

Urban Horticulture Note No. 3

AMENDING CLAY SOILS

Gardeners in many areas of the country can take good soil for granted, but gardeners here in the Triangle have to work for it. Our heavy, sticky, clay soil needs organic matter, and lots of it, to become good garden soil.

The top 8-10" of soil, where plants' roots live, determines the success of your gardening efforts. Plants need oxygen just as people do. Clay soil is too compact to allow roots to "breathe."

Adding **organic soil amendments** to the soil lightens soil texture, discourages compaction, adds nutrients, improves drainage and aeration, moderates soil temperature, and provides pore space, which is essential to plant growth.

Clay without organic matter is like a flattened deck of playing cards. Adding organic material jumbles the cards, permitting water and oxygen to enter the soil.

Red clay has excellent potential; improving drainage and aeration makes it good soil. The gray plastic of the Triangle is among the world's worst soils, but it can be improved by the addition of enough organic material. Sandy soils can also benefit from added organic matter, which improves the sand's moisture retention and adds needed nutrients.

Established beds will need regular additions of soil amendments, since organic matter breaks down quickly in our warm soils. If your gardening style calls for moving plants in and out of a bed regularly, then soil amendments can be added whenever you move a plant. Established beds will benefit from yearly topdressing with compost or mulch.

Do not work in clay soil when it is wet. Mowing wet lawns or working in wet flower and vegetable beds compacts the soil and spreads fungal diseases.

Soil Amendments vs. Mulch

Soil amendments are worked into the soil. Mulch is placed on top of the soil.

Soil amendments and mulches can be either organic (such as ground bark) or inorganic (such as gravel).

After organic mulch decomposes, it can be worked into the soil as an amendment.

Decomposed plant material from just about any source can become an organic soil amendment. It is decomposed enough when you can no longer tell what it used to be. Well-decomposed organic matter is black and crumbly, and smells fresh and loamy. Examples of starting plant material include last fall's leaves, spent mulch; kitchen vegetable scraps, or the summer's bygone annuals and vegetable plants.

Undecomposed organic matter is best thought of as a "work in progress" for gardeners interested in improving their soils. If you can still tell what it was, it's not decomposed enough yet.

Undecomposed organic matter (such as wood chips or shredded leaves) is fine as mulch, but should not be worked into the soil during the growing season. The microorganisms that decompose it will take nitrogen that your plants need.

As always, there's an exception to the rule: under decomposed organic material can be tilled into the soil in the fall, in preparation for spring planting. The winter will allow time for the under decomposed organic material to break down. Freezing and thawing cycles also help.

HOW TO AMEND

Don't Guess: Soil Test!

A soil test will tell you exactly what nutrients your soil needs. Incorporating fertilizer and lime into a bed is a great way to get these nutrients deep into the root zone where they are needed. The NC Department of Agriculture & Consumer Services provides soil testing to North Carolina residents at no cost. The Durham County Extension Center will provide you with the materials necessary for a soil test.

How Much to Use

The ideal amount of organic soil amendment is 25-50% by volume. Less than 25% will not provide enough aeration, and more than 50% is actually detrimental to plant growth.

Digging In Amendments

Spade or till the soil to a depth of about 8" (the full length of a shovel blade). Spread a layer of organic amendment about 2" deep over the area, and work it into the soil. Break up any clods of clay.

Spread a second 2" layer, add any necessary fertilizer or lime (as indicated by the soil test report), and work this second layer in. Make sure that the organic matter is incorporated to the full depth of the bed.

If the soil is difficult to break up, try irrigating the area, waiting a day or two, then spading again. The wetting and drying process helps break up clods. Clay soil is easiest to till when it is slightly moist. Don't dig if the clay is wet and sticky.

Raised Beds

Raising the bed's level above the surrounding soil is another good way to improve drainage, and it happens naturally when adding soil amendments. Simply rake the amended soil into a smooth berm, or build an edge. The amended soil will settle somewhat as the organic material decomposes. If a level surface is desired, take away some of the amended soil for use elsewhere on your property.

