SOIL HEALTH

North Texas Edition

A guide to get you started on understanding your soil and how to work with it

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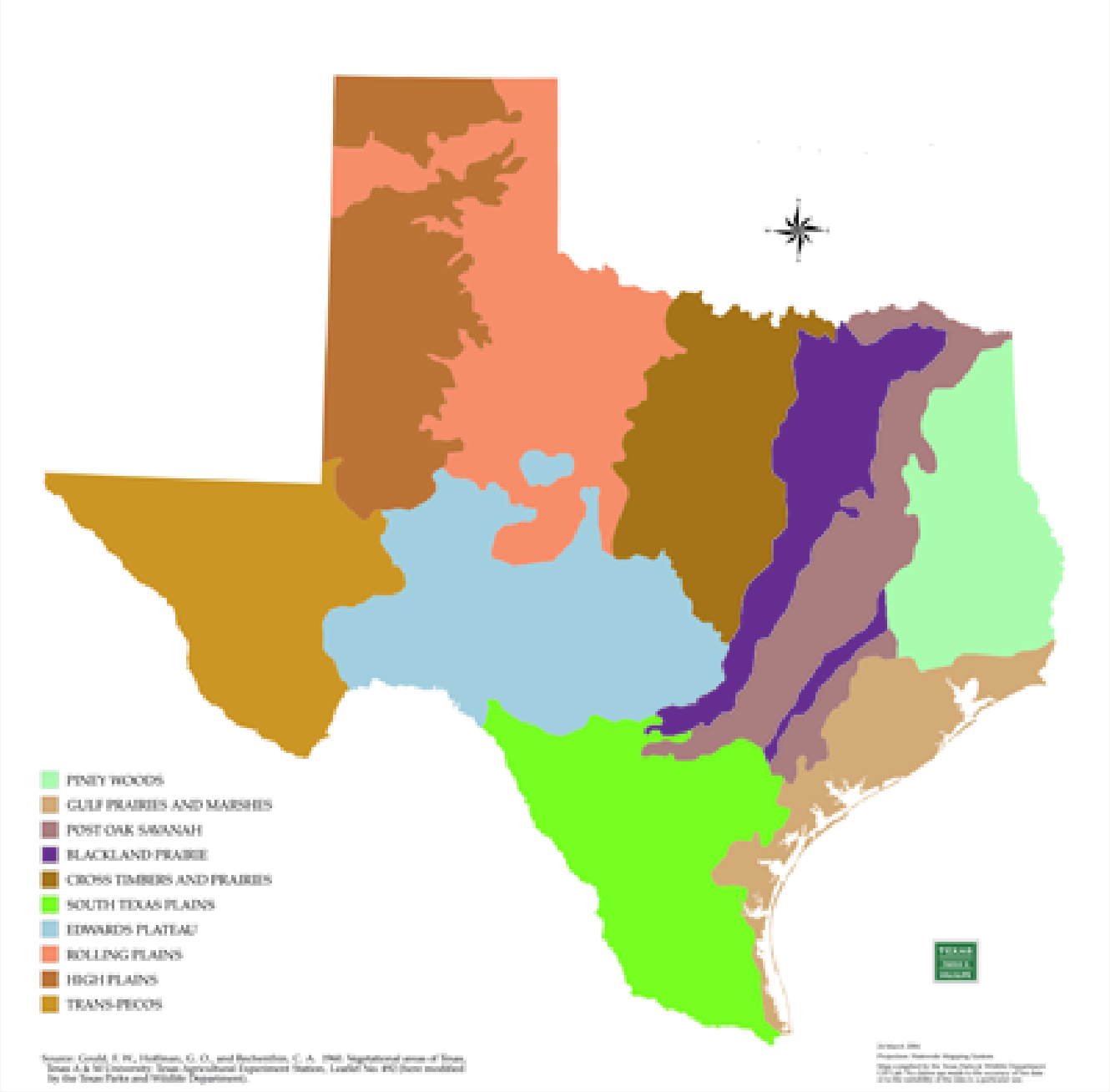
TEXAS SOIL 101

Soils Native to Texas Can be relatively vast and diverse given its shear land size. This is due to the large number of varying eco-regions spread throughout the state. Eco-regions 24-35, 12 to be exact. Texas can also be divided into 21 Major Land Resource Areas that have similar or related soils, vegetation, topography, climate, and land uses. There will be additional information on these 21 Major Land Resource Areas later. Furthermore, these regions fall under larger areas based on Koppen climate classifications. We will not be covering these climate classifications here, as we are focusing on soils; however, it is important information for you to know along with your ecoregion, land resource area, and specific growing zone.

