

Working with clay soil

There is much debate about the best way to garden with clay soil. Growing native plants is very different than cycling through annual vegetables and herbs, and so recommendations for edible gardens usually do not apply to natives. The best approach to native plant gardening with clay soil, as long as weeds or other plants have been able to grow in the area, is to select plants that do not require excellent or good drainage. There are lists of native plants that do well in clay soil (see below) but each garden is different and so gardeners should be adventurous - within reason!**If nothing grows**

In the rare case where nothing is found growing in the soil, one needs to enlist professional assistance to determine the problem and the appropriate solution. Causes may include chemical imbalances, the presence of toxic chemicals, high salinity, or the absence of microorganisms, among other things. There is no way forward without knowing precisely what the problems are.

Texture and structure

This, however, is not a common in most residential yards. Usually, although we are unable to grow some of the plants we prefer, weeds seem to like the soil just fine. Beside selecting plants that can grow in heavier soil, certain gardening practices will improve your success. With clay soil one must be very careful to avoid compaction. The term clay soil refers to the texture of the soil, that is the preponderance of very, very small particles. Sandy soil, in contrast, has an abundance of large-sized particles. The tiny clay particles are typically flat in shape, like small flakes. The flakes can easily stick to each other and other particles resulting in compacted brick-like soil (think clay bricks!). So the best advice is to avoid digging, walking, driving or dragging a wheelbarrow across wet, clay soil.

In addition to texture, soil also has structure. This term refers to the arrangement of soil particles into clumps or aggregates. Clay soil with good structure has gaps, pores, and small cracks throughout the soil that improve infiltration, drainage, and aeration. Rototilling and cultivation destroy soil structure - and set the stage for a healthy crop of weeds. Working wet clay soil, as noted above, damages soil structure, resulting in compacted, often impenetrable soil. Cultivating dry, clay soil, also, damages its structure, and so it is best to garden when the soil is moderately wet. You can tell the moisture is correct if a small ball of soil falls apart when handled. Dry, clay soil will hold together until it breaks, while wet, clay soil will just, well act like clay.

Amending soil

Amending clay soil is difficult to do properly, and if done incorrectly, can exacerbate the problem. Since clay soil has a high percentage of very small particles, one would think that adding sand would improve drainage and aeration. However, if too little sand is added to clay soil, the result is pretty much the same as creating concrete - clay plus sand. The grains of sand migrate to the small pores in the soil where clay particles surround and stick to them. It is generally recommended that coarse sand in the amount of 50% or more by volume is required to improve drainage. Organic

material can be added to the mix, though clay soil itself is fairly rich in nutrients. The organics will decompose over time.

"Soil conditioners" are often recommended for the improvement of heavy soils. They are only helpful, however, if they correct chemical problems. Gypsum, calcium sulfate, may be recommended to improve drainage in clay soils. However, its real purpose is to replace sodium in saline or sodic soils with calcium. If it is determined through a soil test that there is too much sodium, then the soil chemistry needs to be corrected, either through leaching or the addition of gypsum. However, it has not been shown that gypsum improves soil fertility, structure or pH for other soils ([The Myth of Gypsum Magic](#), Linda Chalker-Scott). Lime, another commonly recommended amendment, is made from limestone and contains calcium carbonate and sometimes magnesium carbonate. It is used to raise soil pH, meaning it decreases soil acidity. Western soils are usually fairly alkaline to start with, and so, in addition to adding calcium and magnesium, which may not be needed, it also increases alkalinity. Chemical soil conditioners should only be applied when called for by a soil test.

When amending clay soil one needs to consider what happens at the boundary between the amended soil and the native soil. Water can collect there leading to root problems down the line. Even if water is prevented from collecting, plant roots may not be able to penetrate the harder clay soil, limiting the size and form of the root system.

What to do

I can hear the frustrated gardener say: *Okay, I won't amend the soil, I won't work it or walk on it when it is saturated, I will limit myself to plants that do not require great drainage, but you have not seen my soil. It is terrible. Can't I do something to improve it?*

Many gardeners have found that applying a thick layer of coarse mulch, approximately 2 - 5 inches, works wonders. The mulch protects the soil from compaction, and over a short period of time worms and other insects and microorganisms do much to improve soil structure. I would suggest, though, that if you are planning a desert garden, inorganic mulch is more appropriate since you do not want to further increase soil fertility. In this case, the mulch can still protect the soil, but you will have to be patient as it can take much longer for desert soils to improve.

When planting in clay soil, dig the hole wider but not deeper than the root ball. Roughen sides of the planting hole. Backfill with native soil, do not add amendment to the planting hole. I would also suggest that you remove as much of the potting mix as you can without damaging the root ball. Leaving the container soil on the roots creates conditions similar to adding amended soil to the planting hole. Since water cannot easily move into the surrounding clay soil, the roots may rot in the wet planting hole.

Irrigate slowly to allow water to penetrate with no runoff. On/off cycling allows time for deeper water infiltration. Check for moisture several inches below the surface. Do not water again until soil

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is moderately dry.

Try growing some durable wildflowers like California poppies to begin the process of developing good soil structure. A layer of coarse gravel mulch may help the seedlings germinate and penetrate the soil.

To increase variety in your garden, grow some plants in containers or raised beds (at least two feet deep, and prepared so water does not accumulate at interface) where you can easily modify soil conditions. Remember that plant roots may be unable to penetrate the soil beneath and around a raised bed and select smaller plants that can grow in the confined space.

And most importantly, be patient. As plants start to grow in your clay soil, root growth and other biological activity will gradually improve the soil structure. The garden will settle in, you will learn what works and what doesn't work, and your patience will be rewarded.

RESOURCES

[Growing natives in clay soil](#). Wild Suburbia how-to sheet.

[Horticultural Myths](#) by Linda Chalker-Scott, Washington State University, Extension Urban Horticulture

- [The Myth of Soil Amendments Part II: "If you have a clay soil, add sand to improve its texture"](#)
- [The Myth of Gypsum Magic](#)

[Improving Clay Soils](#), by Keith Baldwin, Fine Gardening.

[Native Plants Tolerant of Clay Soils](#). Leaflets of the Santa Barbara Botanic Garden. Vol. 1, No. 12, 1969. pp. 125-126.

[Soil Science & Management](#), 3rd Edition, by Edward J. Plaster. 1997. Delmar Publishers.

[Working with Clay Soil](#). Bachman's.

PLANT LISTS

[California Native Plants Suitable for Clay Soils in San Francisco Bay Area Gardens](#), Gardening With Native, CNPS – Santa Clara Valley Chapter.

[Clay Tolerant Native Plants](#), Yerba Buena Nursery.

[Plants for Clay Soil](#), Weeding Wild Suburbia.