TEXAS FOUNDATION WATERING AND MAINTENANCE GUIDELINES

!YOU CAN WATER YOUR FOUNDATION DURING WATER RESTRICTIONS!

During extreme drought North Texas will go through watering restrictions put in place by your city or county. Please read your city or county watering guidelines. The main restrictions are normally limited to your yard. Most restrictions allow you to water your foundation with a soaker hose for up to one hour every night.

The main goal is to not allow a gap to be between the house's slab and the dirt. You may need to water 30 min to an hour or more initially to close any existing gaps. Then back off to shorter times and maybe go to every other day to keep the gap closed. Watering the yard as much as possible is also highly recommended. Helping maintain a consistent watering program for the entire yard helps ensure you are protecting your slab.

Expansive soils act like a sponge. As they absorb water, they swell and as they lose water they shrink. Soils tend to dry out (and shrink) during the summer and to absorb water (and swell) during the winter and spring.

As the soil around a house shrinks and swells with the seasons, the house and foundation will move up and down. As long as the foundation movement is not great enough to damage the house and/or foundation, most people do not consider the movement to be a foundation repair problem. If the up and down movement of a house foundation always returns the house foundation to its original level position, then damage to the house and foundation may appear and disappear on a regular basis as the seasons change.

If a homeowner wishes to stop seasonal house and foundation damage, the first course of action should be to follow a controlled watering program. By keeping the moisture content of the soil around the house foundation constant, foundation movement can often be stopped. This has been written to assist the homeowner in performing a simple foundation repair preventive maintenance program.

The goal of a foundation repair preventive maintenance watering program is to maintain a constant level of moisture in the soil around the house and foundation. The best way to water a foundation is to place a soaker hose from one to two feet from the edge of the foundation. Placing the hose a short distance from the foundation allows the water to soak into the soil evenly.

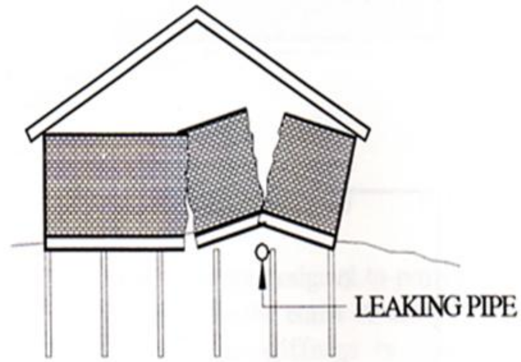
The hose should not be placed against the foundation. When soil has dried and cracked, water can travel along the cracks for several feet in all directions. If the soil around your foundation is dried and cracked, then water placed next to the foundation will run through the cracks and accumulate at the bottom of the grade beam (the thick portion of the foundation that is under the exterior walls). In some cases, an accumulation of water in the soil at the base of a foundation can cause the soil to lose some of its load-bearing capacity. If the soil loses enough load-bearing capacity, the house will sink into the ground.

Obviously, it is necessary to water more during hot, dry weather and less during cold, damp weather. The amount of water required to keep a foundation stable during the summer can be surprisingly large. A single large tree can remove as much as 150 gallons of water, or almost 20 cubic feet of water, from the soil each day. Shrubs and other plants can also remove large quantities of water. During persistent hot dry weather, it may be necessary to water a foundation daily. Watering should supply enough water to keep the moisture content in the soil under the foundation constant. If the amount of water applied is only enough to keep the surface damp, the watering program will not work. Obviously, the homeowner is the only one who can weigh the benefits of controlling foundation movement versus the increased size of the water bill.

CAUSES AND MODES OF FOUNDATION MOVEMENT

Movement As A Result Of Seasonal Moisture Changes:

Foundations that are built directly on expansive soils that are subjected to non-uniform changes in the soil moisture content can suffer from differential movement. During extended periods of dry weather, the expansive supporting soil shrinks causing foundation settlement. During extended periods of wet weather, the expansive supporting soil swells causing upward movement of the foundation (upheaval). Localized site and environmental factors that promote or limit the flow of water into and out of the supporting soil as well as non-uniform distribution of the expansive soil under the foundation affect the magnitudes of the movement (either upward or downward) at different locations of the foundation. It is important to understand that it is differential, not the total movement of the foundation that causes damage to the structure. In other words, the performance of a foundation that moves up and down uniformly with the changing seasons is superior to a foundation where the movement is not uniform.



