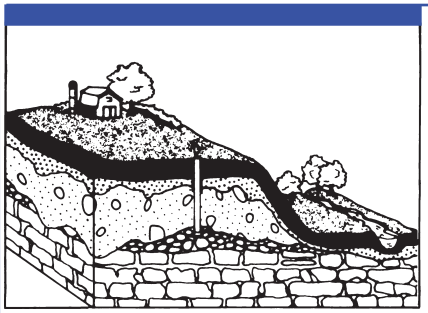

Soil Facts

Modifying Soil for Plant Growth around Your Home

Owners of newly constructed homes in North Carolina commonly confront two issues when landscaping: soil infertility due to poor nutrient availability and physical restrictions created by improper drainage.

The source of the problem

During most new home construction, the topsoil and subsoil are removed from the construction area. If the floor plan includes a basement, additional subsoil material is removed from the site. Removed materials are often placed adjacent to the house and used around the foundation during the final stages of construction. The removal of topsoil and the use of compacted subsoil materials to construct lawns and planting beds can present problems.

Soil Physical Properties

Much of the subsoil in the piedmont and mountain regions has high clay content—commonly called "heavy" soil. If the native soil has been removed and replaced around your home site during construction, this subsoil may now be at the surface. Soils with high clay content tend to have slow water movement and may remain wet for long periods of time. Construction activities also compact the soil, which further reduces the rate of water movement and restricts plant root growth (see Figure 1).

Plants require water storage in soil for use between rainfalls and irrigations. But it is important that the excess water in the soil pore space (the voids around and between soil particles) drains so that plant roots have adequate aeration. Without air movement and exchange, plant roots cannot survive, and plants will, in effect, drown.

Soils in the coastal plain region tend to have high sand content, and are commonly referred to as "light" soils. These soils allow better water movement under natural conditions, but compaction from construction and traffic can reduce infiltration rates drastically.

Soil Fertility

If the soils around your yard, landscape, or gardens have never been amended for plant growth, they may lack the three necessary nutrients: nitrogen, phosphorus, and potassium. These three fertilizer elements must be available in proper proportion to meet plants' nutrient requirements. Native soil may also have an improper soil pH—a measure of acidity or alkalinity—for good plant growth and nutrient availability. Generally, native soil and fill materials in the piedmont and mountain regions are low in both available nutrients and soil pH. Soils in the coastal plain may also have low natural nutrient availability, but pH tends to be less of a concern. All plants require a balanced nutrient supply, but soil pH requirements can be quite different among plant species.

How can you improve soil physical properties?

Increasing the amount and size of pore spaces is an important first step toward improving your soil. A healthy soil typically has more than 40 percent pore space, ranging from large pores,

NC State University
A&T State University
COOPERATIVE EXTENSION
Empowering People • Providing Solutions

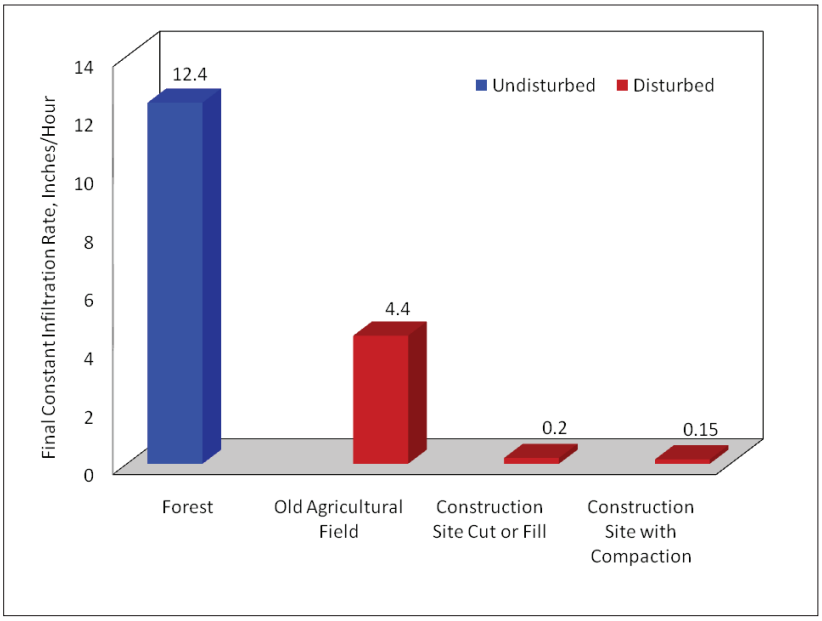

Figure 1. Infiltration rate for undisturbed and disturbed piedmont soils (from Kays, 2008).

which allow drainage, to small pores, which help store water. This combination provides adequate water infiltration and aeration, and it also promotes root growth. Compacted soil reduces the total amount of pore space and the proportion of large pores. Soils made up of small soil particles, such as heavy clay soils, naturally tend to have more small pores, even without compaction, making them difficult to work, difficult to wet, and hard to aerate. Although sandy soils of the coastal plain may not be so restricted from small pore spaces, when they are compacted, their overall amount of pore space can still be low.

