Gardening Basics

Gardening from the Ground Up

A successful garden begins with the soil

Soil is not dirt

Dirt is what people and pets bring into the house that needs to be cleaned up. Soil, with its organic material and microorganisms, contains EVERYTHING that plants need to grow. Soil should be treasured. Folk wisdom tells us that a poor gardener grows weeds, a good gardener grows vegetables, and a great gardener grows soil. The dirt in your North Texas landscape is likely to need some help to become soil.

Types of soil

Texture Sand, silt, or clay

Most native soils are a combination of these three particle types

The relative size of particles if a particle of clay were a BB, then a particle of silt would be the size of a golf ball, and a grain of sand would be the size of a chair

Sandy soils feel gritty; silty soils feel floury, and clay soils feel greasy

Many North Texas soils are “heavy,” having a high proportion of clay

Clay is nutrient-rich but slow draining. Sand is quickly draining but has trouble retaining nutrients and moisture. Loam (a combination of clay, sand, and humus) is generally considered to be ideal soil because it retains moisture and nutrients but doesn’t stay soggy.

Clay is not bad gardening soil, but it is challenging to achieve desirable structure and tilth (Factors that determine tilth include the formation and stability of aggregated soil particles, moisture content, degree of aeration, rate of water infiltration, and drainage.)

What is your soil type?

To determine your soil type, take a handful of moist (but not wet) soil from your garden and give it a firm squeeze. Then, open your hand. One of three things will happen:

It will hold its shape, but when you give it a light poke, it crumbles. Lucky you, you have loamy soil.

It will hold its shape, and when poked, it sits stubbornly in your hand — you have clay soil.

It will fall apart as soon as you open your hand — you have sandy soil.

Clay soil: the good, the bad, and the ugly

The bad:

- Difficult to work
- Dries out slowly
- Surface hard crust restricts moisture penetration

The good:

- Clay can hold moisture and nutrients between its thin layers
- Clay layers have “parking spaces” that can hold nutrients
- The parking spaces are negatively charged, which attracts positively charged (cations) nutrients such as calcium, magnesium, potassium, ammonium nitrate, and zinc.

Soil Analysis

How to take a soil sample:

- Take samples from several locations in your garden or landscape bed, four to six inches deep.
- Mix the samples
- Pack the samples (use two bags for safety), label and ship