In the following section, we will dive deeper into the North Texas eco-regions, their soil types, and how to amend them to a more conducive growing environment for your crop production.

TEXAS ECOREGIONS & SOILS



TEXAS SOILS	2022

POST OAK SAVANNAH

The Post Oak Savannah is a transition zone between the blackland prairies to the west and the Pineywoods to the east. This ecosystem is part of a historic oak belt, which travels south from Canada towards Central America. Few true examples of old-growth Post Oak Savannah in Texas still exist today.

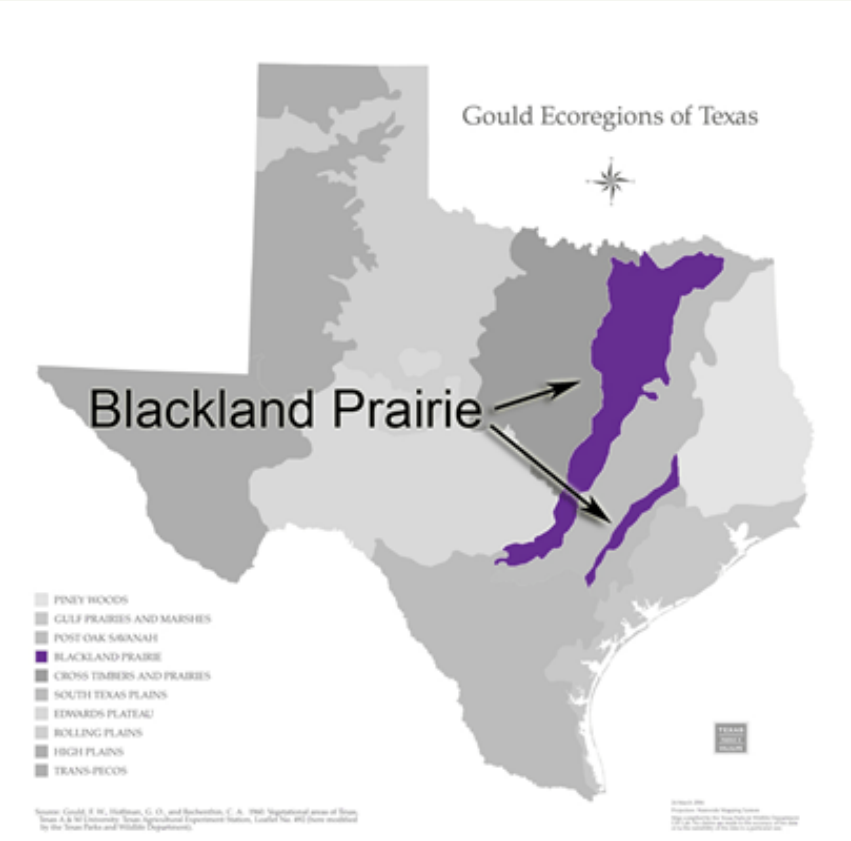
Bottomland soils range from a clay loam to clay, while the uplands have a sandy loam or sandy soil.

The Post Oak Savannah is dominated by native bunch grasses and forbs with scattered post oaks and some plateau live oak, black hickory, and blackjack oak. In recent times this historical vegetation has been replaced by species such as yaupon holly, cedar elm, sugarberry, and eastern red cedar. Upland areas are typically where bunch grasses are concentrated.

The Claypan Area consists of about 6.1 million acres in east-central Texas just east of the Blackland Prairie. The landscape is a gently undulating to rolling, moderately dissected woodland also known as the Post Oak Belt or Post Oak Savannah. Surface drainage is moderate.
Upland soils commonly have a thin, light-colored, acid sandy loam surface layer over dense, mottled red, yellow, and gray claypan subsoils. Some deep, sandy soils with less clayey subsoils exist. Bottomlands are deep, highly fertile, reddish-brown to dark-gray loamy to clayey soils.

