Issued June 1969

Major fieldwork for this soil survey was done in the period 1957–64. Soil names and descriptions were approved in 1965. Unless otherwise indicated, statements in the publication refer to conditions in the county in 1964. This survey was made cooperatively by the Soil Conservation Service and the Texas Agricultural Experiment Station as part of the technical assistance furnished to the Collin County Soil and Water Conservation District.

HOW TO USE THIS SOIL SURVEY

THIS SOIL SURVEY of Collin County, Tex. contains information that can be applied in managing farms and ranches; in selecting sites for roads, ponds, buildings, or other structures; and in judging the suitability of tracts of land for agriculture, community development, or recreation.

Locating Soils

All of the soils of Collin County are shown on the detailed map at the back of this survey.

map and colored to show soils that have the same limitation or suitability. For example, soils that have a slight limitation for a given use can be colored green, those with a moderate limitation can be colored yellow, and those with a severe limitation can be colored red.

Farmers and those who work with farmers can learn about use and management of the soils in the soil descriptions and in the discussions of the capability units and the pasture and hayland groups.

Ranchers and others interested in range con-

Contents

SOIL SURVEY OF COLLIN COUNTY, TEXAS

BY ARTHUR HANSON[1] AND FRANKIE F. WHEELER, SOIL CONSERVATION SERVICE

FIELDWORK BY DAN A. BLACKSTOCK, CURTIS H. DEAVER, AND EDWARD W. PAULS, SOIL CONSERVATION SERVICE, UNITED STATES DEPARTMENT OF AGRICULTURE

UNITED STATES DEPARTMENT OF AGRICULTURE, SOIL CONSERVATION SERVICE, IN COOPERATION WITH THE TEXAS AGRICULTURAL EXPERIMENT STATION

COLLIN COUNTY, in the Blackland Prairie part of north-central Texas (fig. 1), has a total area of 886 square miles, or 567,040 acres, including 11,520 acres of water. McKinney, the county seat, is about 35 miles north of Dallas. The town is in a productive farming and livestock area.

In 1960, total population of the county was 41,247. At the present, the population of the county continues to grow as a part of the Dallas metropolitan area.

Growing cotton, wheat, and grain sorghum and raising beef cattle are the principal agricultural enterprises. In 1964, about 53 percent of the land area in the county was cropland and 31 percent was pasture. The rest of the county was used for residential areas and various other purposes.

Most of the soils in Collin County formed under grass vegetation. They dominantly are dark colored and clayey, and they contain some free lime. All but the nearly level

How This Survey Was Made

Soil scientists made this survey to learn what kinds of soils are in Collin County, where they are located, and how they can be used.

They went into the county knowing they likely would find many soils they had already seen, and perhaps some they had not. As they traveled over the county, they observed steepness, length, and shape of slopes; size and speed of streams; kinds of native plants or crops; kinds of rock; and many facts about the soils. They dug many holes to expose soil profiles. A profile is the sequence of natural layers, or horizons, in a soil; it extends from the surface down into material that has not been changed much by leaching or by roots of plants.

The soil scientists made comparisons among the profiles they studied, and they compared these profiles with those in counties nearby and in places more distant. They classified ment could not be made if they were shown on the soil map as one unit. Such soil types are divided into phases. The name of a soil phase indicates a feature that affects management. For example, Houston Black clay, 0 to 1 percent slopes, is one of several phases of Houston Black clay, a soil type that ranges from nearly level to moderately sloping.

After a guide for classifying and naming the soils had been worked out, the soil scientists drew the boundaries of the individual soils on aerial photographs. These photographs show buildings, field borders, trees, and other details that greatly help in drawing boundaries accurately. The soil map in the back of this survey was prepared from the aerial photographs.

The areas shown on a soil map are called mapping units. On most maps detailed enough to be useful in planning management of farms and fields, a mapping unit is nearly equivalent to a soil type or a phase of a soil type. It is not exactly equivalent, because it is not practical to show on such a map all the small, scattered bits of soil of some other kind that have been seen within an area that is dominantly of a recognized soil type or soil phase.

In preparing some detailed maps, the soil scientists have

General Soil Map

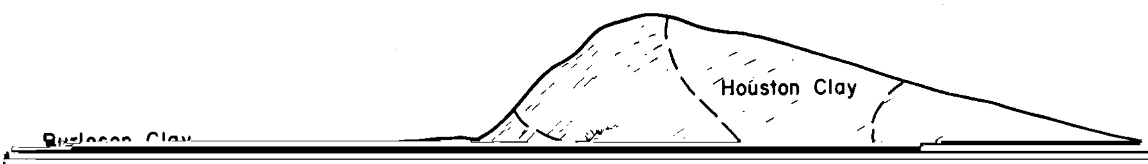
The general soil map at the back of this soil survey shows, in color, the soil associations in Collin County. A soil association is a landscape that has a distinctive proportional pattern of soils. It normally consists of one or more major soils and at least one minor soil, and it is named for the major soils. The soils in one association may occur in another, but in a different pattern.

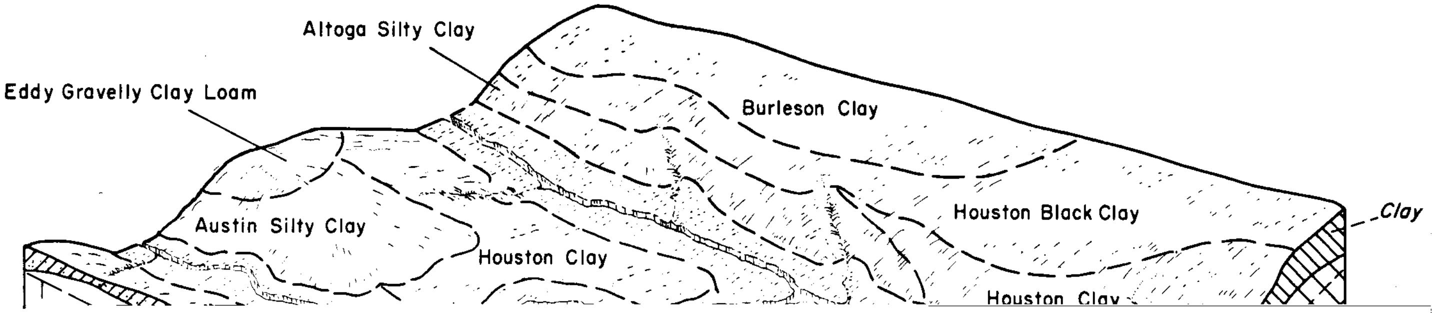
A map showing soil associations is useful to people who want a general idea of the soils in a county, who want to compare different parts of a county, or who want to know the location of large tracts that are suitable for a certain kind of farming or other land use. Such a map is not suitable for planning the management of a farm or field, because the soils in any one association ordinarily differ in slope, depth, stoniness, drainage, and other characteristics that affect management.

The six soil associations in Collin County are described in the following pages.

1. Houston Black-Austin Association


Stephen - Eddy Complex


Houston Clay


Altoga Silty Clay
Eddy Gravelly Clay Loam
Burleson Clay
Austin Silty Clay
Houston Clay
Houston Black Clay
Clay
Houston Clay

The Lewisville, Altoga, and Houston are minor soils in this association. The Lewisville and Altoga soils are lower in the landscape than the major Houston Black and Burleson soils, are in areas that slope to flood plains, and are browner and more permeable. The Houston soils are more sloping and browner than the major Houston Black.

Water moves into the soils in this association rapidly when they are dry and cracked, but water movement is very slow when the cracks are sealed. Capacity for storing moisture is high. In sloping areas, water erosion is a slight to moderate hazard.

Most of this association is cultivated. All crops commonly grown in the county are suitable. The Houston Black soils are well suited to cotton, corn, and grain sorghum. The Burleson soils are also used for these crops,

6. Wilson-Burleson Association

Nearly level to gently sloping, deep, loamy and clayey soils on uplands

This association consists of nearly level to gently sloping soils on uplands. Most of it is in small areas along the eastern boundary of the county, though a small area is in the extreme northwestern part. The association occupies about 3 percent of the county.

Wilson soils make up about 65 percent of this association; Burleson soils, 30 percent; and minor soils, 5 percent. Figure 6 shows the major soils and most of the minor soils in this association.

The Wilson soils have a dark-gray, noncalcareous clay loam surface layer about 7 inches thick. It overlies a dense,

