SOIL SURVEY OF

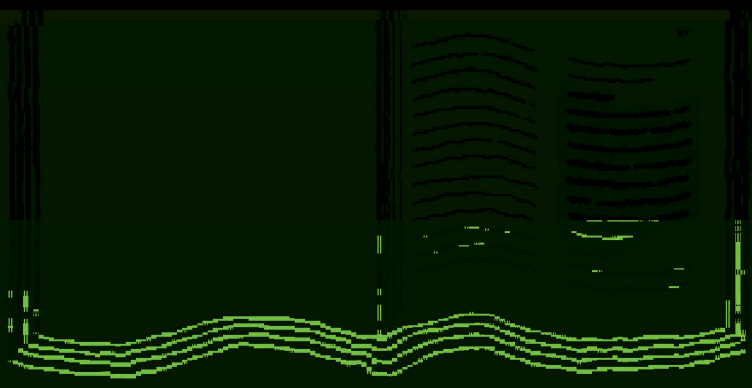
Falls County, Texas

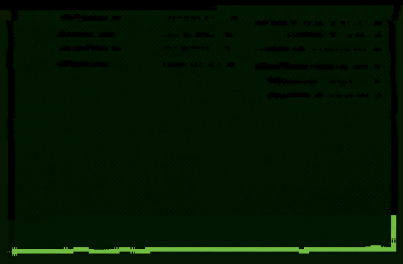
United States Department of Agriculture
Soil Conservation Service
in cooperation with
Texas Agricultural Experiment Station

HOW TO USE

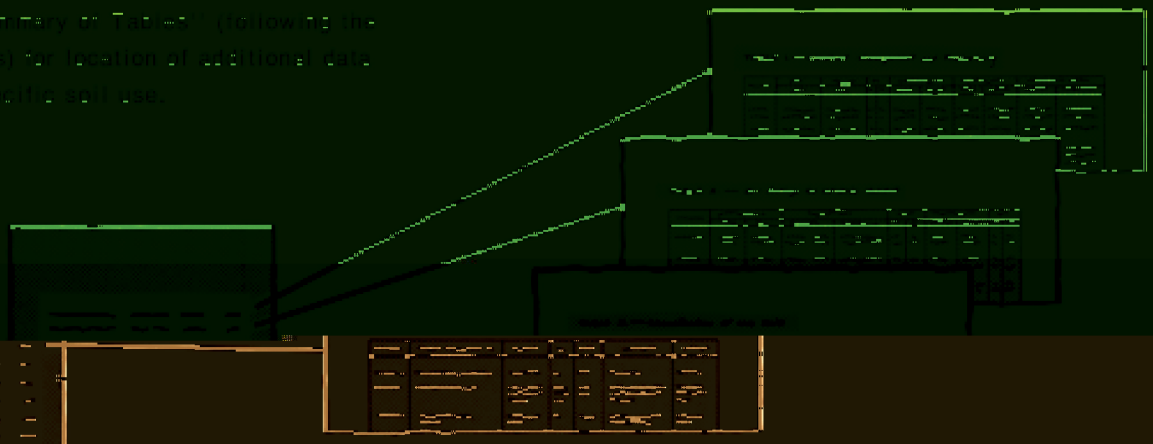
THIS SOIL SURVEY

5. Turn to "Index to Soil Map Units" which lists the name of each map unit and the page where that map unit is described.





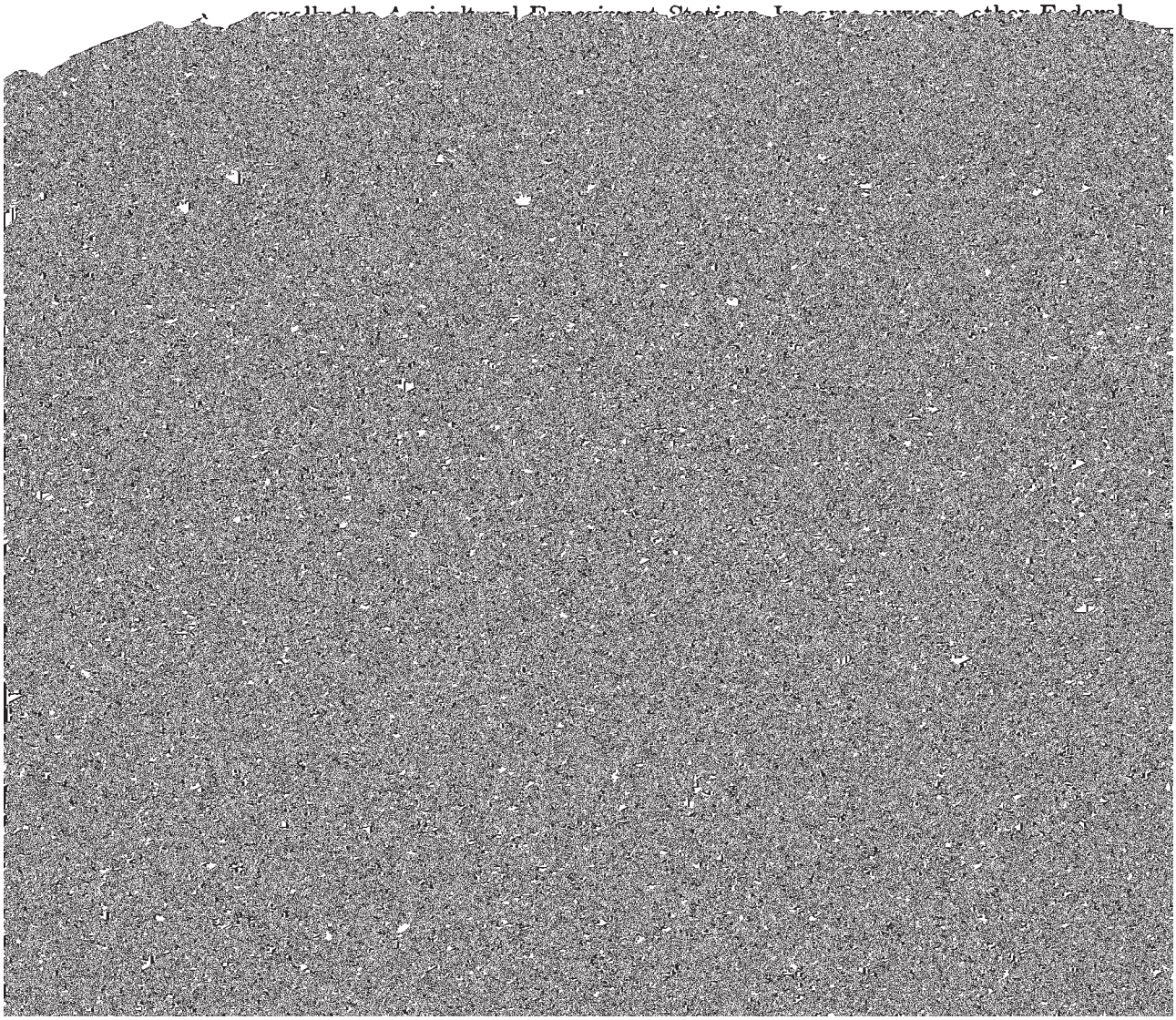
6. See "Summary of Tables" (following the Contents) for location of additional data on a specific soil use.



"Contents" for parts of the publication that will meet your specific needs.

Consult

This is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and agencies of the States,



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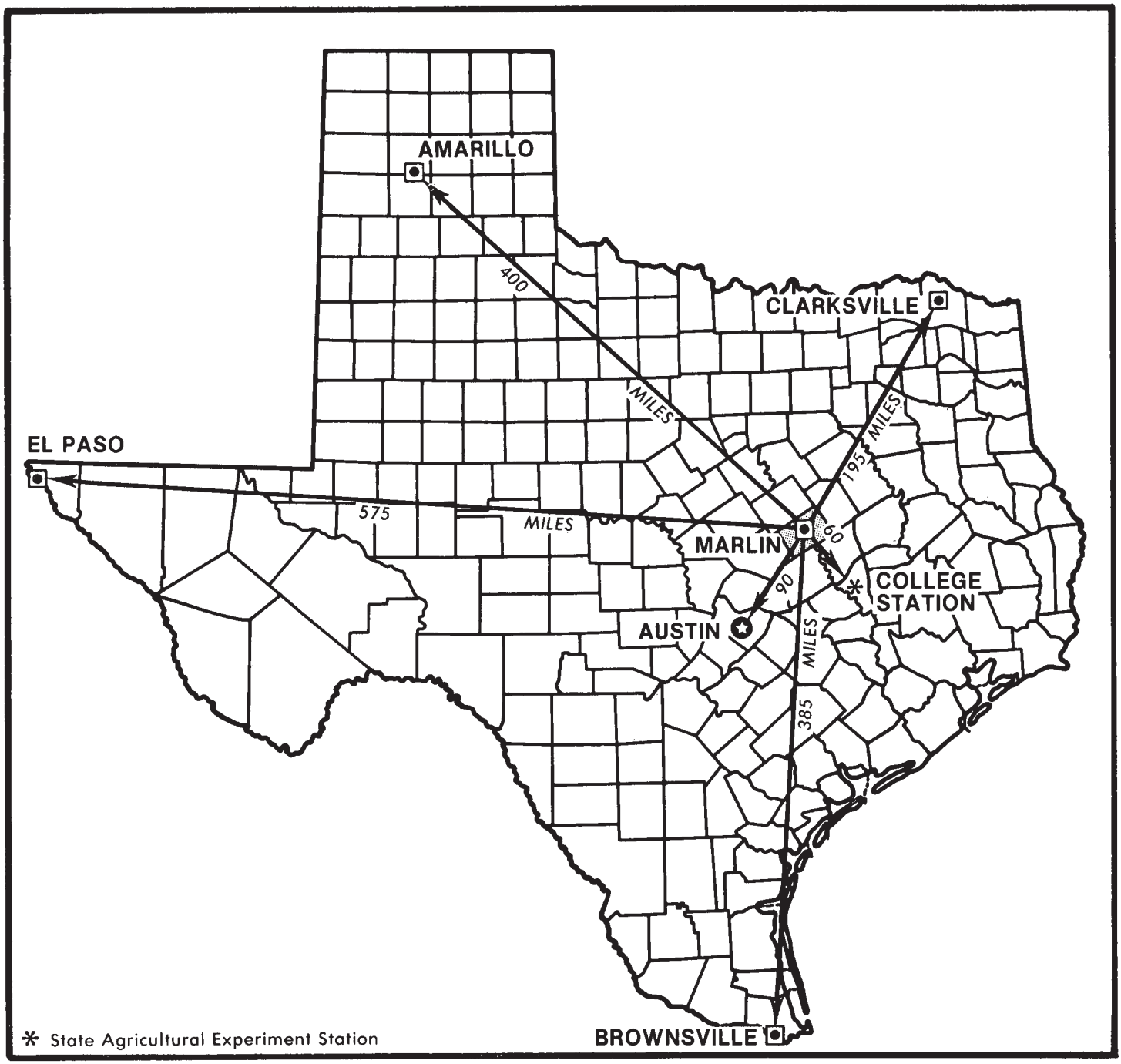
Foreword

The Soil Survey of Falls County, Texas, contains much information useful in any land-planning program. Of prime importance are the predictions of soil behavior for selected land uses. Also highlighted are limitations or hazards to land uses that are inherent in the soil, improvements needed to overcome these limitations, and the impact that selected land uses will have on the environment.

This soil survey has been prepared for many different users. Farmers, ranchers, foresters, and agronomists can use it to determine the potential of the soil and the management practices required for food and fiber production. Planners, community officials, engineers, developers, builders, and homebuyers can use it to plan land use, select sites for construction, develop soil resources, or identify any special practices that may be needed to insure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the soil survey to help them understand, protect, and enhance the environment.

Great differences in soil properties can occur even within short distances. Soils may be seasonally wet or subject to flooding. They may be shallow to bedrock. They may be too unstable to be used as a foundation for buildings or roads. Very clayey or wet soils are poorly suited to septic tank absorption fields.

These and many other soil properties that affect land use are described in this soil survey. Broad areas of soils are shown on the general soil map; the location of each kind of soil is shown on detailed soil maps. Each kind of soil in



Location of Falls County in Texas.

SOIL SURVEY OF FALLS COUNTY, TEXAS

By Jim C. Wyrick, Soil Conservation Service

Soils surveyed by Jim C. Wyrick, David R. Thompson, John W. Huckabee, Jr
Soil Conservation Service

United States Department of Agriculture, Soil Conservation Service,
in cooperation with Texas Agricultural Experiment Station

FALLS COUNTY is in the east-central part of Texas. (See map on facing page.) In 1972 the county had a population of 16,700; Marlin, the county seat, had a population of 6,391. The total area of the county is 489,600 acres, or 765 square miles.

In general the relief is undulating to rolling with some broad flatlands. The Brazos River, which passes through the center of the county, is in a shallow valley 2 to 3 miles wide. The largest streams are Little Brazos River and Big Creek. Flood plains along these streams are 1/4 mile to 1 mile wide. The general slope of the county is to the southeast. The elevations range from 300 to 500 feet above sea level; however, an extreme elevation of about 700 feet is in the northwest corner of the county.

General nature of the county

This section provides general information on the climate, history, natural resources, and farming in Falls County.

Climate

Table 1 gives data on temperature and precipitation for the survey area, as recorded at Riesel, Texas, for the period 1938 to 1972.

In winter the average temperature is 49.8 degrees F, and the average daily minimum temperature is 39.2 degrees. The lowest temperature on record, which oc-

Snowfall is usually of little consequence. It often melts as rapidly as it falls and does not accumulate.

The pattern of the relative humidity is fairly uniform throughout the year, but the humidity varies considerably during the day. The average annual relative humidity is 83 percent at dawn and 52 percent at sunset. The percentage of possible sunshine is 62 percent. The prevailing wind is in a southerly direction throughout the year. The strongest persistent windspeed occurs in March and April.

The average length of the warm season (the number of days free of freezing temperatures) is 257 days. The average date of the last occurrence of 32 degrees F in spring is March 9. The first occurrence of 32 degrees F in fall, on the average, is November 24.

Climatic data in this section were specially prepared from records at the Agricultural Experiment Station, Riesel, Texas.

History

BILLY R. MAREK, District conservationist, Soil Conservation Service, assisted in writing this section.

The history of Falls County began at the Falls of Brazos River. In early times these falls had become widely known as a meeting place for adventurers, prospectors, and travelers from both Texas and the United States. As late as the 1830's, authoritative accounts reveal, only a few settlers lived in the Falls area. This area was occu-

Adams (for Dr. Adams who lived nearby), because the residents listed it as "Adams" when they voted.

Falls County became a prosperous agricultural area because of the fertile soils along the Brazos River.

Natural resources

Soil is the most important natural resource in the county. Forage for livestock and food and fiber for market and home consumption are produced from the soils of the county and are the major source of livelihood.

Water is adequate for home use and farming in all parts of the county. Several wells supply water for supplemental irrigation of crops.

A few oil and gas wells are in the county.

Mineral artesian water wells at sanatoriums in Marlin annually attract many persons.

Farming

The total land area of Falls County is 489,600 acres. Of this area, 19,800 acres is urban land and 2,470 acres is areas of water less than 40 acres in size. Thus, the total usable land is 467,330 acres. Approximately 296,380 acres of this is cropland, 112,960 acres is pasture, 26,000 acres is rangeland, 22,500 acres is woodland, and 9,440 acres is land used for other purposes.

In Falls County the "Conservation Needs Inventory" (*5*) indicates that cropland is being converted to pasture. Warm-season grasses have been planted in these converted areas, and these grasses are the predominant vegetation. The inventory does not indicate a trend to convert cropland from cotton to grain sorghum or to cool-season broadcast crops of small grain for stocker cattle.

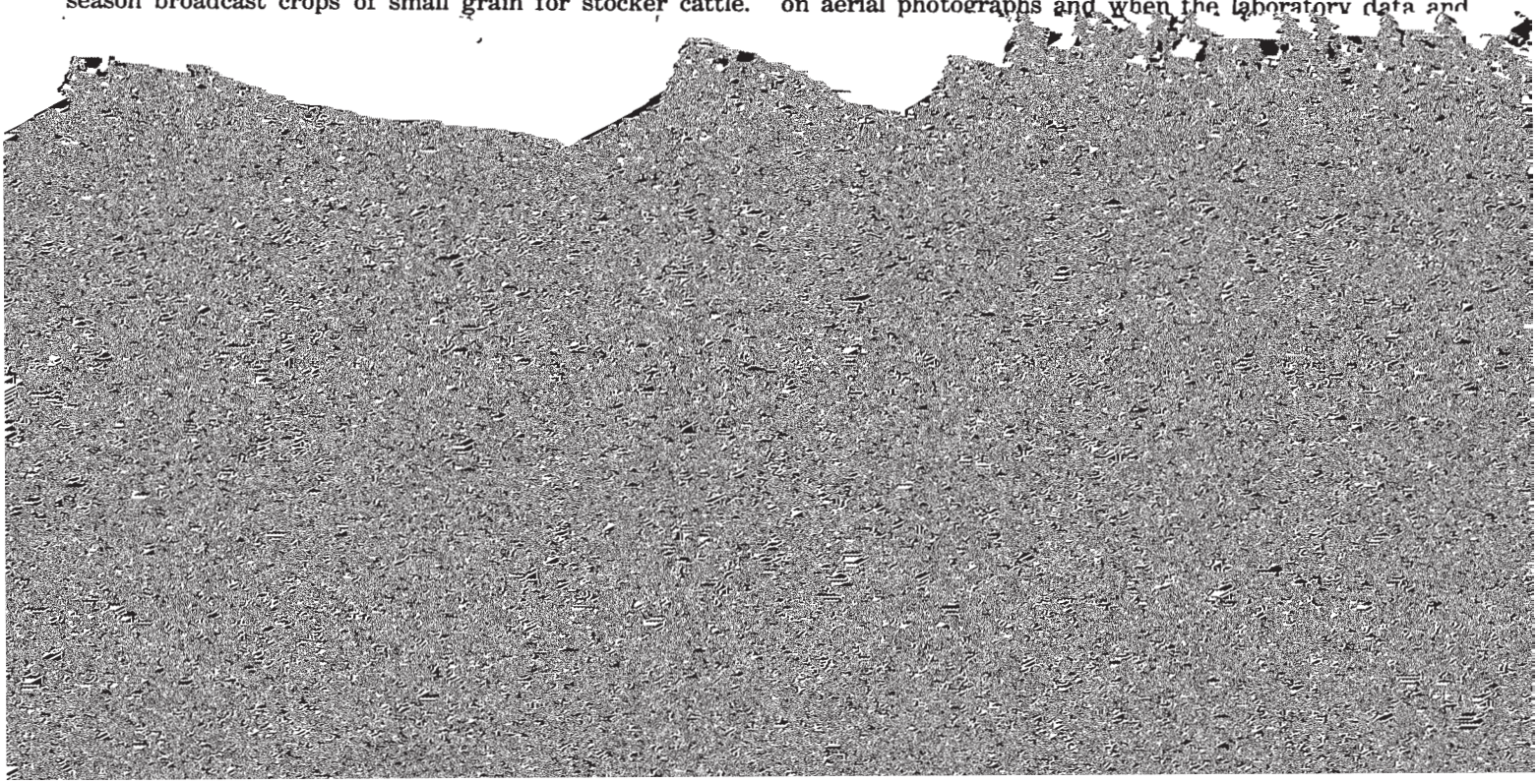
The soil scientists recorded the characteristics of the profiles they studied, and they compared those profiles with others in counties nearby and in places more distant. Thus, through correlation, they classified and named the soils according to nationwide, uniform procedures (*6*).

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

The areas shown on a soil map are called soil map units. Some map units are made up of one kind of soil, others are made up of two or more kinds of soil, and a few have little or no soil material at all. Map units are discussed in the sections "General soil map for broad land use planning" and "Soil maps for detailed planning."

While a soil survey is in progress, samples of soils are taken as needed for laboratory measurements and for engineering tests. The soils are field tested, and interpretations of their behavior are modified as necessary during the course of the survey. New interpretations are added to meet local needs, mainly through field observations of different kinds of soil in different uses under different levels of management. Also, data are assembled from other sources, such as test results, records, field experience, and information available from state and local specialists. For example, data on crop yields under defined practices are assembled from farm records and from field or plot experiments on the same kinds of soil.

But only part of a soil survey is done when the soils have been named, described, interpreted, and delineated on aerial photographs and when the laboratory data and



having properties that are distinctly unfavorable for certain land uses can be located.

Because of its small scale, the map does not show the kind of soil at a specific site. Thus, it is not suitable for planning the management of a farm or field or for selecting a site for a road or building or other structure. The kinds of soil in any one map unit differ from place to place in slope, depth, stoniness, drainage, or other characteristics that affect their management.

Moderately deep to deep, clayey and loamy soils on uplands

The soils in this group make up about 71 percent of the county. The major soils are in the Houston Black, Heiden, Crockett, Wilson, Burleson, Austin, and Altoga series. They are nearly level to sloping and are on uplands and high stream terraces. The soils have a clayey or loamy surface layer and a clayey underlying layer. These soils are somewhat poorly drained to well drained, and they are very slowly permeable to moderately permeable.

The soils are used mainly for cultivated crops and pasture. The major crops are cotton and grain sorghum. Improved bermudagrass, kleingrass, and King Ranch bluestem are the principal improved pasture grasses. Na-

moderately alkaline clay that has light yellowish brown mottles. The underlying layer to a depth of 80 inches is yellow, moderately alkaline shaly clay.

Houston Black soils are on smooth ridges and in valleys, and Heiden soils are on side slopes. Houston Black soils are moderately well drained, and Heiden soils are well drained. Both the Houston Black and the Heiden soils are clay throughout the profile; they are very hard when dry and very plastic and sticky when wet.

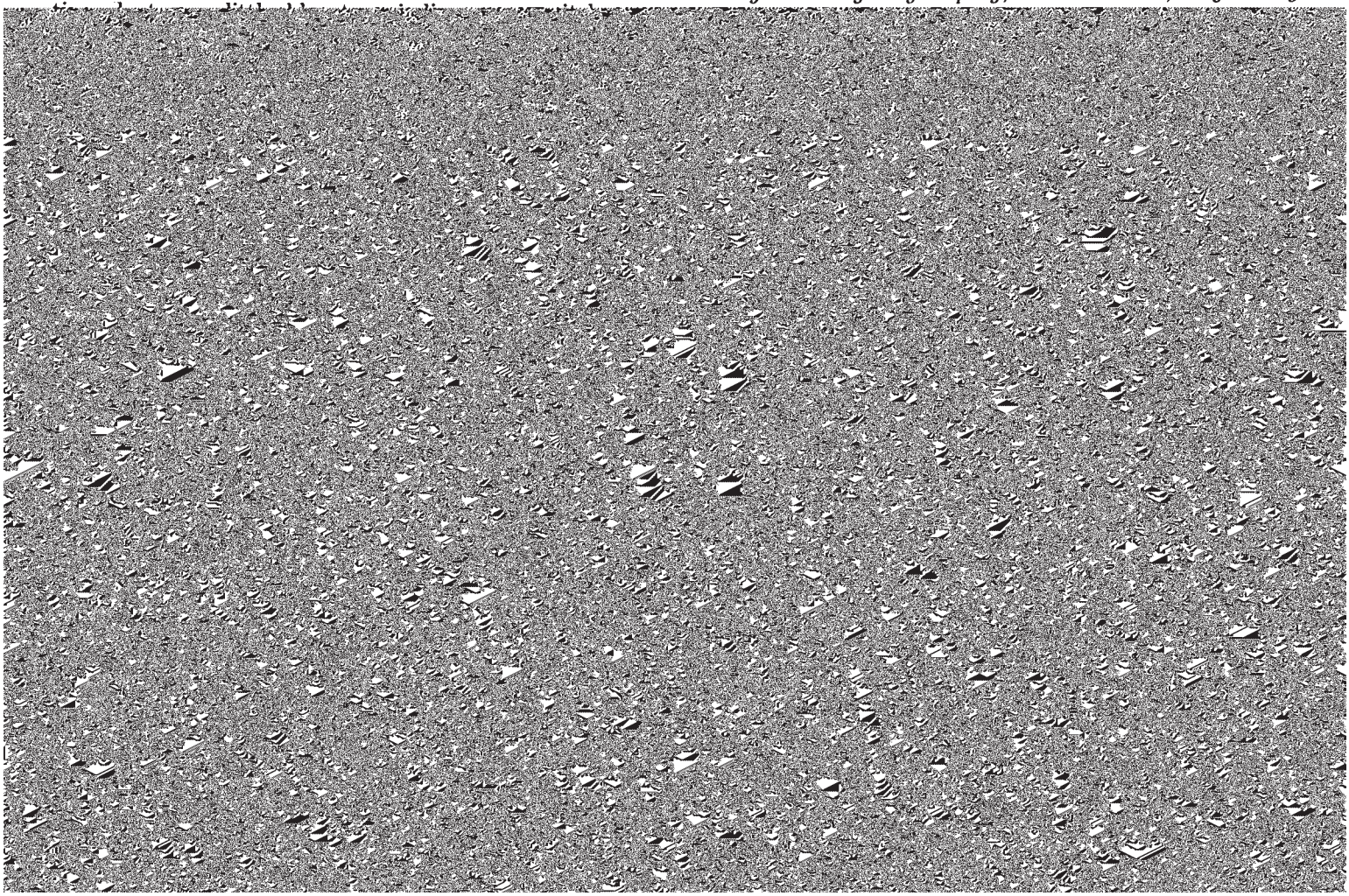
The minor soils in this map unit are the well drained Lott, Altoga, and Ferris soils; the moderately well drained Branyon soils; and the somewhat poorly drained Trinity soils.

This map unit is used mainly for cultivated crops and pasture. Water erosion is the major hazard.

This map unit has high potential for cultivated crops, pasture, and range. It has low potential for urban uses because the soils have high shrink-swell potential, slow percolation, high corrosivity to uncoated steel, and low strength. Potential for recreation is low because the soils are too clayey and are very slowly permeable. This unit has medium potential for openland wildlife habitat.

2. Crockett-Wilson

Nearly level to gently sloping, noncalcareous, very slowly



lowish brown mottles. The underlying layer to a depth of 80 inches is light olive gray, moderately alkaline clay that has yellowish brown mottles.

The Crockett and Wilson soils are at the same elevation on the landscape. The Crockett soils are moderately well drained, and they have a fine sandy loam surface layer. The Wilson soils are somewhat poorly drained and have a silty clay loam or loam surface layer. They are plastic and sticky when wet. Both the Crockett and the Wilson soils are hard when dry.

The minor soils in this map unit are the well drained Altoga, Heiden, and Gowen soils; the moderately well drained Normangee, Axtell, and Houston Black soils; and the somewhat poorly drained Trinity soils.

A large part of this map unit was formerly cultivated, but most areas are now in pasture. The major limitations are erosion and droughtiness.

The soils in this map unit have medium potential for crops and pasture and high potential for range. The soils

drained. Burleson soils have a clay surface layer and they are moderately well drained. Both Wilson and the Burleson soils are very hard when dry; they are very plastic and sticky when wet.

The minor soils in this map unit are the moderately well drained Houston Black, Crockett, Normangee, and Ovan soils; the well drained Altoga soils; and the somewhat poorly drained Trinity soils.

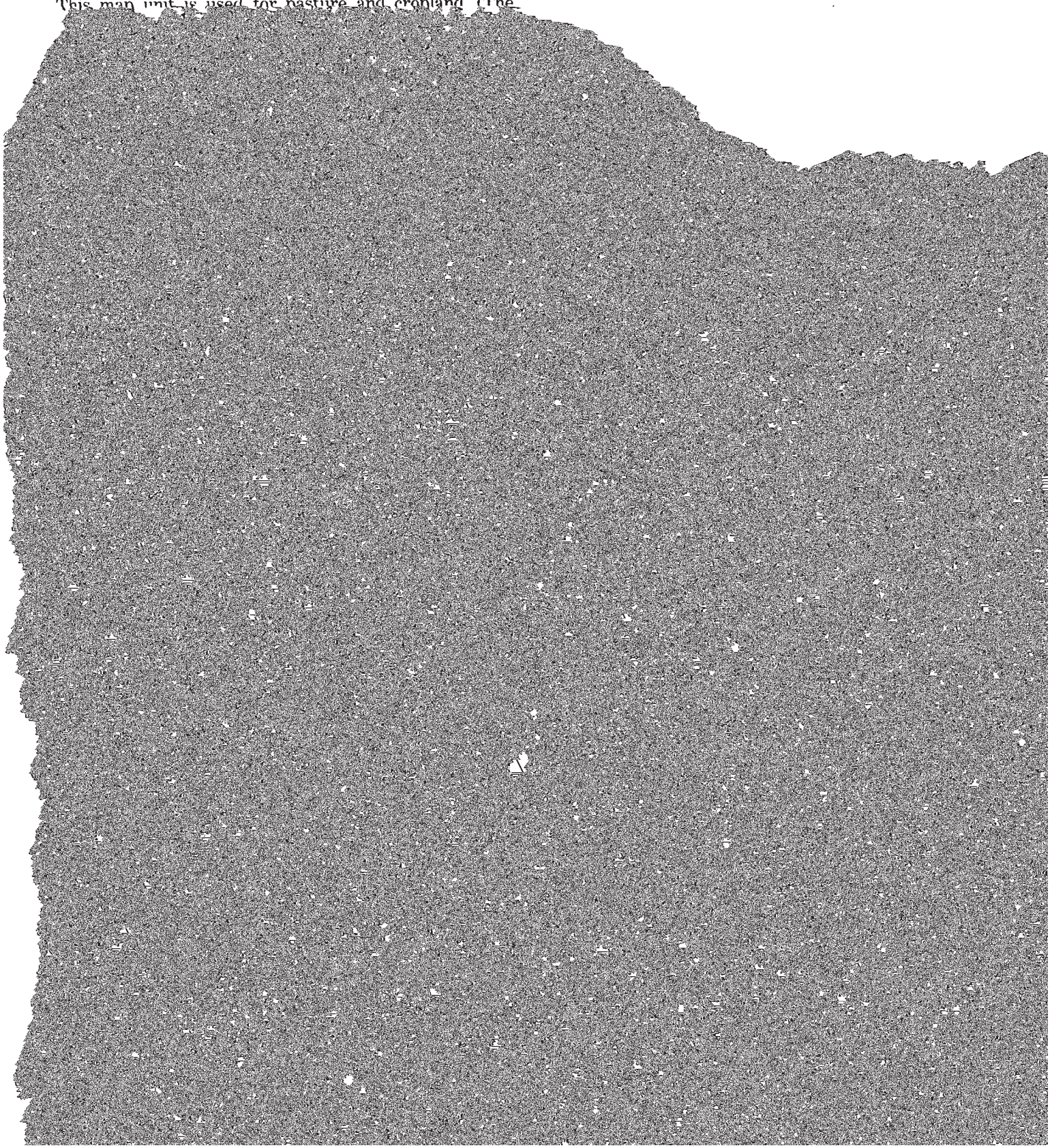
This map unit is used mainly for pasture, but many areas are cultivated. The main limitations for farming are erosion and droughtiness.

