



Building Healthy Soil

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Caring for the garden soil should be as important to home gardeners as it is to farmers. Improving the soil structure is one of the most important aspects of soil care, and adding organic matter is the most effective way to accomplish this. Organic matter also helps maintain the pH balance of the soil and adds nutrients.

Good topsoil is

- relatively dark in color
- active with microorganisms, plant nutrients, and organic matter, and
- usually has a pH between 5.5 and 7.5 (for non-acid loving plants).



Improve the Soil Structure

As the structure of a soil is made more granular and crumbly by decomposing organic matter, the soil absorbs moisture that would otherwise run off, causing erosion and a loss of nutrients in the process. Good soil structure provides channels through which water and air can filter to greater depths. When rain comes after a dry spell, soil that is hard on the surface is much more subject to rapid runoff and erosion than one that is loose and crumbly.

Organic matter in the soil also ensures a continuous food source for soil organisms. As the organisms decompose the organic materials, they help maintain good soil structure, making the soil a more favorable place for root development. The decomposition process improves the soil structure by developing compounds that cement small soil particles together into aggregates, allowing for both increased drainage and moisture retention. Decomposition also changes the organic matter into inorganic nutrients that can be used by growing plants.

Incorporating organic matter aids in sustaining the organic content of the soil. However, organic matter cannot be built

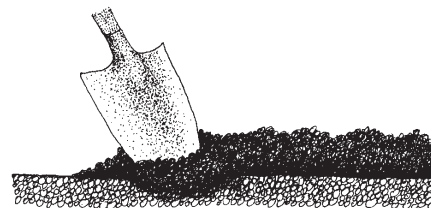
up *permanently* in the soil because it continually decomposes and disappears; soil building must be a continual process in the garden.

Test Your Soil

The first step to improving your soil is to have your soil tested for pH and nutrient levels. Your local Extension agent can provide you with soil test forms and instructions. The soil test report will tell you whether your soil needs lime or nutrients or both. **If the soil test recommends lime, apply it!** Work the lime into the soil with a spade or a tiller to a depth of about 6 inches. Lime changes the pH balance of the soil, which is critical to absorption of nutrients by plants.

Add Organic Matter

To improve the soil structure, or tilth, add organic matter in the form of compost, cover crops, or yard waste. Yard waste such as shredded leaves, crop residues, straw, and similar materials should be tilled into the soil in the fall to allow decomposition through the fall and winter. At the same time, grass clippings, manure, or fertilizer should be incorporated to provide the extra nitrogen required to help break down the dry organic materials. This material can be composted and added to the garden in the spring if you prefer.



Grow Cover Crops and Green Manures

A cover crop, such as rye grass, is a temporary planting, usually done in the fall, that protects the soil from wind and water erosion and adds organic matter. Crops grown for soil improvement are called green manure crops and are left in place for six months to a year. Legumes are especially effi-


cient because they “fix” nitrogen from the air into the soil.

After the summer garden crops have been harvested, and stalks and vines removed, lightly till the garden to prepare a seed bed, incorporating lime and fertilizer, if necessary. Broadcast the cover crop seed, rake lightly to cover it, and then irrigate. Where you have fall crops growing, you can sow cover crop seed between rows a month or less before expected harvest, but not later than November 1.

If you plant a hardy species that survives the winter, it will resume growth as the weather begins to warm, but be careful not to let the crop go to seed. Cover crops and green manures are usually tilled under in the spring before planting. If the crop is tall or thick, cut it with a lawn mower prior to tilling – especially legumes as they may clog machinery. For large gardens, a rototiller is the most practical way to incorporate any type of crop. The crop should be turned under two to three weeks before planting new seed.

Add Nutrients

If your sod test recommends additional nutrients, add them just before planting your main crops. By regularly adding organic matter to the soil, there is less need for chemical fertilizers, since organic matter promotes a gradual release of plant nutrients. Organic matter alone, however, will not provide sufficient nutrients for plants. Animal manures or other fertilizers should also be incorporated into garden soil.