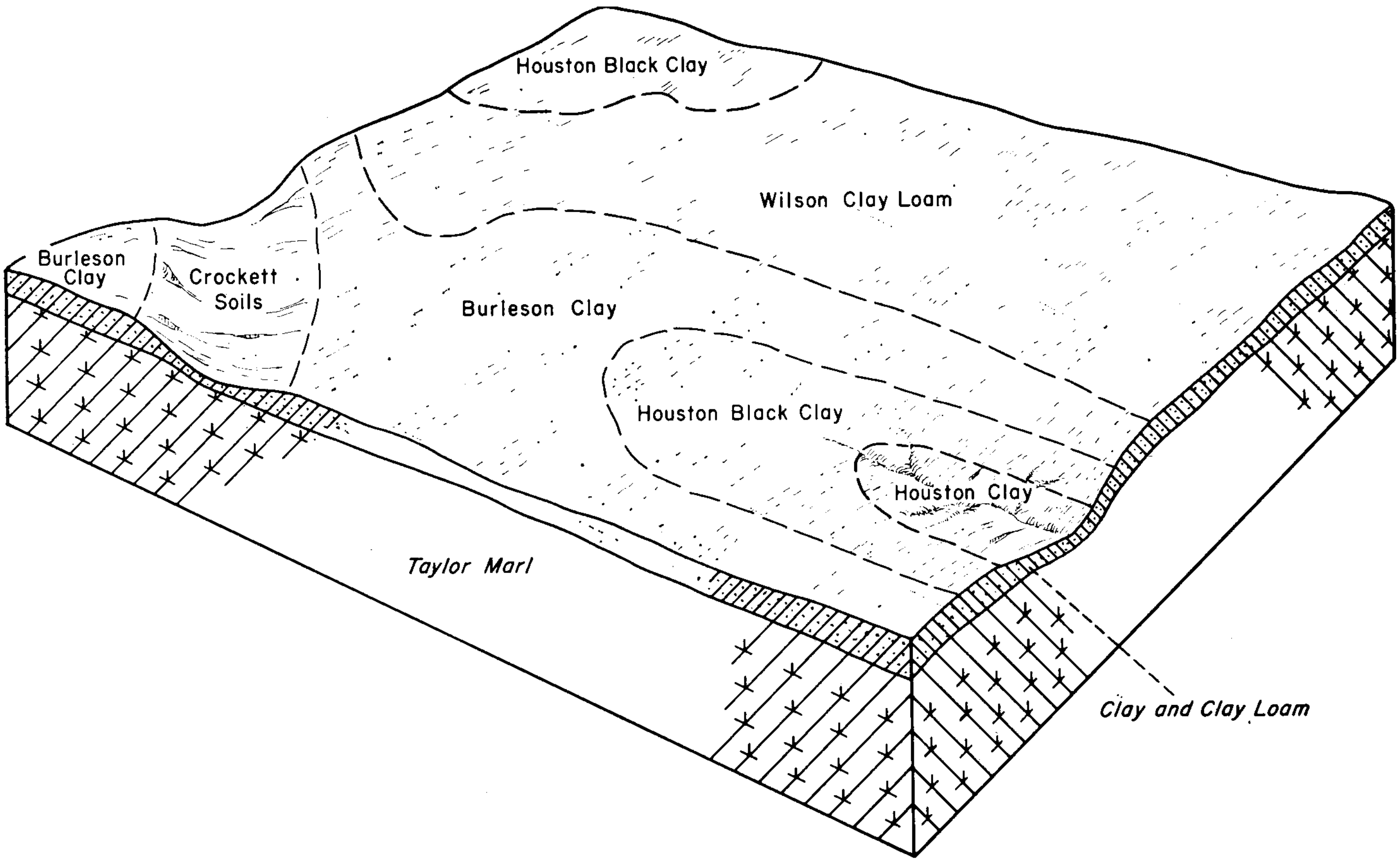


***Figure 6.*—Soils and underlying material in association 6.**

TABLE 1.—*Approximate acreage and proportionate extent of the soils*

Soil	Area	Extent [1]
	Acres	*Percent*
Altoga silty clay, 5 to 8 percent slopes, eroded	15, 258	2. 7
Altoga silty clay, 8 to 12 percent slopes, severely eroded	2, 248	. 4
Austin silty clay, 1 to 3 percent slopes	23, 554	4. 2
Austin silty clay, 3 to 5 percent slopes, eroded	31, 584	5. 6
Austin silty clay, 5 to 8 percent slopes, eroded	13, 956	2. 5
Burleson clay, 0 to 1 percent slopes	4, 813	. 8
Burleson clay, 1 to 3 percent slopes	10, 025	1. 8
Burleson clay, 2 to 4 percent slopes, eroded	3, 032	. 5
Crockett soils, 2 to 5 percent slopes, eroded	3, 104	. 5
Crockett soils, 5 to 8 percent slopes, eroded	161	(2)
Eddy gravelly clay loam, 1 to 3 percent slopes	1, 575	. 3
Eddy gravelly clay loam, 3 to 8 percent slopes, eroded	12, 516	2. 2
Ellis clay, 3 to 8 percent slopes, eroded	494	(2)
Engle clay loam, 1 to 3 percent slopes	459	(2)
Engle clay loam, 3 to 5 percent slopes, eroded	840	. 1
Ferris-Houston clays, 5 to 12 percent slopes, severely eroded	14, 896	2. 7
Frio clay loam, frequently flooded	2, 211	. 4
Frio clay loam, occasionally flooded	6, 373	1. 1
Houston clay, 3 to 5 percent slopes, eroded	28, 675	5. 1
Houston clay, 5 to 8 percent slopes, eroded	22, 165	3. 9
[illegible]	[illegible]	[illegible]
Houston Black clay, 1 to 3 percent slopes	192, 784	34. 0
Houston Black clay, 2 to 4 percent slopes, eroded	24, 422	4. 3
Hunt clay, 0 to 1 percent slopes	1, 289	. 2
Hunt clay, 1 to 3 percent slopes	7, 774	1. 4
Lamar clay loam, 3 to 5 percent slopes, eroded	476	(2)
Lamar clay loam, 5 to 8 percent slopes, eroded	1, 799	. 3
Lamar clay loam, 5 to 12 percent slopes, severely eroded	311	(2)
Lewisville silty clay, 1 to 3 percent slopes	1, 912	. 3
Lewisville silty clay, 3 to 5 percent slopes, eroded	9, 838	1. 7
Stephen silty clay, 1 to 3 percent slopes	7, 459	1. 3
Stephen-Eddy complex, 3 to 5 percent slopes, eroded	6, 987	1. 2
Trinity clay, frequently flooded	29, 181	5. 1
Trinity clay, occasionally flooded	23, 088	4. 1
Wilson clay loam, 0 to 1 percent slopes	1, 524	. 3
Wilson clay loam, 1 to 3 percent slopes	9, 773	1. 7
Gravel pits and quarries	136	(2)
Water area	11, 520	2. 0
Total	567, 040	100. 0

Following the name of each mapping unit, there is a symbol in parentheses. This symbol identifies the mapping unit on the detailed soil map. Listed at the end of each description of a mapping unit are the capability unit and the pasture and hayland group in which the mapping unit was placed. The pages on which each capability unit and each pasture and hayland group are described can be found by referring to the "Guide to Mapping Units" at the back of this survey. Many terms used in the soil descrip-

clay is less than 40 percent. When dry, the A horizon has color value of more than 5. When this horizon is moist, value is more than 3.5, hue is 7.5 YR or 10YR, and chroma is 1.5 to 3.5. Surface horizons that have a value of less than 3.5 when moist are less than 7 inches thick.

The B2 horizon ranges from 6 to 18 inches in thickness and from light silty clay to heavy clay loam in texture. Depth to visible calcium carbonate ranges from 10 to 33 inches. In some areas gravel beds several feet thick occur below a depth of 40 inches.

Altoga soils occur closely with the Austin and Lewisville

Austin Series

The Austin series consists of deep, calcareous, clayey soils that are gently sloping to sloping. These soils formed in clayey marl or chalky limestone on uplands throughout the county.

In a typical profile, the surface layer is about 16 inches thick and consists of dark grayish-brown, calcareous silty clay. The subsoil is calcareous silty clay that is light brownish gray in the upper part and pale brown in the lower

The B2 horizon ranges from 10 to 20 inches in thickness. When dry, this horizon ranges from light brownish gray and pale brown to light yellowish brown and brown in a hue of 10YR or 2.5Y.

The C horizon ranges from 10 to 20 inches in thickness. Visible calcium carbonate makes up about 30 to 60 percent of the C horizon. Depth to the R layer ranges from 30 to 60 inches.

The Austin soils occur with the Altoga, Eddy, Stephen, Lewisville, and Houston Black soils. Austin soils have a darker colored and typically a thicker surface layer than that of Altoga soils, and they are darker throughout and are deeper than the Eddy soils. Austin soils have a thicker solum than

Austin silty clay, 5 to 8 percent slopes, eroded (AuD2).—This sloping eroded soil occupies areas that lead to the natural drains throughout the county. The areas are irregular in shape and range from 4 to 7 acres in size. Slopes are convex and average about 7 percent. Some areas are cut by rills and shallow gullies, but they can easily be crossed by farm machinery. The subsoil is exposed at the surface in a few places.

This soil has a thinner solum than that of the profile described as typical for the Austin series. The surface layer is dark grayish-brown silty clay about 12 inches thick. The subsoil is pale-brown silty clay about 10 inches thick. The substratum is very pale brown silty clay, of which about 50 percent, by volume, is visible calcium carbonate. Depth to the alternating beds of chalky limestone and clayey marl is about 32 inches. The profile of this soil is calcareous throughout.

Included with this soil in mapping were small areas of very shallow Eddy gravelly clay loam, moderately deep Stephen silty clay, and deep Altoga silty clay. The included areas make up less than 10 percent of any area mapped.

Surface runoff is rapid, and water erosion is a severe hazard in unprotected areas. Permeability is moderately slow. Available water capacity is moderate.

A few areas are cultivated, but most of this soil is in pasture. Small grains are grown in most cultivated areas. Crops grow moderately well. King Ranch bluestem and common and Coastal bermudagrasses are the main pasture grasses. Contour farming and terraces are needed in culti-

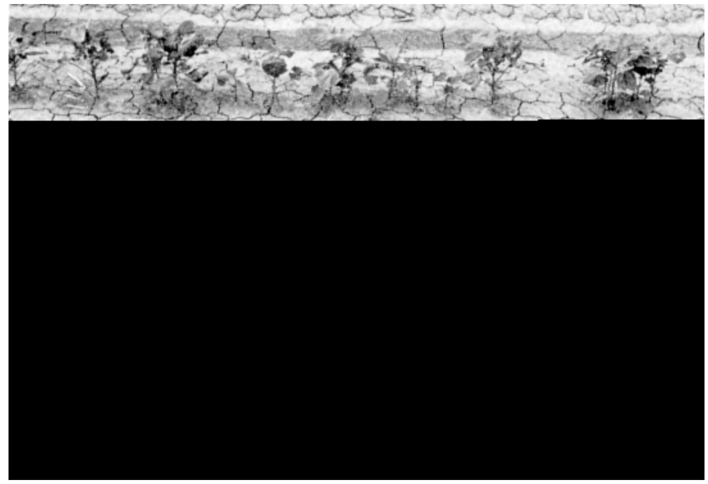


Figure 7.—Surface crusting on Burleson clay, 0 to 1 percent slopes, in a field of young cotton.

Ap—0 to 6 inches, dark-gray (10YR 4/1) clay, very dark gray (10YR 3/1) when moist; surface has a light-gray (10YR 6/1) silty clay crust about one-fourth inch thick; weak angular blocky structure; extremely hard when dry, very firm when moist, very sticky and very plastic when wet; medium acid; noncalcareous; abrupt, smooth boundary.

A11—6 to 22 inches, dark-gray (10YR 4/1) clay, very dark gray (10YR 3/1) when moist; weak angular blocky structure; aggregates have shiny pressure faces; exfaint, brownish mottles in the AC and C horizons are inherited from the parent clay and are not from wetness. Concretions of visible calcium carbonate in the AC and C horizons range from less than 1 to about 5 percent, by volume.

Burleson soils are near the Houston Black, Hunt, and Wilson soils. Burleson soils are crusty on the surface and are slightly less permeable than the Houston Black soils. They have less lime than Hunt soils, which are calcareous below a depth of about 20 inches. The Burleson soils have a more clayey surface layer than the Wilson soils but do not have the dense clay B2t horizon that is characteristic of Wilson soils.

Burleson clay, 0 to 1 percent slopes (BcA).—This soil occurs on alluvial terraces along the streams in the eastern part of the county and on uplands along the east and west boundaries of the county. The soil areas are oval and range from 10 to 350 acres in size. A crust about one-fourth inch thick forms on the surface after a rain.

The profile of this soil is the one described as typical for the Burleson series. In the center of a microdepression, the surface layer is dark-gray, noncalcareous clay about 42 inches thick. Below this layer is gray, noncalcareous clay that is extremely firm when moist. Light olive-brown clay is at a depth of about 70 inches.

Included with this soil in mapping were areas of Hunt clay, Houston Black clay, and Wilson clay loam less than 4 acres in size. The included areas make up less than 5 percent of any area mapped.

Cultivated crops grow moderately well, for surface drainage is slow but adequate, and available water capacity is moderate. Most of this soil is cultivated, chiefly to cotton, corn, small grains, and grain sorghum. The rest is used for pasture and hay. Grassed waterways help to control runoff and water erosion. (Capability unit IIs–6; pasture and hayland group A)

Burleson clay, 1 to 3 percent slopes (BcB).—This soil is on stream terraces in the eastern part of the county and on uplands along the east and west boundaries of the county. The soil areas are irregular in shape and range from 5 to 200 acres in size. Slopes are slightly convex and average about 2 percent. A crust about one-fourth inch thick forms on the surface after a rain. The profile of this

gullies can be crossed by farm machinery, but they are too large to be smoothed by cultivation.

This soil has a thinner solum than the one in the profile described as typical for the Burleson series. In the center of a microdepression, the surface layer consists of about 24 inches of dark-gray, noncalcareous clay. Below this layer is gray clay that is extremely firm when moist. Light-brown clay is at a depth of about 40 inches.

Included with this soil in mapping were areas of eroded, calcareous Houston Black clay. The included areas make up less than 10 percent of any area mapped.

Available water capacity is moderate, surface runoff is moderately rapid, and the hazard of water erosion is moderately severe.

About half of the acreage is used for crops, mainly small grains, grain sorghum, sweetclover, peas, and vetch. The rest is used for pasture. In most years crops grow moderately well. Terraces and contour farming are needed in cultivated fields to help control water erosion. Grassed waterways and diversion terraces help to reduce erosion caused by runoff from other areas. (Capability unit IVe–5; pasture and hayland group B)

Crockett Series

The Crockett series consists of gently sloping to sloping, noncalcareous crusty soils that have a subsoil of blocky clay. These soils are eroded and occupy uplands throughout the county.

In a typical profile, the surface layer is grayish-brown, noncalcareous light clay loam about 6 inches thick. The subsoil extends to a depth of about 42 inches. It is grayish-brown clay mottled with yellowish red and strong brown in the upper part and is mottled light brownish-gray and yellowish-brown clay in the lower part. The substratum, to a depth of 42 inches or more, is light brownish-gray clay.

When these soils are dry, crusts ⅛ to 1 inch thick form on the surface and the soils crack to a depth of at least 20 inches. When these soils are wet, the cracks close.

Representative profile of an Eddy gravelly clay loam (in a native pasture, 400 feet north of center line of Texas Highway 121, from a point 1.3 miles west of the intersection of this highway and Texas Highway 289, about 14 miles southwest of the intersection of Texas Highway 121 and Texas Highway 24 in McKinney):

A1—0 to 5 inches, grayish-brown (10YR 5/2) gravelly clay loam, dark grayish brown (10YR 4/2) when moist;

of gravelly clay loam and free lime and is about 4 inches thick. Many small fragments of chalk are scattered on the surface and throughout the surface layer. Beneath the surface layer is a mixture that is about 95 percent whitish chalk and about 5 percent grayish-brown clay loam. It is underlain by chalky limestone.

Included with this soil in mapping were areas of eroded Stephen silty clay and Austin silty clay. Also included, The A horizon ranges from 9 to 16 inches in thickness, and when dry, it ranges from dark grayish brown to olive in a value of 3 or 4, chroma of 2, 3, or 4, and hue of 10YR, 2.5YR, or 5Y. The A horizon is calcareous in a few places where Ellis soils occur with higher lying, calcareous soils. The AC or B horizon ranges from 8 to 12 inches in thickness. Color ranges from grayish brown to olive in value of 4 or 5, chroma of 2 or 3, and hue of 2.5Y or 5Y.