Several methods can increase pore space in your soil. In clay soil, adding sand will increase the size range of the soil particles and pore spaces. However, it takes a large quantity of sand to produce a measurable effect, and this method is generally cost prohibitive. Unless you can add sand at four to five times the volume of the clay, smaller amounts may be worse than none at all, producing a concrete-like material. Likewise, adding topsoil from off site might provide some benefits, but this option tends to be expensive for large areas. Adding 6 to 8 inches of topsoil may, however, be appropriate for smaller areas when creating raised planting beds. Homeowners should understand that there are no legal standards for topsoil. What is sold as topsoil may be no better than what you already have—and may even introduce new problems.

A more cost-effective solution for larger areas is to add organic materials, such as composted leaves, grass, or wood bark. These materials will, over time, improve the structure and porosity of the soil and may enhance both drainage and nutrient retention. It is important to use materials that have first been composted, because fresh organic materials will settle as they decompose. In the short term, adding organic materials may also increase the need for nitrogen, which is consumed by microbial activity during decomposition. However, in the long term, organic material added over several growing seasons will lead to richer soil. Adding compost to sandy soils typically requires more frequent and sustained repetition, because the organic materials tend to decompose more quickly. Information about preparing compost can be found in N.C. State University's Horticultural Information Leaflet 8100.

Peat is sometimes added to soil for the same purposes as compost. However, peat is not recommended for soils with high clay content. It tends to behave somewhat like clay in that peat is slow to absorb water, but it also tends to retain water and remain wet. Composted materials provide a better alternative for improving physical properties.

Topsoil or soil amendments should be mixed or tilled into the existing soil, rather than merely placed on top, to improve water movement and encourage deeper root growth. Amendments should be added to no more than half the depth of the tiller tines (usually no more than 3 to 4 inches) in a single application. Tilling helps loosen the soil and reduces the immediate effects of compaction, even without amendments. However, without the addition of organic amendments, the benefits of tilling may not last due to repeated traffic and natural settling of the soil.

How can you improve soil fertility?

After soil amendments are applied, the homeowner needs to adjust the nutrient status of this newly improved soil. Some plant nutrients will already be present in the soil. Proper soil testing will reveal nutrient amounts and types. The North Carolina Department of Agriculture and Consumer Services provides soil analysis at no charge. But the analysis is no better than the quality of the soil sample you submit. For complete instructions on how to take a sample, see Extension publication AG-439-30 (http://www.soil.ncsu.edu/publications/Soilfacts/AG-439-30/), or contact your county's Cooperative Extension Center. Take separate soil samples in each location you have renovated, as well as other planting areas around your home. Mail samples to the North Carolina Department of Agriculture and Consumer Services, Agronomic Division (4300 Reedy Creek Road, Raleigh NC 27607-6465), or drop them off at your local Cooperative Extension office. Your report will be delivered via mail after analysis is completed. You can also find your report online.

Your soil report will recommend the types and amounts of fertilizer you need. The report will also indicate whether lime should be added to correct low soil pH (acidity). Application of lime to achieve proper pH can affect whether soil fertilizer elements are available for plant use. Lime and phosphorus tend to stay in the surface of the soil if not tilled in, thus light tilling will help incorporate these two soil amendments and make them more effective.

Your local Cooperative Extension Service Center is a valuable source of information on lawn and garden care (http://www.ces.ncsu.edu/).

Additional information

Careful Soil Sampling, http://www.soil.ncsu.edu/publications/Soilfacts/AG-439-30/

North Carolina Department of Agriculture and Consumer Services, Agronomic Division, http://www.ncagr.com/agronomi/index.htm

A Gardener's Guide to Soil Testing, http://www.cals.ncsu.edu/agcomm/publications/Ag-614.pdf

Soil Basics (Cornell Gardening Resources), http://www.gardening.cornell.edu/factsheets/misc/soilbasics.html

Using Organic Matter in the Garden (Cornell Gardening Resources), http://www.gardening.cornell.edu/factsheets/orgmatter/index.html

Composting for Home Gardens, http://www.ces.ncsu.edu/depts/hort/hil/pdf/hil-8100.pdf

Urban Landscaping for Wildlife with Native Plants, http://www.ncsu.edu/goingnative/whygo/typland.html

Bed Preparation and Fertilization Recommendations for Bedding Plants in the Landscape, http://www.ces.ncsu.edu/depts/hort/hil/hil-551.html

Reference

Kays, Barrett L. 2008. "Strategies for Clay Soils." Landscape Architecture magazine, May 2008, pp. 66–74.

Prepared by

Greg D. Hoyt,
Professor and Soil Extension Specialist;

Joshua L. Heitman,
Assistant Professor;

Deanna L. Osmond,
Professor and Extension Soil Leader

Department of Soil Science, North Carolina State University

and

Al Cooke,
Agricultural Extension Agent,

Chatham County Cooperative Extension Center
P. O. Box 279, 45 South St., Pittsboro, NC 27312

Published by North Carolina Cooperative Extension
http://www.soil.ncsu.edu/publications/Soilfacts/AG-439-70W/

COLLEGE OF AGRICULTURE & LIFE SCIENCES
ACADEMICS ▲ RESEARCH ▲ EXTENSION

NC STATE UNIVERSITY

AG-439-70W

E09-21809—BS/RM-H