UPHEAVAL TO A SLAB-ON-GRADE CAUSED BY A PLUMBING LEAK

Slab/Foundation Movement Caused By Plumbing Leaks:

A slab-on-grade foundation acts as a vapor barrier by resisting soil moisture variations due to evaporative moisture loss and by shielding the under-slab soil from rainfall. Under optimum conditions, the soil moisture under the slab will achieve a degree of equilibrium. When a plumbing leak occurs under a slab, the moisture equilibrium is distorted. As moisture is added to the soil from the leak, soil and foundation movement often result. The type and degree of movement depends upon soil type and expansiveness, soil density, soil moisture content prior to the leak, the length of time over which the leak has occurred, the quantity of moisture being added to the soil over a given period of time and a few other factors.

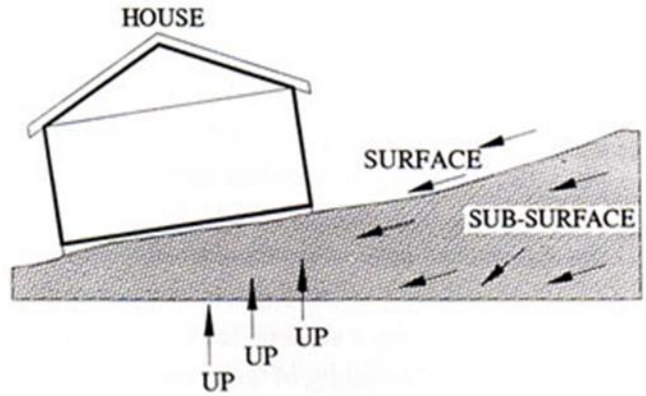
Typical examples:

1. If the soils are expansive and were dryer than optimum prior to the leak and have a high density, the foundation/ slab will heave (move upward) in the vicinity of the leak and corresponding damages will be apparent in the structure. In this example, the soil will probably not contract significantly after the leak is repaired, which will result in a permanent dome in the slab.
2. If the soil is at optimum density and moisture prior to the leak, there is an opportunity for the soil to contract. It is possible, but not probable, that the slab will regain its original elevation profile because clay soil expansion/ contraction generally does not follow a linear progression as moisture is added and then reduced. The slab could be permanently left above or below its initial elevation.
3. Should a leak occur under the slab where the soil is of very low density, the additional moisture often lubricates the solid clay particles and causes consolidation of the support soil prior to leak repair. After the leak is repaired under this example, the slab will often "dish" or settle (move downward) even more.

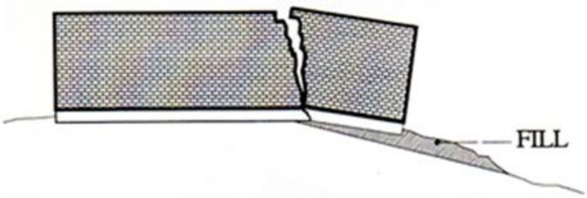
NOTE: Concrete and steel will often develop a "stress memory" after deformation that will not allow the slab to return to its original shape. This may be the result of soil or concrete chips filling cracks in the slab, which prevents the slab from "coming back together" completely. In a post-tensioned slab, stress in the post-tensioning cables may resist the tendency for the slab to move back into place.

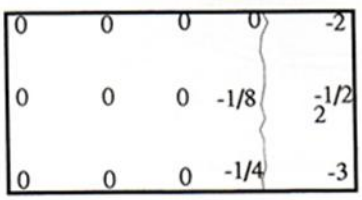
UPHEAVAL TO A SLAB-ON-GRADE CAUSE BY NEGATIVE DRAINAGE

In a conventionally reinforced slab, permanent deformation (yeilding) of the steel reinforcing bars may prevent the slab from returning to its original shape.



Foundation Upheaval Caused by Poor Drainage: Since additional moisture can cause expansive soils to swell, areas of poor drainage near the foundation can cause the soil under the foundation nearby to swell, resulting in upward movement of the foundation.