The C horizon ranges from 8 to 12 inches in thickness and in a few places contains weakly to strongly cemented concretions of calcium carbonate. Depth to the R layer of compact shale ranges from 25 to 40 inches.

Ellis soils occur closely with the Houston soils and Ferris soils. Ellis soils are noncalcareous, whereas the Houston and Ferris soils are calcareous and are less dense and permeable in the layer beneath the surface layer.

Ellis clay, 3 to 8 percent slopes, eroded (EID2).—This moderately sloping to sloping soil is mainly in the western part of the county. It is in irregularly shaped areas that average about 60 acres in size. Slopes average about 6 percent. The surface layer is commonly eroded, and many gullies are cut. The profile of this soil is the one described as typical for the Ellis series.

Included with this soil in mapping were areas of Ferris-Houston clays, 5 to 12 percent slopes, severely eroded. The included areas make up less than 5 percent of any area mapped.

Surface runoff is rapid. In sloping areas, the hazard of water erosion is moderately severe.

Most of the fields were once cultivated to cotton and small grains but are now used for pasture. The rest of the cultivated fields need intense management, though crops

when moist; few root channels; few small concretions of calcium carbonate; calcareous; moderately alkaline; abrupt, smooth boundary.

A12—6 to 18 inches, dark grayish-brown (10YR 4/2) clay loam, very dark brown (10YR 2/2) when moist; moderate, fine, subangular blocky structure; slightly hard when dry, friable when moist; few root channels; few soft masses of segregated calcium carbonate; calcareous; moderately alkaline; gradual, smooth boundary.

B—18 to 32 inches, light brownish-gray (10YR 6/2) clay loam, grayish brown (10YR 5/2) when moist; moderate, fine, subangular blocky structure; hard when dry, firm when moist; few weakly cemented concretions of calcium carbonate; calcareous; moderately alkaline; gradual, smooth boundary.

C—32 to 48 inches +, very pale brown (10YR 8/3) clay loam, pale brown (10YR 6/3) when moist; common, medium, distinct mottles of brownish yellow; weak subangular blocky structure; hard when dry, firm when moist; many soft masses of segregated calcium carbonate in upper part; thin strata of sandstone weakly cemented with calcium carbonate in lower part; calcareous; moderately alkaline.

The A horizon ranges from 12 to 20 inches in thickness and from loam to heavy clay loam in texture. When dry, this horizon ranges from dark grayish brown to dark brown in hue of 10YR, value of 3 to 5, and chroma of 2 or 3. When the A horizon is moist, value ranges from 2 to less than 3.5.

The B horizon ranges from 8 to 20 inches in thickness. When dry, it ranges from light brownish gray to brown in hue of 7.5YR or 10YR, value of 4 to 6, and chroma of 2 to 4. Clay content of the B horizon ranges from 20 to about 35 percent.

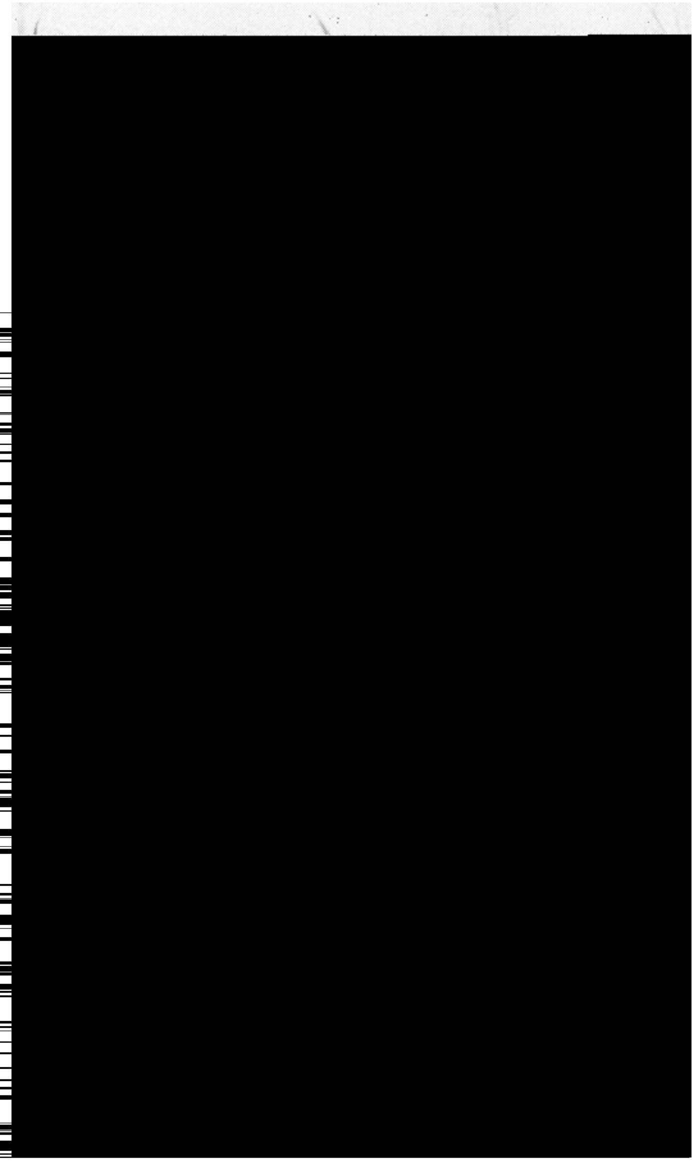
The mottles in the C horizon have a chroma of more than 2, or they do not indicate wetness. Depth to the weakly cemented, calcareous sandstone ranges from 30 to 50 inches.

The Engle soils are near the Austin, Houston, Houston Black

Included with this soil in mapping were areas of eroded Houston clay. The included areas make up less than 6 percent of any area mapped.

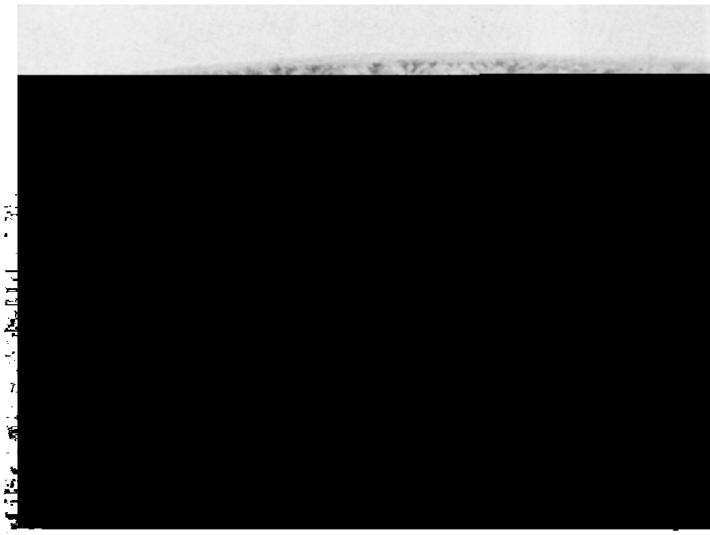
In the more sloping fields, the hazard of water erosion is moderately severe. Surface runoff is moderately rapid; permeability and available water capacity are moderate.

About 60 percent of this soil is used for pasture, and the rest is cultivated. Crops, which are mainly small grains and grain sorghum, are moderately well suited. The main pasture grasses are johnsongrass and common or Coastal bermudagrass. In cultivated fields terraces and contour farming are needed to control water erosion. Grassed



Ferris soils occur closely with the Houston and Ellis soils. The surface layer of Ferris soils is thinner than that of the Houston soils, and the next layer is less dense than the corresponding layer in Ellis soils.

Ferris-Houston clays, 5 to 12 percent slopes, severely eroded (FeE3).—This complex consists of sloping to strongly sloping soils in the rolling areas, mainly in the vicinity of Farmersville. The areas range from 5 to 170 acres in size. Most of these areas are cut by many natural drains. Many areas are deeply gullied (fig. 10).



Frio Series

The Frio series consists of deep, friable, loamy soils. These soils occupy flood plains along the major streams and their tributaries, mainly in the eastern part of the county. Slopes are less than 1 percent.

In cultivated areas, the plow layer of a typical profile is dark grayish-brown, friable clay loam about 6 inches thick. It is underlain by dark grayish-brown heavy clay loam that contains lime and extends to a depth of about 20 inches. The next layer to a depth of 55 inches or more is grayish-brown heavy clay loam.

The Frio soils are moderately permeable. Available water capacity and natural fertility are high.

Cultivated areas of these soils are farmed to cotton, corn, small grains, and grain sorghum. Pasture and hay are grown in fields where frequent flooding is likely.

Representative profile of a Frio clay loam (in a culti-

Included with this soil in mapping were areas of Trinity clay. The included areas make up less than 8 percent of any [illegible]

[redacted]

A1—6 to 16 inches, dark grayish-brown (2.5Y 4.5/2) clay, very dark grayish brown (2.5Y 3/2) when moist; moderate, fine, angular blocky structure; aggregates have shiny pressure faces; very hard when dry, very firm when moist, very sticky and very plastic when wet; few small roots and root channels; calcareous; moderately alkaline; diffuse; wavy boundary.

AC1—16 to 34 inches, grayish-brown (2.5Y 5/2) clay, dark grayish brown (2.5YR 4/2) when moist; few, fine, distinct mottles of yellowish brown; distinct parallelepipeds that have long axes tilted more than 10 degrees from the horizontal; aggregates have shiny pressure faces; many, distinct, intersecting, grooved slickensides in the lower part; extremely hard when dry, extremely firm when moist, very sticky and very plastic when wet; few strongly cemented concretions of calcium carbonate 2 to 5 millimeters in diameter; calcareous; moderately alkaline; diffuse boundary.

AC2—34 to 60 inches +, light brownish-gray (2.5Y 6/2) clay, grayish brown (2.5Y 5/2) when moist; few, medium, distinct, brownish-yellow mottles; distinct parallelepipeds that have axes tilted more than 10 degrees from the horizontal; distinct, grooved, intersecting slickensides are common but are less noticeable below a depth of 50 inches; extremely hard when dry, extremely firm when moist; films, threads, and many, small, weakly and strongly cemented concretions of calcium carbonate; calcareous in the matrix; moderately alkaline.

Within a linear distance of about 6 to 12 feet, the thickness of the A horizon ranges from 7 inches at the center of the microknoll to 30 inches at the center of the microdepressions. Average thickness of the A horizon is more than 12 inches. In undisturbed areas the microknolls are about 6 to 16 inches higher than the microdepressions. When dry, the A horizon ranges from grayish brown to olive brown in hue of 2.5Y, value of 4 or 5, and chroma of 2 to 4. When the A horizon is moist or dry, chroma is more than 1.5, but when it is moist, value ranges from 1 to less than 3.5.

The AC1 horizon ranges from 12 to 30 inches in thickness. When dry, the AC1 horizon has a color range similar to that of the A horizon, except that value is 1 or 2 units higher and chroma is 1 or 2 units weaker. Throughout the profile the content of visible calcium carbonate ranges from 0 to 30 percent, by volume. In degree and color, mottling in the AC1 and AC2 horizons varies considerably. Mottling seems related to the marine clay from which the soil formed, not to wetness or natural drainage. In a few places over chalk or chalky marl, depth to the AC horizon ranges from 30 to 50 inches.

Houston soils are near the Ferris, Houston Black, Hunt, and Lamar soils. The surface layer of Houston soils is thicker than that of the Ferris soils. Houston soils are steeper than the Houston Black and Hunt soils. They are more clayey throughout the solum than the Lamar soils.

Houston clay, 3 to 5 percent slopes, eroded (HcC2).—This soil occurs throughout the county. It occupies upland areas that slope to the natural drains. The areas are oblong and average about 35 acres in size. A few, broad, shallow gullies occur, but they are easily crossed by farm machines. In a few places erosion has exposed the subsoil. Most of the gilgai microrelief has been obliterated by cultivation or erosion. The profile of this soil is the one described as typical for the series.

Included in mapping were areas of severely eroded Ferris clay, eroded Houston Black clay, and eroded Lamar clay loam. These areas are 1 to 3 acres in size and make up

for control of water erosion. Grassed waterways and diversion terraces help to reduce erosion caused by runoff from other areas. (Capability unit IIIe-3; pasture and hayland group C)

Houston clay, 5 to 8 percent slopes, eroded (HcD2).—This sloping soil occurs throughout the county. It is in upland areas that slope to the natural drains. The soil areas are oblong and have an average size of about 25 acres. Erosion has removed much of the surface layer and has exposed the subsoil in some places. A few deep and shallow gullies occur, and most of the deep ones cannot be crossed by farm machines.