Land use is mainly rangeland. Some areas are in improved pastures. Most cropland is in bottomlands that are protected from flooding. Major crops are cotton, grain sorghums, corn, hay, and forage crops, most of which are irrigated. Brush control on rangeland and irrigation water management on cropland are the major soil-management problems. Water erosion is a serious problem on the highly erosive claypan soils, especially where they are overgrazed.

BLACKLAND PRAIRIE



The Texas Blackland Prairies form a disjunct ecological region, distinguished from surrounding regions by fine-textured, clayey soils and predominantly prairie potential natural vegetation. The predominance of Vertisols in this area is related to soil formation in Cretaceous shale, chalk, and marl parent materials. Unlike tall grass prairie soils that are mostly Mollisols in states to the north, this region contains Vertisols, Alfisols, and Mollisols. Dominant grasses included little bluestem, big bluestem, yellow Indian grass, and switchgrass. The region is underlain by Upper Cretaceous marine chalks, limestone, and shale which give rise to the development of the characteristic black, heavy clay soils; along major rivers and tributaries a slightly more sandy soil.

The Blackland Prairies consist of about 12.6 million acres of east-central Texas extending southwesterly from the Red River to Bexar County. There are smaller areas to the southeast. The landscape is undulating with few scattered wooded areas that are mostly in the bottomlands. Surface drainage is moderate to rapid.

Alkaline clays

Chalk

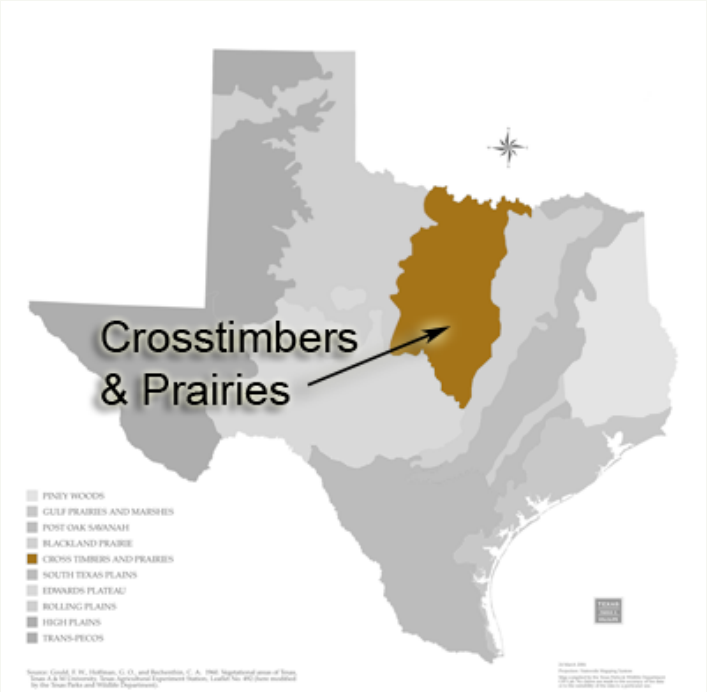
Graylands

Both upland and bottomland soils are deep, dark-gray to black alkaline clays. Some soils in the western part are shallow to moderately deep over chalk. Some soils on the eastern edge are neutral to slightly acid, grayish clays and loams over mottled clay subsoils (sometimes called graylands). Blackland soils are known as “cracking clays” because of the large, deep cracks that form in dry weather. This high shrink-swell property can cause serious damage to foundations, highways, and other structures and is a safety hazard in pits and trenches.

Land use is divided about equally between cropland and grassland. Cotton, grain sorghums, corn, wheat, oats, and hay are grown. Grassland is mostly improved pastures, with native range on the shallower and steeper soils. Water erosion, cotton root rot, soil tilth, and brush control are the major management problems.

Ecoregion 5

CROSS TIMBERS



The term Cross Timbers or the Central Oklahoma/Texas Plains, is used to describe a strip of land in the United States that runs from southeastern Kansas across Central Oklahoma to Central Texas. Made up of a mix of prairie, savanna, and woodland, it forms part of the boundary between the more heavily forested eastern country and the almost treeless Great Plains, and also marks the western habitat limit of many mammals and insects.

The woodland and savanna portions of the Cross Timbers are mainly post oak and blackjack oak on coarse, sandy soils; fire suppression in recent years has increased forest density and allowed eastern red cedar to invade as well.
The prairie portions are chiefly tallgrass on finer, dry soils; overall, the Cross Timbers are not as arable as the surrounding ecoregions. Today, land use is a mixture of rangeland, pastures, and farmland. The area has also been an important site of oil extraction for over 80 years.