This map unit has medium potential for cultivated crops, pasture, and range. It has low potential for urban uses because the soils have wetness, high shrink-swell properties, slow percolation, corrosivity to uncoated steel, and low strength. Potential for recreation is low because the soils are too clayey, very slowly permeable, and subject to wetness. This unit has medium potential for openland wildlife habitat.

Heiden soils, and the moderately well drained Burleson soils.

This map unit is used for pasture and cropland. (The

Deep, sandy and loamy soils on uplands and high stream terraces



The Silawa and Axtell soils are at about the same elevation on the landscape. The Silawa soils are on the steeper parts. Silawa soils have a fine sandy loam or loamy fine sand surface layer. They are well drained. The Axtell soils have a fine sandy loam surface layer. They are moderately well drained.

The minor soils in this map unit are the well drained Silstid and Gowen soils, the moderately well drained Chazos and Padina soils, and the somewhat excessively drained Desan soils.

A large part of this map unit was formerly cultivated, but most areas are now in unimproved pasture. Water erosion and droughtiness are the major limitations for farming.

The potential for cultivated crops is medium; the potential for range and improved pasture is high. The potential for urban uses is low because of high shrink-swell potential, slow percolation, and low strength. The potential for recreation is high. This unit has high potential for openland wildlife habitat.

9. Axtell-Tabor

Nearly level to sloping, noncalcareous, very slowly permeable, loamy soils

The soils in this map unit are on uplands and high stream terraces in the southeast corner of the county. These soils formed in acid to alkaline clays and sandy clays that are interbedded with sandier materials.

This map unit occupies about 2 percent of the county. Axtell soils make up about 43 percent of the unit, and Tabor soils make up about 16 percent. The remaining 41 percent is minor soils.

The Axtell soils have a slightly acid fine sandy loam surface layer about 9 inches thick. It is dark brown in the kaline clay that is mottled brownish yellow, light brownish gray, and yellowish red.

The Axtell and Tabor soils are at about the same level in the landscape. Axtell soils are also in the more steeply sloping areas of the landscape. Both the Axtell and the Tabor soils have a fine sandy loam surface layer and are moderately well drained.

The minor soils in this map unit are the well drained Silawa soils; the moderately well drained Normangee, Chazos, and Crockett soils; and the somewhat excessively drained Desan soils.

This map unit was formerly cultivated, but most areas are now in pasture and abandoned fields. Water erosion and droughtiness are the major restrictions to farming.

The potential for cultivated crops is medium, and the potential for range and pasture is high. The soils in this map unit have low potential for urban land uses because of high shrink-swell potential, low strength, and slow percolation. The potential for recreation is medium because of very slow permeability. The potential for openland wildlife habitat is medium.

10. Silstid-Padina

Nearly level to gently sloping, noncalcareous, moderately permeable to moderately slowly permeable, sandy soils

The soils in this map unit are on uplands in the southeast corner of the county. These soils formed in residuum weathered from beds of sandy or loamy material.

This map unit occupies about 1 percent of the county. Silstid soils make up about 51 percent of the unit, and Padina soils make up about 28 percent. The remaining 21 percent is minor soils.

The Silstid soils have a slightly acid, loamy fine sand surface layer about 26 inches thick. It is brown in the

The minor soils in this map unit are the well drained Silawa soils and the moderately well drained Chazos and Axtell soils.

Some areas of this unit that were formerly cultivated been a slight increase in the number of acres used for specialty crops, urban development, and recreation.

In general the Houston Black-Heiden and Ships-Weswood units have high potential for cultivated farm

for which the unit is named. Most of the delineations. Slopes are convex. Areas are long, narrow bands that

This soil has medium potential for production of crops, but it is limited for this use by low natural fertility. The main crops are cotton and grain sorghum, but small grain is also grown. The major objectives of management are controlling erosion and improving tilth. Terracing and growing high-residue crops help control erosion and maintain tilth.

This soil has high potential for pasture. It is well suited to improved bermudagrass, kleingrass, and weeping

The potential for pasture is high. Such improved grasses as bermudagrass, kleingrass, and weeping lovegrass are well suited to this soil. Fertilization, weed control, and controlled grazing are management practices that are needed to produce good yields.

These soils have high potential for range. The climax plant community is a mixture of tall and mid grasses and an overstory of scattered elm, hackberry, and oak trees.

These soils have low potential for most urban uses. The

5—Austin silty clay, 1 to 3 percent slopes. This moderately deep, well drained, gently sloping soil is on high ridges and convex knolls on uplands. Most areas are broad, but some are long and narrow. Individual areas range from 25 to 100 acres in size.

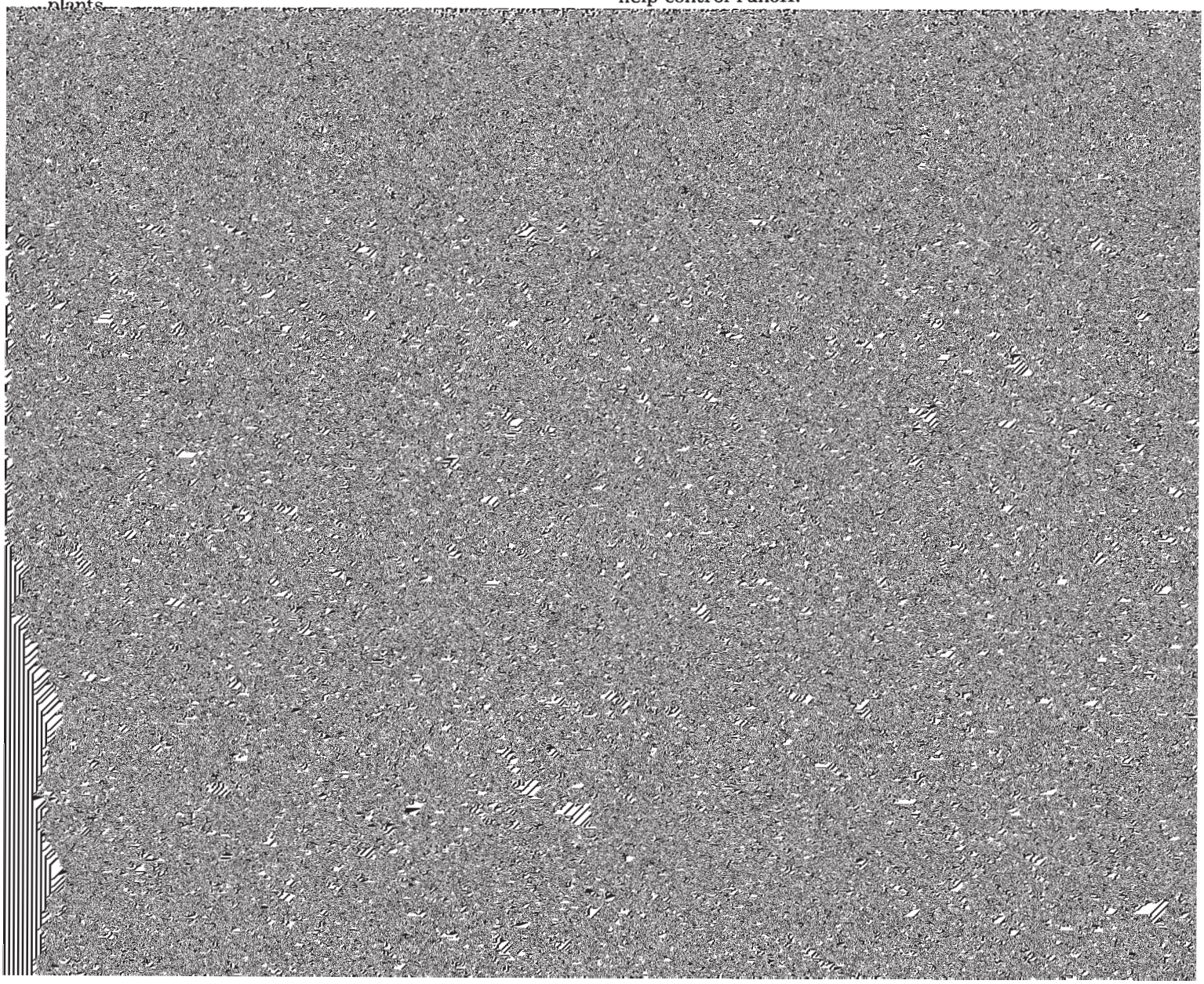
This soil has a surface layer of dark grayish brown, moderately alkaline silty clay about 17 inches thick. Below the surface layer, to a depth of 29 inches, is brown, moderately alkaline silty clay and platy fragments of chalky limestone that increase in amount in the lower part. The underlying material is white, platy, chalky limestone.

This soil has good tilth and can be easily worked. When plowed, the soil crumbles and forms good seedbeds. Permeability is moderately slow, and available water capacity is low. The root zone is moderately deep, and it is easily penetrated by roots. Runoff is medium, and the hazard of water erosion is moderate. The content of lime is high, and as a result iron chlorosis occurs in sensitive plants.

This soil has good tilth and can be worked throughout a wide range of moisture conditions. Permeability is moderately slow, and the available water capacity is low. Roots easily penetrate the moderately deep root zone. Runoff is medium. The hazard of water erosion is moderately severe.

Included with this soil in mapping are intermingled areas of Eddy, Stephen, and Altoga soils. Narrow bands of Houston Black soils are included along some drainageways. The included soils make up 10 to 20 percent of this map unit.

This soil has medium potential for row crops, but it is limited for this use by the low available water capacity and moderate depth to rock. It is used mainly for grain sorghum and small grain, but corn and cotton are also grown. The major objective in management is controlling erosion. Terraces with suited vegetation are needed to help control runoff.



Included with this soil in mapping are small intermingled areas of Silawa and Tabor soils. The included soils make up 10 to 20 percent of this map unit.

This soil has medium potential for crops. In many areas are abandoned fields that are now overgrown with mesquite trees (fig. 6). Droughtiness and low natural fertility are limitations for crops. The principal crops are grain sorghum, small grain, and corn, but such specialty crops as tomatoes and watermelons are also grown. The major objectives of management are improving soil tilth and improving fertility. Large additions of organic matter are needed to reduce surface crusting and improve tilth. Crops that produce large amounts of residue help maintain soil tilth.

This soil has high potential for pasture. It is well suited to improved bermudagrass, kleingrass, and weeping lovegrass. Proper management includes fertilizing with nitrogen, phosphorus, and potassium; weed control; and controlled grazing.

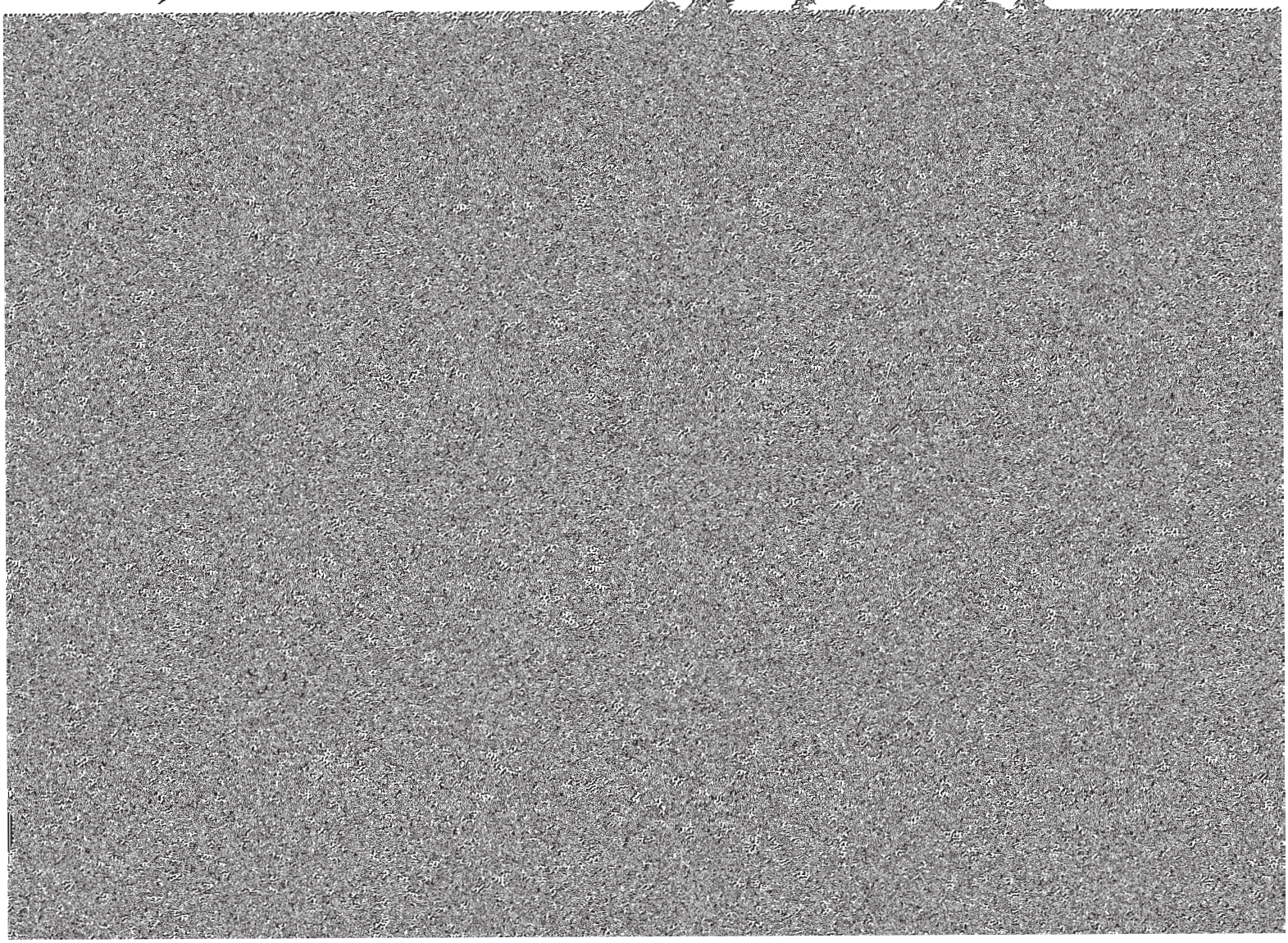
This soil has low potential for range because of droughtiness.

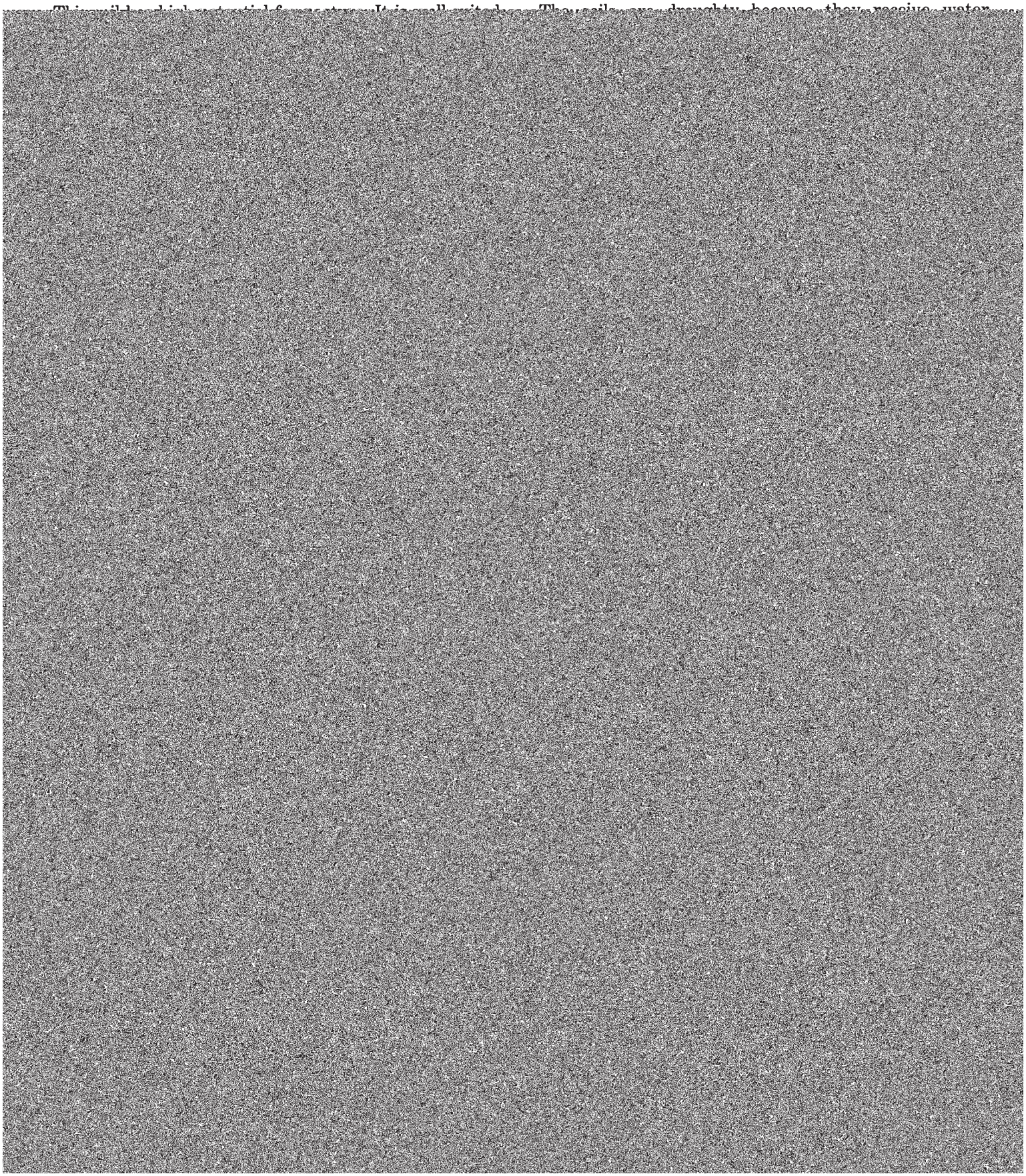
main crops are corn and small grain, but some grain sorghum is also grown. Some areas are used to grow such specialty crops as tomatoes and watermelons. The major objectives in management are controlling erosion and improving soil tilth and fertility. Terracing and use of high-residue crops help control erosion and maintain soil tilth.

This soil has high potential for pasture. It is suited to improved bermudagrass, kleingrass, and weeping lovegrass. Fertilizing with nitrogen, phosphorus, and potassium; weed control; and controlled grazing are needed for high production of grass.

This soil has low potential for range. It is limited for this use by droughtiness.

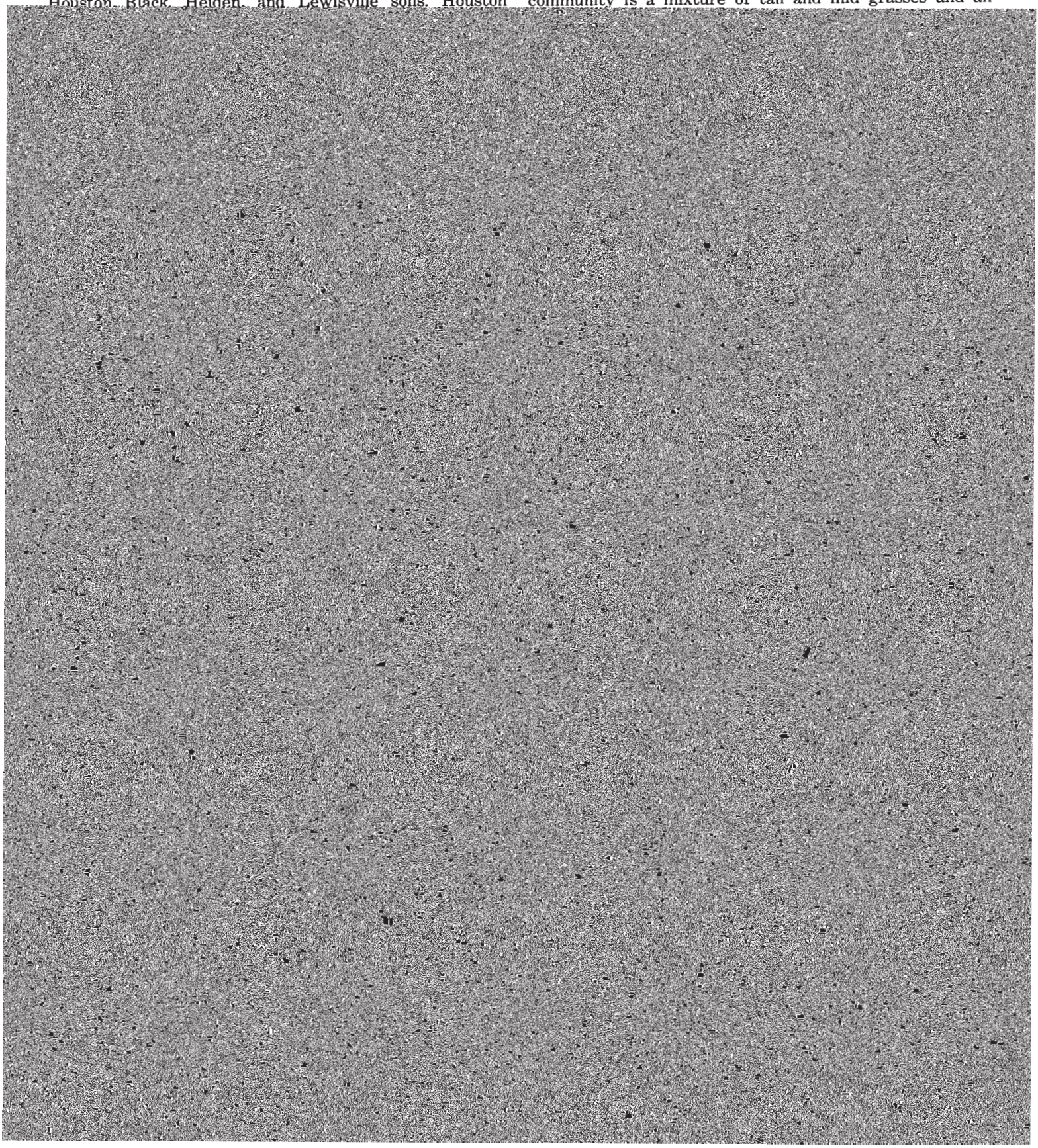
This soil has low potential for most urban uses. Shrinking and swelling with changes in moisture, corrosivity to uncoated steel, low strength, and slow percolation are its most restrictive limitations. Potential for recreation is medium. The very slow permeability is the most restrictive limitation for this use. Potential for openland wildlife habitat is medium, and potential for rangeland wildlife





Included with this soil in mapping are small areas of Houston Black, Heiden, and Lewisville soils. Houston

This soil has high potential for range. The climax plant community is a mixture of tall and mid grasses and an



terraces and uplands. Areas are on broad, convex ridges. They range from 10 to 100 acres in size.

This soil has a surface layer of dark gray, mildly alkaline clay about 42 inches thick. Below the surface layer, to a depth of 47 inches, is gray, mildly alkaline clay that has brownish yellow mottles. The underlying layer, to a depth of 80 inches, is light brownish gray, moderately alkaline clay that has brownish yellow mottles.

This soil is sticky and plastic when wet and is difficult to work. It is extremely hard when dry. Dense plowpans are common in cultivated areas. Permeability is very slow, and available water capacity is high. The root zone is deep, but root movement is very slow in the clayey lower layers. Runoff is medium. The hazard of water erosion is moderate.

Included with this soil in mapping are a few intermingled areas of Houston Black, Branyon, and Wilson soils.

brownish yellow, moderately alkaline sandy clay that has brown, yellowish red, and light brownish gray mottles. The underlying layer, to a depth of 72 inches, is pale brown, moderately alkaline sandy clay that has reddish yellow mottles. It is about 10 percent shaly clay.

This soil is easily worked throughout a wide range of moisture conditions. Permeability is slow, and available water capacity is medium. The root zone is deep, but root penetration is slow and difficult in underlying layers. Runoff is slow. The hazard of water erosion is slight.

Included with this soil in mapping are some soils that have a sandy clay layer below the surface layer. Also included are a few intermingled areas of Axtell, Tabor, and Silstid soils. The included soils make up about 10 to 20 percent of this mapping unit.

This soil has medium potential for crops, but it is

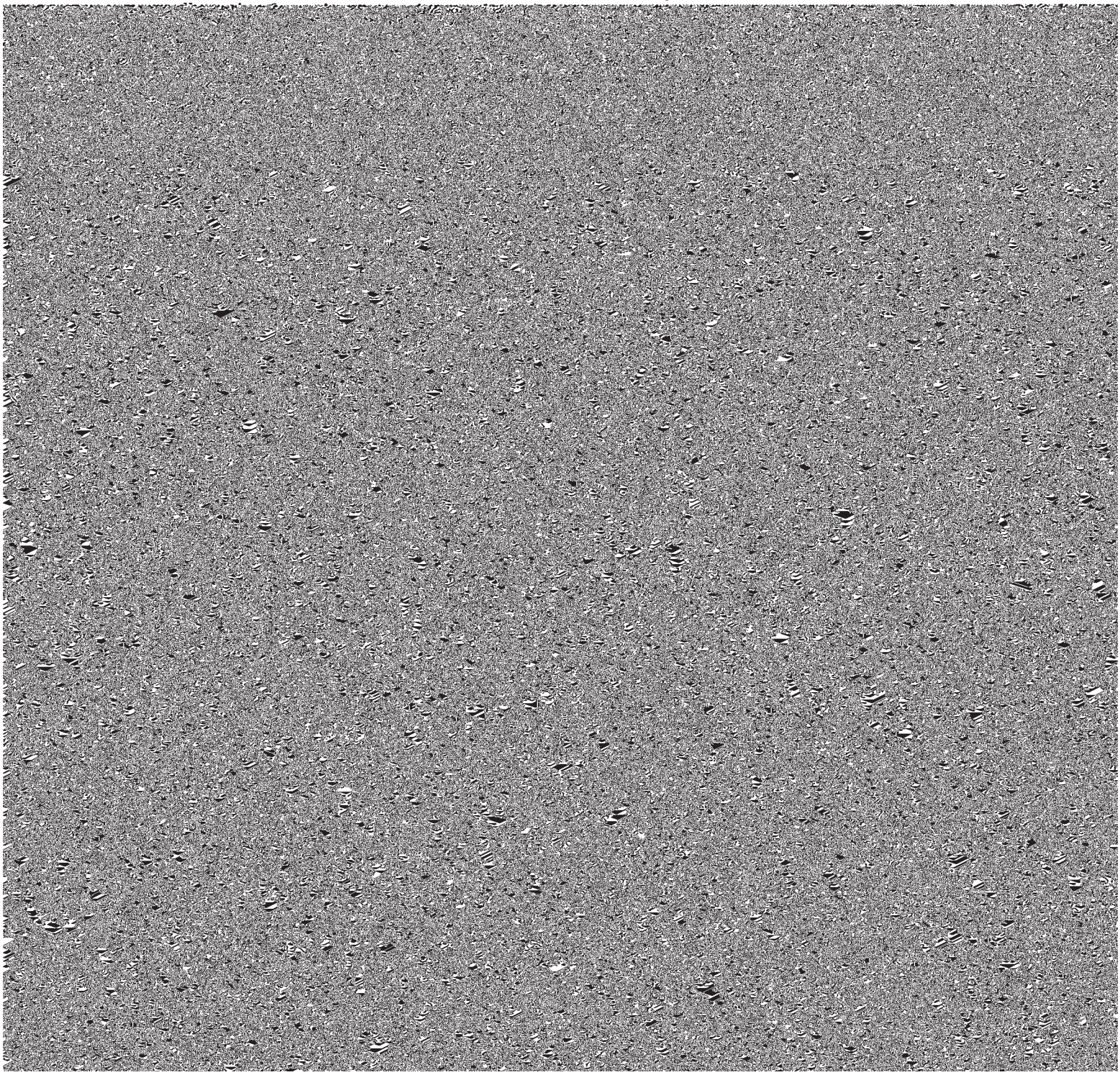
This soil is difficult to work; when dry, it forms extremely hard surface crusts. A dense plowpan forms in cultivated areas. Permeability is very slow, and available water capacity is high. The root zone is deep, but root penetration is slow and difficult in the underlying layers. Runoff is slow. The hazard of water erosion is slight.

Included with this soil in mapping are a few intermingled areas of Normangee and Wilson soils. The included soils make up 10 to 20 percent of this map unit.

