – young, moist, fresh materials)
  - A good compost pile consist of alternating layers of the two like a multi-layer sandwich of browns (bread) and greens (jelly)

3. The Successful Compost Pile

- A good ratio is around 3 parts of browns to 1 part of greens
  - Tossing a few shovel full's of dirt onto the pile can help stimulate the microbes as you build it up

3. The Successful Compost Pile

- **Tips for making and monitoring your pile**
  - The ideal size of a compost pile is around 4-6 feet square
  - If you go larger than this you will need to make holes in the pile for air circulation
  - One way to build a structure to contain your compost pile is with straw bales stacked two high on their sides
  - Cover this with a weighted tarp and then your “old container” can become the ingredients for your next compost pile

3. The Successful Compost Pile

- **Tips for making and monitoring your pile (cont.)**
  - Straw is the perfect brown ingredient because of its structure
  - The ideal moisture level of your pile should be like a squeezed out sponge
  - If your pile stinks, is mushy, or attracts flies, you will want to remake the pile while adding in more brown ingredients
  - If your pile isn’t doing anything than it either needs more moisture added to it or more green material

4. Mineralization

- **Mineralization**
  - Plants need 17 elements to grow well.
  - Our human bodies need at least 27 elements to do well. Where do we get these minerals from? To mineralize your soil use rock powders, sea salt (1 sea water/10 water), kelp.

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