UNDERSTANDING THE BASICS OF SOIL HEALTH

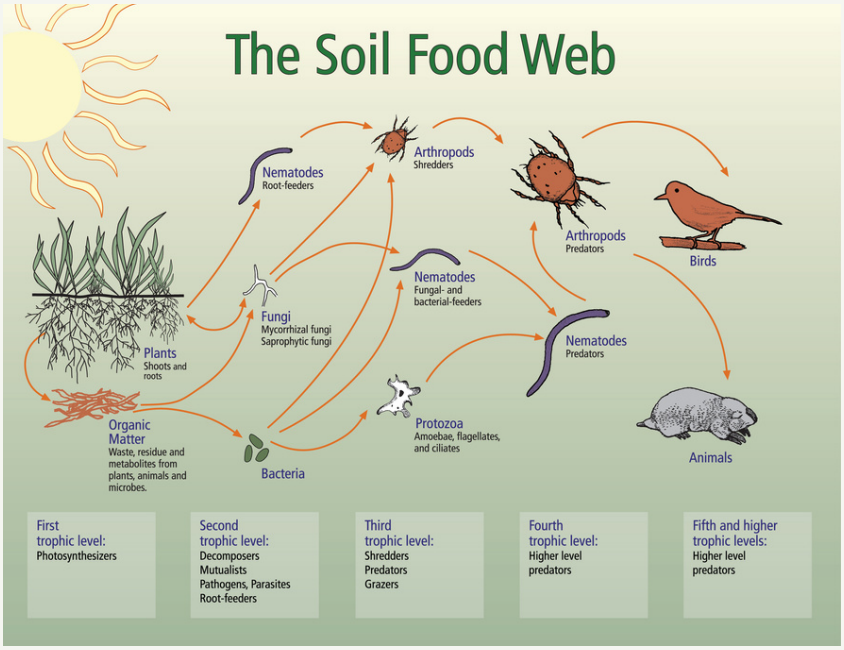
Soil Structure and Texture - refers to the arrangement of soil separates into units called soil aggregates. An aggregate possesses solids and pore space. Aggregates are separated by planes of weakness and are dominated by clay particles. Silt and fine sand particles may also be part of an aggregate.

Water retention and Drainage - the texture of a soil determines soil water holding capacity, permeability, and soil workability. Sand, silt, clay, and organic matter particles in a soil combine with one another to form larger particles. Soil structure is the arrangement of the soil particles into aggregates of various sizes and shapes.

Living Biome- Each biome, or community of plants and animals in a certain climate, has life-forms characteristic of that place. For instance, the plants and animals that inhabit the Amazon rainforest are completely distinct from those in the Arctic tundra. However, not everyone agrees on exactly what constitutes a biome and defining them presents a problem. Biomes are sometimes confused with similar ecological concepts, such as habitats and ecosystems.

What unites all biome is that biomes can be differentiated by the organisms residing there and by the climate, as well as the fact that the organisms within a biome share adaptations for that particular environment. Climate is a major factor in determining types of life that reside in a particular biome, and there are several factors that influence climate, such as latitude, geographic features, and atmospheric processes disseminating heat and moisture.

Given the immense diversity of habitats and ecosystems residing in the various horizon zones of our soil, its practically a living biome onto itself. Which leads us to our next subject; the soil web.