This soil has medium potential for crops. The major

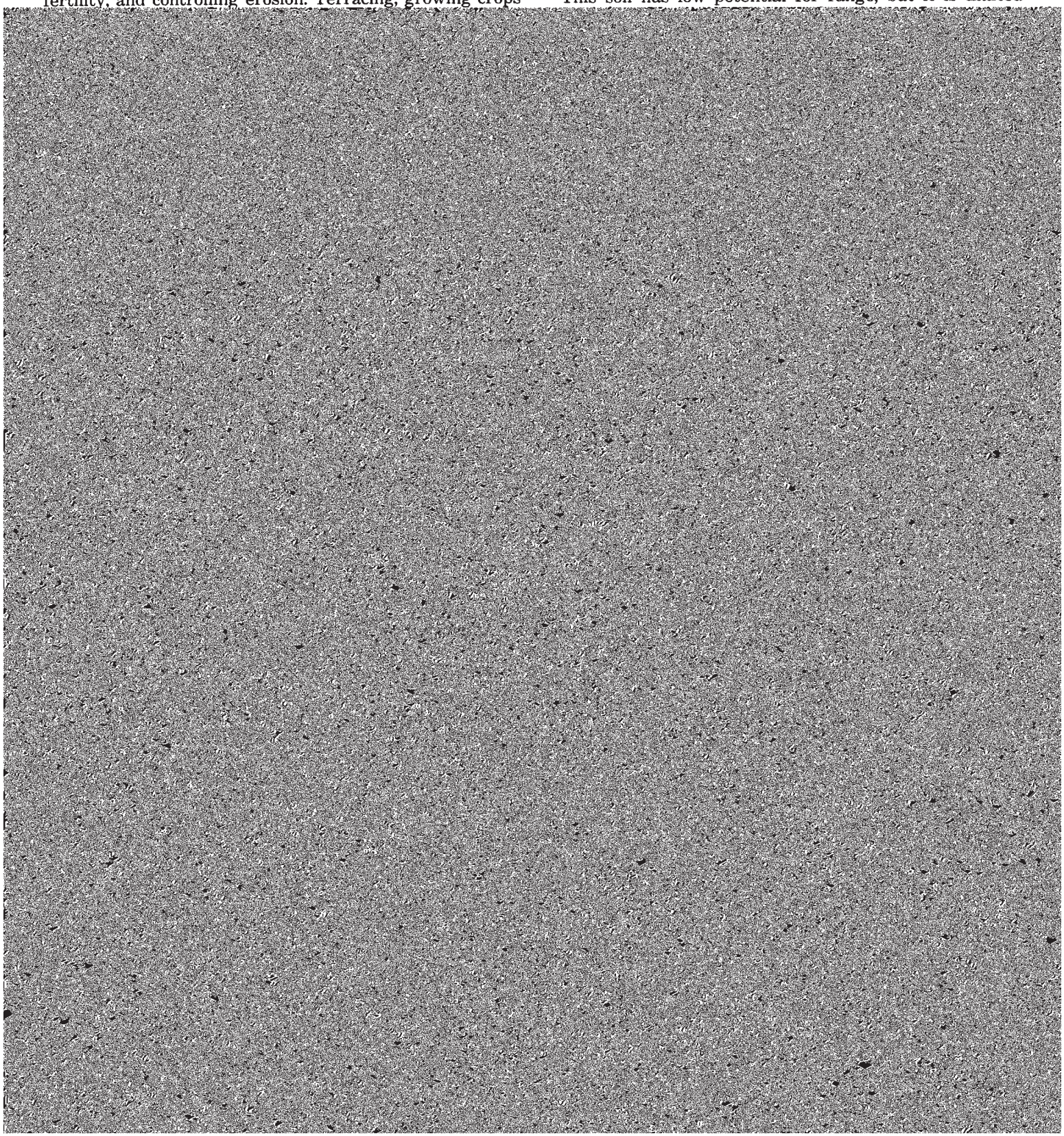
Included with this soil in mapping are a few intermingled areas of Normangee and Wilson soils and eroded Crockett soils. The included soils make up about 10 to 20 percent of this map unit.

This soil has medium potential for production of crops, but it is limited by low natural fertility and rapid loss of soil moisture during the summer. The major crops are small grain for winter grazing and grain sorghum. The major objectives in management are controlling erosion, maintaining fertility, and improving tilth. Terracing and



This soil has low potential for production of crops. The major crops are grain sorghum, cotton, and hay. The objectives in management are improving tilth, maintaining fertility, and controlling erosion. Terracing, growing crops tion of blowing sand unless management practices for soil blowing are used. Weed control, controlled grazing, and fertilization are needed for sustained forage production.

This soil has low potential for range, but it is limited

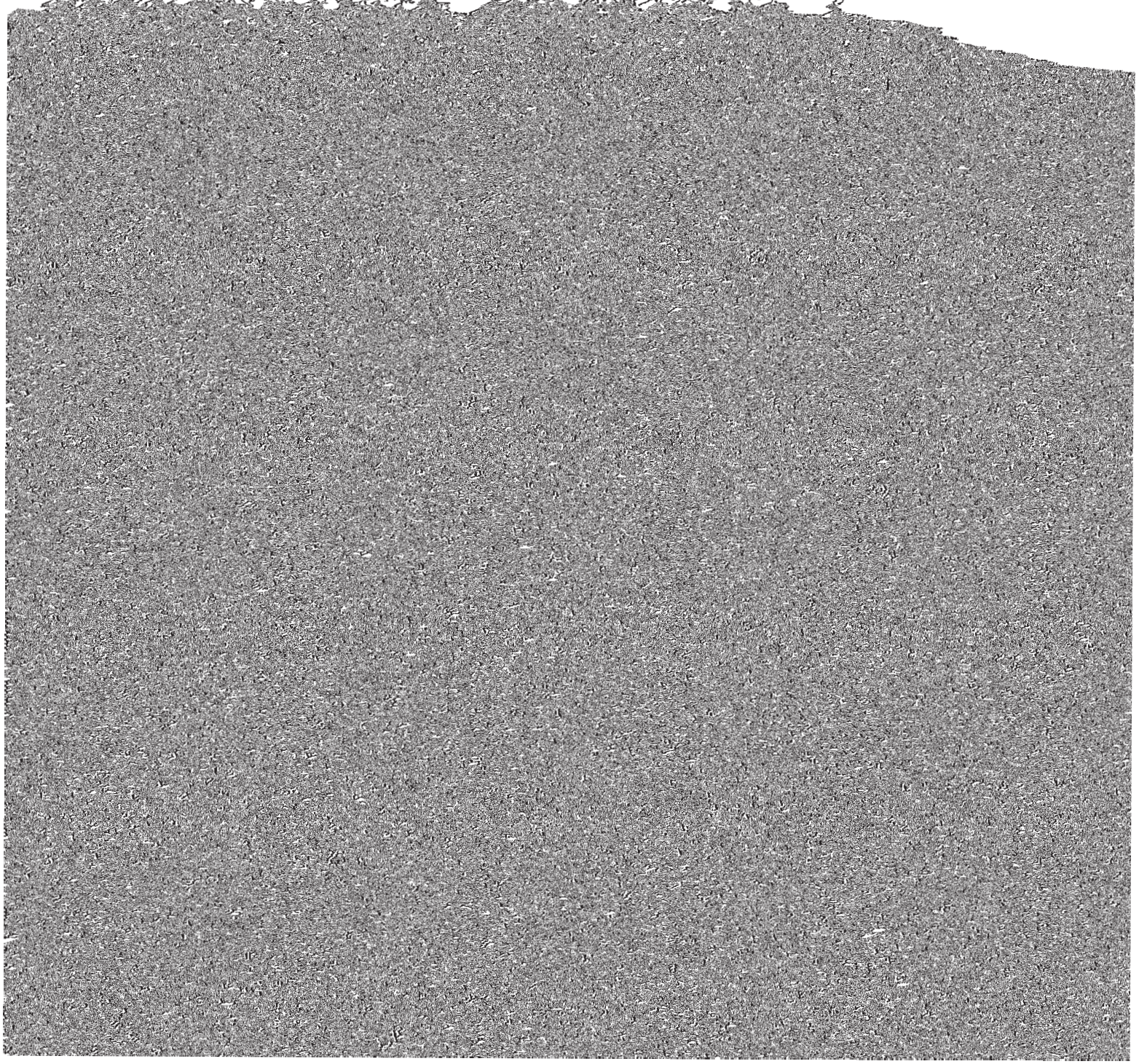


sloping to strongly sloping soils on uplands. It is made up of small areas of Ferris and Heiden soils so intricately mixed that separation is not practical at the scale mapped. Most areas are rilled and are dissected by deep gullies that are 10 to 75 feet apart. Slopes are convex. Areas are in long narrow bands that range from 5 to 25 acres in size.

A typical map unit is 65 percent Ferris soils, 22 percent Heiden soils, and 13 percent gray and olive shaly clay in the bottoms of gullies. The Ferris soils occupy the sides of gullies and sloping areas leading to the gullies. The less

This soil has a surface layer of light brown, moderately alkaline silt loam about 8 inches thick. Below the surface layer, to a depth of 14 inches, is stratified, light brown, moderately alkaline loamy fine sand and very pale brown, moderately alkaline silt loam. The underlying layer, to a depth of 80 inches, is pink, moderately alkaline fine sand.

This soil is easy to work throughout a wide range of moisture conditions. Permeability is moderately rapid, and the available water capacity is low. The root zone is deep and easily penetrated by roots. Runoff is slow, and the hazard of water erosion is slight.



These soils have low potential for crops, recreation, and urban uses. The most restrictive limitation is flooding, which can be overcome only by major flood control.

These soils have medium potential for pasture. They are well suited to improved bermudagrass. Proper pasture management includes fertilization, weed control, and controlled grazing.

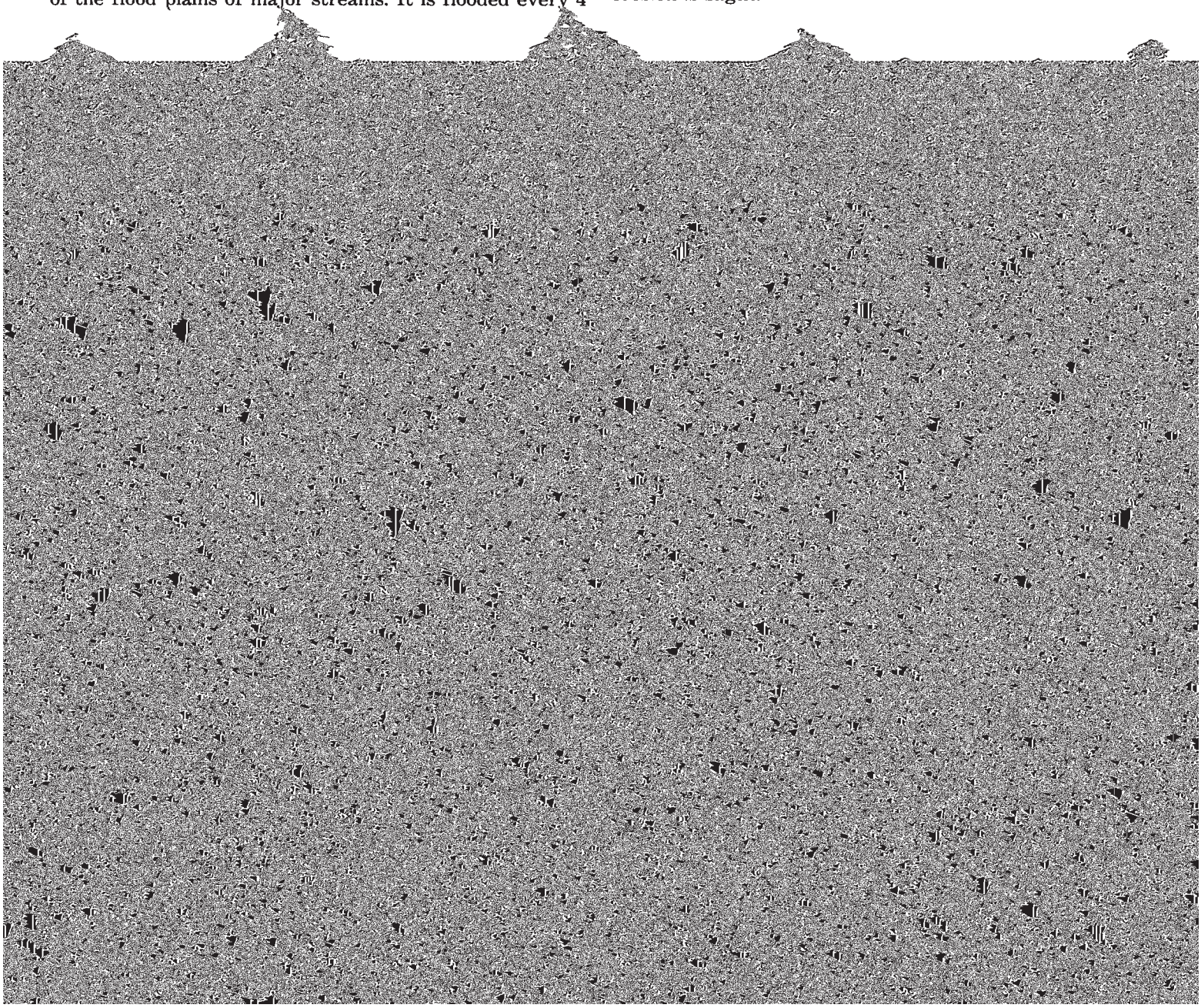
These soils have low potential for range. The climax plant community is tall and mid grasses and an overstory of oak, elm, sycamore, and black willow trees.

Potential of these soils for both openland and rangeland wildlife habitat is high. Capability subclass Vw; Sandy Bottomland range site.

27—Gowen clay loam, occasionally flooded. This deep, well drained, nearly level soil is in protected areas of the flood plains of major streams. It is flooded every 4 major streams. It is flooded two or three times each year; flooding lasts from several hours to several days. Areas have plane slopes of 0 to 1 percent. These areas are on flood plains in long, narrow bands and are dissected by old creek beds and by meandering channels. Individual areas range from 20 to about 200 acres in size.

The soil has a surface layer of very dark grayish brown, neutral clay loam about 23 inches thick. Below the surface layer, to a depth of 36 inches, is brown, neutral clay loam. The underlying layer, to a depth of 80 inches, is dark grayish brown, neutral clay loam stratified with fine sandy loam and clay in the lower part.

Permeability is moderate, and the available water capacity is high. The root zone is deep and easily penetrated by roots. Runoff is slow. The hazard of water erosion is slight.



This soil is used mainly for crops. The potential for crops is high. Cotton and grain sorghum are the main crops, but corn and small grain are also grown. The main objectives of management are controlling erosion and improving tilth. Terracing and growing crops that produce large amounts of residue help control erosion and maintain tilth.

This soil has high potential for pasture. It is well suited to improved bermudagrass, kleingrass, and King Ranch bluestem. Proper pasture management includes fertilization, weed control, and controlled grazing.

This soil has high potential for range, but very few acres are used for this purpose. The climax plant community is tall grasses and an overstory of a few large live oak, elm, and hackberry trees along drainageways.

This soil has low potential for most urban uses. The limitations that affect urban development are the shrinking and swelling with changes in moisture, corrosivity to uncoated steel, and slow percolation. The potential for recreation is low. The most restrictive limitations for this use are the clayey surface layer and the very slow permeability. Potential for openland wildlife habitat is medium, and potential for rangeland wildlife habitat is low. Capability subclass IIe; Blackland range site.

30—Heiden clay, 3 to 5 percent slopes. This deep, well drained, gently sloping soil is on uplands. Slopes are convex. Areas are long and narrow and range from 5 to 20 acres in size.

The surface layer of this soil, to a depth of 20 inches, is dark grayish brown, moderately alkaline clay. Between depths of 20 and 41 inches is olive, moderately alkaline clay. The underlying layer, to a depth of 80 inches, is yellow, moderately alkaline clay that has olive yellow mottles.

This soil is difficult to work. When wet, it is sticky and plastic; when dry, it is hard and clods when plowed. Dense plowpan layers are common in cultivated areas. The permeability is very slow, and the available water capacity is high. The root zone is deep, but penetration by roots is slow. Runoff is slow. The hazard of water erosion is moderately severe.

Included with this soil in mapping are small areas of Ferris, Houston Black, Burleson, and Trinity soils. The Ferris soils occupy gullies and steeper side slopes. The Houston Black and Burleson soils are on less sloping parts of the landscape and the Trinity soils occupy flood plains. The included soils make up 10 percent of this map unit.

This soil is used about equally for crops and pasture. It has medium potential for production of crops, but it is limited by slope. Grain sorghum, cotton, and small grain are the main crops. The main objectives of management are controlling erosion and improving tilth. Terracing and growing crops that produce large amounts of residue help control erosion and maintain soil tilth.

This soil has high potential for pasture. It is well suited to improved bermudagrass, kleingrass, and King Ranch bluestem. Pasture management includes fertilization, weed control, and controlled grazing.

This soil has high potential for range, but very few acres are used for this purpose. The climax plant community is tall grasses and an overstory of a few large live oak, elm, and hackberry trees along drainageways.

This soil has low potential for most urban uses. The limitations that affect urban development are the shrinking and swelling with changes in moisture, corrosivity to uncoated steel, and slow percolation. The potential for recreation is low. The clayey surface layer and the very slow permeability are the most restrictive limitations for this use. Potential for openland wildlife habitat is medium, and potential for rangeland wildlife habitat is low. Capability subclass IIIe; Blackland range site.

31—Heiden clay, 2 to 5 percent slopes, eroded. This deep, well drained, gently sloping soil is on uplands. Most areas are rilled and have shallow gullies that are 100 to 200 feet apart. Slopes are convex. Areas are long and narrow and range from 10 to about 80 acres in size.

This soil has a surface layer of dark grayish brown, moderately alkaline clay about 17 inches thick. Between depths of 17 and 43 inches is grayish brown, moderately alkaline clay. The underlying layer is light yellowish brown, moderately alkaline clay.

This soil is difficult to work. When wet, it is sticky and plastic; when dry, it is hard and clods when plowed. Dense plowpan layers are common in cultivated areas. Permeability is very slow, and available water capacity is high. The root zone is deep, but penetration by roots is slow. Runoff is rapid. The hazard of water erosion is moderately severe.

Included with this soil in mapping are small areas of Ferris soils. This soil occupies shallow gullies and adjoining slopes. This soil makes up about 18 percent of this map unit.

Some areas of this soil are still cultivated, but most areas are now in pasture. This soil has medium potential for production of crops, but it is limited for this use because the surface layer has been eroded away. Grain sorghum, cotton, and small grain are the main crops. The main objectives of management are controlling erosion and improving tilth. Terracing and growing crops that produce large amounts of residue or deep-rooted legumes help control erosion and maintain tilth.

This soil has high potential for pasture. It is well suited to improved bermudagrass, kleingrass, and King Ranch bluestem. Pasture management includes fertilization, weed control, and controlled grazing.

This soil has high potential for range, but very few acres are used for this purpose. The climax plant community is tall grasses and an overstory of a few large live oak, elm, and hackberry trees along the drainageways.

This soil has low potential for most urban uses. Its most restrictive limitations are shrinking and swelling with changes in moisture, corrosivity to uncoated steel, and slow percolation. The potential for recreation is low. The clayey surface layer and the very slow permeability are the most restrictive limitations for this use. Potential for openland wildlife habitat is medium, and potential for

rangeland wildlife habitat is low. Capability subclass IIIe; Blackland range site.

32—Heiden-Ferris complex, 5 to 8 percent slopes, eroded. This map unit consists of well drained, sloping soils on uplands. It is made up of small areas of Heiden and Ferris soils so intermingled that separation is not practical at the scale selected for mapping. Most areas are rilled and have shallow gullies that are 100 to 150 feet apart. They are on convex, complex side slopes. Areas are long and narrow and range from 5 to about 150 acres in

penetration is slow and difficult in lower layers. Runoff is slow. The hazard of water erosion is slight.

Included with this soil in mapping are small intermingled areas of Ships, Weswood, and Yahola soils. The included soils make up about 10 to 20 percent of this map unit.

This soil is used mainly for crops, and it has high potential for this use. The major crops are cotton and grain sorghum, but corn and small grain are also grown. The main objectives of management are maintaining tilth and

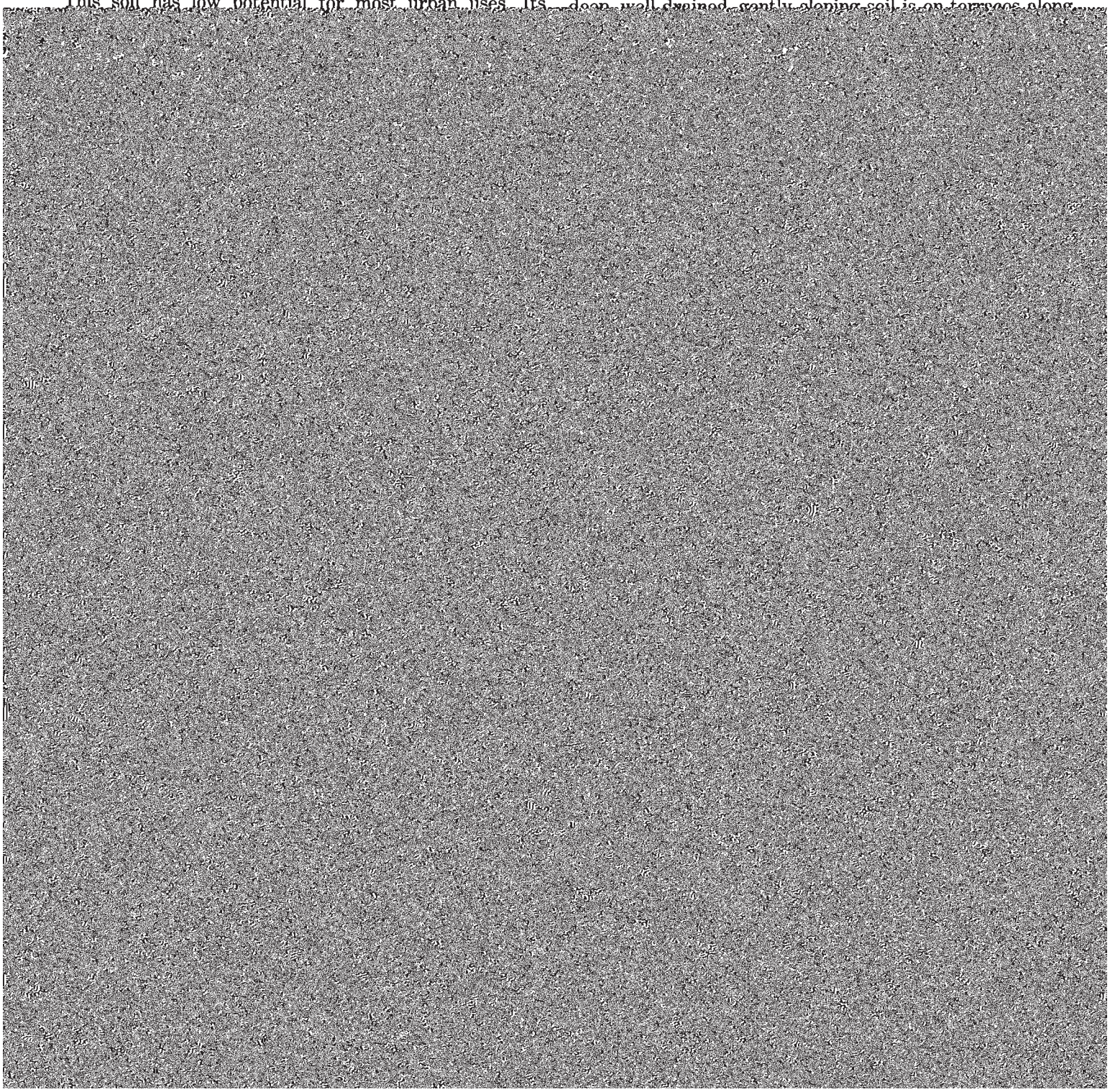
This soil has high potential for pasture. It is well suited to improved bermudagrass, kleingrass, and King Ranch bluestem. Proper pasture management includes fertilization, weed control, and controlled grazing.

This soil has high potential for range, but very few acres are used for this purpose. The climax plant community is tall grasses and an overstory of a few large live oak, elm, and hackberry trees along drainageways.

This soil has low potential for most urban uses. Its with changes in moisture, corrosivity to uncoated steel, low strength, and slow percolation.

The potential for recreation is low. The clayey surface layer and the very slow permeability are the most restrictive limitations for this use. Potential for both openland and rangeland wildlife habitat is medium. Capability subclass IIe; Blackland range site.

36—Lewisville silty clay, 1 to 3 percent slopes. This deep, well drained, gently sloping soil is on terraces along



This soil has a surface layer of dark grayish brown, moderately alkaline silty clay about 11 inches thick. Between depths of 11 and 36 inches is olive brown, moderately alkaline silty clay. The underlying layer, to a depth of 12 inches is light yellowish brown, moderately alkaline silty clay.

This soil has good tilth and can be easily worked. Permeability is moderate, and available water capacity is high. The root zone is deep and easily penetrated by roots. Runoff is medium. The hazard of water erosion is moderate.

Included with this soil in mapping are a few areas of Lewisville soils that have been moderately damaged by water erosion. Also included are a few intermingled areas

This soil has high potential for production of crops. The major crops are cotton and grain sorghum, but corn and small grain are also grown. The major objectives of management are controlling erosion and improving tilth. Terracing and growing crops that produce large amounts of residue or deep-rooted legumes help control erosion and maintain the tilth.

This soil has high potential for pasture. It is well suited to coastal bermudagrass, kleingrass, and weeping lovegrass. Pasture management includes fertilization, weed control, and controlled grazing.

This soil has high potential for range. The climax plant community is a mixture of tall and mid grasses; an overstory of hackberry, elm, and pecan trees along

ry, elm, and pecan trees along drainageways; and scattered oak trees.

This soil has low potential for most urban uses. Its most restrictive limitations are shrinking and swelling with changes in moisture, low strength, corrosivity to uncoated steel, and slow percolation. The potential for recreation is low. The clayey surface layer is the most restrictive limitation for this use. Potential for openland wildlife habitat is high, and potential for rangeland wildlife habitat is medium. Capability subclass IIIe; Clay Loam range site.

40—Normangee clay loam, 0 to 1 percent slopes. This deep, moderately well drained, nearly level soil is on uplands. Slopes are plane. Areas range from 5 to 100 acres in size.

This soil has a surface layer of dark brown, neutral clay loam about 8 inches thick. Between depths of 8 and 18 inches is brown, neutral clay that has yellowish red mottles. Between depths of 18 and 32 inches is pale brown and grayish brown, moderately alkaline clay that has brownish yellow, yellowish red, and reddish yellow mot-

land wildlife habitat is medium. Capability subclass IIIs; Claypan Prairie range site.

41—Normangee clay loam, 1 to 3 percent slopes. This deep, moderately well drained, gently sloping soil is on uplands. Slopes are convex. Areas range from 10 to about 175 acres in size.

This soil has a surface layer of brown, neutral clay loam about 8 inches thick. Between depths of 8 and 17 inches is brown, neutral clay that has dark brown and dark grayish brown mottles. Between depths of 17 and 30 inches is brown, neutral clay that has strong brown and dark grayish brown mottles. Between the depths of 30 and 42 inches is grayish brown, neutral clay that has mottles of strong brown, brownish yellow, and pale brown. The underlying layer, to a depth of 60 inches, is light brownish gray, mildly alkaline clay that has mottles of light yellowish brown, dark yellowish brown, and strong brown.

When dry, this soil becomes extremely hard; when wet, it is sticky. Dense plowpans and surface crusts that form in cultivated areas make this soil difficult to work. Permeability is very slow, and the available water capaci-

convex. Part of the original surface layer has been removed by water erosion. Many areas are dissected by gullies that are 1 to 3 feet deep and about 75 to 100 feet apart. Mapped areas range from 20 to 100 acres in size.

This soil has a surface layer of dark brown, neutral clay loam about 4 inches thick. Between depths of 4 and 15 inches is brown, neutral clay that has red and reddish brown mottles. Between depths of 15 and 29 inches is brown, moderately alkaline clay that has yellow and reddish brown mottles; and between depths of 29 and 42 inches is light yellowish brown, moderately alkaline clay that has light gray and yellow mottles. The underlying layer, to a depth of 60 inches, is brownish yellow, moderately alkaline clay loam that has light red and light brownish gray mottles.

This soil is difficult to work. When wet, it is sticky; when dry, it becomes extremely hard. Surface crusts and dense plowpans form in cultivated areas. Permeability is very slow, and the available water capacity is high. The root zone is deep, but root penetration is slow and difficult in the underlying layers. Runoff is rapid. The hazard of water erosion is severe.

Included with this soil in mapping are a few intermingled areas of eroded Crockett soils. The included soils make up less than 15 percent of this map unit.

This soil has low potential for production of crops. It is limited for this use by the low natural fertility, rapid loss of soil moisture, and loss of the surface layer by water erosion. Where cultivated, the major crops are grain

This soil has a surface layer of dark brown, moderately alkaline silty clay about 20 inches thick. Between depths of 20 and 41 inches is brown, moderately alkaline silty clay. The underlying layer is brown, moderately alkaline silty clay to a depth of 80 inches.

This soil is easily worked throughout a wide range of moisture conditions. The surface crusts and plowpans that form in cultivated areas are generally weak and do not curtail plant growth. Permeability is very slow, and the available water capacity is high. The root zone is deep and easily penetrated by roots. Runoff is slow. The hazard of water erosion is slight.

Included with this soil in mapping are a few intermingled areas of Trinity soils. Also included are a few soils in narrow drainageways that carry floodwater when the main stream overflows its banks. These included soils make up about 10 to 20 percent of this map unit.

This soil has high potential for production of crops. The main crops are grain sorghum and cotton. The major management objectives are maintenance of tilth and fertility. Growing crops that produce large amounts of residue and growing legumes help to maintain tilth.

This soil has high potential for pasture. It is well suited to improved bermudagrass, common bermudagrass, johnsongrass, and kleingrass. Fertilization, controlled grazing, and weed control are needed to maintain high forage yields.

