



Soil Sampling For The Home Gardener

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Don't Guess, Soil Test

A soil test can provide information on the proper amount of lime and fertilizer to apply to your lawn, garden and other areas of your landscape. When gardeners apply only as much lime and fertilizer as is necessary and at the appropriate time, nutrient runoff into surface or ground water is minimized, money is saved, and plant health is optimized. Soil testing can also be used to diagnose common nutrient deficiencies for plants that are growing poorly.

The reliability of the soil test, however, can be no better than the sample you submit. For results you can depend on, it is vitally important that you take samples correctly to accurately represent the soil in your landscape.

This publication explains how to obtain representative soil samples and to submit them for analysis to the Virginia Tech Soil Testing Laboratory. It is an easy-to-learn process that will benefit you, your landscape and the environment.

Soil Sampling Equipment

To collect samples use a stainless steel or chrome-plated soil probe, hand garden trowel, shovel or spade (figure 1). Do not use brass, bronze, or galvanized tools because they will contaminate samples with copper and/or zinc.

The soil probe is the best tool for collecting soil samples. The soil probe works better than a shovel or trowel because this tool equally collects soil in a continuous core from the surface through the entire sampling depth with minimal disturbance of the soil. It also allows for faster sampling.



Figure 1. From left to right: a stainless steel soil probe, a hand garden trowel, shovel, and a spade. All acceptable tools for collecting a soil sample.

Some of the disadvantages of a soil probe are: it cannot be used when the soil is too wet because the soil compresses; it cannot be used when the soil is too dry because it is difficult to penetrate the soil. Soil probes also do not work well in soils that contain gravel.

Soil probes are available through agricultural supply companies or your agriculture Extension agent may be able to help you locate a supplier. Cost is typically \$35 or more.

Mix soil samples in a clean, plastic bucket. If the bucket has been used to hold fertilizer or other chemicals, wash and rinse it thoroughly before using it for soil samples. Even a small amount of lime or fertilizer transferred from the sampling tools to the soil can seriously contaminate the sample and produce inaccurate results.

In addition to these tools, if you plan to submit your sample to the Virginia Tech Soil Testing Laboratory, you will need a Soil Sample Information Sheet and a Soil Sample Box. The form is available online at <http://www.soiltest.vt.edu/>, while both the box and the form are available from the Virginia Cooperative Extension office in your county or city. Look in the government pages of your phone book or <http://www.ext.vt.edu/offices/> for the address and phone number of your local Extension office.

When And How Often To Sample

When is the best time to take soil samples? Take a soil sample a few months before initiating any new landscaping—whether it be seeding a lawn, starting a vegetable garden, putting in a flower bed, or planting perennials. Sampling well in advance of planting will allow time for applied soil amendments to begin making the desired adjustments in soil pH or nutrient levels.

Sample established areas—lawns, trees, shrubbery, and other perennials— at any time of year; however, an ideal time to take samples is when the garden season has ended in the late summer to early fall. Sampling in the fall allows time for corrective pH and nutrient management before new growth starts in the spring. Fall sampling also avoids a sometimes busy spring period at the Soil Testing Laboratory, thus avoiding delays in getting your soil test results.

If an established area exhibits abnormal growth or plant discoloration, take a soil sample right away. For areas recently limed or fertilized, delay sampling at least six to eight weeks.

A soil sample is a composite of numerous sub-samples, so a soil that is too wet will be impossible to mix together. As a rule, if the soil is too wet to work (or is good for making mud pies, figure 2), it is too wet to sample. Another way to judge is to squeeze soil into a ball. If it easily breaks apart, then the soil can be sampled.

How often should a soil be tested? If you live in the Coastal Plain region and have sandy soils, it is best to test every two to three years. The sandy soils in that region do not hold nutrients as long as soils in the other parts of the state and are more likely to become acid through the addition of nitrogen. The nutrient levels in the silt and clay loam soils of the Piedmont

and Mountain regions change less rapidly with lime and fertilizer applications. In these areas, soil testing once every four years is usually sufficient.