Special Case: Planting Trees

While there is not universal agreement on the subject, most experts in this area recommend NOT amending the soil when planting trees. The reason is that the roots must ultimately grow in our native soil, and it's better to let them adapt to it from the beginning. The experts do recommend loosening the soil by digging or tilling an area three to five times the diameter of the root ball, adding any necessary fertilizer or lime, and backfilling with the native soil.

A layer of mulch 3-4" deep will conserve moisture and discourage weeds, and will release nutrients as it decomposes. Leave a few inches of bare soil around the tree trunk to discourage voles.

RECOMMEND SOIL AMENDMENT MATERIALS

Compost (Humus)

Compost, or humus, is decomposed plant material. It makes an excellent organic amendment for clay soils. Almost, any plant-derived material will make good compost. Your lawn, your trees, and your household are excellent sources of FREE raw materials. Creating compost from them takes just a little collecting and a few months' time.

1. From your lawn and garden: save yard waste, grass clippings, spent annuals, etc.
2. From your trees: save raked-up leaves in fall, and grind them up by making several passes over them: with the lawn mower. Leaves will decompose much more rapidly when ground up.
3. From your household: save vegetable peelings, canning wastes, coffee grounds, etc. (but not cooked food or animal by-products).

“Cold” composting simply means piling your organic debris somewhere and letting nature take its time decomposing it...takes a year or two, depending on the materials in the pile. Putting mulch on your beds and letting it decompose there is a simple form of cold composting.

"Hot" composting means building a pile that contains both nitrogen-rich and carbon-rich materials, keeping it moist, and turning it regularly to encourage the microbes that carry out decomposition. The pile heats up from the microbes' activity, and the elevated temperature is usually hot enough to kill weed seeds and disease pathogens that may be in the pile.

Start a compost pile. Your environment, your plants, and your landfill will all benefit. Compost is one of the best soil amendments available and it's free.

Detailed information on Composting is available from the Durham County Extension Center.

Municipal Compost & Mulch

Call the Solid Waste Management office of the City of Durham and ask about free compost and mulch made from shredded and decomposed yard waste. The City's material varies - if you can, tell what individual pieces used to be, it's still too fresh to be used as a soil amendment, but can be used as mulch.

Purchased Compost (Humus)

Few homeowners have sufficient quantities of compost to amend heavy clay soil. Compost can be bought in bags at garden centers, or by the truckload from companies that sell mulch or topsoil.

Pine Bark Soil Conditioner

Finely-ground nuggets sold as "pine bark mulch" is an excellent soil amendment, and has the advantage of being a native and renewable resource. A pea size grind (1/4 to 1/2 is ideal). The nuggets sold as "pine bark mulch" are too big. Brands and names of products vary, so look before you buy.

Pine bark soil conditioner is available in bags or by the truckload. Look in the Yellow Pages under "Soils." Ask suppliers to describe what they sell, as some places mix it with soil. Straight pine bark is a better deal.

There are other products on the market call “soil conditioner” but many are too fine to provide the needed pore space.

Composted Manure

Well-aged manure is an excellent soil amendment material that provides some minor nutrients as well, though its fertilizing capacity is often over-estimated, tilost analyze at about 1-1-1 . Some examples:

	N	P	K
Cow manure, dried	1.3	.9	.8
Hen manure, fresh	1.1	.9	.5
Horse manure, Fresh	.6	.3	.3

Once it is sufficiently composted, manure has no ‘barnyard smell.’ A load or fresh manure in your driveway, however, may raise some concerns among your neighbors.

Gravel

Gravel is useful as a soil amendment for improving drainage. The best size is a pea gravel called “78”. Which is about 3; 8" diameter. It is a permanent soil addition that does not' break down. It does not, or course, add nutrients to the soil; you still need organic material for that. As an added bonus, sharp gravel in the soil seems to deter tunneling moles and voles.

A similar material is expanded shale, sold under brand names such as "Perma-Till." Expanded shale Is lighter weight than gravel, but more expensive.

Putting gravel in the bottom of a planting hole is not a good way to improve drainage in poorly - drained clay soils. A planting hole in such soils can form a "bathtub without a drain," and gravel at the bottom will not drain the water. It is better to incorporate amendments into the soil, and raise the level of the bed above the existing soil.