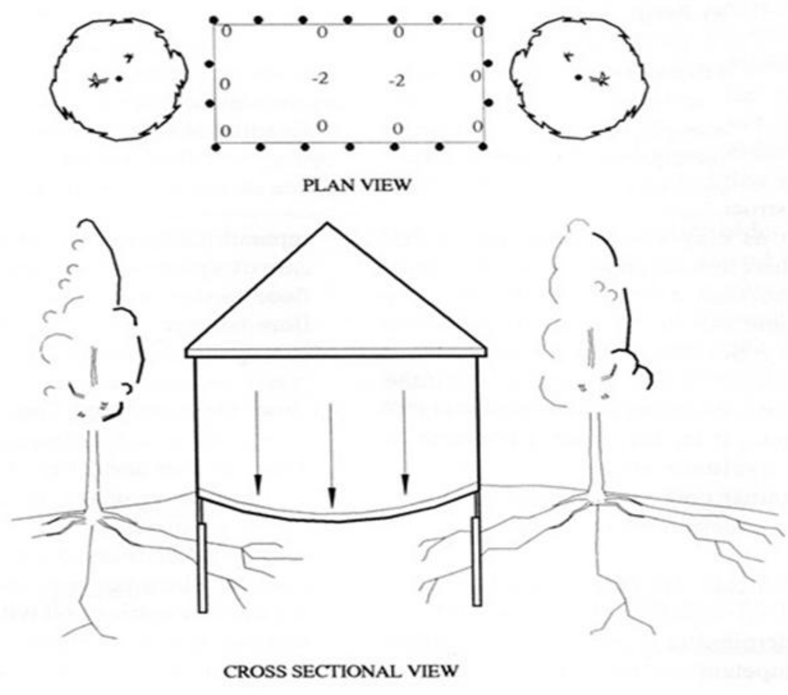




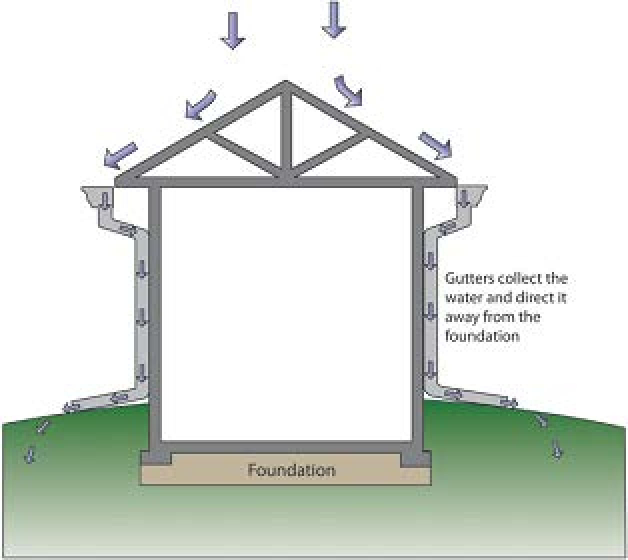
Settlement As A Result Of Poor Pre-Construction Compaction

Settlement As A Result Of Poor Pre-Construction Compaction: Slab-on-grade foundations depend upon the uppermost soil layer(s) to provide sufficient bearing capacity to support the structure and to keep the foundation stable. If the bearing soil was insufficiently compacted prior to construction, the foundation is subject to settlement as the supporting soil consolidates.

INTERIOR SETTLEMENT AS A RESULT OF A DROUGHT



During periods of drought, it is suggested to utilize your soaker hoses on an every-other-day basis, for an hour or so each time.


Gutters collect the water and direct it away from the foundation
Foundation

USDA NRCS
United States Department of Agriculture
Natural Resources Conservation Service

General Soil Map of Texas

For more detailed soil information go to: http://websoilsurvey.nrcs.usda.gov

This map was produced by the USDA - Natural Resources Conservation Service MO9 Soil Survey Office: Temple, TX September 25, 2008

Soil lines are generalized from the NRCS STATSGO database 2004, NAD83, USA Albers Equal Area Conic USGS Original STATSGO map scale is 1:250,000