This soil has high potential for range. The climax plant community is a mixture of tall and mid grasses and an

This soil has low potential for production of crops, recreation, and urban uses. Its potential is limited by flooding, which can only be overcome by major flood control.

This soil has high potential for pasture. It is well suited to improved bermudagrass, common bermudagrass, johnsongrass, and kleingrass. Proper pasture management includes fertilization, controlled grazing, and weed control.

of post oak and blackjack oaks and an understory of mid and tall grasses.

This soil has high potential for urban uses. Its most restrictive limitations are occasional wetness and the hazard of cutbanks caving. The potential for recreation is low. The sandy surface layer is the most restrictive limitation for this use. Potential for both openland and rangeland wildlife habitat is medium. Capability subclass

and between depths of 11 and 18 inches is brown, moderately alkaline very gravelly clay. Between the depths of 18 and 34 inches is brown, moderately alkaline very gravelly clay that has brown mottles. The underlying material, to a depth of 80 inches, is light yellowish brown and light gray, moderately alkaline clayey marl.

and the Roetex soils are in the less well drained positions. These included soils make up about 10 to 20 percent of this map unit.

This soil has high potential for production of crops. The major crops are cotton and grain sorghum, and some corn is also grown. The major objectives of management are

The potential for recreation is low. The flooding hazard and the clayey surface layer are the most restrictive limitations. Potential for openland wildlife habitat is low, and potential for rangeland wildlife habitat is medium. Capability subclass Vw; Clayey Bottomland range site.

50—Silawa loamy fine sand, 0 to 3 percent slopes. This deep, well drained, nearly level to gently sloping soil is on high stream terraces. Slopes are convex. Areas range from 10 to about 150 acres in size.

This soil has a surface layer of slightly acid loamy fine sand about 16 inches thick. The layer is dark yellowish depth of 6 inches and light yellowish brown below. Between depths of 13 and 38 inches is red, medium acid sandy clay loam. Between depths of 38 and 59 inches is red, medium acid fine sandy loam. The underlying layer, to a depth of 70 inches, is red, medium acid loamy fine sand.

This soil can be worked throughout a wide range of moisture conditions. Permeability is moderate, and available water capacity is medium. The root zone is deep and easily penetrated by roots. Runoff is medium. The hazard of water erosion is moderate.

This soil has low potential for production of crops, but it is limited by the erosion hazard, slope, low natural fertility, and medium available water capacity. Terracing and growing crops that produce large amounts of residue help to control erosion and maintain tilth.

This soil is used mainly for pasture, and it has medium potential for this use. It is well suited to improved bermudagrass, weeping lovegrass, and kleingrass. Proper management includes fertilization, weed control, and controlled grazing.

This soil has medium potential for range. The climax plant community is a post oak and blackjack oak savannah and an understory of mid and tall grasses.

This soil has high potential for urban and recreation uses. Low strength is the most restrictive limitation for these uses. Potential for both openland and rangeland wildlife habitats is high. Capability subclass IIIe; Sandy Loam range site.

53—Silawa fine sandy loam, 3 to 8 percent slopes, eroded. This deep, well drained, gently sloping to sloping soil is on ridges and side slopes. It has been damaged by water erosion, and part of the original surface layer has been removed. Many areas are dissected by gullies 1 to 3 feet deep and 75 to 100 feet apart. Mapped areas are 20 to 150 acres in size. Slopes are convex.

This soil has a surface layer of brown, slightly acid fine sandy loam about 9 inches thick. Between depths of 9 and 39 inches is red, medium acid sandy clay loam; and between depths of 39 and 58 inches is reddish yellow, medium acid sandy clay loam. The underlying layer, to a depth of 80 inches, is reddish yellow, strongly acid loamy fine sand.

This soil can be worked throughout a wide range of moisture conditions. Permeability is moderate, and available water capacity is medium. The root zone is deep and easily penetrated by roots. Runoff is medium. The hazard of water erosion is severe.

Included with this soil in mapping are some soils that have a gravelly sandy clay loam layer between depths of 9 and 58 inches. Also included are a few intermingled

both openland and rangeland wildlife habitat is high. Capability subclass IVe; Sandy Loam range site.

54—Silstid loamy fine sand, 0 to 3 percent slopes. This deep, well drained, nearly level to gently sloping soil is on ancient stream terraces. Slopes are convex. Areas are mostly oval and range from 20 to 295 acres in size.

This soil has a surface layer of slightly acid loamy fine sand about 26 inches thick. This layer is brown to a depth of 10 inches and pale brown below. Between depths of 26 and 43 inches is brownish yellow, medium acid sandy clay loam that has pale brown and reddish yellow mottles. Between depths of 43 and 56 inches is yellow, medium acid sandy clay loam that has light gray and reddish yellow mottles. The underlying layer, to a depth of 80 inches, is brownish yellow, medium acid sandy clay loam that has reddish yellow mottles.

This soil can be worked throughout a wide range of moisture conditions. Permeability is moderate, and available water capacity is medium. The root zone is deep and easily penetrated by roots. Runoff is slow. The hazards of soil blowing and water erosion are slight.

Included with this soil in mapping are a few intermingled areas of Chazos, Padina, and Silawa soils. The included soils make up about 10 to 20 percent of this map unit.

This soil has medium potential for production of crops, but it is limited for this use by low natural fertility and the medium available water capacity. The only crops grown on this soil are corn and some specialty crops, such as tomatoes and watermelons. The major objectives of management are to conserve moisture and improve fertility. Growing crops that produce large amounts of residue or growing legumes help to maintain tilth.

This soil is used mainly for pasture, and it has medium potential for this use. It is well suited to improved bermudagrass and weeping lovegrass. Proper pasture management includes weed control, controlled grazing, and applications of fertilizer.

This soil has medium potential for range. The climax plant community is an open savannah of post oak and

This soil has good tilth and can be easily worked, but deep plowing often brings up pieces of chalk. Permeability is moderately slow, and the available water capacity is very low. The root zone is restricted by depth to rock. Runoff is medium. The hazard of water erosion is moderate.

Included with this soil in mapping are a few intermingled areas of Austin and Eddy soils. The included soils make up about 10 to 20 percent of this map unit.

This soil has medium potential for production of crops, but it is limited for this use by depth to rock and very low available water capacity. The major crops are small grain as well as grain sorghum, cotton, and corn. The objectives of management are controlling erosion and improve soil tilth and improve fertility. Growing crops that produce large amounts of residue or growing deep-rooted legumes help maintain tilth.

This soil is used mainly for pasture, and it has high potential for this use. It is well suited to improved bermudagrass, weeping lovegrass, and kleingrass. Proper management includes weed control, controlled grazing, and application of a complete fertilizer.

This soil has high potential for range. The climax plant community is a post oak and blackjack oak savannah and an understory of mid and tall grasses.

This soil has low potential for urban uses. Its most restrictive limitations are shrinking and swelling with changes in moisture, low strength, corrosivity to uncoated

management includes weed control, controlled grazing, and application of a complete fertilizer.

This soil has high potential for range. The climax plant community is a post oak and blackjack oak savannah and an understory of mid and tall grasses.

This soil has low potential for urban uses. Its most restrictive limitations are shrinking and swelling with changes in moisture, low strength, slow percolation, and corrosivity to uncoated steel. The potential for recreation is medium. Occasional wetness and very slow permeability are the most restrictive limitations for this use. Potential for both openland and rangeland wildlife habitat is high. Capability subclass IIIe; Sandy Loam range site.

59—Trinity clay, frequently flooded. This deep, somewhat poorly drained, nearly level soil is on flood plains of minor streams. It is flooded two or three times a year; flooding lasts from several hours to one day. These areas have plane to slightly concave slopes of 0 to 1 percent. The areas are in long, narrow bands paralleling the stream channel. Individual areas are 50 to about 500 acres in size.

The soil has a surface layer of dark gray, moderately alkaline clay about 47 inches thick. Between depths of 47 and 67 inches is gray, moderately alkaline clay. The underlying layer, to a depth of 80 inches, is olive gray, moderately alkaline clay.

This soil is used mainly for crops, and it has high potential for this use. The major crops are cotton and grain sorghum, but corn and small grain are also grown. The major objectives of management of this soil are maintaining fertility and improving tilth. Growing crops that produce large amounts of residue or growing deep-rooted legumes help to maintain tilth.

This soil has high potential for pasture. It is well suited to improved bermudagrass, common bermudagrass, johnsongrass, and kleingrass. Proper pasture management in-

This soil has low potential for urban uses, because of the danger of flooding. The potential for recreation is medium. The silty clay loam surface layer is the most restrictive limitation for this use. Potential for openland wildlife habitat is high, and potential for rangeland wildlife habitat is medium. Capability class I; Loamy Bottomland range site.

62—Weswood complex, 0 to 8 percent slopes. This map unit consists of deep, well drained, nearly level to sloping soils that are on the beveled edges and bottoms of

6 and 32 inches is dark gray, neutral clay loam. Between depths of 32 and 60 inches is gray, mildly alkaline clay loam that has brown mottles in the lower part. The underlying layer, to a depth of 80 inches, is light olive gray, moderately alkaline clay loam that has light gray and light brownish gray mottles.

The soil is difficult to work because of dense plowpan layers that form in cultivated areas. Permeability is very slow, and the available water capacity is high. The root zone is deep, but root penetration is slow and difficult in the underlying layers. Runoff is slow. The hazard of water erosion is slight.

Included with this soil in mapping are a few intermingled areas of Wilson silty clay loam and Crockett soils. The included soils make up about 10 to 20 percent of this map unit.

This soil has medium potential for production of crops, but it is limited by surface crusting and rapid loss of soil moisture during the summer. The major crops are grain sorghum, cotton, and small grain for winter grazing. The major objectives of management are controlling erosion, maintaining fertility, and improving tilth. Growing crops that produce large amounts of residue or growing deep-rooted legumes helps control erosion and maintain the soil tilth.

This soil has medium potential for pasture. It is well

ing crops that produce large amounts of residue and legumes helps maintain tilth.

This soil has medium potential for pasture. It is well suited to coastal bermudagrass, King Ranch bluestem, and weeping lovegrass. Pasture management needed includes fertilization, weed control, and controlled grazing.

This soil has medium potential for range. The climax plant community is a mixture of tall and mid grasses and an overstory of a few live oak, elm, and hackberry trees along streams and in occasional motts.

This soil has low potential for most urban uses. Its most restrictive limitation is shrinking and swelling with changes in moisture, occasional wetness, low strength, corrosivity to uncoated steel, and slow percolation. The potential for recreation is medium. Wetness and the very slow permeability are the most restrictive limitations for this use. Potential for both openland and rangeland wildlife habitat is medium. Capability subclass IIIw; Claypan Prairie range site.

66—Wilson silty clay loam, 1 to 3 percent slopes. This deep, somewhat poorly drained, gently sloping soil is on uplands and ancient stream terraces. Slopes are plane or slightly concave. Areas range from 15 to 150 acres in size.

The soil has a surface layer of very dark gray, mildly alkaline silty clay loam about [illegible] inches thick. Below the [illegible] mildly alkaline clays. The underlying layer to a [illegible]

an overstory of a few live oak, elm, and hackberry trees along streams and occasionally in motts.

This soil has low potential for most urban uses. Its most restrictive limitations are shrinking and swelling with changes in moisture, occasional wetness, low strength, corrosivity to uncoated steel, and slow percolation. The potential for recreation is medium. Occasional wetness and the very slow permeability are the most restrictive limitations for this use. Potential for both openland and rangeland wildlife habitat is medium. Capability subclass IIIe; Claypan Prairie range site.

67—Wilson silty clay loam, 2 to 5 percent slopes, eroded. This deep, somewhat poorly drained, gently sloping soil is on uplands and ancient stream terraces. Slopes are convex or plane. Areas are in long narrow bands, and the soil slopes to natural drainageways. Part of the original surface layer has been removed by water erosion, and many areas are dissected by gullies about 1 to 2 feet deep and 75 to 100 feet apart. Individual soil areas range from 20 to 175 acres in size.

This soil has a surface layer of dark grayish brown, mildly alkaline silty clay loam about 4 inches thick. Below the surface layer, to a depth of 28 inches, is dark gray, mildly alkaline clay. Between depths of 28 and 62 inches

use. Potential for both openland and rangeland wildlife habitat is medium. Capability subclass IVe; Claypan Prairie range site.

68—Yahola fine sandy loam, occasionally flooded. This deep, well drained, nearly level soil is on flood plains of the Brazos River. It is flooded only once every 4 to 10 years; flooding lasts for several hours. Slopes are 0 to 1 percent and plane. Areas are long, narrow bands paralleling the river. Some areas are smooth, and others are channeled by shallow drainageways. These areas range from 10 to 110 acres in size.

This soil has a surface layer of reddish brown, moderately alkaline fine sandy loam about 10 inches thick. Below the surface layer, to a depth of 37 inches, is reddish yellow, moderately alkaline fine sandy loam. Between depths of 37 and 58 inches is reddish brown, moderately alkaline loam. The underlying layer, to a depth of 80 inches, is yellowish red, moderately alkaline fine sandy loam and thin strata of loamy fine sand and clay loam.

This soil is easily worked, although crusts form on the surface. Permeability is moderately rapid, and the available water capacity is medium. The root zone is deep and easily penetrated by roots. Runoff is slow. The hazard of water erosion is slight.

Included with this soil in mapping are small areas of Weswood and Gaddy soils. The Weswood soils are at higher elevations on the flood plain, and the Gaddy soils are parallel to the stream channel. The included soils make up 10 percent of this map unit.

This soil is used mainly for crops, and it has high potential for this use. The major crops are cotton and grain sorghum, but corn and small grain are also grown. The major objectives of management are maintaining fertility and improving tilth. Growing crops that produce large amounts of residue or growing legumes helps to maintain

environment. Also, it can help avoid soil-related failures in uses of the land.

While a soil survey is in progress, soil scientists, conservationists, engineers, and others keep extensive notes about the nature of the soils and about unique aspects of behavior of the soils. These notes include data on erosion, drought damage to specific crops, yield estimates, flooding, the functioning of septic tank disposal systems, and other factors affecting the productivity, potential, and limitations of the soils under various uses and management. In this way, field experience and measured data on soil properties and performance are used as a basis for predicting soil behavior.

Information in this section is useful in planning use and management of soils for crops and pasture; rangeland; as sites for buildings, highways and other transportation systems, sanitary facilities, and parks and other recreation facilities; and for wildlife habitat. From the data presented, the potential of each soil for specified land uses can be determined, soil limitations to these land uses can be identified, and costly failures in houses and other structures, caused by unfavorable soil properties, can be avoided. A site where soil properties are favorable can be selected, or practices that will overcome the soil limitations can be planned.

Planners and others using the soil survey can evaluate the impact of specific land uses on the overall productivity of the survey area or other broad planning area and on the environment. Productivity and the environment are closely related to the nature of the soil. Plans should maintain or create a land-use pattern in harmony with the natural soil.

Contractors can find information that is useful in locating sources of sand and gravel, roadfill, and topsoil. Other information indicates the presence of bedrock, wetness, or

conservationists, and others. For each kind of soil, information about management is presented in the section "Soil maps for detailed planning." Planners of management systems for individual fields or farms should also consider the detailed information given in the description of each soil.

More than 435,342 acres in the survey area was used for crops, pasture, and range in 1967, according to the Conservation Needs Inventory, Texas, 1970 (*5*). Of this total 112,957 acres was used for permanent pasture; 26,001 acres for range; 143,014 acres for row crops, mainly cotton and grain sorghum; 89,382 acres for close-grown crops, mainly wheat and oats; and the rest was idle cropland.

The potential of the soils in Falls County for increased production of food is good. About 96,000 acres of potentially good cropland is currently used as pasture, about 15,000 acres as range, and 13,000 acres as noncommercial forest. In addition to the reserve productive capacity represented by this land, food production could also be in-

The results of effective erosion control practices are a protective surface cover, a reduced amount of runoff, and an increased rate of infiltration. A cropping system that keeps vegetative cover on the soil for extended periods holds soil losses to amounts that maintain the productive capacity. On livestock farms, which require pasture and hay, forage crops of legumes and grasses in the cropping system reduce the amount of erosion on sloping land, provide nitrogen, and improve tilth for the following crop.

Slopes are so short and irregular that contour tillage or terracing is not practical in most areas of the strongly sloping Altoga and Ferris-Heiden soils. On these soils, cropping systems that provide substantial vegetative cover are required to control erosion, unless minimum tillage is practiced. Minimum tillage practices and leaving crop residue on the surface help to increase infiltration and reduce the hazards of runoff and erosion. These practices can be adapted to most soils in the survey area, but are more difficult to use successfully on the eroded soils and on soils that have a clayey surface layer.

alkaline soils on uplands, such as Branyon, Heiden, Houston Black, Lewisville, and Lott soils are also high in natural fertility. Altoga, Austin, Burleson, Ferris, and Wilson soils are mildly alkaline to moderately alkaline on uplands. Their natural fertility is low to medium. The slightly acid Chazos, Desan, Normangee, Silawa, and Silstid soils and the medium acid to strongly acid Axtell, Bastrop, Crockett, Padina, and Tabor soils are low in natural fertility.

The mildly alkaline to moderately alkaline soils of the county require applications of a complete fertilizer. The slightly acid to strongly acid soils need a split application of a complete fertilizer to keep soil moisture and fertility in balance and prevent loss of nutrients by leaching. On all soils, additions of fertilizer should be based on the results of soil tests, on the need of the crop, and on the expected level of yields. The Cooperative Extension Service can help in determining the kind and amount of fertilizer to apply.

Soil tilth is an important factor in germination of seeds and in infiltration of water into the soil. Soils that have good tilth are granular and porous.

Most soils used for crops in the survey area have a dark clay or silty clay surface layer and have a medium to high content of organic matter. Generally such soils have moderate structure. They are difficult to work because they are sticky when wet and extremely hard when dry. Good seedbeds are difficult to prepare. If plowed when wet, these soils then tend to be very cloddy when dry. Dense plovpans gorm in cultivatdd soils and impede the downward movement of plant roots. Fall plowing generally provides good tilth for spring use.

Fall plowing is generally not a good practice on the light-colored soils that have a silt loam, silty clay loam, clay loam, or fine sandy loam surface layer. A crust forms on these soils during winter and spring. The crust is hard when dry, and it is nearly impervious to water. Once formed, the crust reduces the rate of infiltration and increases the amount of runoff. Regular additions of crop residue, manure, and other organic material help reduce crust formation and improve soil structure.

Field crops suited to the soils and climate of the survey area include cotton, grain sorghum, and corn.

Wheat and oats are the common close-growing crops. Alfalfa is also grown to a lesser extent. Grass seed can be produced from kleingrass, weeping lovegrass, or King Ranch bluestem.

Special crops are grown commercially along both sides of the Brazos River. These crops include melons, tomatoes, and other vegetables. The soils in these areas can be adapted to other special crops, such as strawberries, blackberries, peaches, pecans, and many other vegetables (fig. 11).

The deep, loamy soils that have slopes of less than 6 percent have good natural drainage, and they warm up early in spring. They are especially well suited to many vegetables and small fruits. In the survey area these soils are the Silawa, Silstid, Chazos, Padina, Axtell, and Tabor. Their total acreage is about 27,000 acres. Crops generally can be planted and harvested earlier on all these soils than on the other soils in the survey area. Soils at low elevations, where frost is frequent and air drainage is poor, however, generally are poorly suited to early vegetables, small fruits, and orchards.

Latest information and suggestions for growing special crops can be obtained from local offices of the Cooperative Extension Service and the Soil Conservation Service.

Yields per acre

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 4. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors. Absence of an estimated yield indicates that the crop is not suited to or not commonly grown on the soil.

The estimated yields were based mainly on the experience and records of farmers, conservationists, and extension agents. Results of field trials and demonstrations and available yield data from nearby counties were also considered.

The yields were estimated assuming that the latest soil and crop management practices were used. A few farmers may be obtaining average yields higher than those shown in table 4.

The management needed to achieve the indicated yields of the various crops depends on the kind of soil and the crop. Such management provides drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate tillage practices, including time of tillage and seedbed preparation and tilling when soil moisture is favorable; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residue, barnyard manure, and green-manure crops; harvesting crops with the smallest possible loss; and timeliness of all fieldwork.

The estimated yields reflect the productive capacity of the soils for each of the principal crops. Yields are likely to increase as new production technology is developed. The productivity of a given soil compared with that of other soils, however, is not likely to change.

Crops other than those shown in table 4 are grown in the survey area, but estimated yields are not included because the acreage of these crops is small. The local offices of the Soil Conservation Service and the Cooperative Extension Service can provide information about the management concerns and productivity of the soils for these crops.

Capability classes and subclasses

Capability classes and subclasses show, in a general way, the suitability of soils for most kinds of field crops.

The soils are classed according to their limitations when they are used for field crops, the risk of damage when they are used, and the way they respond to treatment. The grouping does not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils; does not take into consideration possible but unlikely major reclamation projects; and does not apply to horticultural crops or other crops that require special management. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for rangeland or for engineering purposes.

In the capability system, all kinds of soil are grouped at three levels: capability class, subclass, and unit. These levels are defined in the following paragraphs. A survey area may not have soils of all classes.

Capability classes, the broadest groups, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class I soils have few limitations that restrict their use.

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class III soils have severe limitations that reduce the choice of plants, or that require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants, or that require very careful management, or both.

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use.

Class VI soils have severe limitations that make them generally unsuitable for cultivation.

Class VII soils have very severe limitations that make them unsuitable for cultivation.

Class VIII soils and landforms have limitations that nearly preclude their use for commercial crop production.

Capability subclasses are soil groups within one class; they are designated by adding a small letter, *e*, *w*, *s*, or *c*, to the class numeral, for example IIe. The letter *e* shows

included. Some of the soils that are well suited to crops and pasture may be in low-intensity use, for example, soils in capability classes I and II. Data in this table can be used to determine the farming potential of such soils.

The capability subclass is identified in the description of each soil map unit in the section "Soil maps for detailed planning."

Rangeland

HERBERT H. SENNE, JR., range conservationist, Soil Conservation Service, helped write this section.

About 5 percent of Falls County can be classified as rangeland, based on the kinds and diversification of plants. Few ranchers depend exclusively on rangeland to feed livestock. Range vegetation often contributes significant amounts of forage during winter months, but it is supplemented by protein concentrate and small grain.

Native vegetation in most of the county is found only in small blocks of less than 100 acres. These blocks of rangeland, for the most part, have been greatly depleted in forage productivity because of improper grazing management and invasion of woody or weedy vegetation which further reduces range forage yields. The amount of forage produced on these lands is generally less than half of that originally produced.

Production of vegetation can be increased by using management practices that are effective for specific kinds of soils and range sites.

Where climate and topography are about the same, differences in the kind and amount of vegetation that rangeland can produce are related closely to the kind of soil. Effective management is based on the relationships among soils, vegetation, and water.

Table 6 shows, for each kind of soil, the name of the range site; the total annual production of vegetation in favorable, normal, and unfavorable years; the characteristic vegetation; and the expected percentage of each species in the composition of the potential natural plant community. Soils not listed cannot support a natural plant community that is predominantly grasses, grasslike

community. It is expressed in pounds per acre of air-dry vegetation for favorable, normal, and unfavorable years. In a favorable year the amount and distribution of precipitation and the temperatures are such that growing conditions are substantially better than average; in a normal year these conditions are about average for the area; in an unfavorable year, growing conditions are well below average, generally because of low available soil moisture.

Dry weight refers to the total air-dry vegetation produced per acre each year by the potential natural plant community. Vegetation that is highly palatable to livestock and vegetation that is unpalatable are included. Some of the vegetation can also be grazed extensively by wildlife.

Common plant names of grasses, grasslike plants, forbs, and shrubs that make up most of the potential natural plant community on each soil are listed. Under *Composition*, the expected proportion of each species is presented as the percentage, in air-dry weight, of the total annual production of herbaceous and woody plants. The amount that can be used as forage depends on the kinds of grazing animals and on the grazing season. Generally all of the vegetation produced is not used.

Some decisions for the planning and application of range management practices require, in addition to knowledge of the kinds of soil and the potential natural plant community, an evaluation of the present condition of the range vegetation in relation to its potential. Range condition is determined by comparing the present plant community with the potential natural plant community on a particular range site. The more closely the existing community resembles the potential community, the better the range condition. The objective in range management is to control grazing so that the plants growing on a site are about the same in kind and amount as the potential natural plant community for that site. Such management generally results in the maximum production of vegetation, conservation of water, and control of erosion. Sometimes, however, a range condition somewhat below the potential meets grazing needs, provides wildlife habitat, and protects soil and water resources.

The western part of Falls County is dominantly clayey soils. These soils have potential to support tall grasses and a climax plant community that is dominantly tall grass prairie. Interspersed areas of trees occur frequently

ing the productivity of range in the area is good if sound range management practices are used, information available in the soil survey is applied, and knowledge procured from rangeland inventories is used.

Engineering

HUGH A. SMITH, engineer, Soil Conservation Service, assisted in writing this section.

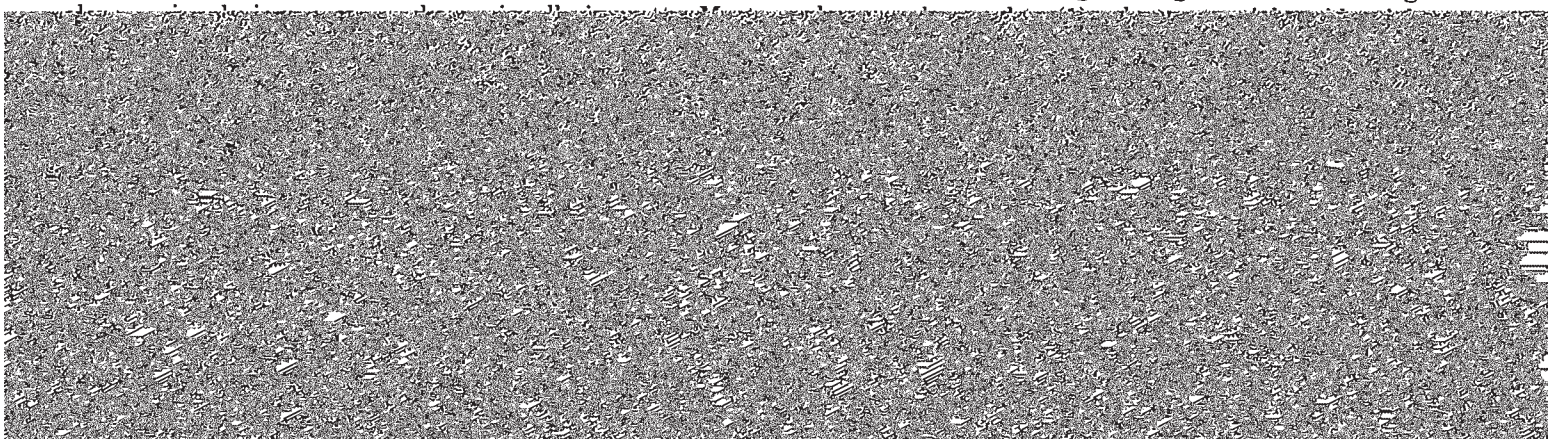
This section provides information about the use of soils for building sites, sanitary facilities, construction material, and water management. Among those who can benefit from this information are engineers, landowners, community planners, town and city managers, land developers, builders, contractors, and farmers and ranchers.

The ratings in the engineering tables are based on test data and estimated data in the "Soil properties" section. The ratings were determined jointly by soil scientists and engineers of the Soil Conservation Service using known relationships between the soil properties and the behavior of soils in various engineering uses.

Among the soil properties and site conditions identified by a soil survey and used in determining the ratings in this section were grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock that is within 5 or 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure or aggregation, in-place soil density, and geologic origin of the soil material. Where pertinent, data about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kind of absorbed cations were also considered.

On the basis of information assembled about soil properties, ranges of values can be estimated for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, shear strength, compressibility, slope stability, and other factors of expected soil behavior in engineering uses. As appropriate, these values can be applied to each major horizon of each soil or to the entire profile.

These factors of soil behavior affect construction and maintenance of roads, airport runways, pipelines, foundations for small buildings, ponds and small dams, irrigation projects, drainage systems, sewage and refuse disposal systems, and other engineering works. The ranges of



which they are built so that performance of similar structures In the soil series descriptions, the consistence of each

limitations are minor and easily overcome; if *moderate*, soil properties or site features are unfavorable for the specified use, but limitations can be overcome by special planning and design; and if *severe*, soil properties or site features are so unfavorable or difficult to overcome that major soil reclamation, special designs, or intensive maintenance is required. Soil suitability is rated by the terms *good*, *fair*, or *poor*, which, respectively, mean about the same as the terms *slight*, *moderate*, and *severe*.

Septic tank absorption fields are subsurface systems of [illegible] soil material. Landfill areas are subject to heavy vehicular traffic. Risk of polluting ground water and trafficability affect the suitability of a soil for this use. The best soils have a loamy or silty texture, have moderate to slow permeability, are deep to a seasonal water table, and are not subject to flooding. Clayey soils are likely to be sticky and difficult to spread. Sandy or gravelly soils generally have rapid permeability, which might allow noxious liquids to contaminate ground water. Soil wetness can be a limitation, because operating heavy equipment on a wet [illegible]

performance of soil after it is stabilized with lime or cement is not considered in the ratings, but information about some of the soil properties that influence such performance is given in the descriptions of the soil series.

The ratings apply to the soil material between the A horizon and a depth of 5 to 6 feet. It is assumed that soil

Soils rated *poor* are very sandy soils and very firm clayey soils; soils with suitable layers less than 8 inches thick; soils having large amounts of gravel, stones, or soluble salt; steep soils; and poorly drained soils.

Although a rating of *good* is not based entirely on high content of organic matter, a surface horizon is generally

ty of a soil for terraces are uniformity and steepness of slope; depth to bedrock, hardpan, or other unfavorable material; large stones; permeability; ease of establishing vegetation; and resistance to water erosion, soil blowing, soil slipping, and piping.