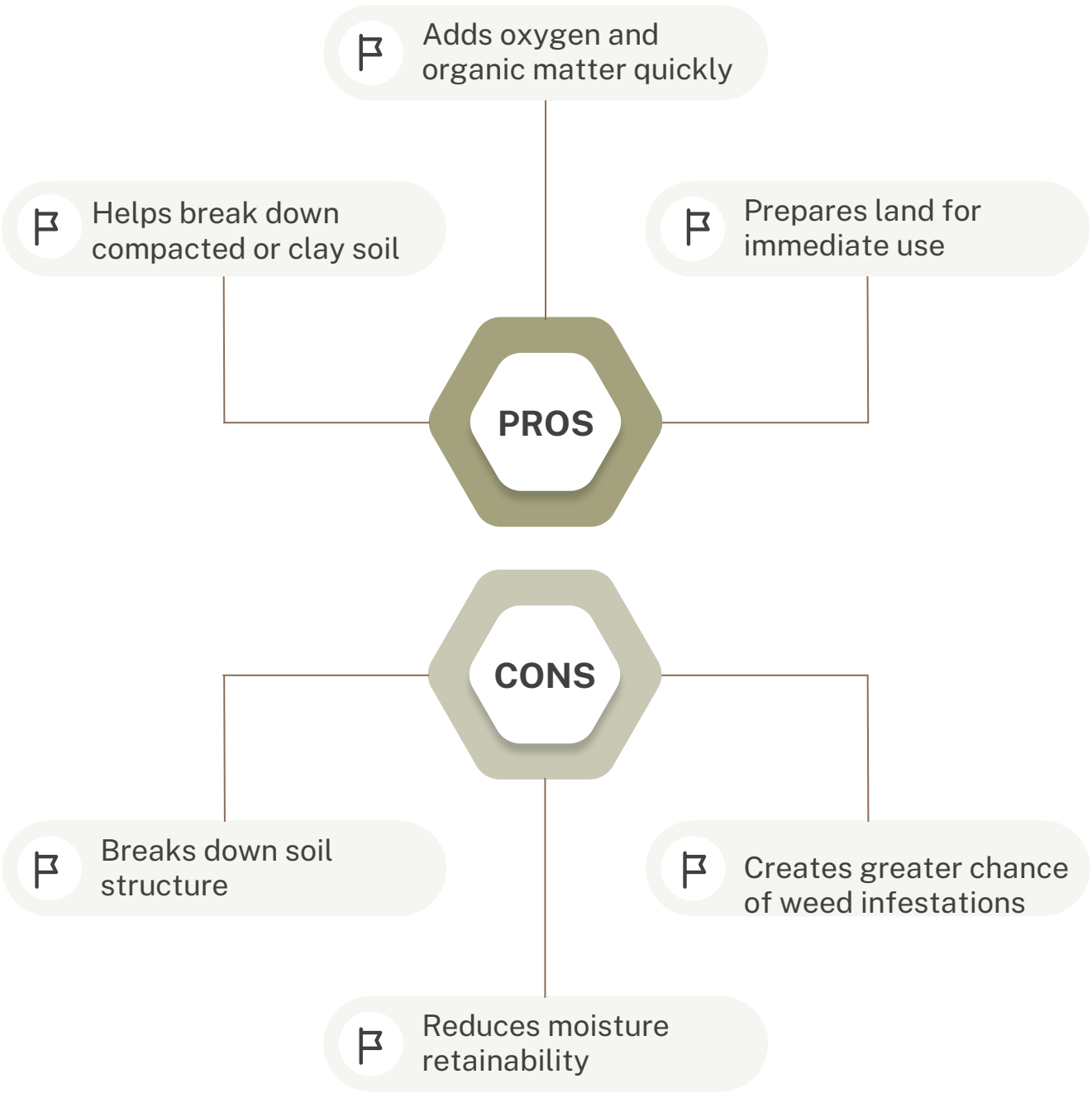
The Soil Web- is made up of bacteria and fungi exploited by one-celled bacteria, algae, fungi, and protozoa, to the more complex nematodes and micro-arthropods, to the visible earthworms, insects, small vertebrates, and plants.

As these organisms eat, grow, and move through the soil, they make it possible to have clean water, clean air, healthy plants, and moderated water flow.

Soil organisms decompose organic compounds, including manure, plant residue, and pesticides, preventing them from entering water and becoming pollutants. They sequester nitrogen and other nutrients that might otherwise enter groundwater, and they fix nitrogen from the atmosphere, making it available to plants. Many organisms enhance soil aggregation and porosity, thus increasing infiltration and reducing runoff. Soil organisms prey on crop pests and are food for above-ground animals. Organisms live in the micro scale environments within and between soil particles. Differences over short distances in pH, moisture, pore size, and the types of food available create a broad range of habitats.

Till vs. No-Till – When it comes to till vs. no-till, each system has advantages and disadvantages. Depending on how much garden space and what type of soil you have, using one system may be more logical than using the other system. Tilling helps to get garden beds started quickly while not tilling works more slowly but improves soil quality in the long run. In areas with heavy clay, initial tilling may be necessary to break up the soil before converting to a no-till system. But this can also create hardpan at the lowest level of tillage. Use your garden's specifications and your goals for your garden to determine which system will work best for you.