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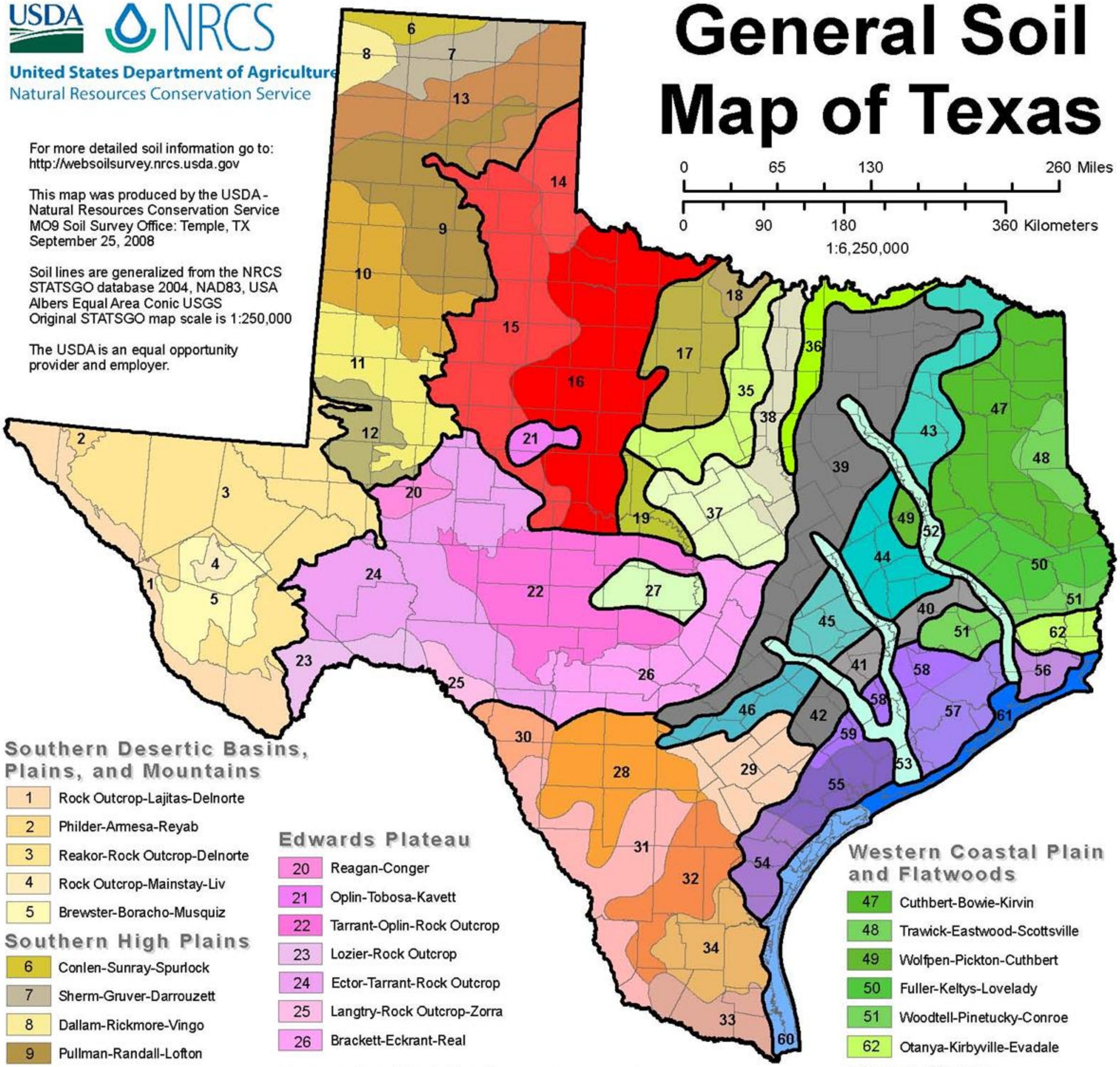

Southern Desertic Basins, Plains, and Mountains

- 1 Rock Outcrop-Lajitas-Delnorte
- 2 Philder-Armesa-Reyab
- 3 Reakor-Rock Outcrop-Delnorte
- 4 Rock Outcrop-Mainstay-Liv
- 5 Brewster-Boracho-Musquiz