This soil has a thinner surface layer than that in the profile described as typical for the series. The surface layer is dark grayish-brown, calcareous clay about 10 inches thick. Below this layer is calcareous clay that is extremely firm when moist. It is grayish brown in the upper part and light brownish gray in the lower part.

Included with this soil in mapping were areas of eroded Ferris clay and eroded Lamar clay loam. These areas are 1 to 4 acres in size, and they make up less than 10 percent of any area mapped.

Surface runoff is rapid, and the hazard of water erosion is severe. Crops do not grow well.

Only a few areas of this soil are cultivated, and the rest is used for pasture. Small grains are the main crops in cultivated areas. The main improved pasture grasses are Coastal bermudagrass and King Ranch bluestem. In cultivated fields terraces and contour farming are needed to help control water erosion.

In some areas grassed waterways and diversion terraces are needed to reduce erosion caused by runoff from other areas. (Capability unit IVe-2; pasture and hayland group C)

Houston Black Series

In the Houston Black series are deep, calcareous, clayey soils that formed in calcareous clay or chalky marl. These soils are nearly level to moderately sloping. They are on uplands throughout the county and are on old alluvial terraces along the major streams in the eastern part.

In the center of a microdepression in a cultivated field, the surface layer (A horizon) is very dark gray, calcareous clay about 44 inches thick. This layer grades gradually to light-gray clay that is distinctly mottled with yellowish brown. The underlying layer, at a depth of 60 inches, is light-gray clay that is prominently mottled with yellowish brown.

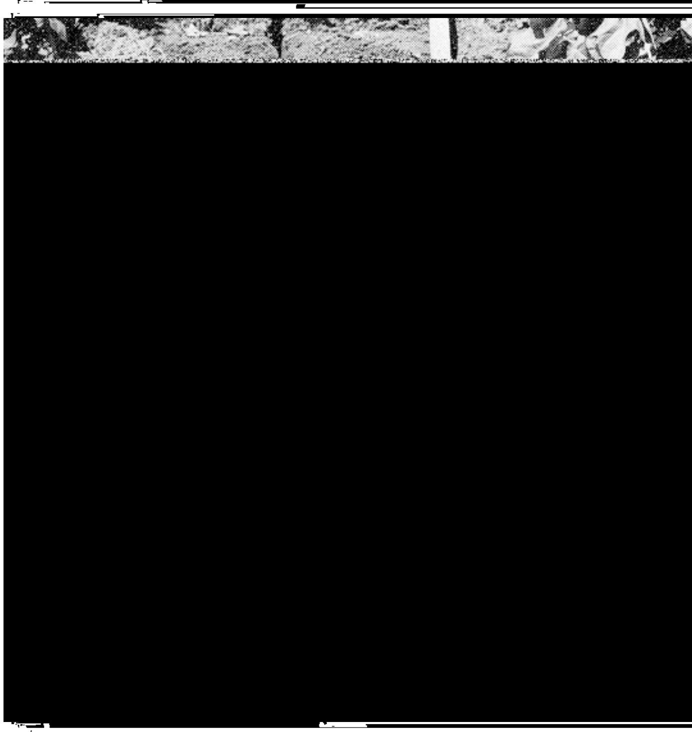
Gilgai microrelief is common on the Houston Black soils. When these soils are dry, they crack to a depth of more than 30 inches (fig. 12). Water enters the cracks rapidly until they close. When these soils are wet, the cracks close, and water moves very slowly into the soils.

Most of the acreage is cultivated, and the rest is used for pasture and hay. The main crops are cotton, corn, small

Ap—0 to 6 inches, very dark gray (10YR 3/1) clay, black (10YR 2/1) when moist; weak granular structure; surface mulch of fine, discrete, very hard aggregates; very hard when dry, very firm when moist, very sticky and plastic when wet; calcareous; moderately alkaline; abrupt boundary.

A11—6 to 22 inches, very dark gray (10YR 3/1) clay, black (10YR 2/1) when moist; moderate, medium, angular blocky structure; aggregates have shiny pressure faces; very hard when dry, very firm when moist, very sticky and very plastic when wet; calcareous; moderately alkaline; diffuse, wavy boundary.

A12—22 to 44 inches, very dark gray (10YR 3/1) clay, black (10YR 2/1) when moist; distinct parallelepipeds that have the long axes tilted more than 10 degrees from



Representative profile of a Houston Black clay at the center of a microknoll, about 8 feet from the profile at the center of the microdepression:

Ap—0 to 6 inches, very dark gray (10YR 3/1) clay, black (10YR 2/1) when moist; weak granular structure; surface mulch of fine, discrete, very hard aggregates; very hard when dry, very firm when moist, very sticky and plastic when wet; calcareous; moderately alkaline; abrupt boundary.

A1—6 to 16 inches, very dark gray (10YR 3/1) clay, black (10YR 2/1) when moist; moderate, medium, angular blocky structure; aggregates have shiny pressure faces; very hard when dry, very firm when moist, very sticky and very plastic when wet; few small concremain crops. Fields planted to cotton require intensive management for preventing root rot. Grassed waterways can be used to help to control water erosion and runoff. (Capability unit IIs–6; pasture and hayland group C)

Houston Black clay, 1 to 3 percent slopes (HoB).—This is the most extensive soil in the county. It occupies uplands throughout the county and stream terraces in the eastern part. Most areas are irregular in shape, and they range from 10 to 200 acres in size, but one is as large as 1,000 acres. A few areas are eroded and rilled, but they can be smoothed by cultivation. Surface runoff and the hazard of erosion are moderate. On the surface is a mulch consisting of fine, discrete, very hard aggregates. Gilgai microrelief is apparent in undisturbed areas, but little microrelief can be seen in cultivated areas. The profile of this soil is the one described as typical for the Houston Black series.

Included with this soil in mapping were areas of Austin silty clay, Hunt clay, Burleson clay, and Engle clay loam. These areas are 1 to 3 acres in size, and they make up less than 8 percent of any areas mapped. Also included, in the western part of the county, were a few areas underlain by chalky limestone at a depth of 40 to 60 inches.

Nearly all of the acreage of this soil is cultivated. Some areas are used for pasture and hay. Cotton, corn, small grains, and grain sorghum are the main crops. Cultivated crops are moderately well suited. Fields planted to cotton require intensive management for preventing root rot. In cultivated areas, terraces help to control water erosion. In some areas grassed waterways and diversion terraces help reduce erosion caused by runoff from surrounding soils. (Capability unit IIe–1; pasture and hayland group C)

Houston Black clay, 2 to 4 percent slopes, eroded (HoB2).—This eroded soil occupies uplands throughout the county. The soil areas are irregular in shape and range from 10 to 50 acres in size. Slopes average about 3 percent. On the surface is a mulch consisting of fine, discrete, very hard aggregates. A few broad, shallow gullies and many

Hunt Series

In the Hunt series are deep, nearly level to gently sloping, clayey soils that have free lime below a depth of 20 inches. These soils are on uplands throughout the county.

In the center of a microdepression in a cultivated field, the surface layer (A horizon) is very dark gray clay about 36 inches thick. The upper 20 inches is noncalcareous. The surface layer grades gradually to gray, calcareous clay that is extremely firm when moist. Underlying material occurs at a depth of 46 inches and is mottled gray and light-gray clay.

Gilgai microrelief is common on the Hunt soils (fig. 13). When the soils are dry, they crack to a depth of more than 30 inches. Water enters the cracks rapidly. When these soils are wet, the cracks seal, and water movement is very slow. Available water capacity is moderate. The hazard of erosion is slight to moderate.

horizontal; few, distinct, intersecting, grooved slicken-
sides in the lower part; aggregates have shiny pres-

in the solum. They have a more clayey A horizon than have the
Wilson soils, though the Wilson soils have a dense clay B2t

thin. Small grains are grown in a few areas, but crops do not grow well.

Representative profile of a Lamar clay loam (in pasture, 500 feet south of county road, from a point 0.5 mile east and 1.5 miles north of the intersection of county road and

areas. (Capability unit IIIe-5; pasture and hayland group E)

Lamar clay loam, 5 to 8 percent slopes, eroded (LaD2).—This soil occurs mainly in the eastern part of the county in areas that slope to natural drains. These areas lime and extends to a depth of 34 inches. The next layer consists of pale-brown silty clay and accumulated lime (fig. 14).

Ap—0 to 6 inches, dark grayish-brown (10YR 4/2) light silty clay, very dark grayish brown (10YR 3/2) when moist; weak subangular blocky and weak granular structure; hard when dry, friable when moist; few strongly cemented concretions of calcium carbonate; calcareous; moderately alkaline; abrupt, smooth boundary.

A1—6 to 16 inches, dark grayish-brown (10YR 4/2) light silty clay, very dark grayish brown (10YR 3/2) when moist; moderate, fine, subangular blocky structure; hard when dry, firm when moist; few root channels; many strongly cemented concretions of calcium carbonate about 2 to 5 millimeters in diameter; calcareous; moderately alkaline; gradual, smooth boundary.

B—16 to 34 inches, grayish-brown (10YR 5/2) silty clay, dark grayish brown (10YR 4/2) when moist; moderate, fine, subangular blocky structure; very hard when dry, firm when moist; many strongly cemented concretions of calcium carbonate 2 to 5 millimeters in diameter and a few threads of soft calcium carbonate; calcareous; moderately alkaline; gradual, smooth boundary.

Cca—34 to 64 inches +, pale-brown (10YR 6/3) silty clay, brown (10YR 5/3) when moist; weak subangular blocky structure; hard when dry, firm when moist;

The solum of this soil is thinner than the one in the profile described as typical for the Lewisville series. The surface layer is dark grayish-brown, calcareous light silty clay about 11 inches thick. Below this layer is grayish

This Stephen silty clay is well drained. Available water capacity and the hazard of erosion are moderate. Permeability is moderately slow.

About 60 percent of this soil is cultivated, and the rest is used for pasture and hay. Small grains are the chief

[redacted]

Trinity clay, frequently flooded (0 to 1 percent slopes) (Tf).—This soil is on flood plains along the major streams and their tributaries, mainly in the eastern part of the county. Frequent flooding is likely. After some periods of flooding, thin deposits of silty material and litter are scattered over the surface. The surface is irregular and, in a few places, is marked by channel scars or partly filled old stream channels. The soil areas are oblong in shape, have smooth boundaries, and average about 100 acres in size. Surface runoff is very slow.

The surface layer of this soil is thicker than the one in the profile described as typical for the Trinity series. The [illegible]

is cultivated. Cotton, corn, grain sorghum, and small grains are the main crops. In most areas pasture and hay are suitable. Grassed waterways are needed in places to receive runoff water from higher areas. Diversion terraces are also helpful. Most cultivated crops benefit from applications of fertilizer. (Capability unit IIs–1; pasture and hayland group J)

Wilson Series

The Wilson series consists of deep, noncalcareous, loamy soils that have a subsoil of dense clay. These soils are nearly [illegible] corner and along the eastern boundary of the county. The main practices used to accomplish these purposes are