Information at http://soitesting.tamu.edu/

Ph = soil acidity

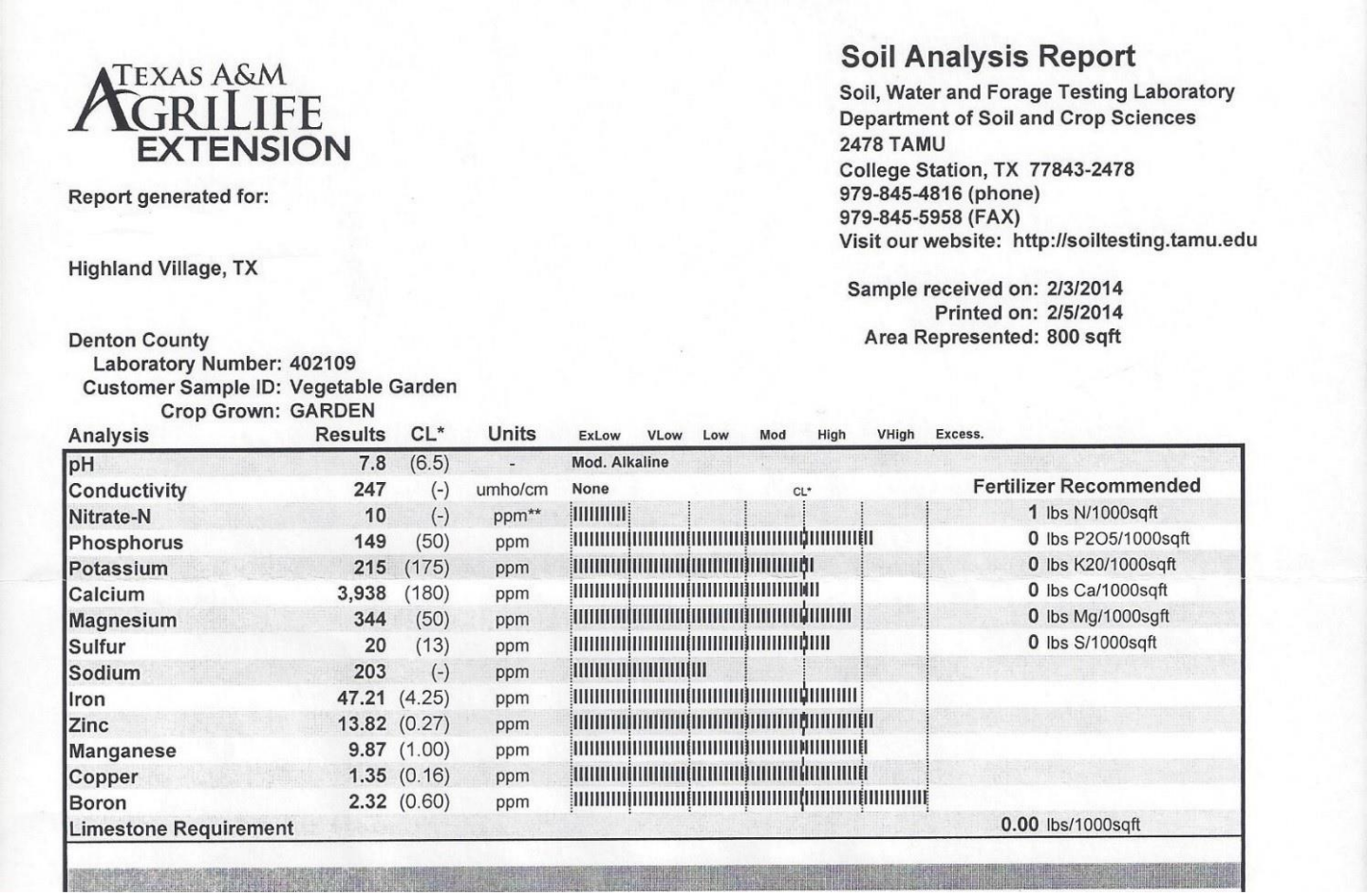
Macronutrients =

N - nitrogen
P - phosphorus
K - potassium
Ca - calcium
Mg - magnesium
S - sulfur

Micronutrients =

Boron (B)
Copper (Cu)
Iron (Fe)
Chloride (Cl)
Manganese (Mn)
Molybdenum (Mo)
Zinc (Zn)

Understanding a soil analysis report



TEXAS A&M AGRILIFE EXTENSION

Soil Analysis Report

Soil, Water and Forage Testing Laboratory
Department of Soil and Crop Sciences
2478 TAMU
College Station, TX 77843-2478
979-845-4816 (phone)
979-845-5958 (FAX)
Visit our website: http://soiltesting.tamu.edu

Report generated for:

Highland Village, TX

Sample received on: 2/3/2014
Printed on: 2/5/2014
Area Represented: 800 sqft

Denton County
Laboratory Number: 402109
Customer Sample ID: Vegetable Garden
Crop Grown: GARDEN

Analysis	Results	CL*	Units	ExLow VLow Low Mod High VHigh Excess.	Fertilizer Recommended
pH	7.8	(6.5)	-	Mod. Alkaline	
Conductivity	247	(-)	umho/cm	None CL*	
Nitrate-N	10	(-)	ppm**		1 lbs N/1000sqft
Phosphorus	149	(50)	ppm		0 lbs P2O5/1000sqft
Potassium	215	(175)	ppm		0 lbs K20/1000sqft
Calcium	3,938	(180)	ppm		0 lbs Ca/1000sqft
Magnesium	344	(50)	ppm		0 lbs Mg/1000sgft
Sulfur	20	(13)	ppm		0 lbs S/1000sqft
Sodium	203	(-)	ppm		
Iron	47.21	(4.25)	ppm		
Zinc	13.82	(0.27)	ppm		
Manganese	9.87	(1.00)	ppm		
Copper	1.35	(0.16)	ppm		
Boron	2.32	(0.60)	ppm		
Limestone Requirement					0.00 lbs/1000sqft

More info: Google search for soil report interpretation Oregon State University

Adding organic matter (compost) helps transition your dirt into soil. **Compost** is organic matter that has been completely decomposed. It will:

- Improve the ability of the soil to accept and store water.
- Increase the activity and number of soil organisms.
- Over time, well-amended soil supplies many of the nutrients your plants require and reduces the need for supplemental chemicals.
- Although you might not expect it, adding organic matter to soil also helps to protect water quality and the environment by limiting chemical runoff into watersheds.

How much compost?

- For landscape beds, add 3 inches of compost (organic matter) and work into 6 to 8 inches of soil.
- For vegetable gardens, add 6 inches of compost and work into the soil.

Adding 3 inches of mulch on top of the soil moderates soil temperature, limits weeds, and conserves water. Over time, organic mulch breaks down into compost and feeds the soil.