Figure 2. A display of soil sample mud pies. If the soil is wet enough to make mud pies, sample when it is drier.

Where To Sample

To obtain an accurate soil sample, all that is needed for most gardeners is to divide your landscape into areas of unique use, i.e., a vegetable garden, lawn, perennial flower bed, etc., and to sample those unique areas individually. However, occasionally one of these unique landscape areas will be made up of one or more distinctly different soils. These soil differences may not be evident to the untrained eye, but different soils can have different chemical and physical properties which will result in differences in plant growth. You will need to take your soil sample in a way that will take into account the distinctly different soils that may exist in your landscape.

Think of it this way. When a breeder seeks a pure-blooded animal, two animals of the same breed are mated. If you mix two breeds you have a mix-blooded animal, one with characteristics of both breeds. So it is with a sample that contains soil from more than one soil type. The sample will reflect a mixture of the characteristics of each soil and therefore not correctly represent either particular soil. So a soil sample that results from mixing distinctly different soils may result in fertilizer and lime recommendations that might be high for one of the soil types and low for another.

How can you tell if your landscape area has uniform soils? Here are a few clues. First, you can expect differences in soils due to vastly different landscape positions (figure 3), i.e., hilltops versus steep slopes versus poorly drained bottom areas as in figure 3. Sample each area separately.

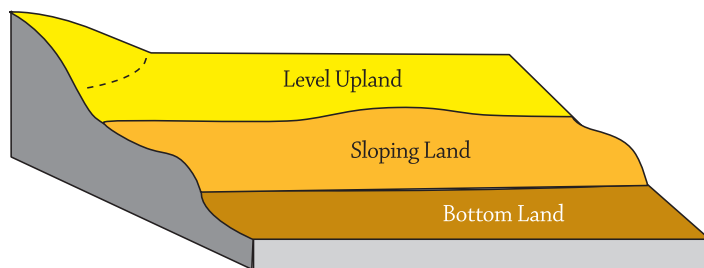


Figure 3. An illustration of different landscape positions. Soils will be different due to vastly different landscape

A second way that different soils may be evident is by differences in soil color. As in figure 4, a predominantly yellow topsoil will likely have different characteristics than a topsoil that is dark brown in color. The eroded area will have different characteristics than either of the other two soils.

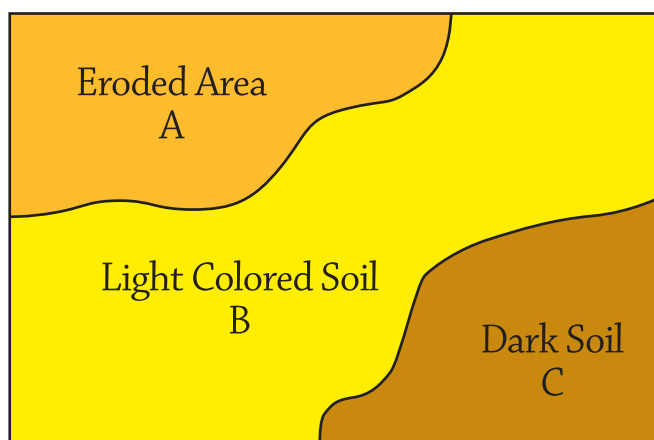


Figure 4. An illustration showing different soil colors

Soil texture is a third factor that may indicate differences in soils. A sandy soil will have different properties than a loam or a clay soil. Appendix 1 describes a method you can use to determine the texture of your soils. For most small landscapes, it will be unusual to find soils with significantly different soil textures. However, severely eroded areas and soils disturbed during building construction are two examples of how human activities may have left soils with different textures in your landscape.

A fourth factor to consider in your landscape are those areas which have had different treatments, perhaps by you or a previous landowner. For example, different treatments exist if your lawn contains two different turf types such as fescue in the front yard and bermudagrass in the back yard. Different treatments exist if you have a portion of a landscaped bed that has consistently received greater amounts of fertilizer or other soil amendment than another portion of the bed.