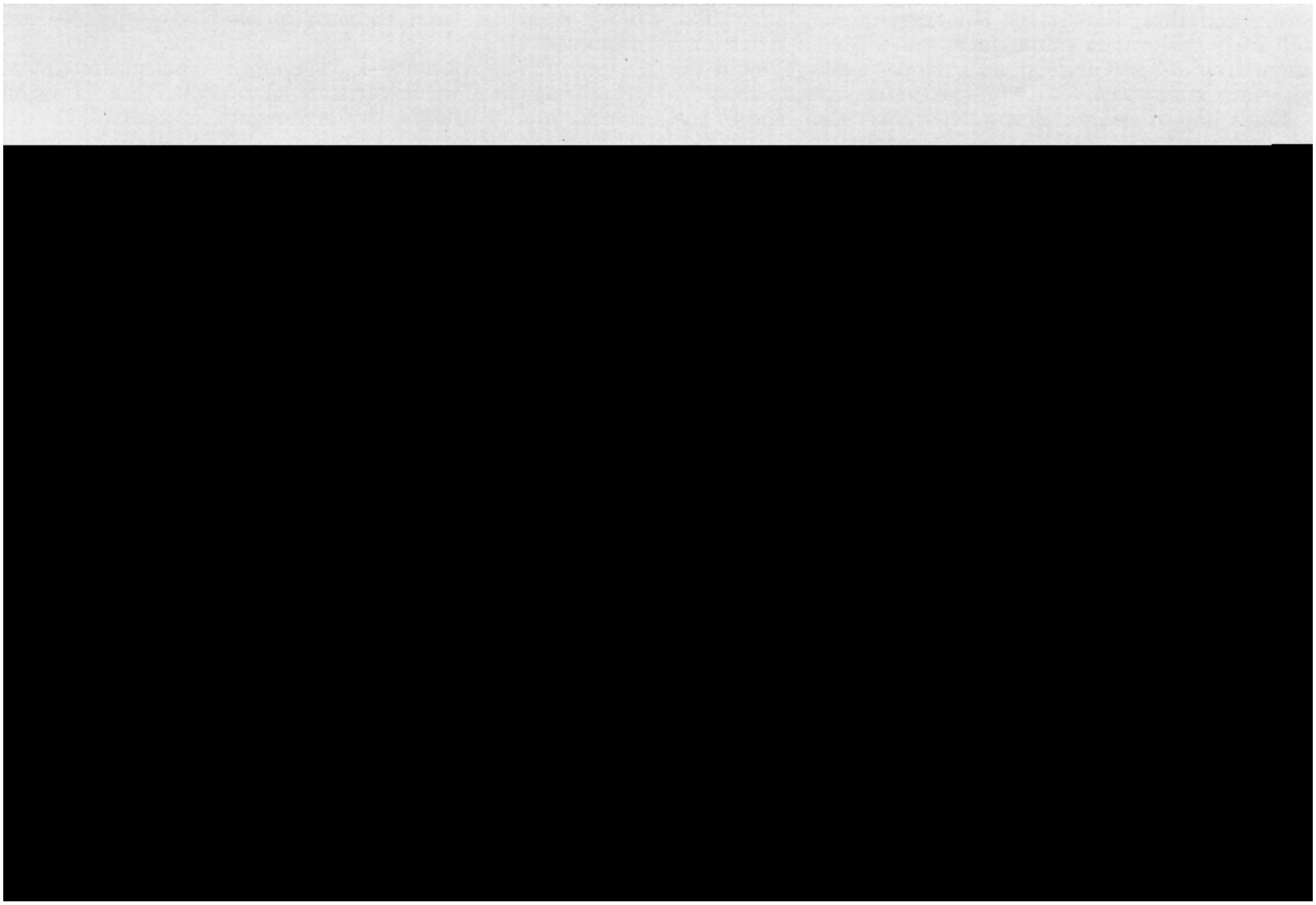


Figure 18.—**Terraces farmed on the contour on Houston Black clay, 1 to 3 percent slopes.**

Class VI. Soils have severe limitations that make them generally unsuited to cultivation and limit their use largely to pasture or range, woodland, or wildlife food and cover.

Class VII. Soils have severe limitations that make them unsuited to cultivation and that restrict

shows that the chief limitation is climate that is too cold or too dry.

In class I there are no subclasses, because the soils of this class have few limitations. Class V can contain, at the most, only subclasses indicated by *w*, *s*, and *c*, because the soils in it are subject to little or no erosion, though they

Management by capability units

In this subsection each capability unit in Collin County is described, and use and management are briefly discussed. The mention of soil series in the description of a capability unit does not mean that all the soils in the series are in the unit. To find the name of the soils in any capability unit, refer to the "Guide to Mapping Units" at the back of this survey.

CAPABILITY UNIT I-1

Only Frio clay loam, occasionally flooded, is in this capability unit. This deep, nearly level soil occupies a small acreage on flood plains that occasionally are damaged by

Lewisville series. They are moderately extensive in Collin County.

Their surface layer is calcareous silty clay or clay loam that is friable to firm and easy to work. The subsoil is silty clay or clay loam that has moderate to moderately slow permeability. Available water capacity is moderate. Erosion is moderate in the gently sloping areas.

These soils are used mainly for cultivated crops, pasture, and hay. Suitable crops are small grains, grain sorghum, corn, sweetclover, alfalfa, peas, and vetch. Johnsongrass, common bermudagrass, and Coastal bermudagrass are suitable pasture grasses, and vetch and buttonclover are suitable pasture legumes.

erosion caused by runoff from surrounding soils. Applications of fertilizer are needed for cultivated crops and forage crops.

CAPABILITY UNIT IIs-6

This capability unit consists of deep, nearly level, clayey soils. These soils are in the Burleson, Houston Black, and Hunt series. They occupy a moderately extensive acreage in the county and occur on uplands and stream terraces.

The soils in this unit have a clay surface layer that is difficult to work. After each rain, the surface of the Burleson soils crusts. When dry, all the soils in this unit have cracks that extend to a depth of more than 30 inches. Water enters these cracks rapidly, but the cracks close when the soils are wet, and water moves into them very slowly. When the clayey subsoil is wet, it impedes movement of water, air, and roots.

The soils of this unit are mostly cultivated. The main crops are cotton, corn, small grains, and grain sorghum, but sweetclover, alfalfa, vetch, peas, and onions are grown in some areas. Cotton root rot is the main concern on the Houston Black soils.

A cropping system is suitable if it provides small grains, grain sorghum, or other crops that produce a large amount of crop residue. The residue is effective in reducing surface crusting, and it also protects these soils during heavy

The soils in this unit are used mainly for crops, though some areas are used for pasture. Small grains, grain sorghum, sweetclover, peas, and vetch are the main crops. Cotton and corn are grown in a few areas, but row crops normally are not well suited. Cotton root rot is troublesome in some areas. Johnsongrass, King Ranch bluestem, and common and Coastal bermudagrasses are the main pasture grasses.

Management is needed to protect the soils against water erosion. The residue from crops helps to protect these soils from damaging rains. A cropping system is suitable if it provides small grains, grain sorghum, or other crops that produce a large amount of residue. Terraces and contour farming are needed to control water erosion in cultivated fields. Diversion terraces and grassed waterways help to control erosion and runoff. Cultivated crops and forage crops grow best if fertilizer is added.

CAPABILITY UNIT IIIe-5

This unit consists of deep, moderately sloping, eroded soils on rolling uplands. These soils are in the Austin, Engle, Lamar, and Lewisville series. They are extensive in this county.

The surface layer is calcareous silty clay or clay loam that is friable and easy to work. The subsoil is silty clay against runoff from adjacent areas. Cultivated crops and forage crops need fertilizer.

CAPABILITY UNIT IVe-2

In this unit are deep, moderately sloping, eroded, clayey soils on rolling uplands. These soils are in the Ellis and Houston series. The Ellis soil is in a small acreage in the county, but the Houston soil is moderately extensive.

Both kinds of soil have a clay surface layer that is difficult to work. When they are dry, these soils crack to depths of 20 to 30 inches or more. The cracks seal when the soils are wet, and the subsoil becomes very slowly permeable to water, air, and roots. Erosion is the main risk. These soils have been considerably damaged by erosion and in places are gullied. A few of the gullies are deep and cannot be crossed by farm machinery.

Cultivated crops and pasture are grown in most areas. Row crops do not grow well, but pasture is a good use. Suitable crops are small grains, sweetclover, peas, and vetch. Little bluestem, King Ranch bluestem, sideoats grama, and common and Coastal bermudagrasses are suitable pasture grasses.

Cropping systems are suitable if they provide grain sorghum or other crops that produce a large amount of residue. Crop residue left on the surface protects these soils against erosion until the next crop can be seeded. In cultivated areas contour farming and terraces help to control water erosion. Grassed waterways and diversion terraces are needed for protection against runoff from surrounding [illegible]

This soil has a calcareous surface layer of light silty clay in the upper part and silty clay in the lower part. The underlying layer is silty clay that has moderately slow permeability. Fragments of limestone are scattered over the surface. Because this soil is droughty in summer, cool-season crops are well suited.

Cultivated crops and pasture are the dominant uses. Small grains and sweetclover are the main crops, but row crops normally do not grow well. Johnsongrass, common and Coastal bermudagrasses, King Ranch bluestem, and sideoats grama are suitable pasture grasses. Suitable legumes are buttonclover, peas, and vetch.

A suitable cropping system is one that provides a continuous cover of vegetation or provides crops that produce a large amount of crop residue. Crop residue left on the surface helps to control erosion and to conserve moisture. Also needed are terraces and contour farming for control of water erosion in cultivated areas. Diversion terraces and grassed waterways give protection against runoff from surrounding areas. Applications of fertilizer are needed for cultivated crops and forage.

CAPABILITY UNIT IVe-5

This unit consists of deep, gently sloping to moderately sloping, eroded soils. These soils are in the Burleson and Crockett series. They are in a small acreage on rolling uplands in the county.

The surface layer of these soils is noncalcareous clay or [illegible]

A suitable cropping system is one that provides a permanent cover of vegetation or provides crops that produce a large amount of crop residue. Crop residue left on the surface helps to control erosion and to conserve moisture. Applications of fertilizer benefit both cultivated crops and forage crops.

CAPABILITY UNIT Vw-1

This unit consists of deep, nearly level clays and clay loams on flood plains. These soils are moderately extensive along the major streams and their tributaries. They are in the Frio and Trinity series.

Frequent flooding is likely, and these soils are subject to washing and deposition of new soil material. They also receive runoff from surrounding, higher areas. When the clayey Trinity soil is dry, it cracks to a depth of at least 20 inches. Water enters the cracks rapidly until the soil is again wet. Then the cracks close, and water movement is very slow.

These soils are used mainly for pasture, hay, or some form of permanent vegetation. Cultivated crops are not suited. Common and Coastal bermudagrasses, johnsongrass, and dallisgrass are suitable grasses. Suitable legumes are vetch, buttonclover, and sweetclover. Some of the wooded areas along streams are used mostly as wildlife habitat.

CAPABILITY UNIT VIe-1

Only Crockett soils, 5 to 8 percent slopes, eroded, is in this capability unit. These deep, sloping, eroded soils are on rolling uplands. They are the least important for farming in the county, and their total acreage is the smallest in the county.

The surface layer is noncalcareous and ranges from clay loam to fine sandy loam. When the soils dry, they crack to a depth of at least 20 inches. Water enters the cracks

Predicted Yields on Dryland Soils

Yields of crops depend chiefly on the tilth and fertility of the soils and on a sufficient supply of moisture at the time of planting and throughout the growing season. Lack of moisture commonly is the limiting factor in Collin County. Consistent high yields on any soil normally indicate that the soil has been well managed; that is, fertility has been kept at a high level; rainwater has been held in the soil; erosion has been controlled; and suitable cropping systems have been used. On the other hand, consistent low yields indicate the soil has not been well managed; that is, it has not been given protection against the loss of soil and water, and measures have not been taken to improve fertility and tilth.

Table 2 gives predicted yields of principal crops grown in the county on arable dryfarmed soils. Soils not generally used for these crops are not listed in table 2. The yields given cannot be expected every year; they are estimated averages for a 15- to 20-year period. In some years yields will be higher, and in other years they will be lower. The yields in table 2 are based on records of experiment stations and on information from farmers and others familiar with the soils of the county.

The yields in columns A are those expected under ordinary management, or the management followed by most of the farmers in the county. One or more of the practices listed for a high level of management are not followed.

The yields in columns B are those expected under a high level of management. Only a few farmers use this level of management, and they obtain high yields. All of the following practices are used:

1. Crop residues are kept on the surface or are [illegible]

[illegible]

TABLE 2.—*Predicted average acre yields of principal dryland soils under two levels of management*

[Yields in columns A are those obtained under ordinary management or the management used by most farmers in the county; yields in columns B are those to be expected under a high level of management]

Soil	Cotton (lint)		Wheat		Grain sorghum		Corn	
	A	B	A	B	A	B	A	B
	Lbs.	*Lbs.*	*Bu.*	*Bu.*	*Lbs.*	*Lbs.*	*Bu.*	*Bu.*
Altoga silty clay, 5 to 8 percent slopes, eroded	----	----	10	20	----	----	----	----
Austin silty clay, 1 to 3 percent slopes	190	400	22	32	3, 800	5, 500	27	50
Austin silty clay, 3 to 5 percent slopes, eroded	120	280	18	25	3, 000	3, 800	20	35
Austin silty clay, 5 to 8 percent slopes, eroded	----	----	12	20	----	----	----	----
Burleson clay, 0 to 1 percent slopes	225	420	20	30	3, 800	5, 800	20	45
Burleson clay, 1 to 3 percent slopes	185	380	18	28	3, 200	5, 200	18	40
Burleson clay, 2 to 4 percent slopes, eroded	100	200	14	25	2, 200	4, 500	16	30
Crockett soils, 2 to 5 percent slopes, eroded	100	200	12	25	2, 000	4, 300	16	30
Eddy gravelly clay loam, 1 to 3 percent slopes	----	----	8	13	----	----	----	----
Engle clay loam, 1 to 3 percent slopes	160	360	18	28	2, 600	5, 000	20	45
Engle clay loam, 3 to 5 percent slopes, eroded	90	180	16	24	2, 000	3, 800	15	30
Frio clay loam, occasionally flooded	250	470	25	38	4, 500	6, 600	33	65
Houston clay, 3 to 5 percent slopes, eroded	175	350	20	28	2, 000	4, 100	20	45
Houston clay, 5 to 8 percent slopes, eroded	----	----	10	20	----	----	----	----
Houston Black clay, 0 to 1 percent slopes	235	475	25	35	3, 900	6, 600	30	58
Houston Black clay, 1 to 3 percent slopes	225	450	23	31	3, 800	6, 400	30	57
Houston Black clay, 2 to 4 percent slopes, eroded	200	390	22	30	3, 000	5, 500	27	52
Hunt clay, 0 to 1 percent slopes	235	440	25	35	3, 900	6, 600	30	58
Hunt clay, 1 to 3 percent slopes	225	425	23	30	3, 800	6, 400	27	56

used for obtaining high yields of forage. In one 5-year period, about 20,000 acres of cropland was sprigged to Coastal bermudagrass.