Grassed waterways are constructed to channel runoff to outlets at a nonerosive velocity. Features that affect the use of soils for waterways are slope, permeability, erodibility, wetness, and suitability for permanent vegetation.

Recreation

The soils of the survey area are rated in table 11 ac-

during the period of use, and do not have slopes or stones or boulders that will increase the cost of shaping sites or of building access roads and parking areas.

Playgrounds require soils that can withstand intensive foot traffic. The best soils are almost level and are not wet or subject to flooding during the season of use. The surface is free of stones or boulders, is firm after rains, and is not dusty when dry. If shaping is required to obtain a uniform grade, the depth of the soil over bedrock or hardpan should be enough to allow necessary grading.

Paths and trails for walking, horseback riding, bicycling, and other uses should require little or no cutting and filling. The best soils for this use are those

The potential of the soil is rated good, fair, poor, or very poor. A rating of *good* means that the element of wildlife habitat or the kind of habitat is easily created, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected if the soil is used for the designated purpose. A rating of *fair* means that the element of wildlife habitat or kind of habitat can be created, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of *poor* means that limitations are severe for the designated element or kind of wildlife habitat. Habitat can be created, improved, or maintained in most places, but management is difficult and must be intensive. A rating of *very poor* means that restrictions for the element of wildlife habitat or kind of wildlife are very severe, and that unsatisfactory results can be expected. Wildlife habitat is impractical or even impossible to create, improve, or maintain on soils having such a rating.

The elements of wildlife habitat are briefly described in

of submerged or floating aquatics. They produce food or cover for wildlife that use wetland as habitat. Major soil properties affecting wetland plants are texture of the surface layer, wetness, reaction, slope, and surface stoniness. Examples of wetland plants are smartweed, wild millet, wild rice, button willow, reedgrass, and indigobush, and rushes, sedges, and reeds.

Shallow water areas are bodies of water that have an average depth of less than 5 feet and that are useful to wildlife. They can be naturally wet areas, or they can be created by dams or levees or by water-control structures in marshes or streams. Major soil properties affecting shallow water areas are depth to bedrock, wetness, surface stoniness, slope, and permeability. The availability of a dependable water supply is important if water areas are to be developed. Examples of shallow water areas are waterfowl feeding areas and ponds.

The kinds of wildlife habitat are briefly described in the following paragraphs.

Openland habitat consists of cropland, pasture,

(calcareous) soils. Some of these flowers are shasta daisies, hollyhocks, petunias, zinnias, and gladioli. Some of the shrubs and trees are crapemyrtle, duranta, elm, and live oak.

Table 13 lists some of the flowers, shrubs, and trees suitable for the soils in Falls County.

Some of the plants are native to Falls County. For lists

Engineering properties and classifications

Table 14 gives estimates of engineering properties and classifications for the major horizons of each soil in the survey area.

Most soils have, within the upper 5 or 6 feet, horizons of contrasting properties. Table 14 gives information for each of these contrasting horizons in a typical profile.

bers in parentheses, is given in table 17. The estimated classification, without group index numbers, is given in table 14. Also in table 14 the percentage, by weight, of rock fragments more than 3 inches in diameter is estimated for each major horizon. These estimates are determined mainly by observing volume percentage in the field and then converting that, by formula, to weight percentage.

Percentage of the soil material less than 3 inches in diameter that passes each of four sieves (U.S. standard) is estimated for each major horizon. The estimates are based on tests of soils that were sampled in the survey area and in nearby areas and on field estimates from many borings made during the survey.

Liquid limit and *plasticity index* indicate the effect of water on the strength and consistence of soil. These indexes are used in both the Unified and AASHTO soil classification systems. They are also used as indicators in making general predictions of soil behavior. Ranges in

Soil reaction is expressed as a range in pH values. The range in pH of each major horizon is based on many field checks. For many soils, the values have been verified by laboratory analyses. Soil reaction is important in selecting the crops, ornamental plants, or other plants to be grown; in evaluating soil amendments for fertility and stabilization; and in evaluating the corrosivity of soils.

Shrink-swell potential depends mainly on the amount and kind of clay in the soil. Laboratory measurements of the swelling of undisturbed clods were made for many soils. For others the swelling was estimated on the basis of the kind and amount of clay in the soil and on measurements of similar soils. The size of the load and the magnitude of the change in soil moisture content also influence the swelling of soils. Shrinking and swelling of some soils can cause damage to building foundations, basement walls, roads, and other structures unless special designs are used. A high shrink-swell potential indicates that special design and added expense may be required if

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist chiefly of deep, well drained to excessively drained sands or gravels. These soils have a high rate of water transmis-

Information about the seasonal high water table helps in assessing the need for specially designed foundations, the need for specific kinds of drainage systems, and the need for footing drains to insure dry basements. Such information is also needed to decide whether or not ser-

Classification of the soils

The soil series of the survey area are described in this section, the current system of classifying soils is defined, and the soils of the area are classified according to that system (table 18).

Soil series and morphology

In this section, each soil series recognized in the survey area is described in detail. The descriptions are arranged in alphabetic order by series name.

Typical pedon of Altoga silty clay in an area of Altoga soils, 5 to 12 percent slopes, eroded; from the intersection of Farm Road 1239 and Interstate Highway 35 in Eddy, 3.6 miles southeast on Farm Road 1239, northeast 1.2 miles, southeast 0.4 mile on a county road, and 1,200 feet east of road in a cultivated field:

A1—0 to 5 inches; pale brown (10YR 6/3) silty clay, brown (10YR 5/3) moist; weak fine subangular blocky structure and granular structure; hard, firm; common very fine to fine roots; common fine pores; calcareous; moderately alkaline; gradual smooth boundary.

B2—5 to 25 inches; very pale brown (10YR 7/3) silty clay, pale brown (10YR 6/3) moist; ped exteriors slightly darker before being

C—29 to 35 inches; white (10YR 8/1) platy chalky limestone that has a hardness of less than 3 on the Moh's scale; few thin tongues of brown silty clay in crevices between plates.

The solum ranges from 20 to 40 inches to chalky limestone. The A horizon is dark grayish brown or brown. The B horizon is brown, pale brown, very pale brown, or light yellowish brown silty clay or silty clay loam. The C horizon is platy chalky limestone or interbedded chalk and marl.

Axtell series

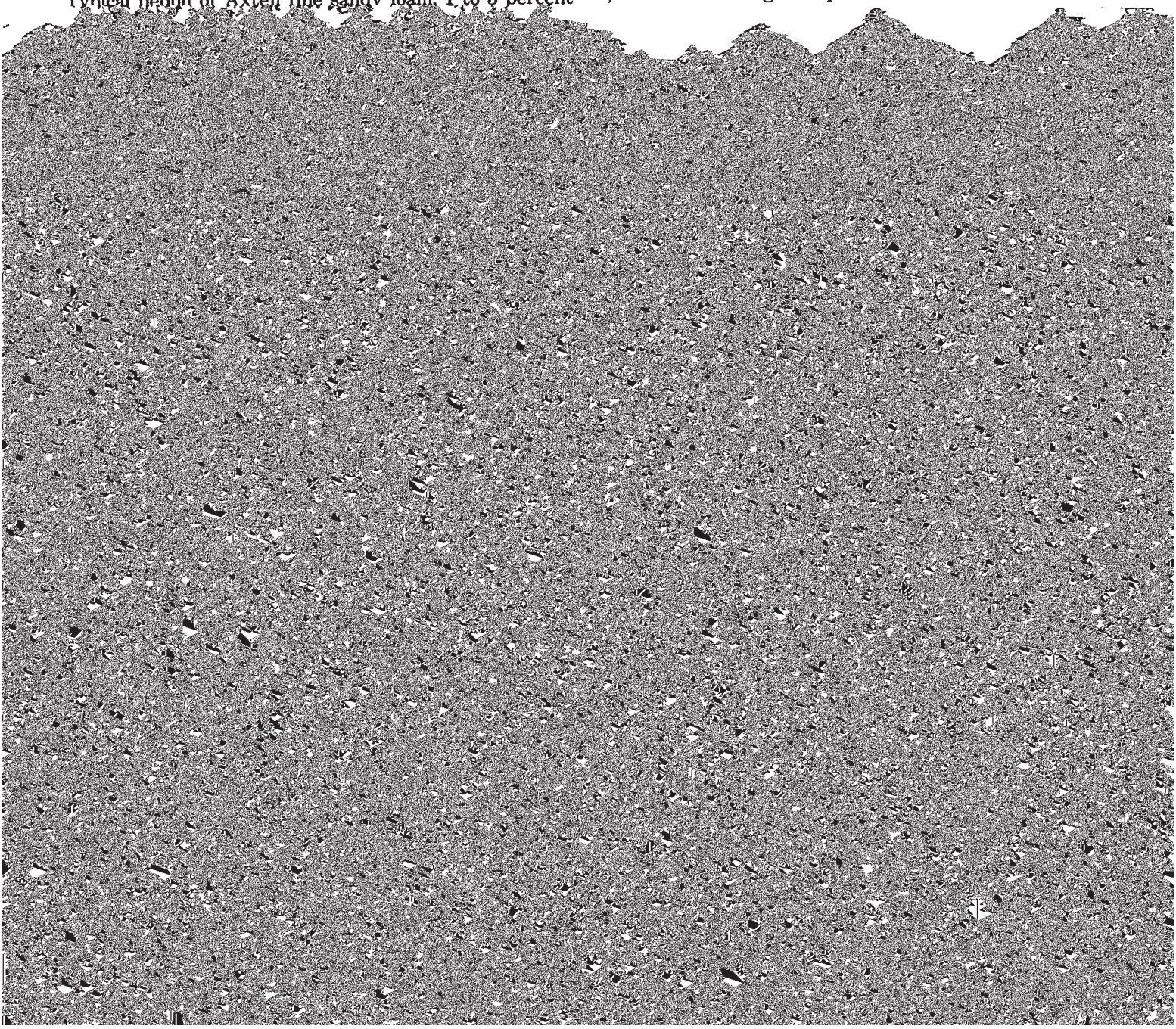
The Axtell series consists of dark brown soils that formed in alkaline clayey and loamy sediment. Axtell soils are on broad ridgetops of uplands and on old stream terraces. Slopes range from 0 to 8 percent.

Typical pedon of Axtell fine sandy loam, 1 to 3 percent loam. The C horizon is strong brown, reddish yellow, light yellowish brown, brownish yellow, very pale brown, or yellow sandy clay loam or clay loam. It has various sizes and amounts of reddish, brownish, yellowish, or grayish mottles. The B3 and C horizons are mildly alkaline or moderately alkaline.

Bastrop series

The Bastrop series consists of brown soils that formed in beds of loamy sediment on low terraces above flood plains. Slopes are 0 to 1 percent.

Typical pedon of Bastrop fine sandy loam; from the intersection of Texas Highway 6 and Farm Road 1240 in Perry, about 1.8 miles north on Texas Highway 6, 4.3 miles southwest and 0.8 mile north on county road, and 1,000 feet west in gravel pit:



soils are considered moderately deep variants of the Blum series. Interpretations are based on moderately deep soil.

Typical pedon of Blum Variant fine sandy loam, 1 to 3 percent slopes; from the intersection of Texas Highway 6 and Farm Road 413 in Reagan, 6.2 miles northeast on Farm Road 413, 0.8 mile north on Farm Road 1771, north on county road until it runs into a private road, then 0.3 mile on the private road, and 50 feet north in pasture:

A11—0 to 11 inches; dark brown (10YR 4/3) fine sandy loam, dark brown (10YR 3/3) moist; weak fine granular structure; slightly hard, friable; common fine roots; common fine pores; few worm casts; neutral; clear smooth boundary.

A12—11 to 15 inches; brown (10YR 5/3) fine sandy loam, dark brown (10YR 4/3) moist; weak fine granular structure; slightly hard, friable; common fine roots; common fine pores; few worm casts; neutral; abrupt wavy boundary.

B21t—15 to 20 inches; mottled grayish brown (10YR 5/2), yellowish red (5YR 5/6), and brownish yellow (10YR 6/8) sandy clay loam; weak fine and medium subangular blocky structure; very hard, firm; few fine roots; few fine pores; few black concretions; neutral; gradual smooth boundary.

B22t—20 to 32 inches; mottled grayish brown (10YR 5/2), brownish yellow (10YR 6/8), and yellowish red (5YR 5/8) clay; moderate medium blocky structure; extremely hard, very firm; few fine roots; few medium black concretions; few clay films on ped faces; slightly acid;

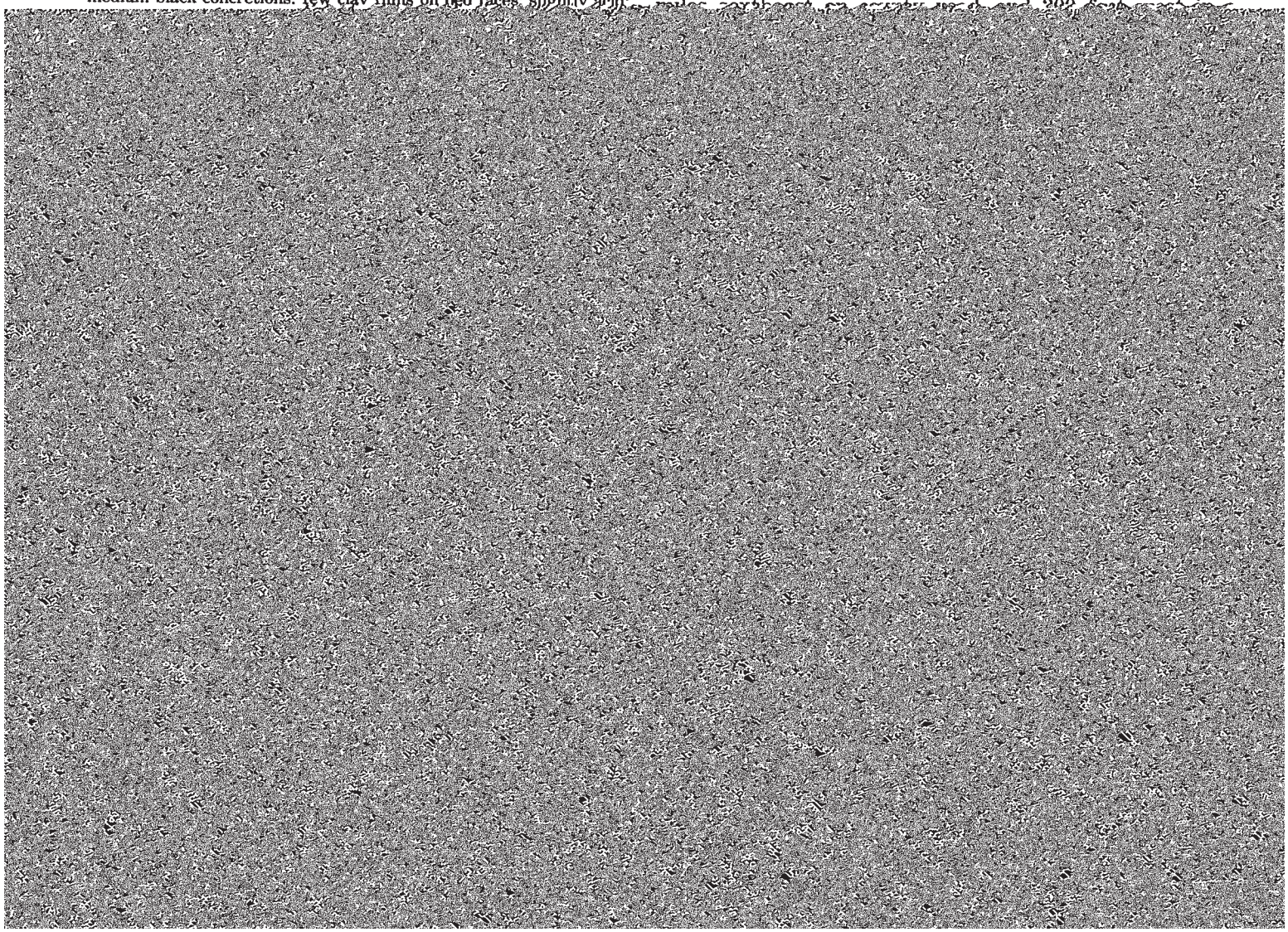
AC—66 to 80 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; common fine faint brown mottles; moderate medium angular blocky structure; very hard, very firm, sticky and plastic; few concretions of calcium carbonate; few fine black concretions; few streaks of gray from above horizons; calcareous; moderately alkaline.

The solum ranges from 80 to more than 100 inches in thickness. The Ap and A11 horizons are dark gray or very dark gray. The A12 horizon is dark gray or gray. The AC horizon is gray, grayish brown, light brownish gray, light gray, pale brown, or light yellowish brown, and contains few to common, fine to medium, faint to distinct, brownish, yellowish, or olive mottles. Some pedons have a yellow silty clay IIC horizon below a depth of 80 inches.

Bunyan series

The Bunyan series consists of brown soils that formed in stratified alluvial sediments of mixed origin on the flood plains of small streams. The slopes range from 0 to 1 percent.

Typical pedon of Bunyan fine sandy loam, frequently flooded; from the intersection of Texas Highway 6 and Farm Road 413 in Reagan, 7.5 miles northeast on Farm Road 413, 0.75 mile southeast, 0.75 mile northeast, 1.25



A11—5 to 19 inches; very dark gray (10YR 3/1) clay, black (10YR 2/1) moist; weak medium angular blocky structure; extremely hard, very firm; shiny pressure faces on peds; mildly alkaline; diffuse wavy boundary.

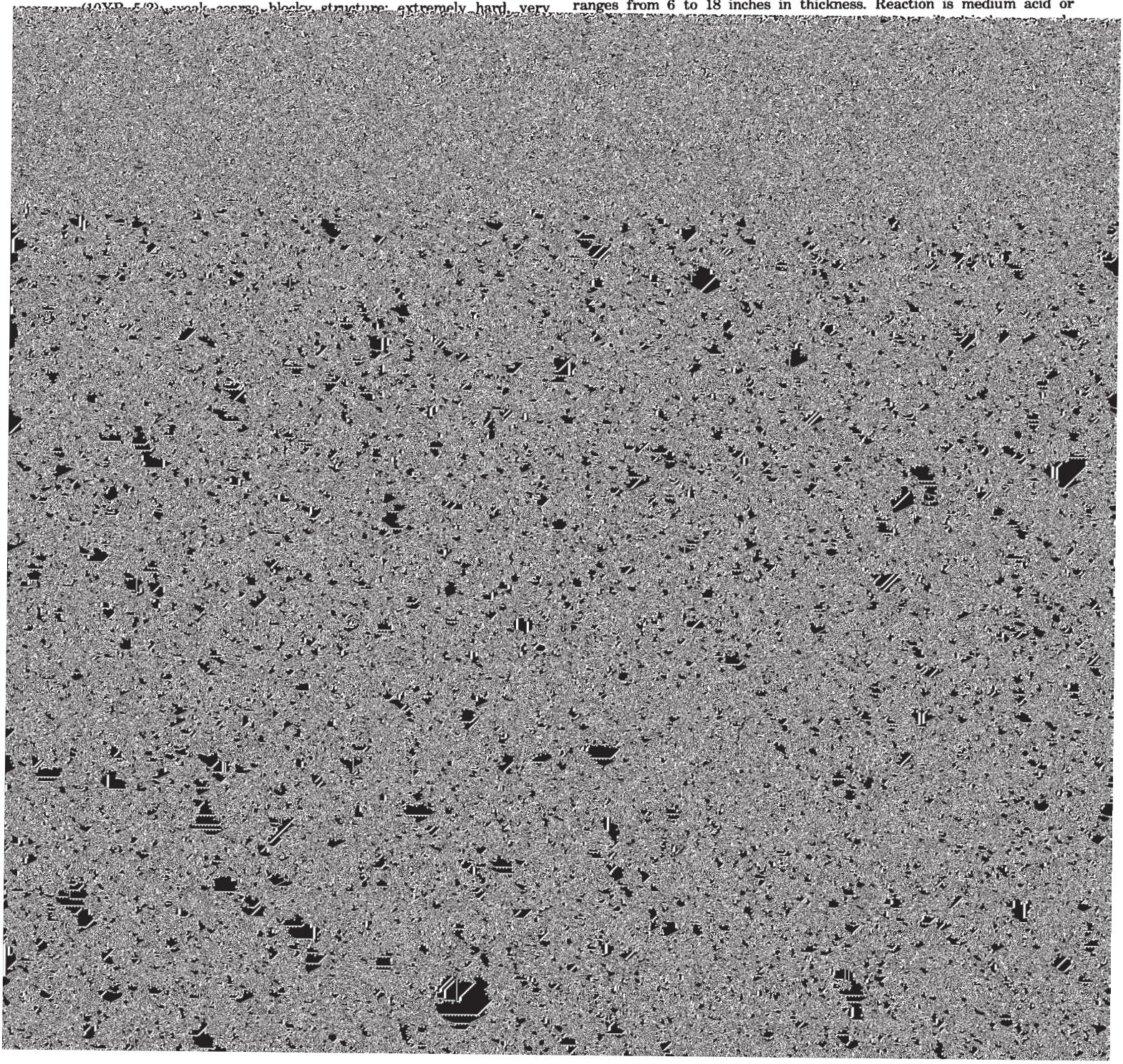
A12—19 to 37 inches; dark gray (10YR 4/1) clay, very dark gray (10YR 3/1) moist; moderate medium blocky structure; extremely hard, very firm; shiny pressure faces on peds; intersecting slickensides border parallelepipeds that have long axes tilted about 45 degrees from the horizontal; few very fine calcium carbonate concretions; few fine black concretions; mildly alkaline; diffuse wavy boundary.

AC1—37 to 47 inches; dark gray (10YR 4/1) clay, very dark gray (10YR 3/1) moist; few fine and medium faint mottles of grayish brown (10YR 5/2); weak coarse blocky structure; extremely hard, very

Clca—41 to 62 inches; brownish yellow (10YR 6/6) sandy clay, yellowish brown (10YR 5/6) moist; many coarse distinct brown (10YR 3/3), common fine prominent yellowish red, and few fine faint light brownish gray mottles; massive; very hard, firm; few fine concretions of calcium carbonate; many fine brown concretions; calcareous; moderately alkaline; gradual smooth boundary.

C2—62 to 70 inches; pale brown (10YR 6/3) sandy clay, brown (10YR 5/3) moist; many coarse prominent reddish yellow (7.5YR 6/8) mottles; 10 percent bedding planes of shaly clay; massive; very hard, firm; calcareous; moderately alkaline.

The solum ranges from 39 to 50 inches in thickness. The A horizon ranges from 6 to 18 inches in thickness. Reaction is medium acid or



C2—73 to 80 inches; mottled yellow (10YR 7/8), light gray (10YR 7/2), and brownish yellow (10YR 6/8) sandy clay loam; very hard, firm; calcareous; moderately alkaline.

The solum ranges from 40 to 65 inches thick. Soft powdery forms of calcium carbonate begin at a depth of 30 to 60 inches. The A horizon ranges from 4 to 11 inches in thickness. It is light brown, dark grayish brown, brown, light brownish gray, or light yellowish brown. Reaction is

Ap—0 to 5 inches; brown (10YR 5/3) gravelly clay loam, dark brown (10YR 4/3) moist; moderate very fine and fine granular structure; hard, firm; many fine roots; common fine pores; about 35 percent by volume of platy fragments of chalk, mostly 0.1 to 3 inches across; calcareous; moderately alkaline; abrupt irregular boundary.

A1—5 to 9 inches; brown (10YR 5/3) very gravelly clay loam, dark brown (10YR 4/3) moist; strong fine granular structure; 60 percent chalk fragments in the upper part of the horizon, chalk fragments

Gaddy series

The Gaddy series consists of light brown soils that formed in stratified, calcareous, loamy alluvial sediment. Gaddy soils are on low bottom lands that extend to the edge of the river. Slopes range from 0 to 1 percent.

Typical pedon of Gaddy loamy fine sand in an area of Gaddy soils, frequently flooded; from the intersection of

Typical pedon of Heiden clay, 1 to 3 percent slopes; from the intersection of U. S. Highway 77 and Texas Highway 53 in Rosebud, about 3.0 miles west on Texas Highway 53, 0.7 mile southeast on Farm Road 1963, 1.5 miles west on Farm Road 1671, 1.2 miles south on county road, and 620 feet west in cultivated field:

A3—0 to 6 inches; dark grayish brown (10YR 4/2) clay, very dark gray-

Ab—24 to 48 inches; reddish brown (5YR 4/4) clay, dark reddish brown (5YR 3/4) moist; moderate medium blocky structure; very hard, very firm, very sticky and plastic; few fine roots; shiny ped faces; calcareous; moderately alkaline; gradual smooth boundary.

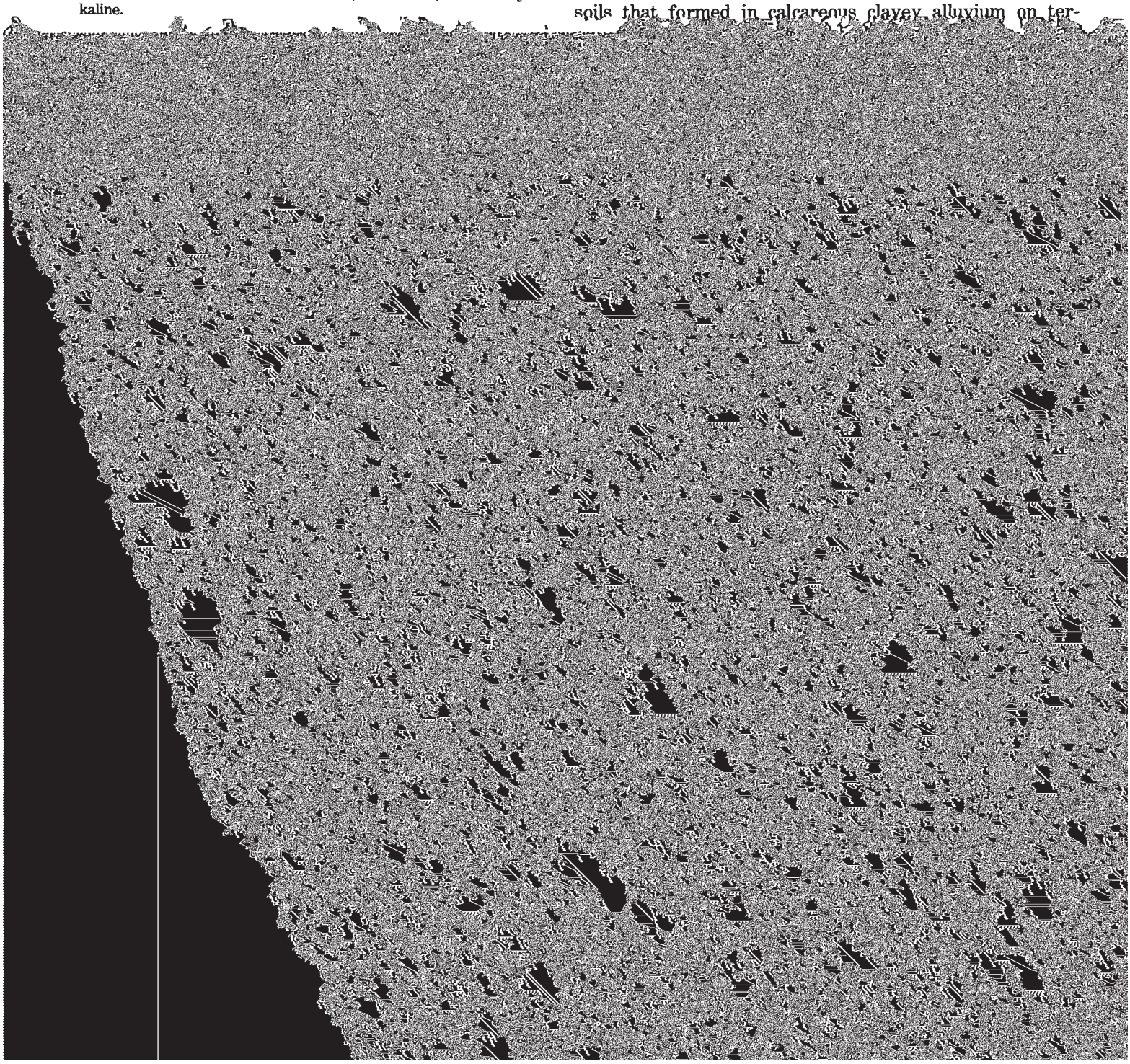
B21b—48 to 56 inches; reddish brown (5YR 4/3) clay, dark reddish brown (5YR 3/3) moist; weak medium blocky structure; very hard, very firm, very sticky and plastic; few fine slickensides; shiny ped faces; calcareous; moderately alkaline; gradual smooth boundary.

B22b—56 to 62 inches; reddish brown (5YR 4/3) clay, dark reddish brown (5YR 3/3) moist; weak medium blocky structure; very hard, very firm, very sticky and plastic; shiny ped faces; few strongly cemented calcium carbonate concretions; calcareous; moderately alkaline.

of 16 to 24 inches. The AC1 horizon is grayish brown, dark grayish brown, light brownish gray, or olive gray. Some pedons have few to common fine mottles of brown, grayish brown, brownish yellow, and yellow. The AC2 horizon is light brownish gray, pale brown, brownish yellow, yellow, light gray, very pale brown, grayish brown, light olive brown, olive yellow, pale olive, olive gray, or olive. Most pedons are mottled with one or more of these colors. Some pedons have a C horizon of marly clay or shaly clay at a depth of 61 to 85 inches.

Lewisville series

The Lewisville series consists of dark grayish brown soils that formed in calcareous clayey alluvium on ter-



granular structure; slightly hard, friable; common fine roots; few fine pores; few snail shell fragments; few fine rounded siliceous pebbles; calcareous; moderately alkaline; clear smooth boundary.