What is composting?

Composting is the transformation of organic material (plant matter) through decomposition into a biologically humus-rich substance suitable for growing plants. Invertebrates (insects and earthworms), and microorganisms (bacteria and fungi) help in this transformation.

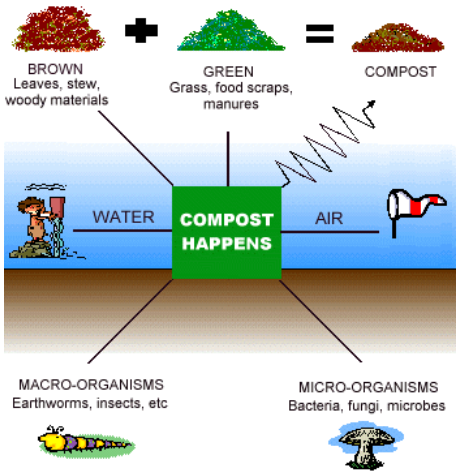
What's happening?

Compost piles contain microorganisms, such as bacteria, fungi, actinomycetes, and macro-organisms, including worms, sow bugs, centipedes, and others. Macro organisms break down large pieces of materials and transform them into digestible forms for microorganisms. Microorganisms account for most of the decomposition in a compost pile. Bacteria use carbon materials for energy and nitrogen materials to build their bodies and reproduce. Types of bacteria function within a unique temperature range. (Psychrophilic 55° to 70 °, Mesophilic 70° to 100° and thermophilic above 100°)

Actinomycetes decompose the more resistant organic substances and contribute dark black to brown pigments to finished compost.

Available oxygen, temperature, and moisture significantly affect the health and performance of the living organisms in the compost pile.

"The Science of Composting" The University of Illinois Extension



Torfaen, CC BY-SA 3.0, via Wikimedia Commons

Steps in the composting process

Original ingredients

↓

Early stage decomposition—most ingredients still recognizable

↓

Middle stage decomposition—bacterial microorganisms at work. Ingredients less recognizable

↓

Late stage decomposition—ingredients no longer recognizable, some fungi and actinomycetes begin working

↓

Later stage decomposition—all ingredients transformed, woody substances may still be recognizable

↓

Curing—pile begins cooling, compost becomes ready to use

Environmental benefits of making your own compost

Choosing a site for the pile

- Place the pile on bare ground, not concrete or asphalt.
- Organisms that decompose organic materials need free contact with both soil and the atmosphere.
- The pile should not be directly exposed to sun, wind, rain, or standing water (the direct sun is hostile to microorganisms, and standing water or too much rain may sour the pile).
- Choose a convenient location to allow turning and moving the pile.
- Leave space between piles

Information extracted from http://aggie horticulture.tamu.edu/earthkind/landscape/don't-bag-it/chapter-4-building-and-maintaining-a-compost-pile

Composting tasks

- Adding ingredients
- Maintaining proper temperature
- Turning pile
- Maintaining moisture
- Harvesting finished product

Turning compost, Canva Stock

Building your pile

You will need to collect enough material to create a 1 cubic yard pile. The mixture should ideally approximate a 30:1 carbon-to-nitrogen ratio. (3 cubic yards for creating a hot pile)

Chop, cut, or shred any coarse materials to increase their surface area for microbes to work. Add all materials at one time if trying to encourage microbial activity.

Layer materials. Start the foundation of the pile by placing a 6-inch layer of bulky materials on the ground. Materials such as brush trimmings or wood chips can be used.

Next, add to the pile a 6-inch layer of high carbon material (high C: N ratio) such as leaves, straw, hay, or a mixture of these.

Add a layer of high-nitrogen materials. Continue to build by layers.

Water the pile Conduct a squeeze test to gauge the moisture content of the compost materials. Add water until squeezing a handful will yield one or two drops of water. Adding too much water may leach out nutrients. Conduct this test each time you add composting materials and water.

What materials to compost?

Green / wet materials (nitrogen)	Brown / dry materials (carbon)
• Fruit and veggie scraps • Egg shells • Tea bags, tea leaves • Fresh green grass clippings and plant trimmings (grown without pesticides or weed killers) • Garden refuse • Green grass clippings • Coffee grounds	• Chopped dry leaves, dried grass clippings • Wood shavings or sawdust • Nuts and shells • Untreated coffee paper filters • Pinecones, pine needles—chopped • Shredded newspaper and other paper products • Twigs • Peanut shells

Do NOT put fats, meat, bones, dairy products, pet poop, diseased plants, weed seeds, or any materials containing pesticides or herbicides in your compost pile.