Coastal bermudagrass is a high-producing, high-quality grass that is established by sprigging. The grass requires a high level of soil management, including fertilization. If

are nearly level to gently sloping and occur mostly on uplands in the extreme northwestern corner of the county and along the east and west boundaries. Some areas are on old alluvial stream terraces, mainly in the eastern part of the county.

The soils in this group have a clay or clay loam surface

The soils in this group are used for pasture and hay consisting mainly of common and Coastal bermudagrasses and johnsongrass. Under an average level of management, Coastal bermudagrass yields about 4.2 animal-unit-months of grazing per acre or about 2.5 tons of hay, and common bermudagrass yields about 3.5 animal-unit-months per acre or about 2.1 tons of hay. Under a high level of management, Coastal bermudagrass produces about 8.3 animal-unit-months per acre or about 5.0 tons of hay, and common bermudagrass produces about 6.0 animal-unit-months per acre or about 3.6 tons of hay.

PASTURE AND HAYLAND GROUP D

cupies flood plains along the major streams and their tributaries, mainly in the eastern part of the county.

This soil receives runoff water from surrounding, higher soils. Because frequent flooding is likely, this soil is subject to washing and deposition of new soil material. When this soil is dry, it has cracks that extend to a depth of at least 20 inches. Water enters the cracks rapidly until this soil is wet. Then the cracks close, and movement of water into the soil is very slow. Surface runoff is very slow.

This soil is used for pasture and hay. Well-suited grasses are common and Coastal bermudagrasses, johnsongrass, and dallisgrass.

Under an average level of management, Coastal ber-

Under an average level of management, Coastal ber-

5. Correlate performance of engineering structures

Listed in table 3 are estimates of properties significant to engineering for each soil in Collin County. For some of the soils, the engineering classifications were estimated on the basis of test data in table 5 for the modal, or typical, profile. For those soils not listed in table 5, the estimates were based on test data obtained for similar soils, on data from field tests, and on data in the soil survey of Ellis County (*6*).

In the column headed "Hydrologic soil group," the soils are placed in one of four groups according to their ability to restrain runoff from a heavy storm after they have been thoroughly wetted. The groups range from tight clays (highest runoff potential—Group D) to open sands (lowest runoff potential—Group A).

Soils in group A have a high infiltration rate, even when thoroughly wetted. They have a high rate of water trans-

cate alkalinity. Most of the soils in Collin County are alkaline.

Shrink-swell potential indicates how much the volume of a soil material changes as moisture content changes. A knowledge of this potential is important in planning the use of a soil for building roads and other engineering structures. Shrink-swell potential is rated *low*, *moderate*, *high*, and *very high*. In general, soils classified as CH and A–7 have a high shrink-swell potential, but deep, clayey soils such as Houston Black clay, are classified as CH and A–7–6 and have a very high shrink-swell potential. Clean sands and gravel (single grain) and sands and gravel having small amounts of nonplastic to slightly plastic fines have a low shrink-swell potential. Also low is the shrink-swell potential of most other nonplastic to slightly plastic soil materials. Eddy gravelly clay loam is an example of

TABLE 3.—*Estimated*

Soil series and map symbols	Hydrologic soil group	Depth from surface	Classification		
			USDA texture	Unified [1]	AASHO [2]
		Inches			
Altoga (AlD2, AlE3)	B	0–25	Light silty clay	CH	A–7–6
		25–66	Silty clay	CL or CH	A–7–6 or A–6
Austin (AuB, AuC2, AuD2)	B	0–42	Silty clay	CH	A–7–6
		42–50	Chalky limestone.		
Burleson (BcA, BcB, BcB2)	D	0–75	Clay	CH	A–7–6
Crockett (CrC2, CrD2)	D	0–6	Light clay loam	CL or ML–CL	A–6 or A–7–6 or A–4
		6–52	Clay	CH	A–7–6
Eddy (EdB, EdD2)	C	0–5	Gravelly clay loam	CL	A–6
		5–30	Chalky limestone.		
Ellis (ElD2)	D	0–32	Clay	CH	A–7–5 or A–7–6
		32–34	Shale.		
Engle (EnB, EnC2)	C	0–48	Clay loam	CL	A–7–6
Ferris (FeE3) (For properties of the Houston soil in this mapping unit, refer to the Houston series.)	D	0–70	Clay	CH	A–7–6
Frio (Ff, Fo)	B	0–55	Clay loam	CL	A–6 or A–7–6
Houston (HcC2, HcD2)	D	0–60	Clay	CH	A–7–6
Houston Black (HoA, HoB, HoB2)	D	0–70	Clay	CH	A–7–6
Hunt (HuA, HuB)	D	0–52	Clay	CH	A–7–6
Lamar (LaC2, LaD2, LaE3)	C	0–46	Clay loam	CL	A–6 or A–7–6
Lewisville (LeB, LeC2)	B	0–16	Light silty clay	CH	A–7–6
		16–64	Silty clay	CL or CH	A–6 or A–7–6
Stephen (ScB, SeC2) (For properties of the Eddy soil in mapping unit SeC2, refer to the Eddy series.)	B	0–14	Silty clay	CH	A–7–6
		14–28	Chalky limestone.		
Trinity (Tf, To)	D	0–56	Clay	CH	A–7–6
Wilson (WcA, WcB)	D	0–7	Clay loam	CL	A–6
		7–60	Clay	CH or CL	A–7–6

properties of the soils

Percentage passing sieve— No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 200 (0.074 mm.)	Permeability	Available water capacity	Reaction	Shrink-swell potential	Potential vertical rise (PVR)	Corrosion potential
			Inches per hour	*Inches per inch of soil*	*pH*			
95–100	95–100	75–95	0.2–0.63	0.18	7.9–8.4	High	Medium: 1.25 to 2.0 inches	High.
95–100	80–98	60–95	0.2–0.63	.17	7.9–8.4	High		
98–100	90–98	85–95	0.2–0.63	.18	7.9–8.4	High	Medium: 1.25 to 2.0 inches	Very high.

TABLE 4.—*Engineering*

Soil series and map symbols	Suitability as source of—		Soil properties affecting—	
	Topsoil	Road fill	Highway location	Farm ponds: Reservoir area

interpretations of soils

Soil properties affecting—Continued			
Farm ponds—Continued: Embankments	Irrigation	Terraces and diversions	Waterways
Fair stability if slopes are flat	Sloping to steep soils; moderately slow intake rate.	Slopes of 5 to 12 percent	High erodibility; steep slopes.
Fair stability if slopes are flat;	Moderately slow intake rate;	Soil properties favorable	Soil properties favorable

TABLE 5.—

[Tests performed by the Texas Highway Department in accordance with standard procedures of the American Association of State High-

Engineering test data

way Officials (AASHO) (*1*). The work by the Highway Department was performed under a cooperative agreement with the U.S. Bureau of Public Roads]

Mechanical analysis [1]		Liquid	Plasticity	Classification	
Percentage passing sieve—	Percentage smaller than—				

Most of the soils in Collin County are rated fair as a source of topsoil. Topsoil is fertile soil material used to topdress areas where vegetation is to be grown, such as roadbanks, dams, ditch lines, gardens, and lawns. Ordinarily topsoil is rich in organic matter. Normally, only the surface layer is used for topsoil, but other layers are also suitable sources. The loamy and fertile Frio soils are good sources of topsoil, but the Eddy soils are poor sources of topsoil because they are very shallow and gravelly.

Most of the soils in the county are rated poor as a source of road fill. Road fill is soil material useful for building up road subgrades for supporting base layers. The suitability of a soil for road fill depends largely on its texture, plasticity, shrink-swell potential, traffic-supporting capacity, susceptibility to erosion, compaction characteristics, and natural water content. Clayey soils, such as Burleson clay, Houston Black clay, and Hunt clay, provide poor sources of road fill because they have a very high shrink-swell potential and are difficult to place and compact.

Most of the soils in the county are clayey and are not suited as sources of sand or gravel. The Altoga, Frio, Lewisville, and Trinity soils, however, provide sources of sand and gravel at depths of 5 to 20 feet.

Soil features listed in the remaining columns, such as those affecting highway location, were selected on the basis of the estimated soil classification. Soils that have a plastic clay layer, such as Houston Black clay and Hunt clay, have a very high shrink-swell potential and are poorly suited as locations for highways.

Frio clay loam and other soils that are frequently flooded

to establish waterways, for the floodwaters kill the plants in the waterways or slow their growth.

Engineering test data

Table 5 gives the engineering test data for samples of the soils of nine series in Collin County. The tests were performed by the Texas State Highway Department according to standard procedures of the American Association of State Highway Officials. The test data for the soil samples indicate the engineering characteristics of the soil at the specific location given in table 5. These same soils will probably have similar characteristics at other sites in the county. Both the AASHO and the Unified systems of engineering classifications are also given.

The engineering soil classifications are based on data obtained by mechanical analyses and by tests to determine the liquid limit and the plastic limit. The *plastic limit* is the moisture content at which the soil material passes from a semisolid to a plastic state. The *liquid limit* is the moisture content at which the material passes to a liquid state. The *plasticity index* is the numerical difference between the plastic limit and the liquid limit. It indicates the range of moisture content within which a soil material is in a plastic condition.

As moisture is removed from a soil, the volume of the soil decreases, in direct proportion to the loss of moisture, until a condition of equilibrium, called the *shrinkage limit*, is reached. Beyond the shrinkage limit, more moisture may be removed, but the volume of soil does not change. In general, the lower the shrinkage limit, the higher the con-

The interpretations in table 6 do not eliminate the need for sampling and testing the soil at a proposed site. The interpretation should be used as a basis for planning more detailed field investigations so that the condition of the soil in place can be determined before a site is put to a specific use. By using the soil map to identify the soils in an area of interest and then referring to the ratings in table 6, the reader can get a general idea of the limitations of the different soils for specific uses.

Use of soils for community development

Expansion of community development in Collin County has been into many areas that are not well suited to buildings and other structures. Planners, builders, and maintenance men have met costly failures that can be traced to mistakes made in selecting soils for proposed structures, or to a lack of information about the soils that were used. Table 6 has been prepared to assist in avoiding these failures. Discussed in the following paragraphs are limitations and use of soils for sewage disposal, foundations for low buildings, and trafficways.

A septic tank filter field disposes of sewage by absorption. In a filter field, subsurface tile is laid in such a way that effluent from the septic tank is distributed with reasonable uniformity into the natural soil. In an efficient system, soil material is required that is permeable enough to permit moderate to rapid percolation of the effluent. Some soils are not suitable as filter fields because they are

of the undisturbed soil to support moving loads, and it indicates whether the soil is desirable as subgrade material. The characteristics of undisturbed soil and of disturbed soil when carefully compacted are similar.

Many of the soils in Collin County contain an abundance of the clay mineral montmorillonite and are not suitable for building foundations. Soils of this kind swell when wet and shrink and crack when dry. This action creates such pressure on walls and foundations that they are likely to crack unless specially reinforced. This change in volume in a soil material as moisture content changes is called the shrink-swell potential (see table 3). The Burleson, Houston, Houston Black, Hunt, and Trinity soils are risky for building foundations or for pipelines because they have a very high shrink-swell potential.

Most of the soils of Collin County are not well suited to gardening and landscaping, for they are not well suited to vegetables, flowers, shrubs, and trees. Those soils that contain a large amount of clay can be improved by mixing sand and organic matter, such as peat moss, into the surface layer so as to prevent cracking and to increase the movement of water, air, and roots.