Different treatments will result in different properties that should be accounted for by sampling the different areas separately.

What's the bottom line? To collect an accurate soil sample that is representative of your landscape, you must, as much as possible, sample from areas that are uniform. So look for changes in soil landscape position, soil color, texture, and treatments to divide areas into separate samples. If there are no evident differences, then sample by unique use areas, i.e., lawn, vegetable garden, orchard, etc.

Where Not To Sample

When collecting samples, avoid small areas where the soil conditions are obviously different from those in the rest of the landscape. For example, in figure 5, your sample should not include soil from the low, wet spot.



Figure 5. An example of a lawn with a low wet spot.

Also, avoid yard or landscape area borders, ditch banks, old brush piles, burn sites, severely eroded areas, old building sites, fence rows, pet dropping and urine spots, etc. Since soil taken from these locations would not be typical of the soil in the rest of the landscape area, including them could produce misleading results.

Soil Sampling As A Diagnostic Tool

If one area of your landscape seems healthy and another area has bare or yellow areas or yields poorly, soil sampling may help to diagnose the problem. Where poor growth exists and this area is large enough to manage separately, then separate composite

samples should be taken from both poor and good areas. By comparing the results, the soil test may point out troubles that exist due to a lack of, or an excess of, nutrients and/or an incorrect pH. However, it should be pointed out that other factors may have a greater influence on plant growth that will not be accounted for by a soil test. These include soil drainage, soil compaction, insects, diseases, rainfall, and other factors.

How To Take A Representative Soil Sample

The first thing you must know to collect a proper soil sample is the depth the sub-samples should be taken. The following table gives you recommended sampling depths for common landscape areas.

Recommended Sampling Depths

Established lawns	2-4 inches
Vegetable and flower gardens	6-8 inches or tillage depth
Trees and shrubs	6 inches

Sample depths are measured from the soil surface downward. For lawns, sample to a depth of 4 inches, excluding any turf thatch. For vegetable and flower gardens, sample to the depth that you plan to incorporate lime or fertilizer, usually 6 to 8 inches. In mulched beds of trees and shrubs, remove any mulch or surface debris, then sample to a depth of 6 inches.

When sampling soil around established trees and shrubs, take sub-samples from an area near the trunk to the outer edges of the branches (the drip line). For a particular landscape area, it is best to use the same sampling depth from year to year so soil test values can be more accurately compared.

How To Take Soil Sub-Samples

We learned earlier that an accurate soil sample must be taken from uniform soil areas. Within that area a soil sample must be made up of multiple sub-samples. These sub-samples are mixed together to make up the composite soil sample for that area. This section describes how to take the soil sub-sample.

STEP 1: Open a hole with a shovel, spade or trowel from the surface to the proper depth for your landscape area (figure 6). Set that soil aside. (If you are using a soil probe, insert it into the soil to the proper depth and remove the plug from the ground).



Figure 6. A shovel can be used to open a hole

STEP 2: With your shovel or trowel remove a 1 inch thick slice from the smooth side of the open hole (figure 7).

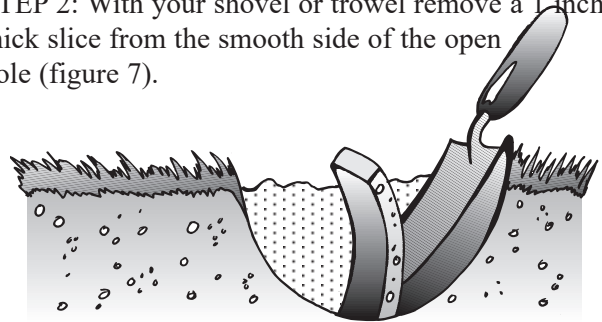


Figure 7. An illustration of a trowel removing a thick slice from the open hole.

