

The key to successful gardening is right below your feet. By paying attention to building healthy soil, you give your plants the nutrients and conditions they need to thrive naturally. Soil care is not complicated or even labor-intensive—it's an ongoing process that you invest in throughout the growing season. All you need is a little information about the attributes of healthy soil and a few simple strategies.

### Basic Components

**About 40 to 45 percent** of soil's volume is solid mineral particles—sand, silt, and clay. Sand and silt provide a skeleton for the soil but retain little if any water and nutrients. Clay holds onto water and nutrients for plants to absorb, but it becomes dense when wet. Loam is the ideal blend of all three and the best kind of soil for most garden plants. Much of the remaining volume of soil is made up of pore space, or air pockets between the particles, which allow room for essential oxygen and water to move through the soil. **The last 5 to 10 percent of healthy soil is organic matter**—the decomposing residues of plants (*mostly*)—and the complex ecosystem of organisms that feed on the decay, from earthworms and beetles to microscopic fungi and bacteria.

### Soil Food Web

Those billions of living things in every teaspoon of healthy soil make up what's known as the "soil food web." They break down organic matter into nutrients for plants to absorb, open up the pore spaces in soil, ward off plant diseases, and help to trap carbon from escaping into the atmosphere. By nourishing the soil food web with a steady supply of organic matter, you feed your plants with nutrients in the exact form they have evolved to use.

**(Be aware that synthetic fertilizers do not feed the soil ecosystem and may even harm it.)**

### The pH Factor

The soil's mineral content determines how acidic or alkaline it is. This is measured by pH, on a scale that ranges from 1 to 14—readings below 7.0 are acidic and above are alkaline. The relative pH impacts a plant's ability to absorb different nutrients from the soil. Most garden plants fare best in slightly acidic soil—between 6.2 and 7.0—but soil that's too acidic can hamper their growth.

### Take a Test

To find out the pH of the soil where you want to plant, you can get a sample tested for little cost through the cooperative extension service of the state university where you live (*such as Pennsylvania State University, Rutgers University, or Delaware State University*). A soil test report also provides you with readings for the key nutrients, phosphorus and potassium (*nitrogen levels change rapidly so soil tests don't measure them accurately*), and the level of organic matter in the soil. With this information, you can determine how to improve its fertility.

### Adding Amendments

You can raise the pH of highly acidic soil by adding powdered limestone. Mixing granular or pelleted sulfur into the soil lowers the pH of highly alkaline soil. Bonemeal and rock phosphate add phosphorus, while greensand increases the potassium levels. Nitrogen, the nutrient that's essential to vigorous leaf and stem growth, is continually used up by plants, so it needs regular replenishment. Blood meal and fish meal are reliable organic sources of nitrogen you can add to your garden's soil. Farmers often apply manure, which is high in nitrogen, to their fields. If you have a source for manure from herbivores (*such as cows, chickens, or rabbits*), you can use it in your garden after it has decomposed for about six months—any sooner and you risk "burning" your plants or introducing unhealthy microbes.





## Compost Cure

The best fertilizer and soil conditioner for your garden is compost. It balances pH, holds and slowly disperses moisture, feeds the soil food web, and gradually releases nutrients. Compost loosens compacted clay soil, and helps sandy soil retain nutrients and water. If you don't have compost, simply mixing in dried grass clippings (*not treated with herbicides*) and shredded fall leaves increases the organic matter content, improving soil structure and nourishing active microbes.

## Green Manure

When you're ready for the peak level of soil improvement, plant legumes such as alfalfa, crimson clover, and hairy vetch in your garden. These "green manures" pull nitrogen out of the air and "fix" it in the soil as they grow and add organic matter after they decompose. If you can alternate these kinds of "cover crops" with vegetables in your garden, you will maximize the soil's fertility and almost never need to add other amendments.

## Container Mix

Paying attention to soil in containers is critically important because plants' roots cannot spread out to scavenge for nutrients and water as they can within garden beds. Soil dug up from the ground is too dense for containers. Instead, use a potting soil mix containing coir (*a by-product of coconut processing*) or peat, perlite, or vermiculite (*natural minerals that capture and distribute moisture*), and compost. Steer clear of mixes with fertilizer already added—often in the form of green or blue crystals. These manufactured fertilizers are high in salts, which accumulate in the soil and leave it too alkaline. Instead, mix in worm castings, a safe, natural source of nitrogen. You can buy it in bags.

## Simple Test

You can get a reading on your soil's organic matter content with this simple, at-home test:

1. **Collect** soil clod samples from different spots in your garden and put them into a clean jar or plastic container.
2. **Allow** the clods to dry at room temperature for a few days.
3. **Fill** a glass jar halfway with water.
4. **Place** a dry clod of soil into the jar.

If the clod remains intact and sends up air bubbles, the soil has a healthy level of organic matter. If the clod disintegrates and clouds the water, the organic matter content is too low and you need to build it up by adding compost, or shredded leaves and grass clippings.

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