



Sustainable Gardening—Building Healthy Soil

WHAT IS HEALTHY SOIL? — HEALTHY SOIL IS A LIVING SYSTEM THAT INCLUDES:

- **Inorganic material**—rock/mineral particles.
- **Air** (especially oxygen) and **water**.
- **Organic material**—living organisms: roots, worms, microbes, etc.; decomposing/decomposed organisms.

CHARACTERISTICS OF HEALTHY SOIL:

- A self-balancing natural **ecosystem** with stable populations of plants & soil organisms.
- Approx. 5% organic matter with a stable, slightly acidic pH that keeps nutrients supplied in plant-available forms.
- Continuous **nutrient cycling** throughout the soil system. Plant roots exude sugars & proteins that attract & feed soil organisms. As these organisms die/decompose or are eaten by others, nutrients are released back to plants.
- Strong “crumb” or granular **soil structure**, with a mixture of pore sizes that hold both air and water.

WHAT CREATES SOIL STRUCTURE? — THE LIFE IN THE SOIL.

- Soil organisms decompose organic matter, slowly producing humus, highly resistant to further breakdown.
- Soil organisms produce glues and filaments that bind tiny mineral particles and humus together into soil crumbs.
- Worms and other burrowing creatures continuously open pathways for roots, air and water.

BENEFITS OF GOOD SOIL STRUCTURE:

- Maintains critical soil air space while acting as a rainfall reservoir...soil becomes like a sponge.
- Drains excess water quickly, avoiding detrimental, disease-friendly anaerobic conditions.
- Helps soil resist erosion & compaction.
- Allows beneficial soil organisms to flourish; they maintain the structure & keep the nutrient cycle going.

WHAT DISRUPTS THE SYSTEM & LEADS TO COMPACTION, EROSION, INFERTILITY, ETC?

- Excessive disturbance, esp. rototilling, construction
- Working or even walking on wet soil
- Excessive watering; excessive dryness
- Leaving soil bare (leave some bare for native bees)
- Chemical fertilizers, pesticides, chlorinated water (includes chloramines)
- Excessive pruning/shearing of plants (stimulates excess growth, depletes soil nutrients)

BENEFITS OF USING COMPOST & MULCH:

- Returns nutrients to the soil; keeps waste out of the landfill.
- Replenishes/supports populations of beneficial soil organisms.
- Helps form soil aggregates, improving soil structure.
 - » Clay soils – improves aeration, water infiltration & percolation.
 - » Sandy soils – increases water-holding capacity, helps hold nutrients.
- Organic mulches decompose in place, providing slower but similar benefits. Sheet mulching is especially effective.
- If you're short on time, keeping the soil covered with an organic mulch is the simplest approach.

SIMPLE THINGS YOU CAN DO TO HELP YOUR SOIL:

- **Work with, not against the ecosystem...handle with care, put back what you remove.**
- Avoid compaction & excessive soil disturbance.
- Reduce pruning & waste—right plant, right place; design beds carefully.
- Avoid chemical/synthetic fertilizers, overfertilizing, overwatering, severe underwatering.
- Use **compost and mulch** to supply/recycle soil microbes & nutrients, to nurture the soil organisms that partner with your plants, and thus to keep the engine running!



Building Healthy Soil—Recipes

Aerobic Compost—The Recipe		Serves: Billions
Ingredients: equal parts browns and greens Chop: into small pieces to improve decomposition Arrange: into pile; reasonable pile size = 3' x 3' x 3' Add: water just to level of wrung-out sponge Stir (turn): often to maintain uniform decomposition	Add: water as needed to maintain moisture level Harvest: when soil-like in appearance Screen: to remove big chunks before adding to soil Incorporate: into top few inches of soil or potting mix Enjoy: a beautiful & healthy garden	
Mulching: Apply disease and weed-free organic mulch 2-4" thick, keeping it away from the root crowns of plants. Apply coarser mulch more thickly, finer-textured mulch more thinly. Reapply as needed.		
Sheet Mulching: Cut or mow weeds. Apply thin layer of compost, cover with dampened newspaper or cardboard, overlapping edges. Cover with 2-4" of mulch as above. Keep damp to hasten decomposition and soil enrichment.		

Building Healthy Soil—Online Resources

- United Nations Food and Agriculture Organization
 - **2015 International Year of Soils.** <http://www.fao.org/soils-2015/en/> A wealth of information & resources. Be sure to check out the quick video entitled *Soils: Our Ally Against Climate Change*.
- USDA Natural Resources Conservation Service
 - **Web Soil Survey.** <https://websoilsurvey.nrcs.usda.gov/app/> Look up information about your soil! (Contact the UC Master Gardener Program of Contra Costa County for assistance with this application.)
- USDA Natural Resources Conservation Service
 - **Soil Health.** <https://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/> An excellent overview that is well worth your time.
- ~~US Bureau of Land Management~~
 - ~~**Soil Biological Communities.** <http://www.blm.gov/nstc/soil/index.html>~~ Sadly, no longer available.
- ReScape California (formerly Bay-Friendly Landscape Coalition)
 - **Bay Friendly Gardening.** <http://rescapeca.org/wp-content/uploads/2016/01/Bay-Friendly-Gardening-Guide.pdf>
- River-Friendly Landscaping (Sacramento)
 - <http://www.ecolandscaping.org/riverfriendly/>
- CalRecycle Organics—lots of composting information
 - <https://www.calrecycle.ca.gov/Organics/CompostMulch/>
- RecycleSmart (formerly Central Contra Costa SWA)
 - Home composting bins & other composting info. <https://www.recyclesmart.org/composting>
- UC Agriculture & Natural Resources
 - **Composting Is Good for Your Garden and the Environment.** <https://anrcatalog.ucanr.edu/pdf/8367.pdf>
 - **Soil Management & Soil Quality for Organic Crops.** <https://anrcatalog.ucanr.edu/pdf/7248.pdf>
 - **Soil Fertility Management for Organic Crops.** <https://anrcatalog.ucanr.edu/pdf/7249.pdf>
- UC Master Gardener Program of Contra Costa County
 - **Composting 101.** <http://ccmg.ucanr.edu/files/172573.pdf>
 - **Using Compost in your Garden.** <http://ccmg.ucanr.edu/files/221120.pdf>
 - **Soil Testing Labs for the Home Gardener.** <http://ccmg.ucanr.edu/files/51308.pdf>