Finding the Carbon: Nitrogen ratio of your materials
Ideal C: N = 20:1 - 40:1* These ratios are based on the weight of the materials.
To calculate the carbon to nitrogen of your compost mix:
Find the approximate percentages of carbon and nitrogen in your ingredients using online tables. Warning: not all experts agree on the percentages for common composting materials
Multiply percent by the weight of materials in your pile.
Divide carbon percentage by nitrogen percentage.
Or, download a C: N calculator (Compost C: N calculator" from Cornell University: http://compost.css.cornell.edu/download.html)

Example: Calculating Carbon: Nitrogen ratio for 50 lbs. of hay, 20 lbs. of kitchen scraps, and 2 lbs. of coffee grounds
50 lbs. hay x 40% C = 20 lbs. C
10 lbs. kitchen scraps x 10% C = 1 lb. C
2 lbs. coffee grounds x 25% C = 0.5 lb. C
20 + 1 + 0.5 =21.5 lbs. Total Carbon Value

50 lbs. hay x 1% N = 0.5 lb. N
10 lbs. kitchen scraps x 1% N = 0.1 lb. N
2 lbs. coffee grounds x 1 % N = 0.02 lb. N
0.5 + 0.1 + 0.02 = 0.62lb. Total Nitrogen Value

Calculated C:N ratio: 21.5/0.62= 34.7 parts carbon to 1 part nitrogen

Before you get out your calculator, here is a simplified guideline:
Make sure your pile has a greater amount of carbon-containing material (about 2/3) than it does nitrogen containing material (about 1/3) by volume.
Or equal parts carbon and nitrogen materials by weight.
If your pile is too wet, add more carbon. If it is too dry, add more nitrogen.

Higher carbon compost additions

Ingredient	C: N
shredded newspaper*	170:1
straw	75:1
shredded cardboard	350:1
dried leaves	70:1
old hay	55:1
sawdust	400:1
wood chips	400:1
small branches/twigs	500:1
paper towel	110:1
tissue paper	70:1
dried grass clippings	50:1
pine needles	80:1

Higher nitrogen composting materials

Ingredient	C: N
fresh grass clippings	15:1
weeds	30:1
kitchen scraps	20:1
coffee grounds	20:1
manures	10-20:1
freshly cut hay	25:1
seaweed	20:1
alfalfa	12:1
hair/fur	10:1
fish emulsions	8:1
blood meal	4:1

Caution about hay and manure
Some commercial composts and mulch can contain herbicide residues, according to a Texas A&M AgriLife Extension Service horticulturist.
For example, the herbicide aminopyralid is used to control broadleaf weeds in pastures, said Dr. Joe Masabni, AgriLife Extension vegetable specialist. “The problem arises when growers use straw mulch composted from hay pastures or composted manure from animals grazing on treated pastures. This is a very serious concern for all growers because the herbicide can survive the animal digestive system and for three years or longer in the compost pile.”

These herbicides are sold under the following trade names:
Picloram is sold as Tordon, Access, Surmount, Grazon , and Pathway.
Clopyralid is sold as Curtail, Confront, Clopyr AG, Lontrel, Stinger, Millennium Ultra, Millenium Ultra Plus, Reclaim, Redeem, and Transline.
Aminopyralid sold as Milestone, Forefront, Pharaoh, and Banish.

Taking care of compost pile

Passive
Let sit, it takes several months, perhaps a year or more

Active
Turn often, keep moist (H2O 40 60% of weight), and have the proper ratio of C: N (30:1).
It takes 2 6 weeks (depending on the ingredients)

When is the pile done?

Unfinished compost may harm plants if worked into soil because of heat from decomposition or stealing nitrogen. However, it may be used as mulch on top of the soil.
Or wait until:

- The pile cools off and decreases to about one third of its original volume (depending on the original ingredients).
- The pile is dark, crumbly, and has an earthy odor.
- The temperature is within 10 F of the air temperature.

Types of home composting systems

The information given herein is for educational purposes only. Reference to commercial products or trade names is made with the understanding that no discrimination is intended and no endorsement by the Texas A&M AgriLife Extension Service is implied.

Bin less pile

Bin less pile, Canva Stock

Just a pile with no partitions. It should be several feet deep. Recommended dimensions for a heap are 5 feet wide by 3 feet high (University of Illinois Extension Service). Hard to maintain sufficient depth to achieve high enough temperatures Takes several months to a year to achieve useable compost. Nothing to build, difficult to move.