STEP 3: With the slice of soil on the blade of the shovel, remove the sides of the slice with a trowel (figure 8), knife or your hands to create a ribbon of soil 2 inches wide and 1 inch thick of the proper depth. Place the ribbon (or plug if using a soil probe) into a container.



Figure 8. An example of creating a ribbon of soil from the initial slice.

STEP 4: Remove any surface mat of grass or litter and any rocks. Place the soil in a clean bucket or container (figure 9).



Figure 9. After the grass and rocks have been removed, place the soil

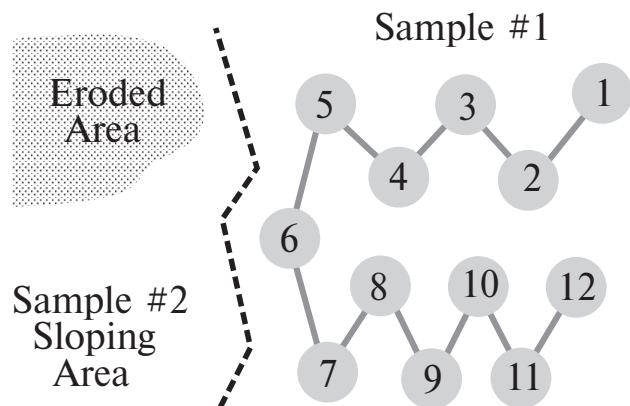


Figure 10. Illustration of a sample pattern for a composite sample.

Remember that a clean, plastic container is best.

STEP 5: Continue to take additional soil sub-samples from the uniform landscape area. By mixing these sub-samples together, you create the composite sample that will be sent to the Soil Testing Laboratory. The next section will explain how many sub-samples you should take for the composite sample.

Making The Composite Sample

Take 10 or more sub-samples from different locations within each uniform sampling area to make a composite sample. Take the sub-samples in a random manner, such as with a zigzag pattern to minimize the variability that may be present in your sampling area. This allows you to obtain a reasonably representative soil sample.

In figure 10, composite sample #1 contains 12 sub-samples. Sample 2 should contain at least 10 sub-samples as well. You should avoid the eroded area when making composite samples #1 and #2. If it is large enough in size, a third composite sample could be collected from this area (figure 10).

The larger the area, the more sub-samples that are needed. The more sub-samples you take, the more representative your sample will be of your landscape area. When you realize that your 1/2 pound composite sample could represent thousands, or perhaps millions of pounds of soil, you can understand why proper sampling is so important.

When you have taken sufficient sub-samples from a uniform area, thoroughly mix the sub-sample slices or cores, breaking up clumps and removing all foreign matter such as roots, stalks, rocks, etc. Now you are ready to prepare the sample for the Soil Testing Laboratory.

Submitting the Sample to the Lab

Obtain free Soil Sample boxes and Soil Sample Information Sheets from your local Virginia Cooperative Extension office, certain agribusinesses, and garden centers. Use permanent ink or pencil to fill out forms and label boxes.

Fill the sample box completely with loose air-dried soil and label it with your name, and sample identifier (figure 11). Give the sample an identifier of up to five letters and/or numbers. Choose a unique identifier that will help you remember the area it corresponds to, such as FYARD, BYARD, ROSE2, or GARDN. Be sure to keep a record of the areas sampled with their corresponding identifier. This is particularly helpful if you are taking multiple samples.

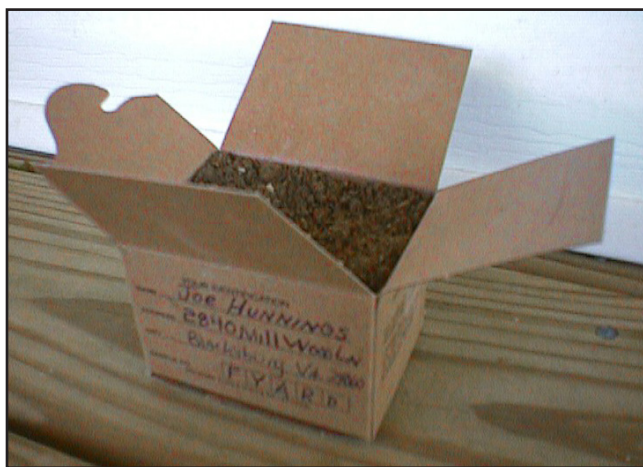


Figure 11. A full soil sample box properly labeled with name, address, and sample identification.

