West Coast Seeds

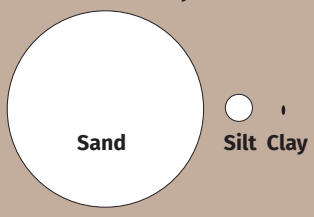
Untreated seeds for organic growing, non-gmo

Soil Science 101

What is soil made of? How does it work? Why do plants thrive in one soil, but not another? The answers to these questions are helpful in understanding the needs of plants and crops. Soil science is a big subject, but here are some of the basic principles. We cover these concepts (and others) in greater depth online. Look under "Resources" for our additional Articles and Instructions. We encourage you to learn about and practice soil sustainability. Healthier soil means healthier crops.

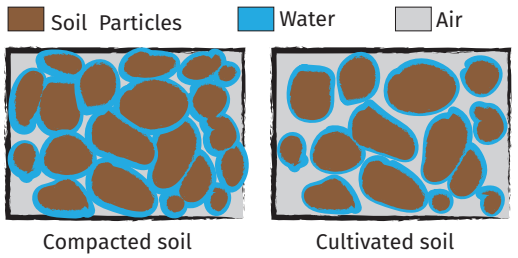
What is soil made of?

Soil is composed of three types of particles: Sand, silt, and clay.



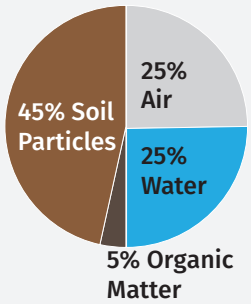
In ideal balance, these three particle types make up "loam". Loam is perfect for farming because it releases nutrients well, drains well, but is able to retain some moisture. Plants thrive in it. Soil with too much clay or too much sand can be amended to bring things in better balance.

Porosity: The spaces between soil particles include macropores and micropores.



What else is soil composed of?

Air: Air plays an important role in soil. Lack of aeration in soil is usually caused by excess water. Most roots will not grow in soil that lacks oxygen. Aerobic organisms die in these conditions, while anaerobic organisms thrive. The latter give off foul smelling gasses like hydrogen sulfide, methane, and ethylene, all of which inhibit plant growth. If a compost pile is not aerated enough, it may give off these stinky gasses. Regular aeration (turning) will prevent the buildup of these gasses. Excess aeration in soil is usually caused by over-cultivation. The population of aerobic organisms explodes, and they consume all the available organic matter.



Water: Without water, soil particles cannot adhere to one another. In really dry conditions, the soil can actually blow away in the wind. Soil nutrients are soluble in water, so plants need that moisture in order to draw the nutrients into their tissues.

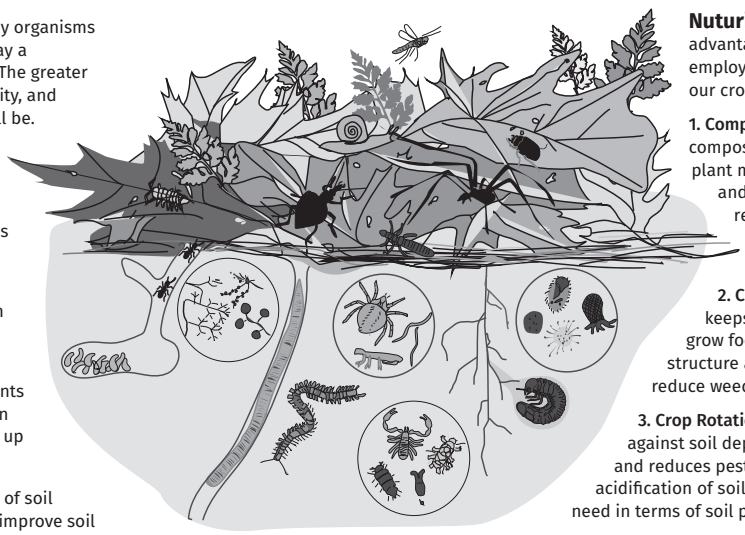
Organic matter: Any dead plant or animal material (including manures). These are composed of carbohydrates, proteins, cellulose, lignins, and waxes. Organic matter feeds soil organisms, which in turn feed plants. Organic matter acts like a slow release fertilizer, holding nutrients in a stable form, and releasing them as it breaks down. Organic matter improves soil porosity, aeration, and drainage, but it makes only a small proportion of the overall content of soil.