Southern High Plains

- 6 Conlen-Sunray-Spurlock
- 7 Sherm-Gruver-Darrouzett
- 8 Dallam-Rickmore-Vingo
- 9 Pullman-Randall-Lofton
- 10 Amarillo-Acuff-Olton
- 11 Patricia-Brownfield-Nutivoli
- 12 Jalmar-Penwell-Triomas
- 13 Mobeetie-Berda-Veal

Central Rolling Red Plains

- 14 Miles-Springer-Delwin
- 15 Miles-Delwin-Woodward
- 16 Tillman-Vernon-Hollister

Texas North Central Prairies

- 17 Bluegrove-Bonti-Truce
- 18 Stoneburg-Anocon-Kirkland
- 19 Bonti-Throck-Callahan

Edwards Plateau

- 20 Reagan-Conger
- 21 Oplin-Tobosa-Kavett
- 22 Tarrant-Oplin-Rock Outcrop
- 23 Lozier-Rock Outcrop
- 24 Ector-Tarrant-Rock Outcrop
- 25 Langtry-Rock Outcrop-Zorra
- 26 Brackett-Eckrant-Real

Texas Central Basin

- 27 Keese-Ligon-Rock Outcrop

Rio Grande Plain

- 28 Duval-Uvalde-Pryor
- 29 Olmos-Weesatche-Samosa
- 30 Olmos-Langtry-Elindio
- 31 Montell-Catarina-Maverick
- 32 Delmita-Pernitas-Randado
- 33 McAllen-Hidalgo-Brennan
- 34 Nueces-Sarita-Falfurrias

Cross Timbers

- 35 Windthorst-Chaney-Duffau
- 36 Gasil-Crosstell-Callisburg

Grand Prairie

- 37 Brackett-Purves-Real
- 38 Aledo-Sanger-Bolar

Texas Blackland Prairie

- 39 Houston Black-Heiden-Wilson
- 40 Frelsburg-Latium-Crockett
- 41 Frelsburg-Bleiblerville-Carbengle
- 42 Frelsburg-Hallettsville

Texas Claypan Area

- 43 Woodtell-Crockett
- 44 Edge-Tabor-Silstid
- 45 Edge-Padina
- 46 Straber-Padina-Crockett

Western Coastal Plain and Flatwoods

- 47 Cuthbert-Bowie-Kirvin
- 48 Trawick-Eastwood-Scottsville
- 49 Wolfpen-Pickton-Cuthbert
- 50 Fuller-Keltys-Lovelady
- 51 Woodtell-Pinetucky-Conroe
- 62 Otanya-Kirbyville-Evadale

Flood Plains

- 52 Tinn-Trinity-Kaufman
- 53 Pledger-Brazoria-Norwood

Gulf Coast Prairie

- 54 Victoria-Orelia-Edroy
- 55 Laewest-Dacosta-Edna
- 56 Beaumont-League-Labelle
- 57 Lake Charles-Bernard-Edna
- 58 Katy-Wockley-Gessner
- 59 Telferner-Cieno-Nada

Gulf Coast Saline Prairie

- 60 Mustang-Daggerhill-Barrada
- 61 Harris-Surfside-Francitas

General Soil Map of Texas

Soil, a natural body composed of minerals, organic matter, liquids, and gases, occurs on Earth's surface and supports plant growth. Soils form in environments ranging from desert landscapes to coastal grassflats permanently covered by water up to 2.5 m deep. Soil formation is related to five factors: parent material, climate, topography, living organisms, and time. The soil under your feet determines land use, kinds of crops grown, need for fertilizers, and erosion potential. The state of Texas is divided into 15 major land resource areas, each of which is a grouping of similar soils, vegetation, climate, and topography.

Southern Desertic Basins, Plains, and Mountains soils formed in an area of linear mountain ranges and broad desert basins bordered by sloping alluvial fans and piedmont slopes known as the Basin and Range. Shallow soils, including Brewster, Lajitas, and Mainstay soils, formed on mountainous terrain in igneous bedrock. Soils that are shallow to a root-restrictive layer of cemented caliche (CaCO) occur in gravelly sediments weathered from igneous sources, such as Delnorte and Boracho soils, and from limestone sources, such as Philder soils. Very deep soils formed in basin sediments from limestone, such as Armesa and Reyab soils, and from mixed sources, such as Reakor soils. Liv soils, moderately deep to igneous bedrock, formed in gravelly igneous sediments. Very deep, loamy Musquiz soils occur on broad plains.