TILLING PROS & CONS



TILLING PROS & CONS

Pros

- Preserves natural soil structure
- Reduces erosion and water run off
- Less mineral leaching & better soil nutrition

VS

Cons

- Takes times to build & requires patience
- Creates vegetation that create greater risk for pests and disease
- Can reduce their performance in academics.

SOIL TESTING

Now that we understand the basics of soil health and before you begin working the land, acquiring a soil test is absolutely imperative. Especially in the initial stages of developing your farm. It will give you a snapshot of what you are working with. What deficiencies and surpluses are currently present in the soil. The amount of organic matter that is present as well as a profile of minerals. And what measures you need to take to improve on those findings.

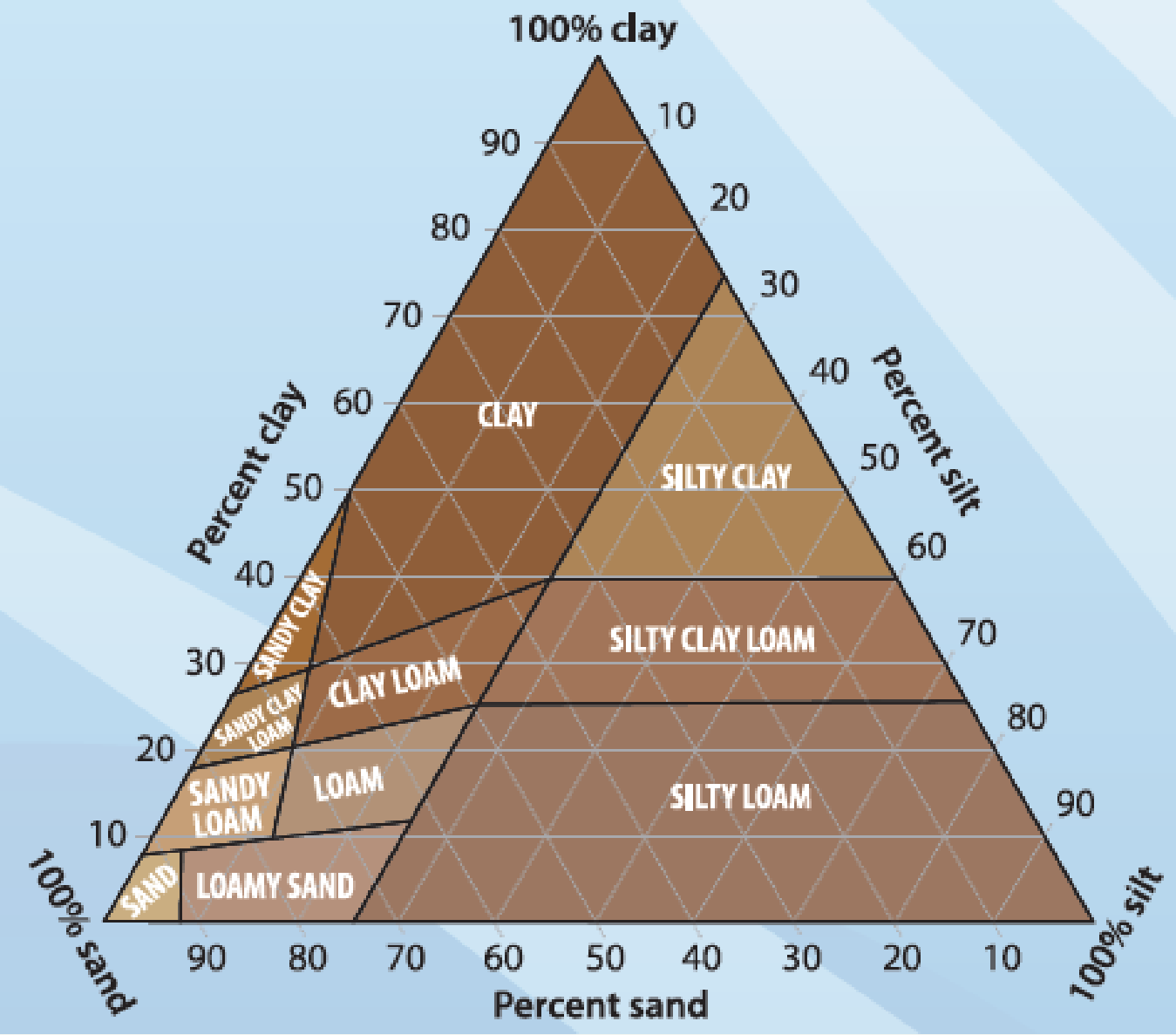
Types of test- there are varying types of test. Home test are the most common, but they will only give you a basic profile of N-P-K. Which is useful when adding amendments and organic fertilizers to the soil, but not much information beyond that. Sending off a sample to a lab for extensive testing is going to give you the most information about your soil. As mentioned above it would include things like, the amount of organic matter present, if there is an abundance of minerals present and which ones, your soil makeup and structure, and so on. Some labs will even test for toxins for an additional fee, but not all labs offer that testing. Determining if you have any toxins and what specific contaminate are there, will better help you plan for remediation and restoration strategies.