A1—5 to 15 inches; dark grayish brown (10YR 4/2) silty clay, very dark grayish brown (10YR 3/2) moist; moderate fine subangular blocky structure and granular structure; hard, firm; common fine roots; calcium carbonate equivalent is 54 percent; few fine and medium fragments of chalk; few snail shell fragments; few fine siliceous pebbles; calcareous; moderately alkaline; clear smooth boundary.

B21—15 to 30 inches; brown (10YR 5/3) silty clay, dark brown (10YR 4/3) moist; moderate fine subangular blocky structure; hard, firm; few fine roots; calcium carbonate equivalent is 60 percent; few fine and medium fragments of chalk; few snail shell fragments; few worm casts; calcareous; moderately alkaline; clear smooth boundary.

B22ca—30 to 47 inches; pale brown (10YR 6/3) silty clay, brown (10YR 5/3) moist; few fine faint very pale brown mottles; weak fine subangular blocky structure; hard, firm; common worm casts; calcium carbonate equivalent is 66 percent; common fine and medium fragments of chalk and soft bodies of calcium carbonate; calcareous; moderately alkaline; clear smooth boundary.

C—47 to 80 inches; mottled light gray (10YR 7/2), yellow (10YR 8/6), and white (10YR 8/1) chalky marl; massive to blocky structure and weak conchoidal fractures; very hard and brittle, very firm; many soft calcium carbonate bodies and few fine fragments of chalk in the upper part; calcareous; moderately alkaline.

The solum ranges from 40 to 60 inches in thickness. Beginning at a depth of 10 inches, the calcium carbonate equivalent ranges from 50 to 65 percent. This soil is silty clay, silty clay loam, or clay loam. Clay content ranges from 35 to 50 percent. Of this, 25 to 35 percent is silicate clay. In some areas a few waterworn pebbles are on the surface and within the solum. The A horizon is dark grayish brown or very dark grayish brown. The B21 horizon is pale brown, brown, grayish brown, or pale yellow. The B22ca horizon is brown, pale brown, very pale brown, light yellowish brown, or pale yellow. The C horizon is yellow, light gray, very pale brown, or white marly clay, chalky marl, or clayey marl.

Normangee series

The Normangee series consists of brown soils that formed in alkaline marine sediment, clay, sandy clay, and material weathered from shale. Normangee soils are on broad uplands, narrow ridgetops, and sloping sides of drainageways. Slopes range from 0 to 5 percent.

Typical pedon of Normangee clay loam, 1 to 3 percent slopes; from the intersection of U. S. Highway 77 and Loop 265 in Rosebud, 0.5 mile northeast on Loop 265, then 5.5 miles southeast on Farm Road 413, and 300 feet northwest in pasture:

Ap—0 to 8 inches; brown (10YR 4/3) clay loam, dark brown (10YR 3/3) moist; moderate fine subangular blocky; very hard, firm; few rounded pebbles of quartz; neutral; clear wavy boundary.

B21t—8 to 17 inches; brown (10YR 4/3) clay, dark brown (10YR 3/3) moist; few fine faint dark brown and few medium faint dark grayish brown (10YR 4/2) mottles; moderate medium blocky structure; extremely hard, very firm; few fine black concretions; few fine quartz pebbles; distinct clay films on peds; neutral; gradual smooth boundary.

B22t—17 to 30 inches; brown (10YR 5/3) clay, dark brown (10YR 4/3) moist; common medium distinct strong brown (7.5YR 5/6) and few medium faint dark grayish brown (10YR 5/2) mottles; moderate medium blocky structure; extremely hard, very firm; few fine black concretions and pebbles of quartz; distinct clay films on peds; neutral; gradual smooth boundary.

B23t—30 to 42 inches; grayish brown (10YR 5/2) clay, dark grayish brown (10YR 4/2) moist; common medium distinct mottles of strong brown (7.5YR 5/6), brownish yellow (10YR 6/8), and pale brown (10YR 6/3); weak fine blocky structure; extremely hard, very firm; few clay films; neutral; gradual smooth boundary.

C—42 to 60 inches; light brownish gray (10YR 6/2) clay, grayish brown (10YR 5/2) moist; common medium faint light yellowish brown (10YR 6/4) and dark yellowish brown (10YR 4/6) mottles and few fine distinct strong brown mottles; massive; extremely hard, very firm; few fine soft bodies of calcium carbonate; mildly alkaline.

The solum ranges from 40 to 46 inches in thickness. The A horizon is dark grayish brown, dark brown, brown, or yellowish brown. Reaction is medium acid to neutral. The B21t horizon is reddish brown, yellowish brown, or brown and has few to common fine or medium mottles of reddish brown, red, yellowish red, dark grayish brown, dark brown, very pale brown, or yellowish brown. Its reaction is slightly acid or neutral. The B22t and B23t horizons are grayish brown, dark brown, brown, pale brown, very pale brown, dark yellowish brown, light yellowish brown, or light brown. They have various amounts and sizes of yellowish, reddish, or brownish mottles. The B22t, B23t, and C horizons are neutral to moderately alkaline. The C horizon is gray, light brownish gray, or yellowish brown weathered shale, clay, or clay loam.

Ovan series

The Ovan series consists of dark grayish brown soils that formed in calcareous clayey alluvium. Ovan soils are on the flood plains of major streams. Slopes range from 0 to 1 percent.

Typical pedon of Ovan silty clay, frequently flooded; from the intersection of U. S. Highway 77 and Texas Highway 7, which is 0.8 mile west of Chilton, about 0.4 mile southeast on U. S. Highway 77, and 210 feet east in pasture:

Ap—0 to 7 inches; dark grayish brown (2.5Y 4/2) silty clay, very dark grayish brown (2.5Y 3/2) moist; moderate medium fine granular structure; very hard, very firm, very sticky and plastic; common fine roots; few snail shell fragments; calcareous; moderately alkaline; abrupt smooth boundary.

A11—7 to 29 inches; dark grayish brown (2.5Y 4/2) silty clay, very dark grayish brown (2.5Y 3/2) moist; weak medium angular blocky structure; very hard, very firm, very sticky and plastic; common fine roots; COLE 0.09; shiny pressure faces on peds; vertical cracks 1/2 inch wide extend through this horizon; calcareous; moderately alkaline; diffuse smooth boundary.

A12—29 to 46 inches; dark grayish brown (2.5Y 4/2) silty clay very dark grayish brown (2.5Y 3/2); moderate medium angular blocky structure; very hard, very firm, very sticky and plastic; few fine roots; COLE 0.09; few calcium carbonate threads and films in lower part; few coarse slickensides that do not intersect; few parallelepipeds; calcareous; moderately alkaline; diffuse boundary.

B2—46 to 80 inches; grayish brown (10YR 5/2) silty clay, dark grayish brown (10YR 4/2) moist; moderate medium blocky structure; very hard, very firm, very sticky and plastic; common calcium carbonate threads and films; few coarse slickensides and parallelepipeds; calcareous; moderately alkaline.

The solum ranges from 60 inches to more than 90 inches thick. Calcium carbonate films, threads, or soft bodies are at a depth of 30 inches to more than 60 inches. The A horizon is dark grayish brown, grayish brown, dark brown, or brown and ranges from 39 to 48 inches in thickness. The B horizon is dark grayish brown, brown, pale brown, light yellowish brown, or grayish brown. Some pedons have few fine faint yellowish brown mottles. The C horizon, where present, is dark grayish brown or brown.

Padina series

The Padina series consists of pale brown soils that formed in thick sandy beds that appear to have been reworked by wind. Padina soils are on uplands and stream terraces. Slopes range from 0 to 5 percent.

Typical pedon of Padina fine sand, 0 to 5 percent slopes, from the intersection of Texas Highway 6 and Farm Road 413 in Reagan, 8.0 miles southeast on Texas Highway 6 toward Bremond, 4.6 miles north on Texas Highway 14, 0.6 mile southeast on a county road, and 100 feet north of county road in wooded area:

A1—0 to 8 inches; pale brown (10YR 6/3) fine sand, brown (10YR 5/3) moist; single grained; loose; common fine, medium, and coarse roots; medium acid; clear smooth boundary.

A2—8 to 49 inches; very pale brown (10YR 7/4) fine sand, light yellowish brown (10YR 6/4) moist; single grained; loose; few fine and medium roots; medium acid; clear wavy boundary.

B21t—49 to 65 inches; very pale brown (10YR 7/3) sandy clay loam, pale brown (10YR 6/3) moist; common coarse distinct reddish yellow (5YR 6/6) and few fine distinct strong brown and light gray mottles; weak coarse blocky structure; very hard, very firm; few fine roots; few fine pores; thin patchy clay films; strongly acid; gradual smooth boundary.

B22t—65 to 80 inches; white (10YR 8/2) sandy clay loam, light gray (10YR 7/2) moist; many coarse prominent red (2.5YR 4/6) and common medium prominent reddish yellow (7.5YR 6/6) mottles; weak

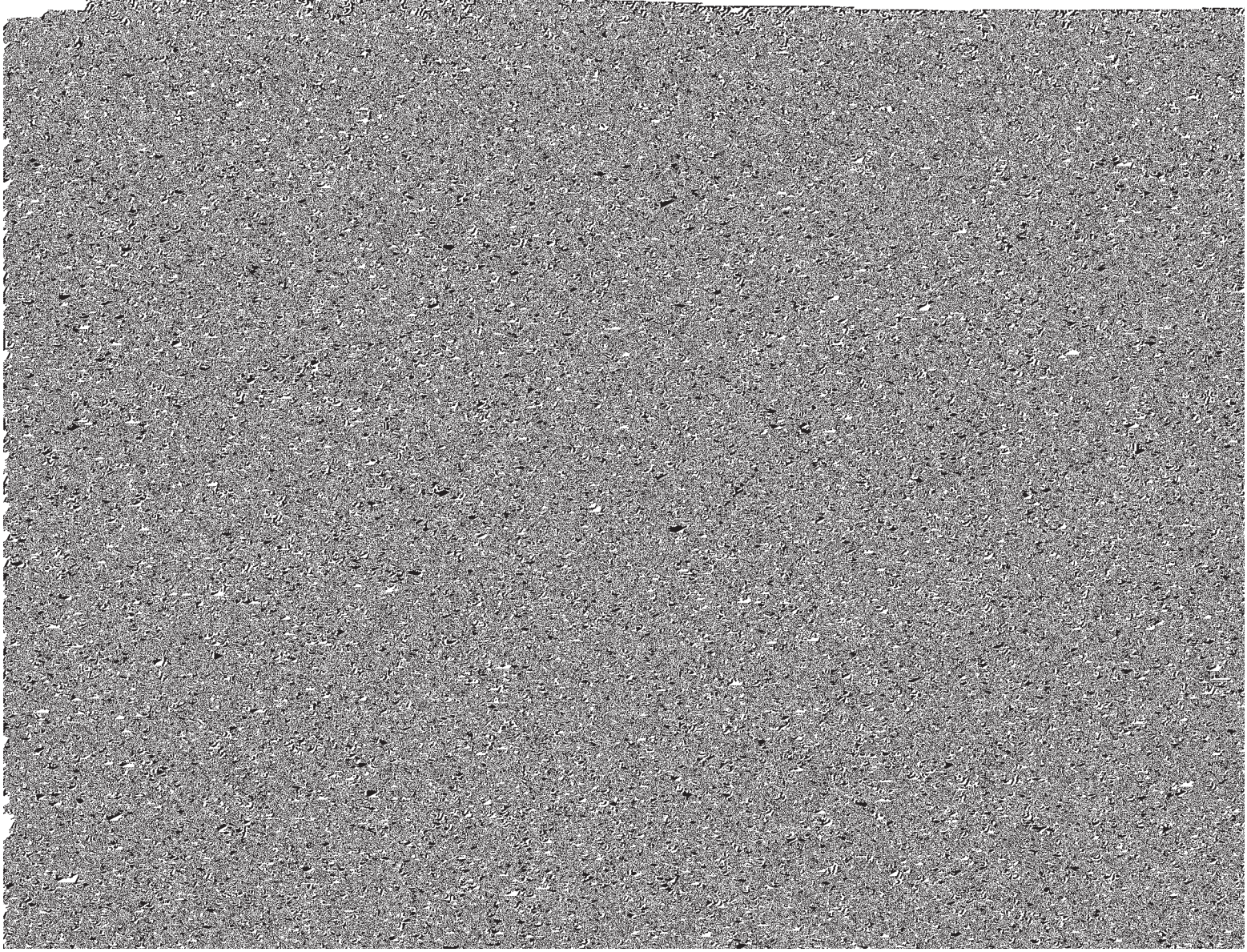
C—54 to 62 inches; reddish brown (2.5YR 4/4) silty clay, dark reddish brown (2.5YR 3/4) moist; common medium prominent grayish brown (10YR 5/2) mottles; massive; very hard, very firm, very sticky and plastic; common fine slickensides; few fine strongly cemented calcium carbonate concretions; calcareous; moderately alkaline.

The solum ranges from 50 to 56 inches in thickness. The A horizon is dark reddish brown, reddish brown, or dark brown. The B2 horizon is reddish brown or red. The C horizon is reddish brown, reddish gray, or dark brown. The B2 and C horizons are clay and silty clay that have few to common, fine to coarse, and distinct to prominent grayish and brownish mottles.

Satin series

The Satin series consists of black soils that formed in ancient gravelly clay sediment on broad uplands. Slopes range from 1 to 5 percent.

Typical pedon of Satin clay loam, 1 to 5 percent slopes; from the intersection of Texas Highway 6 and Texas Highway 7 in Marlin, 4.0 miles north on Texas Highway 6, 0.2 mile west on a county road, and 230 feet south in a



Typical pedon of Ships clay; from the intersection of Texas Highway 7 and Texas Highway 6 in Marlin, 0.8 mile west on Texas Highway 7, and 315 feet north in a cultivated field:

Ap—0 to 6 inches; reddish brown (5YR 4/3) clay, dark reddish brown (5YR 3/3) moist; weak fine blocky structure; very hard, firm; common fine roots; calcareous; moderately alkaline; clear smooth boundary.

A1—6 to 34 inches; reddish brown (5YR 4/3) clay, dark reddish brown (5YR 3/3) moist; moderate fine blocky structure; very hard, very firm; common fine roots; shiny pressure faces on some peds; calcareous; moderately alkaline; gradual wavy boundary.

B2—34 to 54 inches; red (2.5YR 4/6) clay, dark red (2.5YR 3/6) moist; moderate fine blocky structure; very hard, very firm; few fine roots; few short slickensides; vertical streaks of darker soil from horizon above; few small calcium carbonate concretions; calcareous; moderately alkaline; diffuse wavy boundary.

C—54 to 80 inches; reddish brown (2.5YR 4/4) clay, dark reddish brown (2.5YR 3/4) moist; massive; very hard, very firm; few short slickensides; few threads and soft bodies of calcium carbonate; few calcium carbonate concretions; calcareous; moderately alkaline.

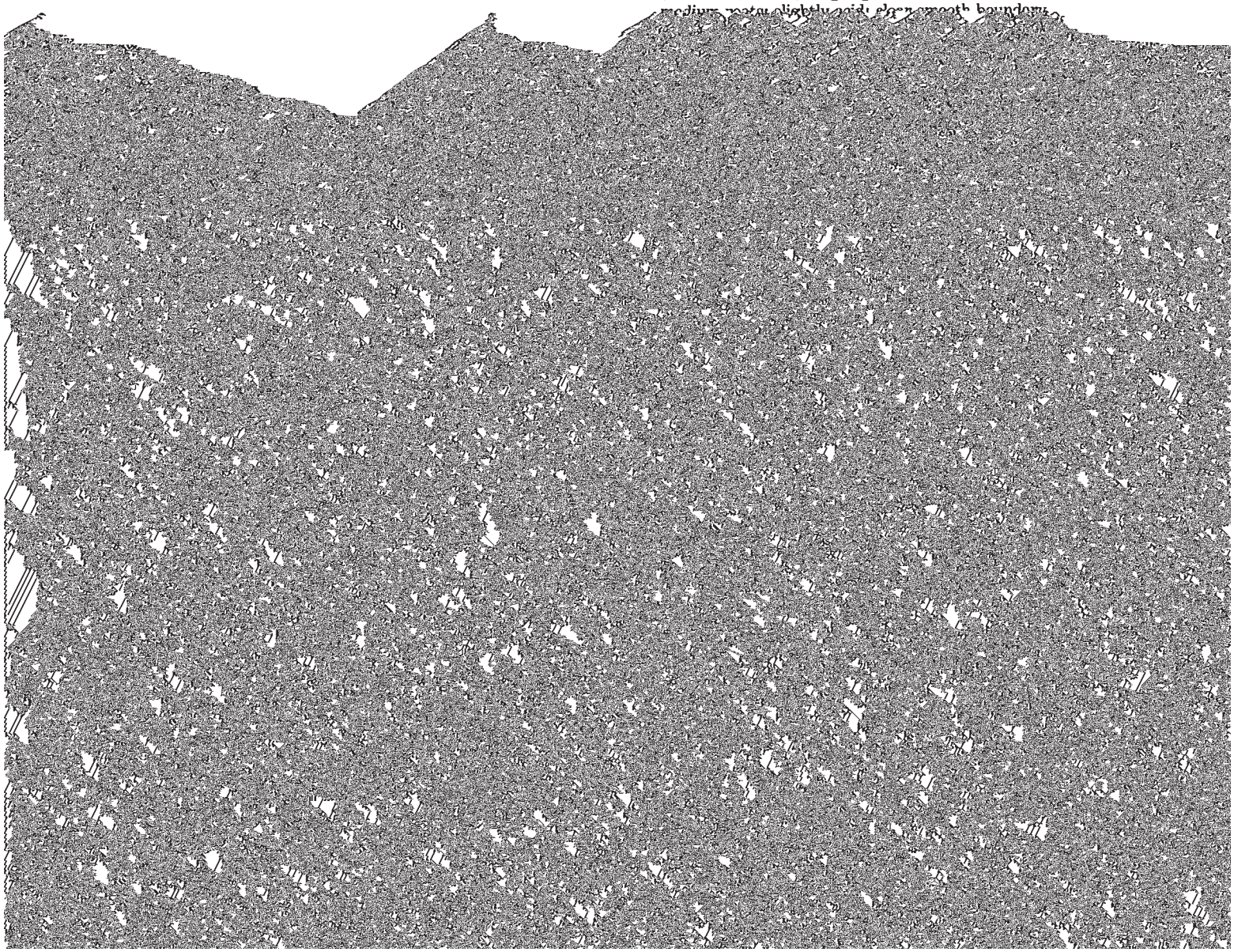
these horizons is medium acid or strongly acid. The B3 horizon is fine sandy loam or sandy clay loam. The C horizon is loamy fine sand or fine sandy loam.

Silstid series

The Silstid series consists of brown soils that formed in residue weathered from beds of sandy and loamy material on uplands and stream terraces. Slopes range from 0 to 3 percent.

Typical pedon of Silstid loamy fine sand, 0 to 3 percent slopes; from the intersection of Texas Highway 6 and Farm Road 413 in Reagan, about 6.5 miles northeast on Farm Road 413, 4.0 miles south on Farm Road 2413, 2.1 miles northeast and 1.0 mile southeast on county road, 0.2 mile south on Texas Highway 14, 0.8 mile southeast on county road, 400 feet south on private road, and 600 feet northwest in wooded pasture:

A1—0 to 10 inches; brown (10YR 5/3) loamy fine sand, dark brown (10YR 4/3) moist; single grained; loose, friable; common fine and medium roots; slightly acid; clear smooth boundary.



C1&A—15 to 19 inches; about 70 percent white (10YR 8/2) platy chalk fragments and platy chalk in place, about 30 percent dark brown (10YR 4/3) silty clay in the horizontal and vertical crevices and between the loose chalk fragments; few fine roots; calcareous; moderately alkaline; abrupt irregular boundary.

C2—19 to 28 inches; white (10YR 8/2) and very pale brown (10YR 8/3) platy chalk that is less than 3 on Moh's scale; few tongues of dark brown silty clay in crevices between some chalk plates.

Thickness of the solum, and depth to chalky limestone ranges from 11 to 19 inches. The A horizon is 2 to 10 percent, by volume chalk fragments. It is dark brown, dark grayish brown, or brown. The C1&A horizon is 50 to 70 percent platy chalk fragments. The C2 horizon is white or very pale brown.

Tabor series

The Tabor series consists of brown soils that formed in acid to alkaline clay and sandy clay interbedded with sandier material. Tabor soils are on broad uplands and stream terraces. Slopes range from 0 to 3 percent.

Typical pedon of Tabor fine sandy loam, 1 to 3 percent slopes; from the intersection of Texas Highway 6 and Farm Road 413 in Reagan, about 6.5 miles northeast on Farm Road 413, 4.0 miles south on Farm Road 2413, 1.0 mile northeast on county road to intersection, then 400 feet northwest of county road in a wooded pasture:

A1—0 to 7 inches; brown (10YR 5/3) fine sandy loam, dark brown (10YR 4/3) moist; weak fine granular structure; hard, very friable; slightly acid; clear smooth boundary.

A2—7 to 12 inches; pale brown (10YR 6/3) fine sandy loam, brown (10YR 5/3) moist; massive; hard, very friable; many fine roots; many fine pores; strongly acid; abrupt wavy boundary.

B21t—12 to 28 inches; brown (10YR 5/3) clay, dark brown (10YR 4/3) moist; few fine faint mottles of reddish yellow, common fine and medium faint grayish brown (10YR 5/2) mottles on faces of peds, and common medium faint brownish yellow (10YR 6/6) mottles; moderate medium blocky structure; extremely hard, very firm; common fine roots between peds; common fine pores; continuous clay films; COLE 0.08; few black concretions; strongly acid; gradual [illegible] and Coefficient of Linear Extensibility (COLE) ranges from 0.08 to 0.10. The C horizon is yellowish brown, light brownish gray, pale brown, brownish yellow, light gray, or white and has various amounts and sizes of reddish yellow, yellowish red, yellowish brown, pale brown, or brownish yellow mottles. It is clay, sandy clay loam, or clay loam.

Trinity series

The Trinity series consists of dark gray soils that formed in calcareous clayey alluvium. Trinity soils are on bottom lands and on flood plains along major streams. Slopes range from 0 to 1 percent.

Typical pedon of Trinity clay, frequently flooded; from the intersection of U. S. Highway 77 and Texas Highway 53 in Rosebud, 1.3 miles southwest on Texas Highway 53 and 520 feet south in pasture:

Ap—0 to 6 inches; dark gray (5Y 4/1) clay; very dark gray (5Y 3/1) moist; fine and medium granular structure and fine subangular blocky structure; very hard, firm, very sticky and very plastic; many fine roots; many fine pores; COLE 0.09; calcareous; moderately alkaline; clear smooth boundary.

A11—6 to 17 inches; dark gray (5Y 4/1) clay; very dark gray (5Y 3/1) moist; moderate fine blocky structure; very hard, firm, very sticky and very plastic; common fine roots; common fine pores; shiny pressure faces on peds; COLE 0.09; calcareous; moderately alkaline; diffuse smooth boundary.

A12—17 to 47 inches; dark gray (10YR 4/1) clay; very dark gray (10YR 3/1) moist; weak coarse blocky structure; very firm, very sticky and plastic; common fine roots; common fine pores; shiny pressure faces on peds; few fine calcium carbonate concretions; COLE 0.09; calcareous; moderately alkaline; diffuse smooth boundary.

AC—47 to 67 inches; gray (5Y 5/1) dark gray (5Y 4/1) moist; weak fine blocky structure; very hard, very firm; few slickensides and parallelepipeds; few fine roots; few bodies of calcium carbonate; calcareous; moderately alkaline; diffuse smooth boundary.

C—67 to 80 inches; olive gray (5Y 5/2) clay, olive gray (5Y 4/2) moist; massive; very hard, very firm; common fine calcium carbonate concretions; calcareous; moderately alkaline.

The A horizon is dark gray or very dark gray. Some pedons have [illegible] and sizes of brown and olive mottles. The AC horizon [illegible]

snail shell fragments; calcareous; moderately alkaline; clear smooth boundary.

C1—18 to 38 inches; stratified reddish brown (5YR 5/4) silty clay loam and yellowish red (5YR 5/6) clay loam; thin strata (1/8 to 1/4 inch thick) of very fine sandy loam and clay; massive, but parts to platy fragments along bedding planes; hard, firm, slightly sticky; many evident bedding planes; common worm casts; calcareous; moderately alkaline; clear smooth boundary.

C2—38 to 60 inches; reddish brown (5YR 5/4) silty clay loam and thin layers of yellowish brown and reddish brown very fine sandy loam and silt loam; massive; hard, firm; common fine pores; many evident bedding planes; few worm casts; calcareous; moderately alkaline.

The A horizon is reddish brown or light reddish brown silty clay loam or silt loam. The B2 horizon is reddish brown, light reddish brown, yellowish red, or reddish yellow silty clay loam or silt loam. The C horizon is reddish brown, yellowish red, light reddish brown, reddish yellow, or

Yahola series

The Yahola series consists of reddish brown soils that formed in slightly altered, loamy, calcareous alluvium. Yahola soils are on long narrow flood plains paralleling the river. Slopes range from 0 to 1 percent.

Typical pedon of Yahola fine sandy loam, occasionally flooded; from the intersection of U. S. Highway 77 and Farm Road 431 in Travis, 5.5 miles northeast on Farm Road 413, 4.3 miles north on Farm Road 2027, 2.7 miles northeast on county road, and 75 feet west in pasture.

A1—0 to 10 inches; reddish brown (5YR 5/4) fine sandy loam, reddish brown (5YR 4/4) moist; weak fine granular structure; slightly hard, very friable; calcareous; moderately alkaline; gradual smooth boun-

order. An example is Ustoll (*Ust*, meaning burnt, plus *oll*, from Mollisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of expression of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and a prefix that suggests something about the properties of the soil. An example is Calciustolls (*Calci*, meaning limy horizons, plus *ustoll*, the suborder of Mollisols that have an ustic moisture regime).

SUBGROUP. Each great group may be divided into three subgroups: the central (typic) concept of the great groups, which is not necessarily the most extensive subgroup; the intergrades, or transitional forms to other orders, suborders, or great groups; and the extragrades, which have some properties that are representative of

ing in the soil, the relief of the land and its effect on runoff, and the length of time it took the soil to form.

The effect of a factor on a soil can differ from place to place, but the interaction of all the factors determines the kind of soil that forms. In the following paragraphs the factors of soil formation are discussed as they relate to the soils in the survey area.

Climate

Falls County has subhumid, warm temperate climate. Winters are usually short and mild; summers are long and have hot days and warm nights.

This climate contributes to the formation of soils in several ways. In winter, precipitation is mostly in the form of persisting fogs, drizzles, and light showers. These contribute to low soil temperature, poor aeration of soils,

The vegetation, predominantly oak-savannah, has affected the formation of soils in the eastern part of the county. The soils that formed under hardwood vegetation are medium to low in content of organic matter and have light-colored surface layers. Some of these soils are

Throughout the county, soils formed along major streams on fluviatile terrace deposits. These deposits range from sandy clay to clay and are as much as 60 feet deep. The finer-textured old alluvium was deposited by

retain evidence of stratification and other characteristics of their recent alluvial sediment.

Old soils have well-expressed soil horizons. In places they formed on uplands. Axtell soils are examples of old soils. This parent material has been in place for a long time. Clay particles have moved downward and have accumulated in the subsoil. A thin, darkened upper part of the surface layer and a thin, leached lower part of this layer have formed. Axtell soils bear little resemblance to the original parent material. The clay soils, such as Houston Black, Heiden, and Burleson, are young in terms of horizon development, even though they are old chronologically. Thus, horizon development is not related to passage of time alone.

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Glossary

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coat, clay skin.

Claypan. A slowly permeable soil horizon that contains much more clay than the horizons above it. A claypan is commonly hard when dry and plastic or stiff when wet.

Climax vegetation. The stabilized plant community on a particular site. The plant cover reproduces itself and does not change so long as the environment remains the same.

Coefficient of Linear Extensibility (COLE). A quantitative method of determining shrink-swell behavior of soil. It is an estimate of the vertical component of swelling of a natural soil clod. COLE is expressed as: low (00.03); moderate (0.03-0.06); and, high (00.06).

Complex slope. Irregular or variable slope. Planning or constructing terraces, diversions, and other water-control measures is difficult.

Complex, soil. A map unit of two or more kinds of soil occurring in such an intricate pattern that they cannot be shown separately on a soil map at the selected scale of mapping and publication.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard; little affected by moistening.

Corrosive. High risk of corrosion to uncoated steel or deterioration of concrete.

Cutbanks cave. Unstable walls of cuts made by earthmoving equipment. The soil sloughs easily.

Deferred grazing. A delay in grazing until range plants have reached a specified stage of growth. Grazing is deferred in order to increase the vigor of forage and to allow desirable plants to produce seed. Contrasts with continuous grazing and rotation grazing.

Somewhat excessively drained.—Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.

Well drained.—Water is removed from the soil readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well drained soils are commonly medium textured. They are mainly free of mottling.

Moderately well drained.—Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically for long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum, or periodically receive high rainfall, or both.

Somewhat poorly drained.—Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.

Poorly drained.—Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for long enough during the growing season that most mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall, or a combination of these.

Very poorly drained.—Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients, as for example in "hillpeats" and "climatic moors."

Erosion. The wearing away of the land surface by running water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of the activities of man or other animals or of a catastrophe in nature, for example, fire, that exposes a bare surface.

Excess fines. Excess silt and clay. The soil does not provide a source of gravel or sand for construction purposes.

Excess lime. Excess carbonates. Excessive carbonates, or lime, restrict the growth of some plants.

Fast intake. The rapid movement of water into the soil.