Soil is a living ecosystem: The porous physical structure of soil provides homes for countless soil organisms. They feed on organic matter in the soil, but they also feed on each other, as well as the waste of other organisms. Different organisms are able to consume organic matter at different points in its decomposition. Once a decomposing leaf has been grazed upon by snails and slugs, It may be physically dragged down into the soil by earthworms. Its remains may be broken down further by bacteria, fungi, and other organisms. The decay-resistant material that remains at the end of this process is known as humus.

Cultivation: Soil particles have a natural tendency to compact over time, particularly over long periods when the soil is not being cultivated, like over winter. Loosening the soil improves porosity, aeration, and drainage. It provides space for plants to take root. Some growers like to turn over (till) the soil with a fork or plow prior to planting. Others prefer soil organisms to do the cultivation for them. In the No-Dig school of gardening, organic matter is regularly added to the soil surface as mulch. This encourages earthworms and other soil organisms to move up and down in the soil, which achieves a similar effect to tilling. It's good to experiment to see what works best in your particular garden space.

Soil fertility: As they grow, plants use up minerals and nutrients, removing them from the soil. If soil is cropped intensively, its nutrients can become depleted. Organic gardeners need to think of themselves as stewards not just of crops, but of the soil in which those crops are planted. While organic fertilizers can replace or suplement the basic nutrients needed by plants (See What the Heck is N-P-K? on page 127), nurturing of overall soil health is the greater goal.

Soil organisms: Countless tiny organisms and their infinite interactions play a fundamental role in soil health. The greater the biological population, diversity, and activity, the healthier the soil will be. This rich biological activity results in healthier plants with better defences against disease and other pressures. All organic gardening practices focus on the promotion of soil health and biodiversity.



- Soil organisms break down organic matter from one stage to another.
- During this process, nutrients are released into the soil in forms that plants can take up via their roots.
- The wastes and secretions of soil organisms act like glue to improve soil structure.
- Tunneling organisms aerate and drain the soil.
- Soil organisms themselves contain nutrients that are released when they die.
- Some soil organisms fix atmospheric nitrogen in the soil.

Nuturing Soil Health: Organic gardeners take advantage of natural phenomena that already exist. We employ these natural processes to improve the health of our crops as well as the soil.

1. Compost: Plant matter not used as food can be composted and returned to the soil as a mulch. As this plant matter breaks down, it releases many minerals and nutrients. It improves moisture retention and reduces evaporation. It feeds soil organisms, and encourages strong soil biology. It turns "waste" into a rich source of organic matter.

2. Cover Crops: Employing cover crops (see page 114) keeps the soil active even when it is not being used to grow food. By their nature, these plants can improve soil structure and fertility, fix atmospheric nitrogen in the soil, reduce weed pressure, and improve biodiversity.

3. Crop Rotation: This core concept (see page 17) protects against soil depletion, but it also helps to prevent crop diseases and reduces pest pressure. It takes advantage of the natural acidification of soil (see page 108) so that crops always get what they need in terms of soil pH.

4. Biodiversity: Both above and below the soil, organic gardeners work to improve the diversity of organisms. The benefits of this are seen in companion planting, in beneficial insects, and enriching microbial activity in the soil.

5. Organic Fertilizers: By definition, the ingredients in organic fertilizers come from the natural environment. They are sustainable and can be replenished naturally. They enrich soil structure, feed soil organisms, and produce stronger crops with better resistance to pest and disease pressure.