Southern High Plains soils formed on a nearly level plain on an elevated plateau, commonly bordered by moderately steep escarpments on west and east margins. Numerous playa basins dot the plains. The area is characterized by deep, well-developed soils, with clay increasing in subsoil horizons and accumulations of calcium carbonate. Sherm, Darrouzett, Pullman, Lofton, and Randall soils have clayey subsoil horizons and shrink-swell properties. Acuff, Olton, and Gruver are loamy soils having dark surface horizons (higher organic matter), whereas Amarillo, Dallam, Rickmore, and Vingo are loamy soils having less organic matter. Patricia, Brownfield, Jalmar, and Triomas soils have sandy surface horizons. Nutivoli and Penwell are sandy, less-developed soils. Conlen, Sunray, Spurlock, and Veal soils are calcareous throughout, and Mobeetie and Berda soils are loamy and occur along flanking escarpments.

Central Rolling Red Plains soils formed on an erosional surface characterized by rolling plains having ancient stream terraces associated with stream dissection. Soils (mostly red) formed in gently dipping Triassic and Permian sedimentary deposits and alluvium weathered from outcropping bedrock. Miles, Delwin, and Springer are well-developed soils having sandy surface horizons. Woodward and Vernon soils are moderately deep to sandstone and mudstone bedrock, respectively. Loamy Tillman and Hollister soils are very deep with shrink-swell properties.

Texas North Central Prairies soils formed on a dissected plateau with narrow, steep-sided valleys carved by generally southeastward flowing streams. Soil parent materials are primarily sedimentary rocks of Pennsylvanian age. Bonti, Bluegrove, Callahan, Stoneburg, and Throck soils, moderately deep to sandstone, siltstone, or claystone, occur on gently sloping to steep, broad ridges and plains. Deep Truce soils and very deep Anocon soils formed on similar landscapes. Very deep Kirkland soils formed in clayey alluvium over siltstone or claystone.

Edwards Plateau soils formed on mesas and plateaus of erosion-resistant limestone containing deeply incised canyons, limestone ridges and hills, and gently sloping valley floors. Tarrant, Lozier, Ector, Langtry, Brackett, Eckrant, and Real soils are shallow to limestone and differ in texture, mineralogy, or organic matter content. Conger, Kavett, Oplin, and Zorra soils have a root-restrictive layer of cemented caliche (CaCO) over limestone bedrock. Very deep soils occurring on broad plateaus and in alluvial-fan and valley-fill sediments include loamy, calcareous Reagan soils. Clayey Tobosa soils occur on alluvial plains, broad uplands, and depressions.

Texas Central Basin soils formed on an erosional surface of outcropping Precambrian igneous and metamorphic rocks and sedimentary rocks of Cambrian and Cretaceous age. The landscape is dominated by hills of granite, gneiss, and schist that are incised by southeastward-flowing rivers. Shallow Keese soils formed over granite and gneiss on gently sloping to steep hillslopes. Moderately deep Ligon soils formed in schist and gneiss on gently sloping, broad, convex ridges.

Rio Grande Plain soils formed on a broad coastal plain consisting of sediments of Tertiary and Quaternary age. The southern extent of this nearly level plain is within the ancestral valley cut by the Rio Grande. The coastal-plain landscape is dissected by generally southeastward flowing streams. Weesatche, Duval, Samosa, Hidalgo, Brennan, Pernitas, Uvalde, Pryor, Elindio, and McAllen soils are deep and very deep, well-developed, loamy soils that occur on nearly level to moderately sloping plains and broad ridges. Olmos, Delmita, and Randado soils, shallow to a root-restrictive layer of cemented caliche (CaCO), formed in gravelly Pleistocene sediments. Langtry soils are shallow, Montell and Catarina soils are clayey sodium-affected soils, and Maverick soils are clayey and moderately deep to weathered shale bedrock. Falfurrias, Sarita, and Nueces soils are very deep, sandy soils on the sand-sheet prairie that covers the southeast parts of the South Texas Coastal Plain.