Favorable. Favorable soil features for the specified use.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Flooding. The temporary covering of soil with water from overflowing streams, runoff from adjacent slopes, and tides. Frequency, duration, and probable dates of occurrence are estimated. Frequency is expressed as none, rare, occasional, and frequent. *None* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions; *occasional* that it occurs on an average of once or less in 2 years; and *frequent* that it occurs on an average of more than once in 2 years. Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, and *long* if more than 7 days. Probable dates are expressed in months; *November-May*, for example, means that flooding can occur during the period November through May. Water standing for short periods after rainfall or commonly covering swamps and marshes is not considered flooding.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Gilgai. Typically, the microrelief of Vertisols—clayey soils having a high coefficient of expansion and contraction with changes in moisture content. Commonly a succession of microbasins and microknolls in nearly level areas or of microvalleys and microridges parallel with the slope.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

Hardpan. A hardened or cemented soil horizon, or layer. The soil material is sandy, loamy, or clayey and is cemented by iron oxide, silica, calcium carbonate, or other substance.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. The major horizons of mineral soil are as follows:

O horizon.—An organic layer, fresh and decaying plant residue, at the surface of a mineral soil.

A horizon.—The mineral horizon, formed or forming at or near the surface, in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon most of which was originally part of a B horizon.

A2 horizon.—A mineral horizon, mainly a residual concentration of sand and silt high in content of resistant minerals as a result of the loss of silicate clay, iron, aluminum, or a combination of these.

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of change from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics caused (1) by accumulation of clay, sesquioxides, humus, or a combination of these; (2) by prismatic or blocky structure; (3) by redder or browner colors than those in the A horizon; or (4) by a combination of these. The combined A and B horizons are generally called the solum, or true soil. If a soil lacks a B horizon, the A horizon alone is the solum.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the A or B horizon. The material of a C horizon may be either like or unlike that from which the solum is presumed to have formed. If the material is known to differ from that in the solum the Roman numeral II precedes the letter C.

R layer.—Consolidated rock beneath the soil. The rock commonly underlies a C horizon, but can be directly below an A or a B horizon.

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are—

Border.—Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.

Basin.—Water is applied rapidly to nearly level plains surrounded by levees or dikes.

Controlled flooding.—Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.

Corrugation.—Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.

Furrow.—Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.

Sprinkler.—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.

Subirrigation.—Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.

Wild flooding.—Water, released at high points, is allowed to flow onto an area without controlled distribution.

Range site. An area of range where climate, soil, and relief are sufficiently uniform to produce a distinct kind and amount of native vegetation.

Reaction, soil. The degree of acidity or alkalinity of a soil, expressed in

diameter. Small stones adversely affect the specified use.

Soil. A natural, three-dimensional body at the earth's surface that is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods 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 millimeters 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* (0.005 to 0.002 millimeter); and *clay* (less than 0.002 millimeter).

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in mature soil consists of the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and other plant and animal life characteristics of the soil are largely confined to the solum.

Structure, soil. The arrangement of primary soil particles into aggregates of other [illegible] but the limited [illegible]

bordering a river, a lake, or the sea. A stream terrace is frequently called a second bottom, in contrast with a flood plain, and is seldom subject to overflow. A marine terrace, generally wide, was deposited by the sea.

Thin layer. Otherwise suitable soil material too thin for the specified use.

Tilth, soil. The condition of the soil, especially the soil structure, as related to the growth of plants. Good tilth refers to the friable state and is associated with high noncapillary porosity and stable structure. A soil in poor tilth is nonfriable, hard, nonaggregated, and difficult to till.

Topsoil (engineering). Presumably a fertile soil or soil material, or one that responds to fertilization, ordinarily rich in organic matter, used to topdress roadbanks, lawns, and gardens.

Trace elements. The chemical elements in soils, in only extremely small amounts, essential to plant growth. Examples are zinc, cobalt, manganese, copper, and iron.

Unstable fill. Risk of caving or sloughing in banks of fill material.

Variant, soil. A soil having properties sufficiently different from those

Illustrations

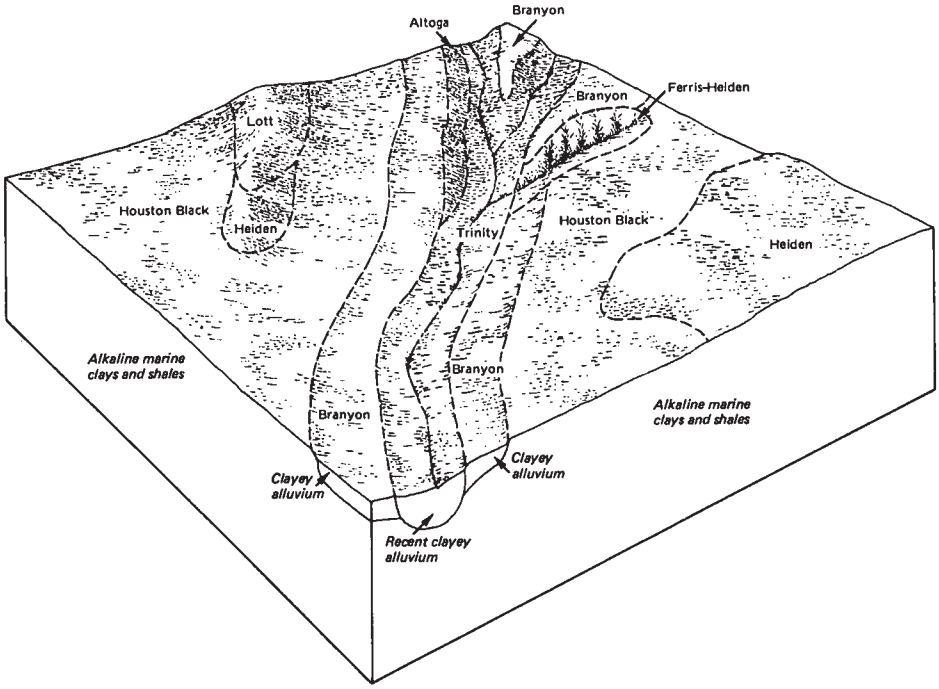
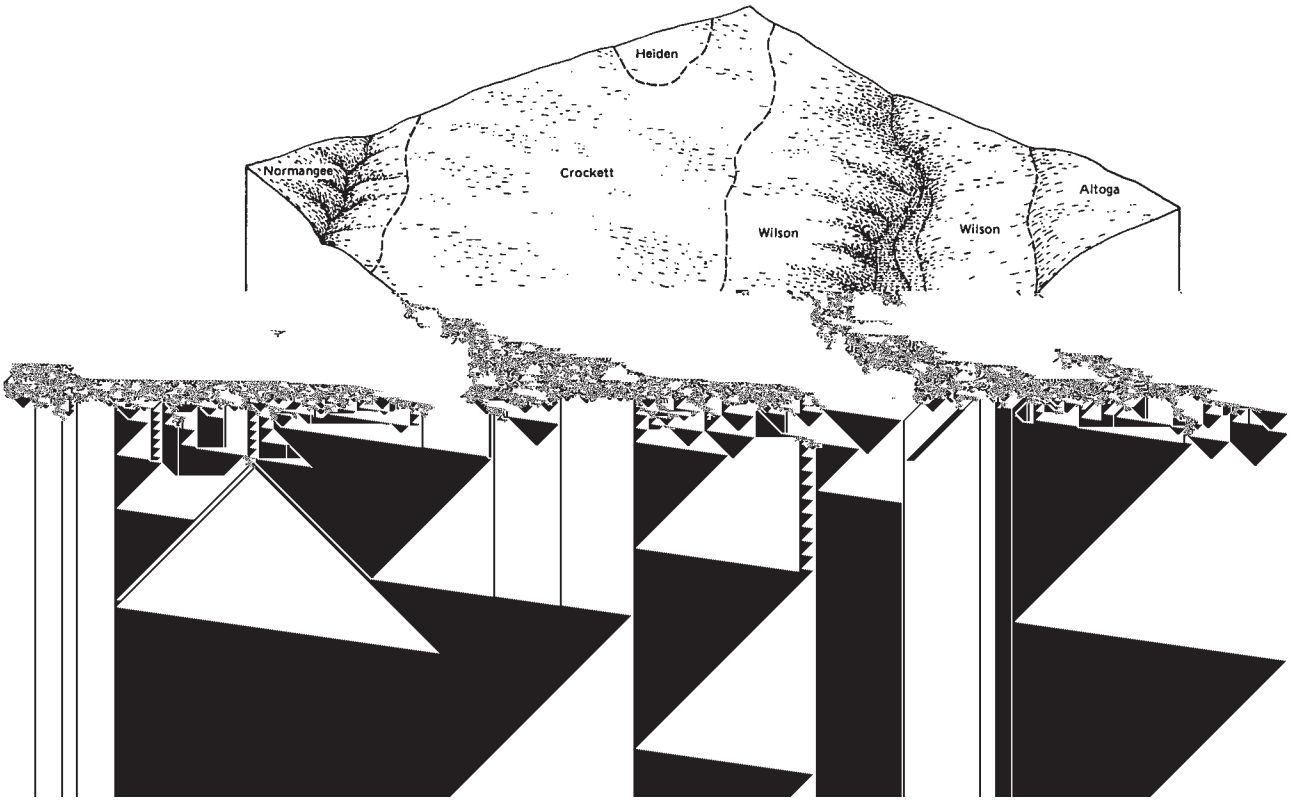


Figure 1.—Typical pattern of soils in the Houston Black-Heiden map unit.



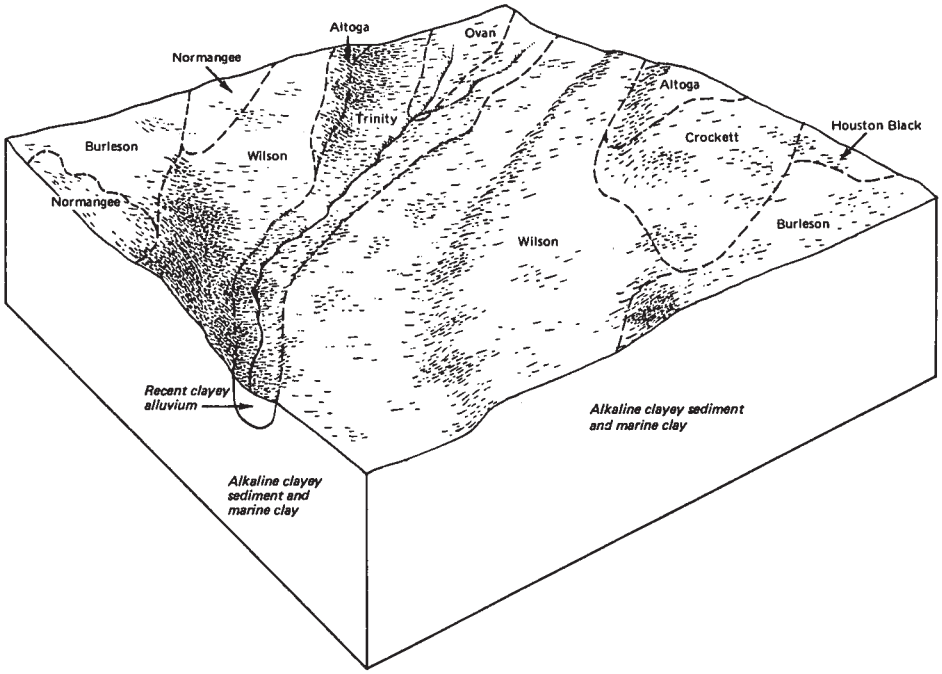
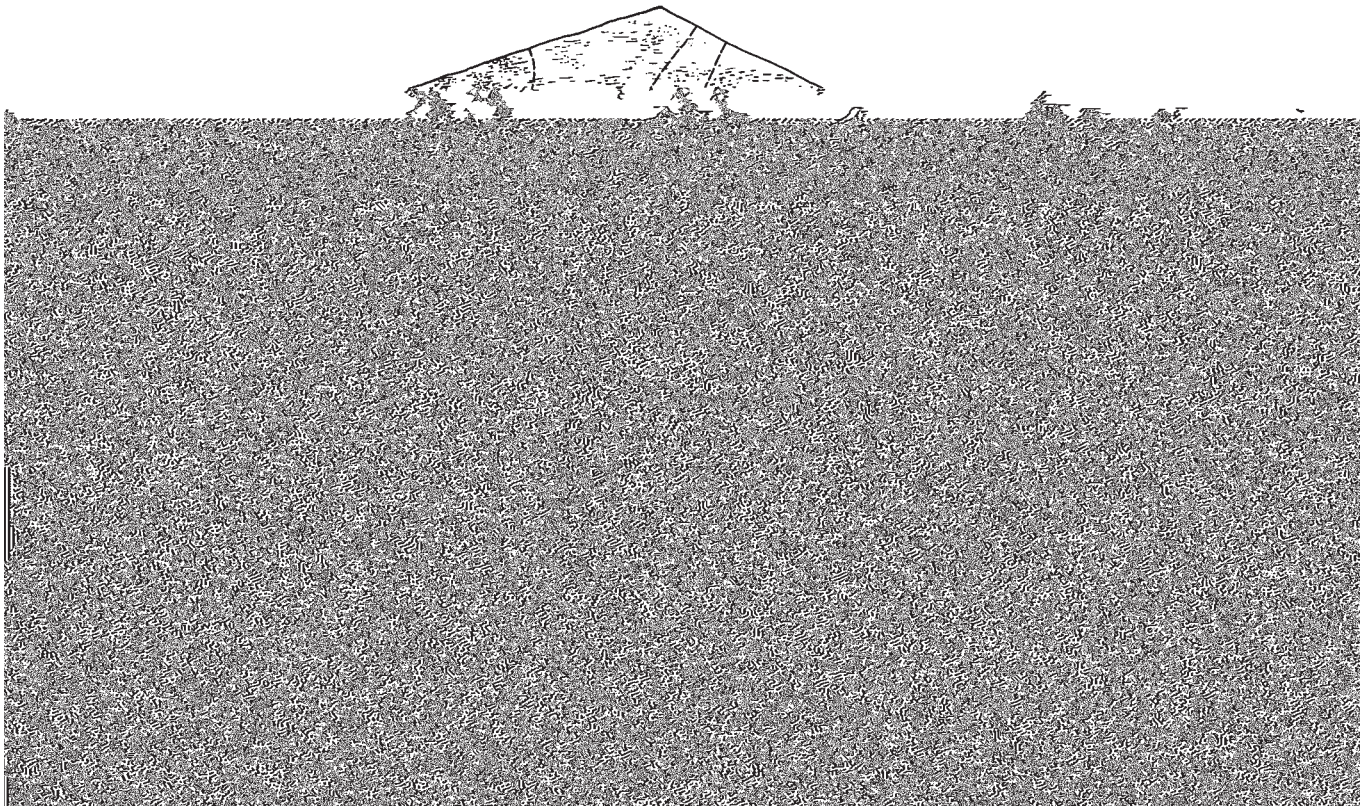


Figure 3.—Typical pattern of soils in the Wilson-Burleson map unit.



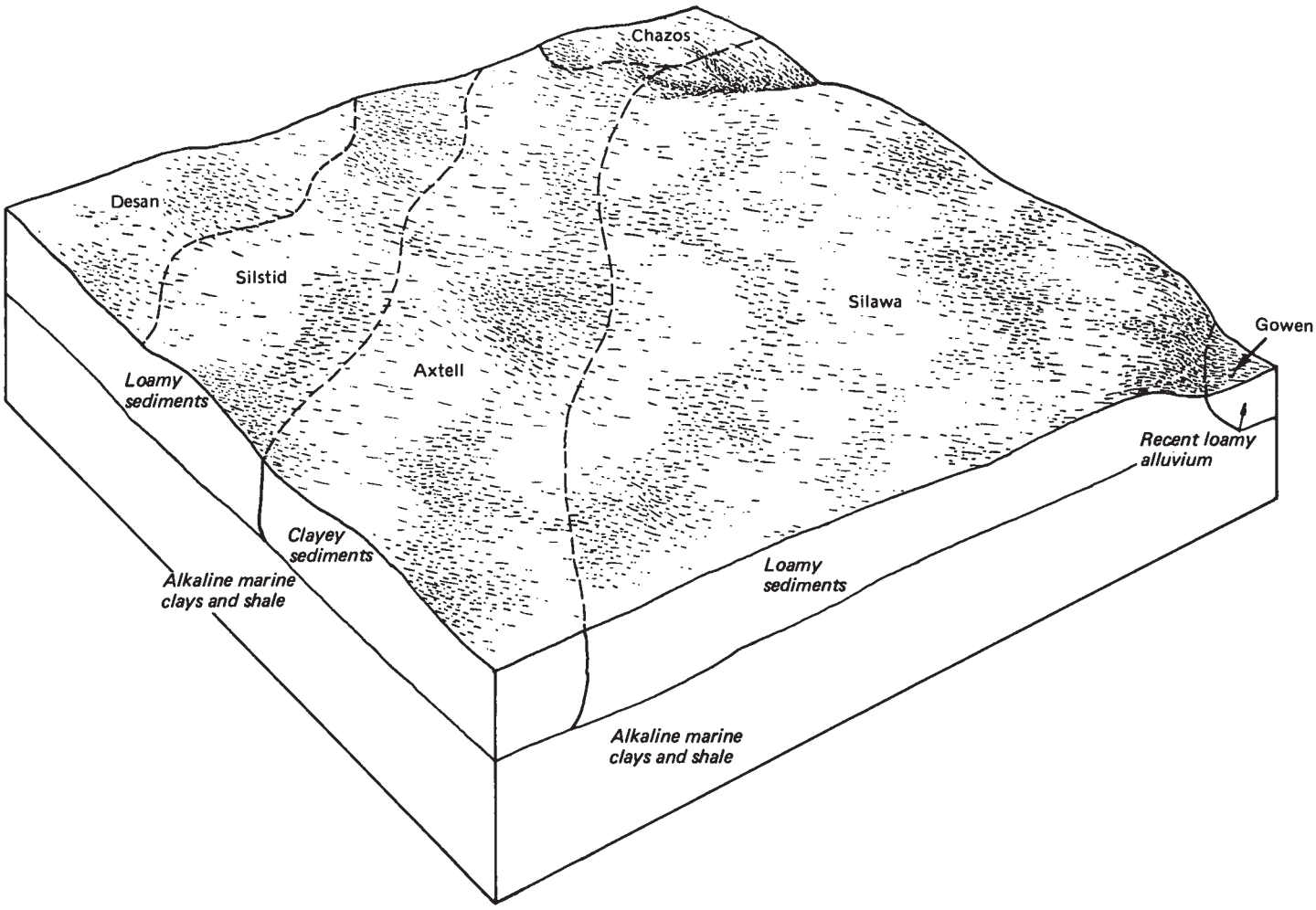


Figure 5.—Typical pattern of soils in the Silawa-Axtell map unit.

Figure 6.—Abandoned field invaded by mesquite trees. The soil is Axtell fine sandy loam, 0 to 1 percent slopes.

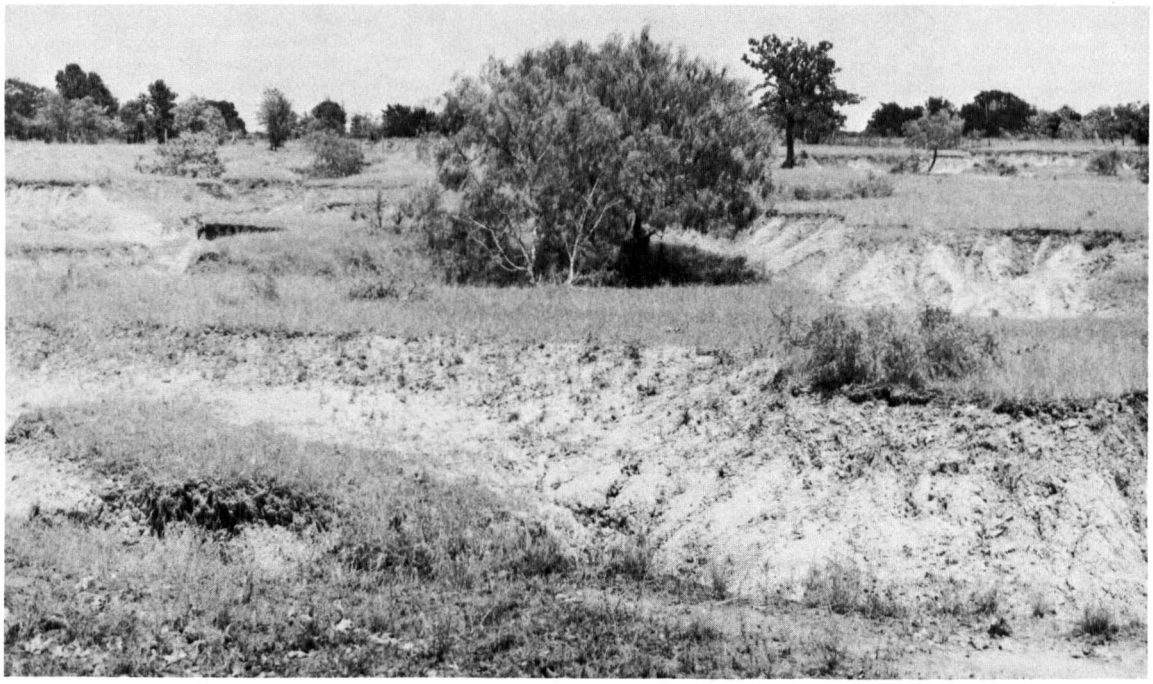


Figure 7.—Typical area of Axtell and Crockett soils, 2 to 8 percent slopes, severely eroded.

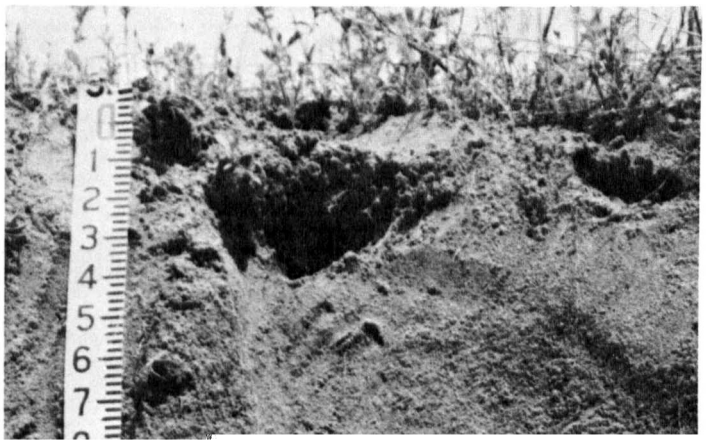


Figure 8.—Profile of Padina fine sand, 0 to 5 percent slopes.

Figure 9.—Prochaska [illegible] of Pontotoc [illegible]

Figure 10.—Profile of Wilson silty clay loam, 0 to 1 percent slopes

Tables

TABLE 1.--TEMPERATURE AND PRECIPITATION DATA

[Based on 1938-72, records at Riesel, Texas]

Month	Temperature		Precipitation									
				Probability of receiving--					Mean number of days with--		
	Average daily maximum	Average daily minimum	Average total	0.05 inch or more	1.00 inch or more	2.00 inches or more	3.00 inches or more	5.00 inches or more	0.10 inch or more	0.50 inch or more	1.00 inch or more
	°F	°F	In	Pct	Pct	Pct	Pct	Pct			
January--	58.1	37.1	2.07	90	75	48	22	4	4.1	1.4	0.4
February-	62.2	40.6	2.64	94	86	66	38	6	4.9	1.7	0.6
March----	69.4	46.3	2.52	89	72	51	37	10	4.1	1.5	0.7
April----	77.9	56.1	3.91	97	92	81	62	24	5.0	2.4	1.3
May------	83.7	63.1	4.26	99	98	85	62	30	5.5	3.1	1.4

TABLE 2.--POTENTIALS AND LIMITATIONS OF MAP UNITS ON THE GENERAL SOIL MAP

Map unit	Percent of county	Cultivated farm crops	Pasture	Range	Urban uses	Recreation	Openland wildlife
1. Houston Black-Heiden.	33	High	High	High	Low: percs slowly, shrink-swell, corrosivity, low strength.	Low: percs slowly, too clayey.	Medium: insufficient cover.
2. Crockett-Wilson	22	Medium: erodes easily, droughty.	Medium: erodes easily, droughty.	High	Low: shrink-swell, low strength, percs slowly.	Medium: percs slowly.	High.
3. Wilson-Burleson	15	Medium: erodes easily, droughty.	Medium: erodes easily, droughty.	Medium: erodes easily.	Low: wetness, shrink-swell, percs slowly, corrosivity, low strength.	Low: wetness, percs slowly, too clayey.	Medium: insufficient cover.
4. Austin-Altoga	1	Medium: slope, erodes easily, depth to bedrock, droughty.	High	High	Low: percs slowly, shrink-swell, corrosivity.	Low: too clayey.	Medium: insufficient cover.
5. Ships-Weswood	12	High	High	High	Low: flooding, wetness, shrink-swell, low strength, percs slowly.	Low: flooding, too clayey.	High.
6. Gowen-Trinity	3	Medium: flooding.	High	High	Low: flooding, wetness, shrink-swell.	Low: flooding.	Medium: insufficient cover.
7. Ovan-Trinity	2	Medium: flooding, wetness.	High	High	Low: flooding, wetness, shrink-swell.	Low: flooding, too clayey, percs slowly.	Medium: insufficient cover.
8. Silawa-Axtell	9	Medium: erodes easily, droughty.	High	High	Low: shrink-swell, low strength, percs slowly.	High	High.
9. Axtell-Tabor	2	Medium: erodes easily, droughty.	High	High	Low: low strength, shrink-swell, percs slowly.	Medium: percs slowly.	Medium: insufficient cover.
10. Silstid-Padina	1	Low: droughty, soil blowing.	Medium: droughty.	Low: droughty.	High	Low: too sandy.	Low: insufficient water.

TABLE 3.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
1	Aledo soils, 1 to 5 percent slopes	210	(1)
2	Altoga silty clay, 1 to 3 percent slopes	2,730	0.6
3	Altoga soils, 3 to 5 percent slopes, eroded	5,560	1.1
4	Altoga soils, 5 to 12 percent slopes, eroded	8,860	1.8
5	Austin silty clay, 1 to 3 percent slopes	1,690	0.3
6	Austin silty clay, 3 to 5 percent slopes, eroded	1,370	0.3
7	Axtell fine sandy loam, 0 to 1 percent slopes	910	0.2
8	Axtell fine sandy loam, 1 to 3 percent slopes	7,790	1.6
9	Axtell fine sandy loam, 2 to 5 percent slopes, eroded	5,470	1.1
10	Axtell and Crockett soils, 2 to 8 percent slopes, severely eroded	1,750	0.4
11	Bastrop fine sandy loam	570	0.1
12	Blum Variant fine sandy loam, 1 to 3 percent slopes	700	0.1
13	Branyon clay, 0 to 1 percent slopes	8,780	1.8
14	Branyon clay, 1 to 3 percent slopes	4,370	0.9
15	Bunyan fine sandy loam, frequently flooded	1,630	0.3
16	Burleson clay, 0 to 1 percent slopes	10,800	2.2
17	Burleson clay, 1 to 3 percent slopes	2,630	0.5
18	Chazos loamy fine sand, 1 to 5 percent slopes	5,170	1.1
19	Crockett fine sandy loam, 0 to 1 percent slopes	8,260	1.7
20	Crockett fine sandy loam, 1 to 3 percent slopes	19,150	3.9
21	Crockett fine sandy loam, 2 to 5 percent slopes, eroded	13,450	2.7
22	Desan loamy fine sand, 0 to 5 percent slopes	4,360	0.9
23	Eddy gravelly clay loam, 1 to 5 percent slopes	120	(1)
24	Ferris-Heiden complex, 5 to 12 percent slopes, severely eroded	5,440	1.1
25	Gaddy silt loam, occasionally flooded	950	0.2
26	Gaddy soils, frequently flooded	1,960	0.4
27	Gowen clay loam, occasionally flooded	2,030	0.4
28	Gowen clay loam, frequently flooded	10,600	2.2
29	Heiden clay, 1 to 3 percent slopes	22,830	4.7
30	Heiden clay, 3 to 5 percent slopes	8,190	1.7
31	Heiden clay, 2 to 5 percent slopes, eroded	17,310	3.5
32	Heiden-Ferris complex, 5 to 8 percent slopes, eroded	7,470	1.5
33	Highbank silty clay loam	1,990	0.4
34	Houston Black clay, 0 to 1 percent slopes	11,500	2.3
35	Houston Black clay, 1 to 3 percent slopes	45,800	9.4
36	Lewisville silty clay, 1 to 3 percent slopes	2,920	0.6
37	Lewisville silty clay, 3 to 5 percent slopes	3,550	0.7
38	Lott silty clay, 1 to 3 percent slopes	3,340	0.7
39	Lott silty clay, 3 to 5 percent slopes	3,720	0.8
40	Normangee clay loam, 0 to 1 percent slopes	320	0.1
41	Normangee clay loam, 1 to 3 percent slopes	2,960	0.6
42	Normangee clay loam, 2 to 5 percent slopes, eroded	4,780	1.0
43	Ovan silty clay, occasionally flooded	7,050	1.4
44	Ovan silty clay, frequently flooded	9,660	2.0
45	Padina fine sand, 0 to 5 percent slopes	3,480	0.7
46	Roetex clay, frequently flooded	2,380	0.5

TABLE 4.--YIELDS PER ACRE OF CROPS AND PASTURE

[All yields were estimated for a high level of management in 1975. Absence of a yield figure indicates the crop is seldom grown or is not suited]

Soil name and map symbol	Cotton lint	Grain sorghum	Corn	Improved bermudagrass
	Lb	Bu	Bu	AUM[1]
Aledo:				
1	---	---	---	---
Altoga:				
2	275	50	35	7.0
[2]3	225	35	25	5.0
[2]4	---	---	---	3.5
Austin:				
5	350	75	50	6.5
6	250	60	35	6.0
Axtell:				
7	250	40	35	6.5
8	250	35	35	6.5
9	150	30	20	5.0
[2]10	---	---	---	4.5
Bastrop:				
11	400	70	50	7.0
Blum Variant:				
12	400	60	45	8.0
Branyon:				
13	450	85	55	7.0
14	450	80	50	7.0
Bunyan:				
15	---	---	---	7.0
Burleson:				
16	400	85	50	7.0
17	450	80	50	7.0
Chazos:				
18	[illegible]	40	25	7.0

TABLE 4.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Cotton lint	Grain sorghum	Corn	Improved bermudagrass
	Lb	Bu	Bu	AUM[1]
Gowen:				
27	500	70	50	8.0
28	---	---	---	8.0
Heiden:				
29	400	80	60	8.0
30	350	55	50	6.0
31	350	40	45	6.0
[2]32	---	25	---	3.5
Highbank:				
33	525	90	70	9.0
Houston Black:				
34	500	90	60	8.0
35	450	85	55	8.0
Lewisville:				
36	500	80	59	7.5
37	375	70	55	7.0
Lott:				
38	400	80	70	6.5
39	350	70	60	6.0
Normangee:				
40	350	55	48	8.0
41	300	50	44	8.0
42	---	40	---	6.0
Ovan:				
43	450	100	60	8.0
44	---	---	---	8.0
Padina:				
[2]45	---	---	30	4.5
Roetex:				
46	---	---	---	3.5
Satin:				
47	250	35	---	3.5
Ships:				
48	550	80	65	9.0
[2]49	---	---	---	9.0
Silawa:				
50	325	45	50	5.5
51	395	50	55	6.0
52	335	40	45	5.5
53	---	---	---	4.5
Silstid:				
54	---	40	45	5.5

See footnotes at end of table.