Complete the Soil Sample Information Sheet

The Virginia Cooperative Extension Soil Sample Information Sheet is an important part of the sample process. The Information Sheet is available online at <http://www.soiltest.vt.edu>, or from your local Virginia Cooperative Extension Office. It also includes a page of sampling instructions.

To get the most value from your soil test, take the time to fill in the blanks on the Information Sheet as completely and accurately as possible. Be sure to list the correct plant code for each sample you submit. Also, check to make sure that the sample identifier you put on the Sheet corresponds to the identifier on the sample box and in your records. Costs for the various soil tests that are offered are listed on the information sheet. If you need assistance with the Information Sheet, contact your local Extension office.

Mail the completed Information Sheet with the sample box and payment in a sturdy shipping box to the Virginia Tech Soil Testing Lab, 145 Smyth Hall (0465), 185 Ag Quad Ln., Blacksburg, VA 24061.

Results From the Soil Testing Laboratory

Soil samples at the Virginia Tech Soil Testing Laboratory are usually analyzed within one week of the time they are received. However, in early spring, processing the sample and mailing you your results may take two weeks due to the large number of samples sent in by farmers at this time.

The Soil Testing Laboratory will provide you with information on the availability of nutrients in your soil. The routine soil test costs \$10 (cost subject to change). The test measures and makes recommendations for the following major nutrients: P (phosphorus); K (potassium); Ca (Calcium); Mg (Magnesium) and five micronutrients. In addition, the routine test determines the soil pH and makes recommendations on how to raise or lower the pH. Less frequently needed tests that are available at an additional cost include organic matter and soluble salts.

A soil test is not usually performed for the presence of N (nitrogen). Nitrogen can quickly move out of the root zone of the soil by downward movement of water or by plant uptake. Due to nitrogen's potential for rapid

changes in availability in the soil, a soil test may show nitrogen levels that no longer exist. Soil Testing Laboratories still provide nitrogen fertilizer recommendations. The recommendations are based on years of research that has determined plant nitrogen needs.

When testing is complete, a report is either emailed or mailed to you and an electronic copy is available to the Agriculture Extension Agent for your county or city (figure 12). Supplemental

notes are mailed with the report and are also available online at www.soiltest.vt.edu. The notes explain the technical terms used in the report and provide extra details on fertilizer application schedules and rates for specific kinds of plants. Feel free to contact your Extension Agent for more help on sampling, interpreting soil test results, and understanding how to implement them. The phone number for your local Extension office appears on the upper left of your report.

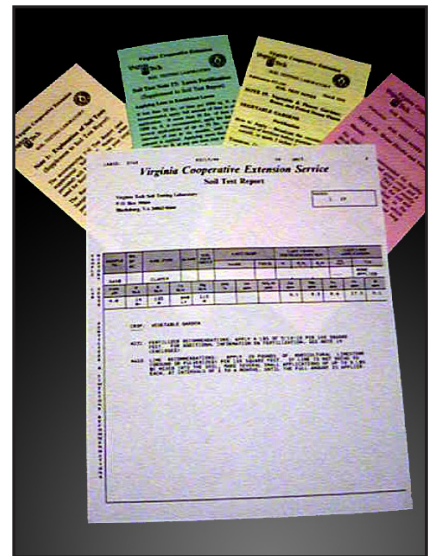


Figure 12. A soil test report with supplemental information.

Appendix 1: Soil Sampling For The Home Gardener

Determining soil texture by feel