Bin System

Single bin (at least 3x3x3 feet, but not over 5x5x5 feet). It can be made with lumber, concrete blocks, and reinforced wire. Materials needed: lumber, nails, bolts, wire staples, wood preservatives, hardware cloth, or wood slats. Three bins; one to fill, one that's "cooking," and one to draw from. It does not require turning but should stay moist. Ready in about 1 year.

Bin system, Canva Stock

Commercial composting bin

Expensive, limited capacity. It can be challenging to turn. Good choice if the available space is small.

Commercial compost bin, Canva Stock

Tumblers

A compost tumbler is a fully sealed container that can be rotated to mix the composting materials. The sealed container helps contain the heat generated by the composting process, thereby speeding the process of converting kitchen and yard waste into compost.
Expensive, limited capacity and weight may make it difficult to turn. Keeps out rodents and other pests.

Compost tumbler, Canva Stock

Trench Composting

This is the simplest way to compost kitchen scraps. Dig a one-foot-deep hole. Chop and mix the food wastes into the soil, then cover with at least 8 inches of additional soil. Depending on soil temperature, the supply of microorganisms in the soil, and the content of the materials, decomposition will occur in one month to one year. Rotate.

Trench composting, Canva Stock

Vermicomposting

What is worm composting?

Worm composting uses worms to recycle food scraps and other organic material into a valuable soil amendment called vermicompost or worm compost. Worms eat food scraps, which become compost as they pass through the worm's body. Compost exits the worm through its' tail end. The joint action of worms and microbes makes soil nutrients more available to vegetation.

Setting up a worm bin

Setting up a worm bin is easy. All you need is a box, moist newspaper strips, and worms. Worms need moisture, air, food, darkness, and warm (but not hot) temperatures. Bedding, made of newspaper strips or leaves, will hold moisture and contain air spaces essential to worms.

Commercial worm composting bins, Canva Stock

Containers: A good size bin is a 5 to 10-gallon box or approximately 24" X 18" X 8". The box should be shallow rather than deep, as red wigglers are surface dwellers and prefer to live in the top 6" of the soil. Line the bottom with plastic (e.g., from a plastic bag or old shower curtain). Cover the bin with a loose-fitting lid. This lid should allow air into the bin.

Worms: Choose red worms or red wigglers, which can be ordered from a worm farm. The scientific name for the two commonly used red worms are Eisenia foetida and Lumbricus rubellus

Conditions: Worms need moisture, air, food, darkness, and warm (but not hot) temperatures. Bedding, made of newspaper strips or leaves, will hold moisture and contain air spaces essential to worms.

Harvesting worm compost

After 3 - 5 months, when your bin is filled with compost (and very little bedding), it is time to harvest the bin. To prepare for harvesting, do not add new food to the bin for two weeks. Push all the worm bin contents to one half of the bin, removing any large pieces of undecomposed food or newspaper. Put fresh bedding and food scraps in the empty side of the bin. Continue burying food scraps only in freshly bedded half. Over the next 2 3 weeks, the worms will move over to the new side (where the food is), conveniently leaving their compost behind in one section. When this has happened, remove the compost, and replace it with fresh bedding. To facilitate worm migration, cover only the new side of the bin, causing the old side to dry out and encouraging the worms to leave the old side. Mixed worm compost with your potting or garden soil to make nutrients available to plants. Or the compost can be used as a top dressing for your indoor or outdoor plants.

What method is right for me???

How much space do I have?
Is it indoor or outdoor or both?
What do I want to compost?
How much waste do I have in a week?
How and where do I want to use the compost?
How much time can I spend on it a week?
What's my ewww factor?
How committed am I to composting (time and money)?

Resources

- Texas A&M Earth-Kind ® Guide on Composting: https://aggie-horticulture.tamu.edu/earthkind/landscape/dont-bag-it/
- Composting Overview from AgriLife: https://agrilifeextension.tamu.edu/library/gardening/composting/
- Soil testing: http://soiltesting.tamu.edu/
- "Composting Fundamentals:" https://aggie-horticulture.tamu.edu/earthkind/landscape/don't-bag-it/chapter-2-composting-fundamentals/
- "Composting for the Homeowner": http://web.extension.illinois.edu/homecompost/methods.cfm
- "COMPOSTING AND MULCHING: A Guide to Managing Organic Landscape Refuse": http://www.caes.uga.edu/publications/pubDetail.cfm?pk_id=6406
- Worm Composting Basics": http://compost.css.cornell.edu/worms/basics.html
- Vermicomposting Composting with Worms": http://pods.dasnr.okstate.edu/docushare/dsweb/Get/Document-1494/
- "Compost C: N calculator" from Cornell University: http://compost.css.cornell.edu/download.html