AMENDING TEXAS SOILS

Let’s now dig into how to amend the soil types commonly found in these areas. The basic types consist of clays, sandy loam, and silt. Most areas of Texas have some form or amount of clay, especially in the Northern areas of Texas and even in the areas that have predominantly sandy loam. Clay is not necessarily a bad thing. It is typically rich in minerals and nutrients, the problem lies in that it is locked up in these heavier clays, and the texture can be dense and even hardpan in some areas. It also has poor drainage and water retention.

There are a lot of approaches to amending the texture and freeing up those nutrients and minerals. Mechanical approaches include tilling, if you are against tilling then broad forking is the next best option provided you can get the broad fork to penetrate the soil. If not, then subsoiling might be another viable option.

A more passive approach still would be to cover crop with a mix of plants that all work at different levels to address different issues. For instance, you would want daikon radish to deeply penetrate, breaking up the soil and later aerating it as the roots die of leaving a void much like a broad fork, inoculated peas for fixing nitrogen, and a lush green cover crop for adding organic matter. This is a much slower process for breaking up clays, however, it causes the least disturbance of the soils structure in its entirety.



In all three of these methods, you will be adding organic matter in the form of compost. Compost in large quantities and compost teas is the fastest way to amend clay soils. Whether or not you are tilling it in, migrating it slowly down into the lower soil horizons via broad forking, or layering it in a no till discipline, organic matter (more specifically the microbial organisms contained within) are going to begin to free up some of those nutrients bound up in the clay.

We talked about freeing up nutrients in clays, now let's focus on texture. You can use things like expanded shale, red and green sandy loam, leaf mold from shredded leaves, worm castings and earth worms added directly to your plots. All of these can add to your soils texture and structure. You would think adding sand might be helpful. However, only certain types of sand will work. If you added plain sand or play sand to clays, you would get cement. A coarser sand with larger granules or sharp sand in smaller quantities is better, and better still is green or red sandy loam, or a mix of the two.

Areas with predominantly sandy loams are great areas to farm. Typically adding large amounts of organic matter will suffice. Broad forking is still recommended and viable provided there is enough structure to retain the voids and fracturs from the fork. In East Texas in the pine forest the sandy loam is mixed with red clays. The significant amount of pine trees contributes to the soil being more acidic. You will ether need to plant acid loving crops such as blueberries and the like, or you will need to amend the soils to a more neutral pH. The best way to do this, is by again adding large amounts of compost. This will naturally lower the pH. Azomite can also be added, this is another mineral source as well as minutely contributing further to lowering the pH. Conventionally farmers have used agricultural limestone, often referred to as liming.

Lastly, but most importantly, you should not add any amendment that will drastically change any soils make-up without first acquiring a detailed soil test. The recommendations above are mostly neutral in the sense that all the amendments and practices can be applied most anywhere without negative effect. If you drastically change the makeup of the soil by adding too much of the wrong thing, you are making more work for yourself in correcting the changes. Not to mention wasting time and money. A soil test is imperative to a farmers seasonal decision making processes from crop selection and rotation to amendment planning and soil management. It is important to routinely test the soil to monitor any changes over time. This will be easier to correct a problem before it gets worse by evading detection.

Happy Growing!

References:
https://tpwd.texas.gov
http://texastreeid.tamu.edu