NOT Recommended: Peat, Moss

Peat moss is acceptable for houseplants, for starting seeds, and for amending sand', soils: these applications put peat's water-retention characteristics to good use. Peat moss does not perform well as a soil amendment in clay; it first turn; the bed into a soggy bog, and then decays rapidly, leaving” the soil as sticky as when you started.

NOT Recommended: Sand

Sand is not a good amendment for clay soils. Any mixture less than 70% sand in 30% clay actually packs more densely that straight clay. This makes a readily compactable soil that isn’t fun to garden in. Add a bit of water and make your own bricks.

NOT Recommended: Gypsum

Gypsum "clay buster" sold in garden centers is useful in alkaline clay soils, but is not effective on our type of clay.

NOT Recommended: Fresh Manure

Fresh animal manure (in addition to being fragrant) is too salty to use near plants. It will dry out roots and cause burned edges on the leaves. Compost it until it no longer smells like the barnyard; once decomposed it makes an excellent soil amendment. Manure is also a good nitrogen source in the compost pile, to offset higher-carbon materials like dried leaves and plant stems. Don't use human waste or pet wastes, as these can transmit diseases to humans. Cow, horse, rabbit, and chicken manure are fine.

NOT Recommended: Fresh Wood Chips or Sawdust

Wood chips can take years to decompose, and wood needs a lot of additional nitrogen to balance its high carbon content. If wood chips or sawdust are decomposing in your garden soil, they will take nitrogen from the soil to the detriment of your plants.

Hardwood chips break down faster than pine chips. Loads of wood chips from the city or from tree cutting crews may contain large log chunks that will break down even more slowly than chips. Some types of wood may raise soil pH undesirably.

Wood chips are sometimes used as barn bedding for farm animals; the manure mixed in will provide additional nitrogen for decomposition. Owners of horse stables may be glad to have you take their barn waste away, but don't till it into your garden until it's well rotted.

Decomposed sawdust is a good soil amendment.

Of course, undecomposed materials can be used on top of the soil as mulch.

MAYBE: "Topsoil"

Purchased topsoil is not necessarily better than amending your native soil with organic materials. Sometimes the "topsoil" you purchase is not much different from your existing soil; it's just not compacted yet. Sometimes it contains too much sand. Unsterilized topsoil may contain weed seeds.

Topsoil is offered in many formulations; you can sometimes request a topsoil mixture with extra organic material added.

Purchased topsoil is fine for raised beds, though the caveats above still stand. Ask suppliers to describe what they sell. Better yet, visit the yard yourself.

Whether you use purchased topsoil or make your own amended soil, be sure to mix the new materials thoroughly with the native soil. If new soil is just spread over the existing soil, plants will not root into the clay underneath, and the plants will dry out in hot weather.

It's Worth the Work!

Durham's heavy clay soil CAN become good soil. Adding organic material and relieving compaction makes a world of difference to your plants.

FOR MORE INFORMATION

Master Gardener Volunteers at the Durham County Extension Center can provide advice and helpful publications on many gardening and landscape topics. Master Gardener Volunteers are in the office daily, and our phone number is **560-0528**. We welcome your calls!

The following are a few of the publications available from your Durham County Extension Center:

- Urban Horticulture Note 1: Durham's Weather
- Urban Horticulture Note 2: Durham's Soil
- Urban Horticulture Note 3: Amending Clay Soils
- Urban Horticulture Note 4: Improving Soil Fertility
- Urban Horticulture Note 5: Submitting Samples for Soil Testing
- Urban Horticulture Note 6: Understanding the Soil Test Report
- Urban Horticulture Note 7: Planting Trees & Shrubs

- Publication AG-69: Carolina Lawns
- Publication AG-46: Composting: Managing Yard Wastes
- Publication WQWM-151: Home Lawn Care and Water Quality
- Leaflet No. 551: Bedding Plants: Soil Preparation & Fertilization

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The use of brand names in this publication does not imply endorsement of the products or services named or criticism of similar ones not mentioned.