Cross Timbers soils formed on a rolling landscape with low to moderate relief dissected by numerous narrow streams. Outcropping sandstones, shales, and limestones of Cretaceous age cover the landscape, and unconsolidated sands and gravels fill the rivers and streams. Duffau, Gasil, and Windthorst soils are deep, highly weathered soils that formed in interbedded sandstone and shale. These soils formed on convex uplands and are very susceptible to erosion. Chaney, Crosstell, and Callisburg soils have clayey subsoils and are deep to claystone or shale.

Grand Prairie soils formed on gently rolling to hilly, dissected limestone plateaus and in adjacent, gently sloping valleys. Steep slopes border valleys along major streams, and most soils formed in flat-lying limestones and calcareous shales of Cretaceous age. Shallow soils—including Aledo, Brackett, Purves, and Real—occur on hills and ridges and differ in texture, mineralogy, and organic matter content. Moderately deep Bolar soils occur on similar landscapes. Clayey Sanger soils, which formed in shale parent materials, have shrink-swell properties.

Texas Blackland Prairie soils formed on a nearly level to gently rolling plain, dissected by generally southeastward flowing streams—a landscape that developed on outcrops of calcareous shales of Cretaceous age. The Austin Chalk (Balcones Escarpment) borders the Blackland Prairie to the west. The shale parent materials have produced a significant extent of clayey soils having high shrink-swell properties, including Houston Black, Heiden, Freisburg, Bleiblerville, and Latium soils. Loamy soils on similar landscape positions, which formed in interbedded sandstone and shale, include Hallettsville, Crockett, Wilson, and Carbengle.

Texas Claypan Area soils formed on nearly level to sloping plains dissected by perennial streams and their tributaries. Large floodplains and stream terraces are associated with meandering river systems. Over most of the area, soils have well-developed, clayey, subsoil horizons with sandy and loamy surface textures. Woodtell, Edge, Crockett, and Straber soils occur on interstream divides and ridges, and Tabor soils are on stream terraces. Padina and Silstid soils have sandy surface layers more than 20 inches thick.

Western Coastal Plain and Flatwoods soils formed on nearly level to steep, coastal-plain uplands that are intricately dissected by streams. Parent materials are alluvial and marine sediments of Tertiary age. Pineywoods soils are mostly highly weathered, acidic soils that support pine-hardwood vegetation. Cuthbert, Bowie, Kirvin, Eastwood, Scottsville, Woodtell, and Pinetucky are deep soils that occur on interstream divides and low ridges. Trawick soils formed in glauconitic sediments. Conroe, Pickton, Lovelady, and Wolfpen soils have sandy surface layers more than 20 inches thick, and Fuller and Keltys soils are loamy and deep to mudstone. Flatwood soils are highly weathered and acidic and support pine-hardwood vegetation characterized by loblolly pine. The very deep Otanya, Kirbyville, and Evadale soils occur on low-relief uplands and flat plains.

Flood plains soils formed in alluvium on flood plains, the nearly level plains that border a stream and that are subject to inundation under river flood-stage conditions. Tinn, Trinity, Kaufman, Pledger, and Brazoria soils have clayey textures and high shrink-swell properties. Loamy Norwood soils have an irregular distribution of organic matter with soil depth.

Gulf Coast Prairie soils formed in alluvial and marine sediments of (primarily) Quaternary age that were deposited under fluctuating sea-level conditions. The area is characterized by low local relief and dissection by rivers that flow to the Gulf of Mexico. Victoria, Laewest, Edroy, Beaumont, League, and Lake Charles soils are well-developed, clayey soils with high shrink-swell properties. Orelia, Dacosta, Edna, Labelle, Gessner, Bernard, Katy, Telferner, Wockley, Cieno, and Nada soils have loamy surface textures and loamy and clayey subsoil horizons, and they differ primarily on drainage class and mineralogy.

Gulf Coast Saline Prairies soils formed in Quaternary sediments on nearly level coastal lowland plains, including coastal marshes, tidal flats, and barrier islands. Clayey, saline soils include Barrada, Harris, Surfside, and Francitas. Sandy Mustang and Daggerhill soils occur on dune landforms on barrier-island landscapes.