Different kinds of plants require different degrees of acidity or alkalinity. Roses and most annual flowers, most vegetables, and most grasses generally grow best in soils that are neutral (noncalcareous) or only slightly acid. Azaleas, camellias, and similar plants need acid soils. Some plants grown on soils high in lime, such as the Austin

TABLE 6.—*Limitations of soils for building*

Soil series and map symbols	Degree and kind of limitation for—		
	Sewage disposal		Foundations for low buildings
	Filter fields	Lagoons	
Altoga (AlD2, AlE3)	Severe: Moderately slow permeability; slopes of 5 to 12 …	Severe: Slopes of 5 to 12 percent.	Severe: High shrink-swell potential; low bearing capa…

sites, trafficways, and recreational uses

Degree and kind of limitation for—Continued			
Trafficways	Intensive camp and play areas	Picnic areas	Paths and trails
Severe: Poor traffic-supporting capacity.	Severe: Poor trafficability; slopes of 5 to 12 percent.	Severe: Poor trafficability	Severe: Poor trafficability.
Severe: Poor traffic-supporting capacity.	Severe: Poor trafficability; slopes of 1 to 8 percent.	Severe: Poor trafficability	Severe: Poor trafficability.
Severe: Very poor traffic-supporting capacity.	Severe: Very slow permeability; poor trafficability.	Severe: Poor trafficability	Severe: Poor trafficability.
Severe: Very poor traffic-supporting capacity.	Severe: Very slow permeability; slopes of 3 to 8 percent.	Moderate: Fair trafficability	Moderate: Fair trafficability.
Slight to moderate: Very shallow over chalky limestone.	Severe: Very shallow over chalky limestone; slopes of 1 to 8 percent; fair trafficability.	Slight	Severe: Fair trafficability; very shallow over chalky limestone.
Severe: Very poor traffic-	Severe: Poor trafficability;	Severe: Poor trafficability	Severe: Poor trafficability

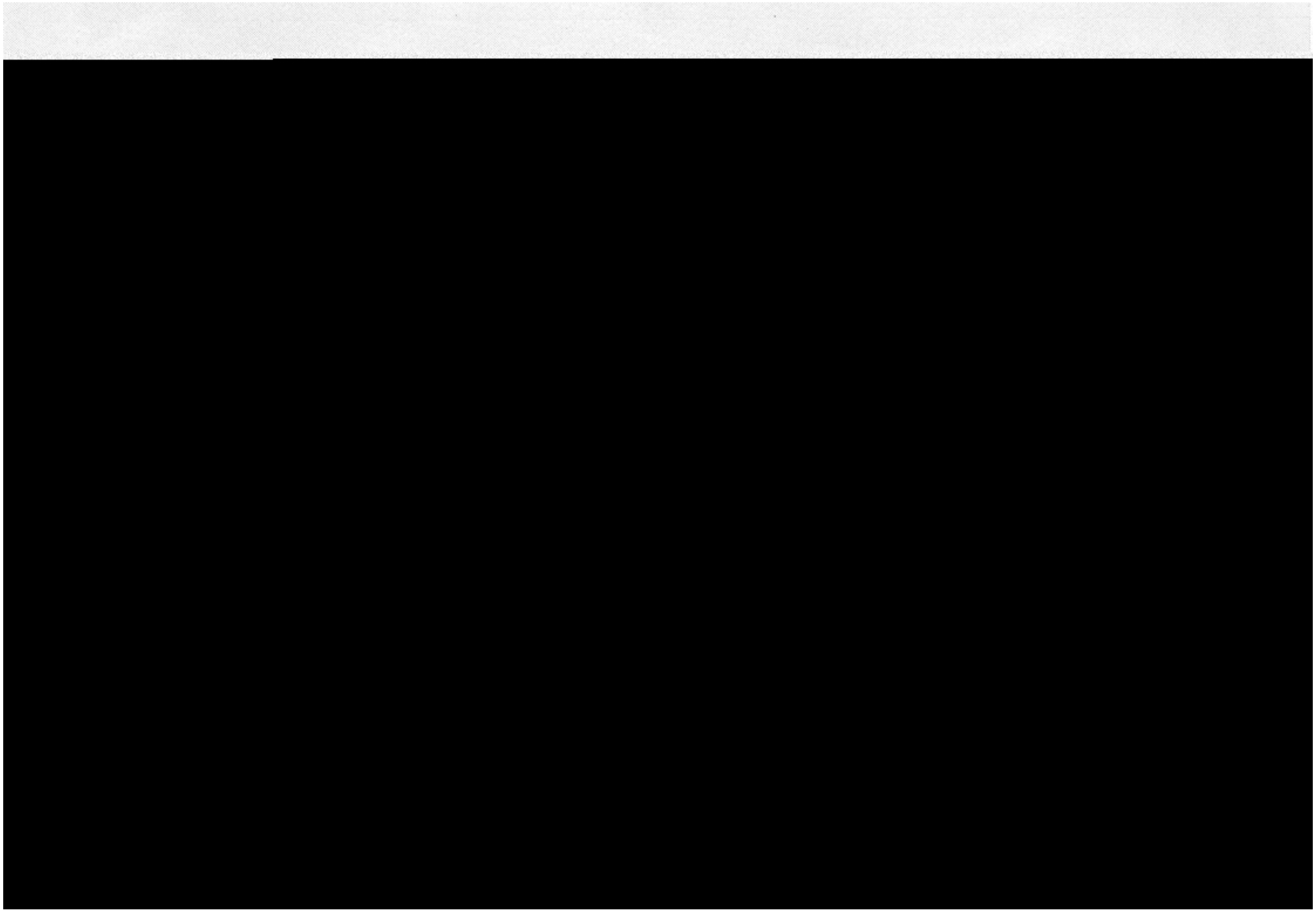


Figure 20.—**Part of a floodwater-retarding structure used for recreational purposes. This structure was built in an area of Altoga silty clay, 5 to 8 percent slopes, eroded.**

Important properties in evaluating soils used for picnic areas are trafficability, flood hazard, and slope. The Trinity soils, for example, are severely limited as sites for picnic areas because they support foot traffic poorly and are likely to be flooded. In table 6 the ratings for picnic areas are based only on soil properties and do not include the presence of trees, lakes, or other features that may affect a site.

Paths and trails refer to the uses of soils for trails, cross-country hiking, bridle paths, and the random movement of people. Most of the soils in the county have moderate or severe limitations as sites for paths or trails, mainly because of trafficability. Trafficability, if applied to paths and trails, refers to the ease with which people move about on foot, on horseback, or in small vehicles.

sification is explained, and each soil series represented in the county is placed in some of the categories in that system. Physical and chemical data for the Burleson, Houston Black, and Stephen series will be published in a Soil Survey Interpretations report in the near future.

Factors of Soil Formation

Soil is the product of the interaction of the five major factors of soil formation. They are climate, living organisms (especially vegetation), parent material, relief, and time. If a factor, such as climate or vegetation, varies from place to place, different kinds of soils form.

Living organisms

Plants, animals, insects, bacteria, and fungi are important in the formation of soils. They add to the supply of organic matter and nitrogen in the soil and cause gains or losses in plant nutrients. Living organisms change soil structure and help to increase porosity in places where they disturb the soil.

Vegetation, dominantly tall and mid grasses, has affected soil formation more than other living organisms. This vegetation was effective in contributing to the accumulation of organic matter and in darkening the soils.

Parent material

Parent material is the unconsolidated soil mass from which the soils were formed. It determines the limits of the chemical and mineralogical composition of the soil. In Collin County soils developed from material in three geological systems. These are the Upper Cretaceous, Quaternary, and Recent. In the Upper Cretaceous system are Eagle Ford shale, Austin chalk, Taylor marl, and Neylandville marl.

Eagle Ford shale underlies the entire county and is near the surface in the northwestern part of the county. The shale is dark bluish gray to nearly black when exposed. It weathers readily and forms dark clayey soils. The Burleson, Crockett, Wilson, and Ellis soils are the dominant soils that formed over Eagle Ford shale.

Austin chalk overlies Eagle Ford shale and consists of alternating beds of chalk, chalky limestone, and thin seams of marl. This formation is several hundred feet thick. Most of the soils that formed over this chalk are calcareous, granular, and crumbly. Deep soils that formed over the chalk are in the Austin, Houston Black, and Houston series. Shallow soils that formed in chalk are in the Eddy and Stephen series.

The Taylor formation overlies Austin chalk in the eastern part of the county. The members of this formation in the county are Taylor marl, Wolfe City sand, and Pecan Gap chalk.

Dominant in the Taylor formation is Taylor marl

Burleson and Houston Black soils. Others are sloping and are the parent material of Altoga and Lewisville soils.

Recent formations consist of alluvial deposits on flood plains along the major streams and their tributaries. These deposits are calcareous loamy and clayey material. Examples of soils formed in this material are the Frio and Trinity.

Relief

Relief affects soil formation through its influence on drainage, erosion, plant cover, and soil temperature. In much of Collin County the soils have slopes of less than 3 percent. Northeast of Farmersville and in some areas near streams, the soils have slopes of as much as 12 percent. Erosion is moderate to severe on the steeper soils where they are not protected, and it has affected soil formation. Soils once classified as Houston soils have been eroded to the extent that the original dark grayish-brown upper layer has been removed, and the profile is lighter colored. These lighter colored soils are now classified as Ferris soils.

Houston Black soils formed in nearly level areas that have slow but adequate drainage and have black horizons that extend to a depth of more than 40 inches. The plant cover is thin in many areas of steep soils. This thin cover increases susceptibility to erosion and retards soil formation.

Soil temperature varies slightly according to position of the slopes. During summer, soils on slopes facing north are slightly cooler than those on slopes facing south and generally produce more vegetation.

Time

Time, generally a long time, is required for the formation of soils with distinct horizons. The length of time that parent materials have been in place is commonly reflected in the degree of development of the soil profile.

The soils in Collin County range from young to old. The young soils have had very little profile development, but the older soils have well-expressed soil horizons. Trinity

Much leaching of carbonates and salts has occurred in Wilson and Crockett soils. Some leaching has occurred in Hunt soils, and they do not have free lime in the upper 15 to 20 inches. Most of the soils in Collin County, however, are only slightly leached. Houston Black clay, for example, has a thick A horizon that is high in carbonates. The clay soil was leached slowly, and not enough time has passed for removal of the carbonates.

Reduction and transfer of iron, a process called gleying, is evident in the poorly drained soils of the county. The grayish color in the subsoil horizons indicates the reduction and loss of iron. Some horizons have mottles of yellowish red to brown or strong brown and concretions indicating a segregation of iron. The Crockett soils are examples of somewhat poorly drained, grayish soils that are mottled in the lower horizons.

Translocation of clay minerals has taken place in Crockett and Wilson soils and has contributed to horizon development. The B horizons generally have accumulations of clay (clay films) in the pores and on surfaces of peds.

aging farms, fields, and woodlands; in developing rural areas; in engineering work; and in many other ways. They are placed in broad classes to facilitate study and comparison in large areas, such as countries and continents.

The system currently used was adopted for general use by the National Cooperative Soil Survey in 1965. The current system is under continual study. Therefore, readers interested in developments of the system should search the latest literature available (*3*, *5*).

The current system of classification has six categories. Beginning with the broadest, these categories are order, suborder, great group, subgroup, family, and series. In this system the criteria used as a basis for classification are soil properties that are observable and measurable. The properties are chosen, however, so that the soils of similar genesis, or mode of origin, are grouped together. In table 7, the soil series of Collin County are placed in some categories of the current system. Most of the classes of the current system are briefly defined in the following paragraphs.

ORDER: Ten soil orders are recognized in the current

Inceptisols are generally on young but not recent land surfaces; hence, their name is derived from the Latin *inceptum*, for beginning. In this county Inceptisols include some of the soils formerly called Lithosols and Regosols.

Mollisols are soils that have high base supply and a dark A horizon that is friable or soft and has a high content of organic matter. In this order are soils that were formerly called Chernozems, Brunizems, and Rendzinas.

Alfisols are soils that have a clay-enriched B horizon that is high in base saturation. In Collin County this order includes soils previously called Planosols and Reddish Prairie soils.

SUBORDER: Each order is subdivided into suborders, primarily on the basis of those soil characteristics that seem to produce classes with the greatest genetic similarity. The suborders narrow the broad climatic range permitted in the orders. Soil properties used to separate suborders mainly reflect either the presence or absence of waterlogging or soil differences resulting from the climate or vegetation.

GREAT GROUP: Suborders are separated into great groups on basis of uniformity in kinds and sequence of major soil horizons and features. The horizons used to make separations are those in which clay, iron, or humus have accumulated or those that have pans that interfere with growth of roots or movement of water. The features used are the self-mulching properties of clays, soil temperature, major differences in chemical composition (mainly calcium, magnesium, sodium, and potassium), and the like. The great group is not shown separately in table 7, because it is the last word in the name of the subgroup.