Clover

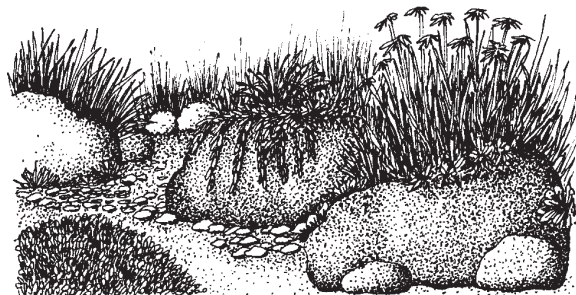
Alfalfa

Cover Crops

Roots improve the tilth (soil structure) more than tops of plants when they are incorporated. Different crops vary in the depth of their roots. Fine grasses and clover roots work on the upper 6 to 12 inches; alfalfa and sweet clover have taproots which extend deeper. When they die and rot, the roots leave channels for water and air movement in the soil.

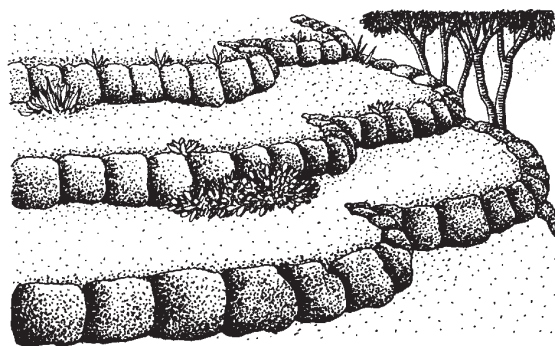
Correct Severe Situations

Many extreme soil conditions can be corrected through the addition of organic matter or the use of some creative solutions.

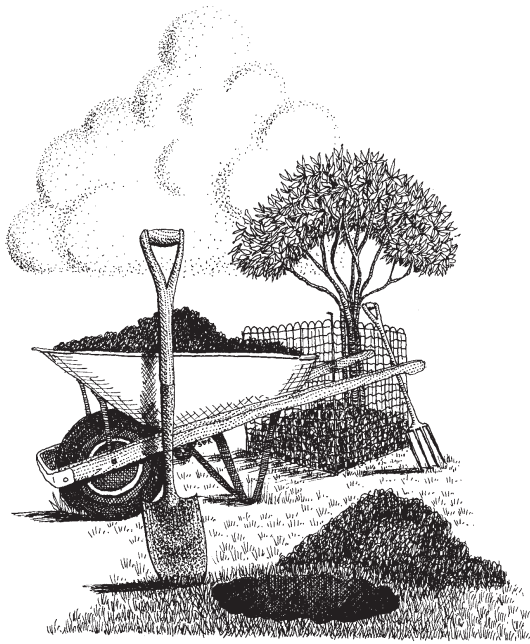


If your soil is *very rocky*, consider using large rock formations as landscape features and plant a rock garden. You can also improve the soil in the least rocky pockets and then plant. Rocks can be raked out by hand or you can use a tractor for large areas. Be sure to incorporate lots of organic matter.

For soil that is *primarily clay or sand*, or that has a *hard surface crust* (water runs off), or is *compacted*, incorporate 2 to 3 inches of organic matter in the top few inches of soil and mulch liberally for several years. Also, plant cover crops each year until the soil is improved.



Raised beds or terraces are good solutions for improving *extremely poor or shallow* (bedrock close to surface or topsoil removed during construction) soil or soil with *poor drainage*. The site can also be graded, then covered with an 8 to 12 inch layer of topsoil – but guard against erosion. Poor drainage can also be helped by installing drainage tile.



For more information on selection, planting, cultural practices, and environmental quality, contact your local Virginia Cooperative Extension Office. If you want to learn more about horticulture through training and volunteer work, ask your Extension agent about becoming an Extension Master Gardener. For monthly gardening information, subscribe to *The Virginia Gardener Newsletter* by sending your name and address and a check for \$5.00 made out to "Treasurer, Va. Tech" to The Virginia Gardener, Department of Horticulture, Virginia Tech, Blacksburg, VA 24061-0349. Horticultural information is also now available on the Internet by connecting with Virginia Cooperative Extension's server at <http://www.ext.vt.edu>

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