

An Overview of Soil

What are some features of good soil?

Any farmer will tell you that a good soil:

- drains well and warms up quickly in the spring
- does not crust after planting
- soaks up heavy rains with little runoff
- stores moisture for drought periods
- has few clods and no hardpan
- resists erosion and nutrient loss
- supports high populations of soil organisms
- does not require increasing fertilizer for high yields
- has that rich, earthy smell
- produces healthy, high quality crops.

All these criteria indicate a soil that functions effectively today and will continue to produce long into the future. Creating soils with these characteristics can be accomplished by utilizing management practices that optimize the processes found in native soils.

Soil composition

Weights of soil organisms in the top 7 inches of fertile soil.

Organism per pounds of liveweight/acre

Bacteria	1000	Algae	100	Insects	100
Actinomycetes	1000	Protozoa	200	Worms	1000
Molds	2000	Nematodes	50	Plant roots	2000

Soil textures

Texture Designation

Coarse Textured

Fine Textured

Sand Loamy sand Sandy loam Fine sandy loam Loam Silty loam Silt Silty clay loam Clay loam Clay

Soil structure

Structure refers to the combination or "aggregation" of sand, silt and clay particles into larger secondary clusters. If you grab a handful of soil, good structure is apparent when the sand, silt, and clay particles are aggregated into granules or crumbs. Both texture and structure determine pore space for air and water circulation, erosion resistance, looseness, ease of tillage, and root penetration. However, while texture is an innate property of the native soil and does not change with agricultural activities, structure can be improved or destroyed readily through our choice and timing of farm practices.

The organic soil component contains all the living creatures in the soil and the dead ones in various stages of decomposition. An acre of living soil can contain 900 pounds of earthworms, 2400 pounds of fungi, 1500 pounds of bacteria, 133 pounds of protozoa, 890 pounds of arthropods and algae, and even small mammals in some cases. In fact, the soil could be viewed as a living entity, rather than an inert body.

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Soil Building Techniques:

If you walk through a natural woodland, you will see many fallen logs and branches on the ground and layers of organic matter, all forming an complex blanket merging with the forest floor. The older these logs, leaves, animal droppings, and layers of living and dead plants are, the more life they sustain. A log that has rested on the forest floor for five or ten years will be covered in moss, mushrooms, wildflowers and even young trees. Poke at it a little and you will notice that the decaying wood is damp in all but the most vicious of droughts. The same is true for the soil found under the leaf layer on the forest floor. These layers of organic matter provide food for soil organisms and insects, retain critical life-giving moisture, and as they breakdown provide nutrients for regenerating plants and trees. To build soil, we need only to mimic this regenerative process happening all around us. Building soil ultimately takes time but employing techniques like cover cropping, humanure composting, organic yard and food waste composting, sheet composting, mulching, and Hugelkulture will accelerate the process.

Composting is nature's process of recycling decomposed organic materials into a rich soil known as compost. Anything that was once living will decompose. Basically, backyard composting is an acceleration of the same process nature uses.

Sheet composting or sheet mulching accelerates decomposition by adding layers of cardboard, newspaper, and weed-free, woody and leafy matter in an attempt to mimic the forest floor.

Cover Crops or green manures are easy to plant and require only basic care to thrive. The garden and farming technique suppresses weeds, builds productive soil, and helps control pests and diseases. Cereal grains, legumes, and brassicas are most commonly used for cover crops.

Hugelkultur is an old method developed in Eastern Europe. It uses woody wastes such as fallen logs and pruned branches in order to build soil fertility and improve drainage and moisture retention.

Recommended Books:

- Soul of the Soil, By Joseph Smillie and Grace Gershuny. Chelsea Green Publishing
- Soil Fertility - Renewal & Preservation, By E. Pfeiffer. The Langhorne Press
- Gaia's Garden: A Guide to Home-Scale Permaculture, by Toby Hemenway and John Todd. Chelsea Green Publishing
- Edible Forest Gardening, By Dave Jacke with Eric Toensmeier, Chelsea Green Publishing

Online Reading:

- Vermont Crops and Soils: Providing information about field and forage crop production and utilization in Vermont and beyond. <http://www.uvm.edu/pss/vtcrops/>
- Soil Microbiology: A one page primer by Vern Grubinger, VT Vegetable and Berry Specialist. University of Vermont Extension <http://www.uvm.edu/vtvegandberry/factsheets/SoilMicrobes.html>
- Good article, '10 Easy Soil Tests' from Organic Gardening magazine <http://www.organicgardening.com/learn-and-grow/10-easy-soil-tests>
- ATTRA Project (National Center for Appropriate Technology) This publication covers basic soil properties and management steps toward building and maintaining healthy soils. <http://www.soilandhealth.org/01aglibrary/010117attraoilmanual/010117attra.html#utilize>
- The Penn State Agronomy Guide is a comprehensive publication on crop and soil management and pest management for farms of all sizes. <http://pubs.cas.psu.edu/FreePubs/PDFs/agrs026.pdf>