SUBGROUP: Great groups are subdivided into subgroups, one representing the central (typic) segment of the group and the others, called intergrades, that have properties of the group and also one or more properties of another great group, subgroup, or order. Subgroups may also be made in those instances where soil properties intergrade outside of the range of any other great group, suborder, or order. The names of subgroups are derived by placing one or more adjectives before the name of the great group.

FAMILY: Families are separated within a subgroup primarily on the basis of properties important to the

the soils that have been classified in the Hunt series will be placed in the Burleson series and part in the Houston Black series.

Additional Facts About the County

This section was prepared for those who want general information about Collin County. It discusses briefly the history of the county, climate, flood prevention, and agricultural statistics.

History

In 1846 the Texas Legislature created Collin County from Fannin County and named it after Collin McKinney, a pioneer settler of the area who signed the Texas Declaration of Independence. The county seat was established at Buckner in 1847 but was moved to McKinney about a year later. At that time some of the countryside was in timber.

Climate [5]

The climate of Collin County is warm temperate, subtropical, and humid. Summers are hot. Average annual rainfall is 34.80 inches; average annual temperature, 65.3° F.; and average annual relative humidity, about 63 percent.

Table 8 summarizes data on climate recorded at McKinney in Collin County. These data were based on a 29-year record through 1963.

A wider range between maximum and minimum temperature is characteristic of the climate in Collin County, but the periods of extreme cold occur only occasionally and are short lived. Mild weather occurs frequently. Likewise, the extremely high temperatures that sometimes occur in summer usually do not last long. Sudden changes in temperature and humidity occur in winter when cold, dry, polar air replaces warm tropical air. After passage of a cold front, drops in temperature of 20° or more within an hour are common. The high temperatures of summer are associated with fair skies, southwesterly winds, and dry air.

Rainfall is fairly evenly distributed throughout the year,

TABLE 8.—*Normal monthly and annual temperatures and precipitation at McKinney*
[Elevation, 612 feet]

Month	Temperature			Precipitation		
	Average	Absolute maximum	Absolute minimum	Average	Driest year (1963)	Wettest year (1957)
				Inches	*Inches*	*Inches*
January	44. 2	87	−1	2. 21	0. 46	1. 26
February	49. 1	85	−5	2. 59	. 22	2. 00
March	55. 6	94	7	2. 78	2. 30	4. 34
April	65. 0	96	29	3. 97	4. 23	14. 42
May	72. 8	100	37	5. 28	7. 05	12. 58
June	80. 6	107	51	3. 22	. 97	2. 18
July	84. 4	112	59	2. 42	1. 39	. 12
August	85. 0	118	54	1. 78	(1)	. 69
September	77. 3	110	39	2. 82	2. 42	4. 15
October	67. 8	99	27	2. 95	. 17	2. 72
November	54. 7	93	11	2. 61	1. 89	7. 46
December	46. 7	89	6	2. 17	1. 38	1. 98
Year	65. 3	118	−5	34. 80	22. 48	53. 90

[1] Trace.

temperature in fall is 260 days. The average date of the last occurrence of a 32° temperature in spring is March 23, but on an average of 1 year out of every 5, a freeze occurs after April 5. The average date of the first occurrence of a 32° temperature in fall is November 15, but on an average of 1 year out of every 5, a freeze occurs before November 1. Average dates vary locally within the county because of differences in elevation and slope.

Flood Prevention

Flood prevention work was authorized by Public Law 534, which the Congress passed in 1944. This bill authorizes local landowners, the Soil Conservation Service, the Soil and Water Conservation Districts, and the County Commissioners to work together for flood prevention. This work is coordinated with the plan of the Army Corps of Engineers for flood control of major streams.

The county is divided into seven watersheds so that planning and construction is more convenient. These watersheds are Pilot Grove Creek, Sister Grove Creek, White Rock Creek, Rowlett Creek, Little Elm Creek, Upper East Fork Laterals, and East Fork Trinity River above Lavon Reservoir.

Sixty-three floodwater-retarding dams have been constructed in the county, mainly on Honey, Wilson, Rowlett, and Sister Grove Creeks. About 82 or more have been planned for future construction in the county. When these structures have been completed, much of the area in Frio and Trinity soils now classified as frequently flooded probably will be classified as occasionally flooded.

The prevention of flood damage is the chief purpose for

Figure 21.—**Aerial view of a floodwater-retarding structure in an area of Stephen-Eddy complex, 3 to 5 percent slopes, eroded.**

Crops

Cotton, wheat, and grain sorghum are the most important crops grown in the county. Although cotton is still the main cash crop, a smaller acreage is now planted than in the 1930's.

The acreage in cotton increased from 73,698 acres in 1959 to 79,934 acres in 1964. Cotton sold on the market decreased from 35,774 bales in 1959 to 33,205 bales in 1964.

Wheat, the main small grain, increased from 51,119 acres in 1959 to 79,546 acres in 1964. Most of the wheat is grown for market, but some of the acreage is pastured.

The area in grain sorghum harvested has decreased from [illegible] acres in 1959 to [illegible] acres in 1964. Corn and oats

sion; medium, ranging from 5 millimeters to 15 millimeters (about 0.2 to 0.6 inch) in diameter along the greatest dimension; and *coarse*, more than 15 millimeters (about 0.6 inch) in diameter along the greatest dimension.

Munsell notation. A system for designating color by degrees of the three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 designates a color with a hue of 10YR, value of 6, and a chroma of 4.

Noncalcareous. As used in this survey, a soil that may or may not be alkaline but that does not contain enough free lime to effervesce (fizz) visibly when treated with cold, dilute hydrochloric acid.

Parallelepipeds. A six-sided prism whose faces are parallelograms.

Parent material. The disintegrated and partly weathered soil from which a soil has formed.

Ped. An individual natural soil aggregate, such as a crumb, a prism, or a block, in contrast to a clod.

pH value. A numerical means for designating relatively weak acidity and alkalinity in soils. A pH value of 7.0 indicates precise neutrality; a higher value, alkalinity; and a lower value, acidity.

Profile, soil. A vertical section of the soil through all its horizons and extending into the parent material.

Reaction, soil. The degree of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is precisely neutral in reaction, because it is neither acid nor alkaline. In words, the degrees of acidity or alkalinity are expressed thus:

	pH		*pH*
Extremely acid	Below 4.5	Mildly alkaline	7.4 to 7.8
Very strongly acid	4.5 to 5.0	Moderately alkaline	7.9 to 8.4
Strongly acid	5.1 to 5.5	Strongly alkaline	8.5 to 9.0
Medium acid	5.6 to 6.0	Very strongly alkaline	9.1 and higher
Slightly acid	6.1 to 6.5		
Neutral	6.6 to 7.3		

grated effect of climate and living matter acting upon parent material, as conditioned by relief, over a period of time.

Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes of separates recognized in the United States are as follows: *Very coarse sand* (2.0 to 1.0 millimeter); *coarse sand* (1.0 to 0.5 millimeter); *medium sand* (0.5 to 0.25 millimeter); *fine sand* (0.25 to 0.10 millimeter); *very fine sand* (0.10 to 0.05 millimeter); *silt* (0.05 to 0.002 millimeter); and *clay* (less than 0.002 millimeter). The separates recognized by the International Society of Soil Science are as follows: I (2.0 to 0.2 millimeters); II (0.2 to 0.02 millimeter); III (0.02 to 0.002 millimeter); IV (less than 0.002 millimeter).

Solum. The upper part of a soil profile, above the parent material, in which the processes of soil formation are active. The solum in mature soil includes the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material.

Stratified. Composed of, or arranged in, strata, or layers. The term is confined to geological material. Alluvium is commonly stratified, and its strata inherit characteristics of the parent material. Layers that are the result of the soil-forming processes are called horizons.

Structure, soil. The arrangement of primary soil particles into compound particles or clusters that are separated from adjoining aggregates and have properties unlike those of an equal mass of unaggregated primary soil particles. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are (1) *single grain* (each grain by itself, as in dune sand) or (2) *massive* (the particles adhering without any regular cleavage, as in many claypans and hardpans).

Subsoil. Technically, the B horizon; roughly, the part of the profile below the plow depth.

GUIDE TO MAPPING UNITS

[For a full description of a mapping unit, read both the description of the mapping unit and the description of the soil series to which the mapping unit belongs.

[See table 1, p. 7, for approximate acreage and proportionate extent of soils; table 2, p. 33, for predicted average acre yields of principal dryfarmed crops; and pp. 36 to 44 for information on engineering uses of soils]

			Capability unit		*Pasture and hayland group*	
Map symbol	*Mapping unit*	*Page*	*Symbol*	*Page*	*Symbol*	*Page*
AlD2	Altoga silty clay, 5 to 8 percent slopes, eroded.	8	IVe–3	31	E	35
AlE3	Altoga silty clay, 8 to 12 percent slopes, severely eroded.	8	VIe–2	32	I	35
AuB	Austin silty clay, 1 to 3 percent slopes	9	IIe–3	29	D	35
AuC2	Austin silty clay, 3 to 5 percent slopes, eroded.	9	IIIe–5	30	E	35
AuD2	Austin silty clay, 5 to 8 percent slopes, eroded.	10	IVe–3	31	E	35
BcA	Burleson clay, 0 to 1 percent slopes	11	IIs–6	30	A	34
BcB	Burleson clay, 1 to 3 percent slopes	11	IIIe–1	30	A	34
BcB2	Burleson clay, 2 to 4 percent slopes, eroded	11	IVe–5	31	B	34
CrC2	Crockett soils, 2 to 5 percent slopes, eroded	12	IVe–5	31	B	34
CrD2	Crockett soils, 5 to 8 percent slopes, eroded	12	VIe–1	32	B	34
EdB	Eddy gravelly clay loam, 1 to 3 percent slopes.	13	IVs–1	31	H	35
EdD2	Eddy gravelly clay loam, 3 to 8 percent slopes, eroded.	13	VIe–2	32	H	35
ElD2	Ellis clay, 3 to 8 percent slopes, eroded	14	IVe–2	31	H	35
EnB	Engle clay loam, 1 to 3 percent slopes	14	IIe–3	29	D	35
EnC2	Engle clay loam, 3 to 5 percent slopes, eroded.	14	IIIe–5	30	E	35
FeE3	Ferris-Houston clays, 5 to 12 percent slopes, severely eroded.	16	VIe–2	32	I	35
Ff	Frio clay loam, frequently flooded	16	Vw–1	32	J	36
Fo	Frio clay loam, occasionally flooded	17	I–1	29	J	36
HcC2	Houston clay, 3 to 5 percent slopes, eroded	18	IIIe–3	30	C	34
HcD2	Houston clay, 5 to 8 percent slopes, eroded	18	IVe–2	31	C	34
HoA	Houston Black clay, 0 to 1 percent slopes	19	IIs–6	30	C	34
HoB	Houston Black clay, 1 to 3 percent slopes	20	IIe–1	29	C	34
HoB2	Houston Black clay, 2 to 4 percent slopes, eroded.	20	IIIe–3	30	C	34
HuA	Hunt clay, 0 to 1 percent slopes	21	IIs–6	30	C	34
HuB	Hunt clay, 1 to 3 percent slopes	21	IIe–1	29	C	34
LaC2	Lamar clay loam, 3 to 5 percent slopes, eroded.	22	IIIe–5	30	E	35
LaD2	Lamar clay loam, 5 to 8 percent slopes, eroded.	22	IVe–3	31	E	35
LaE3	Lamar clay loam, 5 to 12 percent slopes, severely eroded.	22	VIe–2	32	I	35
LeB	Lewisville silty clay, 1 to 3 percent slopes	23	IIe–3	29	D	35
LeC2	Lewisville silty clay, 3 to 5 percent slopes, eroded.	23	IIIe–5		E	35
ScB	Stephen silty clay, 1 to 3 percent slopes	24	IIIe–6	30	H	35
SeC2	Stephen-Eddy complex, 3 to 5 percent slopes, eroded:	25				
	Stephen soil		IVe–4	31	H	35
	Eddy soil		VIe–2	32	H	35
Tf	Trinity clay, frequently flooded	26	Vw–1	32	F	35
To	Trinity clay, occasionally flooded	26	IIs–1	29	J	36
WcA	Wilson clay loam, 0 to 1 percent slopes	26	IIs–5	29	A	34
WcB	Wilson clay loam, 1 to 3 percent slopes	27	IIIe–1	30	A	34

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