TABLE 4.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Cotton lint	Grain sorghum	Corn	Improved bermudagrass
	Lb	Bu	Bu	AUM[1]
Stephen:				
55	250	55	34	4.0
Tabor:				
56	250	50	40	6.0
57	250	55	40	6.0
Trinity:				
[3]58	450	90	60	8.0
59	---	---	---	8.0
Weswood:				
60, 61	500	90	75	9.0
[2]62	390	65	60	8.0
Wilson:				
63, 65	350	50	45	5.5
64, 66	300	40	35	5.5
67	250	35	25	5.0
Yahola:				
68	425	55	40	8.0

[1]Animal-unit-month: The amount of forage or feed required to feed one animal unit (one cow, one horse, one mule, five sheep, or five goats) for a period of 30 days.
[2]This map unit is made up of two or more dominant kinds of soil. See map unit description for the composition and behavior of the whole map unit.
[3]Yields are for areas protected from flooding.

TABLE 5.--CAPABILITY CLASSES AND SUBCLASSES

Class	Total Acreage	Major Management concerns (subclass)			
		Erosion (e)	Wetness (w)	Soil Problem (s)	Climate (c)
		Acres	Acres	Acres	Acres
I	16,480	---	---	---	---
II	148,840	86,330	40,340	22,170	---
III	212,200	139,220	42,100	30,880	---
IV	46,980	42,540	---	4,440	---
V	46,370	---	46,370	---	---
VI	16,260	16,050	---	210	---
VII	---	---	---	---	---
VIII	---	---	---	---	---

TABLE 6.--RANGE PRODUCTIVITY AND COMPOSITION

[Soils not listed are not in range sites; such soils can be used for grazing if grass cover is established]

Soil name and map symbol	Range site name	Potential production		Common plant name	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
Aledo:					
1	Shallow	Favorable	3,000	Little bluestem	30
		Normal	2,000	Indiangrass	15
		Unfavorable	1,800	Sideoats grama	10
				Big bluestem	10
				Switchgrass	5
				Silver bluestem	5

TABLE 6.--RANGE PRODUCTIVITY AND COMPOSITION--Continued

Soil name and map symbol	Range site name	Potential production: Kind of year	Potential production: Dry weight	Common plant name	Composition
			Lb/acre		Pct
Axtell:					
10:					
Crockett part	Claypan Prairie	Favorable	6,000	Little bluestem	10
		Normal	5,000	Indiangrass	10
		Unfavorable	3,000	Virginia wildrye	10
				Florida paspalum	10
				Sideoats grama	10
				Texas wintergrass	10
				Silver bluestem	10
				Paspalum	10
				Big bluestem	5
				Other perennial forbs	5
				Other trees	5
				Other perennial grasses	5
Bastrop:					
11	Sandy Loam	Favorable	5,000	Little bluestem	50
		Normal	4,000	Indiangrass	10
		Unfavorable	2,000	Switchgrass	5
				Purpletop	5
				Sideoats grama	5
				Fall witchgrass	5
				Post oak	5
				Blackjack oak	5
				Lindheimer hackberry	5
				Other perennial forbs	3
				Other annual forbs	2

TABLE 6.--RANGE PRODUCTIVITY AND COMPOSITION--Continued

Soil name and map symbol	Range site name	Potential production: Kind of year	Potential production: Dry weight	Common plant name	Composition
			Lb/acre		Pct
Chazos:					
18	Loamy Sand	Favorable	4,500	Little bluestem	40
		Normal	4,000	Switchgrass	5
		Unfavorable	3,000	Beaked Panicum	5
				Yellow Indiangrass	5
				Sand lovegrass	5
				Longleaf uniola	5
				Brown seed Paspalum	5
				Purpletop	5
				Other shrubs	5
				Panicum	5
				Other perennial forbs	5
				Blackjack oak	5
				Post oak	5
Crockett:					
19, 20, 21	Claypan Prairie	Favorable	6,000	Little bluestem	10
		Normal	5,000	Indiangrass	10
		Unfavorable	3,000	Virginia wildrye	10
				Florida paspalum	10
				Sideoats grama	10
				Texas wintergrass	10
				Silver bluestem	10
				Paspalum	10

TABLE 6.--RANGE PRODUCTIVITY AND COMPOSITION--Continued

Soil name and map symbol	Range site name	Potential production: Kind of year	Potential production: Dry weight	Common plant name	Composition
			Lb/acre		Pct
Ferris:					
[1]24:					
Heiden part	Blackland	Favorable	7,000	Little bluestem	50
		Normal	6,000	Big bluestem	15
		Unfavorable	3,500	Indiangrass	10
				Eastern gamagrass	2
				Switchgrass	2
				Sideoats grama	2
				Virginia wildrye	2
				Vine-mesquite	2
				Other perennial forbs	10
				Other trees	5
Gaddy:					
25, [1]26	Sandy Bottomland	Favorable	3,800	Switchgrass	30
		Normal	2,700	Sand bluestem	15
		Unfavorable	2,000	Indiangrass	15
				Little bluestem	5
				Texas bluegrass	5
				Beaked panicum	5
				Purpletop	5
				Goldenrod	5
				Heath aster	5
				Maximilian sunflower	5
				Other trees	5
Gowen:					
27, 28	Loamy Bottomland	Favorable	8,000	Indiangrass	20

TABLE 6.--RANGE PRODUCTIVITY AND COMPOSITION--Continued

Soil name and map symbol	Range site name	Potential production: Kind of year	Potential production: Dry weight	Common plant name	Composition
			Lb/acre		Pct
Heiden:					
[1]32:					
Ferris part	Eroded Blackland	Favorable	7,000	Little bluestem	30
		Normal	5,500	Indiangrass	15
		Unfavorable	4,000	Big bluestem	15
				Switchgrass	5
				Florida paspalum	5
				Eastern gamagrass	5
				Virginia wildrye	5
				Sideoats grama	5
				Texas wintergrass	5
				Meadow dropseed	5
				Other perennial forbs	5
Highbank:					
33	Loamy Bottomland	Favorable	8,000	Virginia wildrye	25
		Normal	6,500	Beaked panicum	10
		Unfavorable	5,000	Indiangrass	10
				Little bluestem	10

TABLE 6.--RANGE PRODUCTIVITY AND COMPOSITION--Continued

Soil name and map symbol	Range site name	Potential production: Kind of year	Potential production: Dry weight	Common plant name	Composition
			Lb/acre		Pct
Ovan:					
43, 44	Clayey Bottomland	Favorable	7,500	Little bluestem	40
		Normal	6,000	Canada wildrye	15
		Unfavorable	4,000	Big bluestem	10
				Purpletop	10
				Texas wintergrass	5
				American elm	5
				Pecan	5
				Other annual forbs	5
				Other trees	5
Padina:					
145	Deep Sand	Favorable	3,000	Little bluestem	20
		Normal	2,000	Post oak	5
		Unfavorable	1,000	Sand lovegrass	5
				Blackjack oak	5
				Purpletop	10
				Yellow Indiangrass	5
				Switchgrass	5
				Panicum	10
				Paspalum	10
				Other perennial forbs	5
				Longleaf uniola	5
				Bluejack oak	5
				Splitbeard bluestem	5
				Other trees	5
Roetex:					
46	Clayey Bottomland	Favorable	6,000	Virginia wildrye	15
		Normal	5,000	Sedge	15
		Unfavorable	3,000	Eastern gamagrass	10
				Beaked panicum	10
				Broadleaf uniola	10
				Florida paspalum	10
				Switchgrass	5
				Indiangrass	5
				Big bluestem	5
				Other perennial forbs	5
				Other perennial grasses	5
				Other trees	5
Satin:					
47	Gravelly Loam	Favorable	4,500	Little bluestem	45
		Normal	3,500	Indiangrass	10
		Unfavorable	2,000	Sideoats grama	5
				Silver bluestem	5
				Texas wintergrass	5
				Tall dropseed	5
				Hairy grama	5
				Other perennial forbs	10
				Other perennial grasses	5
				Other trees	5
Ships:					
48, 149	Clayey Bottomland	Favorable	7,500	Virginia wildrye	15
		Normal	6,000	Beaked panicum	15
		Unfavorable	4,500	Broadleaf uniola	10
				Indiangrass	5
				Switchgrass	5
				Little bluestem	5
				Rustyseed paspalum	5
				Eastern gamagrass	5
				Other perennial grasslikes	15
				Other trees	15
				Other perennial forbs	5

See footnotes at end of table.

TABLE 6.--RANGE PRODUCTIVITY AND COMPOSITION--Continued

Soil name and map symbol	Range site name	Potential production: Kind of year	Potential production: Dry weight	Common plant name	Composition
			Lb/acre		Pct
Silawa:					
50	Loamy Sand	Favorable	6,000	Little bluestem	50
		Normal	5,000	Indiangrass	10
		Unfavorable	3,000	Switchgrass	5
				Purpletop	5
				Fall witchgrass	5
				Post oak	5
				Blackjack oak	5
				American beautyberry	5
				Other perennial forbs	5
				Other annual grasses	5
51, 52, 53	Sandy Loam	Favorable	5,500	Little bluestem	50
		Normal	4,500	Indiangrass	10
		Unfavorable	2,500	Switchgrass	5
				Purpletop	5
				Sideoats grama	5
				Fall witchgrass	5
				Post oak	5
				Blackjack oak	5
				Hackberry	5
				Other perennial forbs	3
				Other annual grasses	2
Silstid:					
54	Sandy	Favorable	4,500	Little bluestem	50
		Normal	4,000	Indiangrass	10
		Unfavorable	2,000	Crinkleawn	5
				Purpletop	5
				Switchgrass	5
				Fringeleaf paspalum	5
				Post oak	5
				Blackjack oak	5
				Other annual grasses	5
				Other perennial forbs	5
Stephen:					
55	Chalky Ridge	Favorable	4,500	Little bluestem	30
		Normal	3,500	Indiangrass	15
		Unfavorable	2,000	Big bluestem	10
				Sideoats grama	10
				Texas wintergrass	5
				Silver bluestem	5
				Hairy grama	5
				Other perennial grasses	10
				Other perennial forbs	5
				Other trees	5
Tabor:					
56, 57	Sandy Loam	Favorable	6,500	Little bluestem	50
		Normal	5,500	Indiangrass	10
		Unfavorable	3,500	Blackjack oak	10
				Post oak	10
				Purpletop	5
				Brownseed paspalum	5
				Other trees	5
				Other perennial grasses	5
Trinity:					
58, 59	Clayey Bottomland	Favorable	6,500	Virginia wildrye	15
		Normal	4,000	Sedge	15
		Unfavorable	3,000	Eastern gamagrass	10
				Switchgrass	10
				Indiangrass	10
				Giant cane	5
				Beaked panicum	5
				Panicum	5
				Other trees	20
				Other perennial forbs	5

See footnotes at end of table.

TABLE 6.--RANGE PRODUCTIVITY AND COMPOSITION--Continued

Soil name and map symbol	Range site name	Potential production		Common plant name	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct

TABLE 7.--BUILDING SITE DEVELOPMENT

["Shrink-swell" and some of the other terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe"]

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
Aledo:					
1	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.
Altoga:					
2, [1]3, [1]4	Moderate: too clayey.	Severe: shrink-swell, low strength.	Moderate: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: low strength, shrink-swell.
Austin:					
5, 6	Severe: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.
Axtell:					
7, 8, 9	Severe: too clayey.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.
[1]10:					
Axtell part	Severe: too clayey.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.
Crockett part	Severe: too clayey.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, corrosive, low strength.	Severe: shrink-swell, low strength.
Bastrop:					
11	Slight	Slight	Slight	Slight	Moderate: low strength.
Blum Variant:					
12	Severe: depth to rock.	Moderate: shrink-swell.	Severe: depth to rock.	Severe: depth to rock.	Moderate: low strength.
Branyon:					
13, 14	Severe: too clayey, cutbanks cave.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.
Bunyan:					
15	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.
Burleson:					
16, 17	Severe: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.

TABLE 7.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
Eddy:					
23	Moderate: depth to rock.	Moderate: depth to rock.	Moderate: depth to rock.	Moderate: depth to rock.	Moderate: depth to rock.
Ferris:					
[1]24:					
Ferris part	Severe: too clayey.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.
Heiden part	Severe: cutbanks cave, too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.
Gaddy:					
25	Severe: floods, cutbanks cave.	Severe: floods.	Severe: floods.	Severe: floods.	Moderate: floods.
[1]26	Severe: floods, cutbanks cave.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.
Gowen:					
27	Severe: floods.	Severe: floods.	Severe: floods.	Moderate: floods.	Moderate: shrink-swell, floods.
28	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.
Heiden:					
29, 30, 31	Severe: cutbanks cave, too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.
[1]32:					
Heiden part	Severe: cutbanks cave,	Severe: shrink-swell,	Severe: shrink-swell,	Severe: shrink-swell,	Severe: shrink-swell,

TABLE 7.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
Ovan:					
43	Severe: too clayey.	Severe: floods, shrink-swell.	Severe: floods, shrink-swell.	Severe: floods, shrink-swell.	Severe: floods, shrink-swell.
44	Severe: too clayey.	Severe: floods, shrink-swell.	Severe: floods, shrink-swell.	Severe: floods, shrink-swell.	Severe: floods, shrink-swell.
Padina:					
[1]45	Severe: cutbanks cave.	Slight	Moderate: wetness.	Slight	Slight.
Roetex:					
46	Severe: too clayey, floods.	Severe: floods, shrink-swell.	Severe: floods, shrink-swell.	Severe: floods, shrink-swell.	Severe: shrink-swell, wetness.
Satin:					
47	Severe: too clayey, small stones.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.
Ships:					
48	Severe: too clayey.	Severe: floods, shrink-swell.	Severe: floods, shrink-swell.	Severe: floods, shrink-swell.	Severe: shrink-swell.
[1]49	Severe: too clayey, floods.	Severe: floods, shrink-swell.	Severe: floods, shrink-swell.	Severe: floods, shrink-swell.	Severe: shrink-swell, floods.
Silawa:					
50, 51	Slight	Slight	Slight	Slight	Moderate: low strength.
52, 53	Slight	Slight	Slight	Moderate: slope.	Moderate: low strength.
Silstid:					
54	Moderate: cutbanks cave.	Slight	Slight	Slight	Slight.
Stephen:					
55	Severe: depth to rock.	Moderate: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Moderate: depth to rock.
Tabor:					
56, 57	Severe: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.
Trinity:					
58	Severe: wetness, too clayey.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell.
59	Severe: wetness, floods, too clayey.	Severe: floods, shrink-swell, wetness.	Severe: floods, shrink-swell, wetness.	Severe: floods, shrink-swell, wetness.	Severe: floods, shrink-swell.
Weswood:					
60	Moderate: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Moderate: low strength.
61	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: low strength.
[1]62	Moderate: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: low strength.

See footnote at end of table.

TABLE 7.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
Wilson: 63, 64, 65, 66, 67	Severe: wetness, too clayey.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.
Yahola: 68	Severe:	Severe:	Severe:	Severe:	Moderate:

TABLE 8.--SANITARY FACILITIES

["Percs slowly" and some of the other terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," "good," "fair," and other terms used to rate soils]

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill

TABLE 8.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Crockett:					
20, 21	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey.
Desan:					
22	Slight	Severe: seepage.	Moderate: too sandy.	Moderate: seepage.	Poor: too sandy.
Eddy:					
23	Severe:	Severe:	Severe:	Slight	Poor:

TABLE 8.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Ovan:					
43	Severe: percs slowly, floods.	Slight	Severe: floods, too clayey.	Severe: floods.	Poor: too clayey.
44	Severe: percs slowly, floods.	Slight	Severe: floods, too clayey.	Severe: floods.	Poor: too clayey.
Padina:					
[1]45	Moderate: percs slowly.	Severe: seepage.	Moderate: too sandy, wetness.	Moderate: seepage.	Poor: too sandy.
Roetex:					
46	Severe: percs slowly, floods.	Severe: floods.	Severe: floods, wetness.	Severe: floods, wetness.	Poor: too clayey, wetness.
Satin:					
47	Severe: percs slowly.	Moderate: small stones, slope.	Severe: too clayey.	Slight	Poor: too clayey, small stones.
Ships:					
48	Severe: percs slowly.	Slight	Severe: too clayey.	Moderate: floods.	Poor: too clayey.
[1]49	Severe: percs slowly, floods.	Severe: floods.	Severe: too clayey, floods.	Severe: floods.	Poor: too clayey.
Silawa:					
50, 51, 52, 53	Slight	Severe: seepage.	Severe: seepage.	Slight	Good.
Silstid:					
54	Slight	Moderate:	Slight	Slight	Poor:

TABLE 8.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Weswood:					
62	Moderate: floods.	Moderate: seepage, slope.	Moderate: floods.	Moderate: floods.	Fair: too clayey.
Wilson:					
63, 65	Severe: percs slowly.	Slight	Severe: too clayey.	Moderate: wetness.	Poor: too clayey.
64, 66, 67	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Moderate: wetness.	Poor: too clayey.
Yahola:					

TABLE 9.--CONSTRUCTION MATERIALS

["Shrink-swell" and some of the other terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," and "poor"]

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Aledo:				

TABLE 9.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Eddy:				
23	Fair: thin layer.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: thin layer, excess lime.
Ferris:				
[1]24:				
Ferris part	Poor: shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey.
Heiden part	Poor: shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey.
Gaddy:				
25	Good	Poor: excess fines.	Unsuited: excess fines.	Fair: thin layer.
[1]26	Good	Poor: excess fines.	Unsuited: excess fines.	Poor: too sandy.
Gowen:				
27, 28	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: too clayey.
Heiden:				
29, 30, 31	Poor: shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey.
[1]32:				
Heiden part	Poor: shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey.
Ferris part	Poor: shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey.
Highbank:				
33	Poor: low strength, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: too clayey.
Houston Black:				
34, 35	Poor: shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey.
Lewisville:				
36, 37	Poor: low strength, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey.
Lott:				
38, 39	Poor: low strength, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey.
Normangee:				
40, 41, 42	Poor: shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey.
Ovan:				
43, 44	Poor: shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey.
Padina:				
[1]45	Good	Fair: excess fines.	Unsuited: excess fines.	Poor: too sandy.

See footnote at end of table.

TABLE 9.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Roetex:				
46	Poor: shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey.
Satin:				
47	Poor: shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey, small stones.
Ships:				
48, [1]49	Poor:	Unsuited:	Unsuited:	Poor:

TABLE 10.--WATER MANAGEMENT

["Seepage" and some of the other terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe"]

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
Aledo:						
1	Severe: depth to rock.	Severe: thin layer.	Depth to rock	Rooting depth, droughty.	Depth to rock, rooting depth.	Droughty, rooting depth.
Altoga:						
2, [1]3, [1]4	Moderate: seepage.	Moderate: unstable fill.	Not needed	Complex slope, erodes easily.	Favorable	Favorable.
Austin:						
5, 6	Severe: depth to rock.	Moderate: compressible.	Not needed	Slow intake	Favorable	Favorable.

TABLE 10.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
Ferris:						
[1]24:						
Heiden part-----	Slight---------	Moderate: unstable fill, shrink-swell.	Not needed-----	Slow intake, slope.	Slope----------	Percs slowly, slope.
Gaddy:						
25, [1]26----------	Severe: seepage.	Moderate: unstable fill, piping.	Not needed-----	Seepage--------	Erodes easily	Erodes easily.
Gowen:						
27	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

TABLE 10.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
Ships: 48, [1]49	Slight	Moderate: compressible.	Percs slowly	Slow intake, percs slowly.	Percs slowly	Percs slowly.
Silawa: 50, 51, 52, 53	Severe: seepage.	Moderate: piping, erodes easily.	Not needed	Erodes easily	Erodes easily	Erodes easily.
Silstid: 54	Moderate: seepage.	Moderate: piping.	Not needed	Erodes easily, seepage.	Too sandy	Erodes easily.
Stephen: 55	Severe: depth to rock.	Severe: thin layer.	Not needed	Droughty, rooting depth.	Depth to rock, rooting depth.	Droughty, rooting depth.
Tabor: 56, 57	Slight: favorable.	Moderate: unstable fill.	Not needed	Slow intake	Percs slowly	Percs slowly.
Trinity: 58	Slight	Moderate: compressible, unstable fill.	Percs slowly	Percs slowly, wetness.	Wetness	Wetness, percs slowly.
59	Slight	Moderate: compressible, unstable fill.	Percs slowly, floods.	Percs slowly, floods, wetness.	Floods, wetness, percs slowly.	Floods, wetness, percs slowly.
Weswood: 60, 61, [1]62	Moderate: seepage.	Moderate: piping, erodes easily.	Not needed	Favorable	Favorable	Favorable.
Wilson: 63, 64, 65, 66, 67	Slight	Moderate: unstable fill.	Percs slowly	Percs slowly, slow intake.	Percs slowly	Percs slowly.
Yahola: 68	Severe: seepage.	Moderate: unstable fill, seepage, piping.	Not needed	Floods	Not needed	Not needed.

[1]This map unit is made up of two or more dominant kinds of soil. See map unit description for the composition and behavior of the whole unit.

TABLE 11.--RECREATIONAL DEVELOPMENT

["Percs slowly" and some of the other terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe"]

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
Aledo:				
1	Moderate: small stones.	Slight	Severe: depth to rock, small stones.	Slight.
Altoga:				
2, [1]3	Moderate: too clayey.	Moderate: too clayey.	Moderate: too clayey.	Moderate: too clayey.
[1]4	Moderate: too clayey.	Moderate: too clayey.	Severe: slope.	Moderate: too clayey.
Austin:				
5, 6	Severe: too clayey.	Severe: too clayey.	Severe: too clayey.	Severe: too clayey.
Axtell:				
7, 8, 9	Severe: percs slowly.	Slight	Severe: percs slowly.	Slight.
[1]10:				
Axtell part	Severe: percs slowly.	Slight	Severe: percs slowly.	Slight.
Crockett part	Severe: percs slowly.	Slight	Severe: percs slowly.	Slight.
Bastrop:				
11	Slight	Slight	Slight	Slight.
Blum Variant:				
12	Moderate: percs slowly.	Slight	Moderate: percs slowly.	Slight.
Branyon:				
13, 14	Severe: percs slowly, too clayey.	Severe: too clayey.	Severe: percs slowly, too clayey.	Severe: too clayey.
Bunyan:				
15	Severe: floods.	Moderate: floods.	Severe: floods.	Moderate: floods.
Burleson:				
16, 17	Severe: percs slowly, too clayey.	Severe: too clayey.	Severe: percs slowly, too clayey.	Severe: too clayey.
Chazos:				
18	Moderate: percs slowly.	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.
Crockett:				
19, 20, 21	Severe: percs slowly.	Slight	Severe: percs slowly.	Slight.
Desan:				
22	Severe: too sandy.	Severe: too sandy.	Severe: too sandy, soil blowing.	Severe: too sandy.
Eddy:				
23	Moderate: percs slowly, small stones.	Moderate: small stones.	Severe: depth to rock.	Moderate: small stones, too clayey.

See footnote at end of table.

TABLE 11.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
Ferris:				
[1]24:				
Ferris part	Severe: too clayey, percs slowly.	Severe: too clayey.	Severe: too clayey, percs slowly, slope.	Severe: too clayey.
Heiden part	Severe: too clayey, percs slowly.	Severe: too clayey.	Severe: too clayey, percs slowly.	Severe: too clayey.
Gaddy:				
25	Severe: floods.	Moderate: floods.	Moderate: floods.	Slight.
[1]26	Severe: floods.	Severe: floods.	Severe: floods.	Moderate: floods.
Gowen:				
27	Severe: floods.	Moderate: floods.	Moderate: too clayey, floods.	Moderate: too clayey.
28	Severe: floods.	Moderate: floods.	Severe: floods.	Moderate: too clayey, floods.
Heiden:				
29, 30, 31	Severe: too clayey, percs slowly.	Severe: too clayey.	Severe: too clayey, percs slowly.	Severe: too clayey.
[1]32:				
Heiden part	Severe: too clayey, percs slowly.	Severe: too clayey.	Severe: too clayey, percs slowly.	Severe: too clayey.
Ferris part	Severe: too clayey, percs slowly.	Severe: too clayey.	Severe: too clayey, percs slowly, slope.	Severe: too clayey.
Highbank:				
33	Moderate: percs slowly.	Moderate: too clayey.	Moderate: percs slowly, too clayey.	Moderate: too clayey.
Houston Black:				
34, 35	Severe: percs slowly, too clayey.	Severe: too clayey.	Severe: percs slowly, too clayey.	Severe: too clayey.
Lewisville:				
36, 37	Moderate: too clayey.	Moderate: too clayey.	Moderate: too clayey.	Moderate: too clayey.
Lott:				
38, 39	Severe: too clayey.	Severe: too clayey.	Severe: too clayey.	Severe: too clayey.
Normangee:				
40, 41, 42	Severe: percs slowly.	Moderate: too clayey.	Severe: percs slowly.	Moderate: too clayey.
Ovan:				
43	Severe: floods, too clayey.	Severe: floods, too clayey.	Severe: floods, too clayey.	Severe: too clayey.

See footnote at end of table.

TABLE 11.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
Yahola: 68	Severe: floods.	Moderate: floods.	Moderate: floods.	Slight.

[1]This map unit is made up of two or more dominant kinds of soil. See map unit description for the composition and behavior of the whole unit.

TABLE 12.--WILDLIFE HABITAT POTENTIALS

[See text for definitions of "good," "fair," "poor," and "very poor"]

Soil name and map symbol	Potential for habitat elements						Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Wetland wildlife	Rangeland wildlife
Aledo:									
1	Poor	Poor	Poor	Fair	Very poor.	Very poor.	Poor	Very poor.	Poor.
Altoga:									
2, [1]3	Fair	Fair	Fair	Fair	Poor	Very poor.	Fair	Very poor.	Fair.
[1]4	Poor	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Very poor.	Fair.
Austin:									
5, 6	Fair	Good	Fair	Fair	Poor	Very poor.	Fair	Very poor.	Fair.
Axtell:									
7, 8, 9	Fair	Fair	Good	Good	Poor	Very poor.	Fair	Very poor.	Good.
[1]10:									
Axtell part	Poor	Fair	Good	Good	Poor	Very poor.	Fair	Very poor.	Good.
Crockett part	Poor	Fair	Good	Good	Poor	Very poor.	Fair	Very poor.	Good.
Bastrop:									
11	Good	Fair	Good	Good	Poor	Very poor.	Good	Very poor.	Good.
Blum Variant:									
12	Fair	Good	Good	Good	Poor	Poor	Good	Poor	Good.
Branyon:									
13, 14	Good	Good	Poor	Fair	Poor	Poor	Fair	Poor	Fair.
Bunyan:									
15	Very poor.	Poor	Fair	Good	Poor	Very poor.	Poor	Very poor.	Fair.
Burleson:									
16, 17	Good	Good	Poor	Poor	Very poor.	Very poor.	Fair	Very poor.	Poor.
Chazos:									
18	Fair	Good	Good	Good	Poor	Very poor.	Good	Very poor.	Good.
Crockett:									
19, 20, 21	Fair	Good	Good	Good	Poor	Poor	Good	Poor	Good.
Desan:									
22	Fair	Good	Fair	Fair	Poor	Very poor.	Fair	Very poor.	Fair.
Eddy:									
23	Poor	Poor	Poor	Fair	Very poor.	Very poor.	Poor	Very poor.	Poor.
Ferris:									
[1]24:									
Ferris part	Poor	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Very poor.	Fair.

See footnote at end of table.

TABLE 12.--WILDLIFE HABITAT POTENTIALS--Continued

Soil name and map symbol	Potential for habitat elements						Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Wetland wildlife	Rangeland wildlife
Ferris:									
[1]24:									
Heiden part	Poor	Fair	Fair	Fair	Poor	Very poor.	Fair	Very poor.	Fair.
Gaddy:									
25	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Very poor.	Fair.
[1]26	Very poor.	Poor	Fair	Fair	Very poor.	Very poor.	Poor	Very poor.	Fair.
Gowen:									
27	Good	Good	Fair	Good	Poor	Very poor.	Good	Very poor.	Fair.
28	Very poor.	Poor	Fair	Good	Poor	Very poor.	Poor	Very poor.	Fair.
Heiden:									
29	Good	Good	Fair	Fair	Poor	Very poor.	Good	Very poor.	Fair.
30, 31	Fair	Good	Fair	Fair	Poor	Very poor.	Fair	Very poor.	Fair.
[1]32:									
Heiden part	Fair	Good	Fair	Fair	Poor	Very poor.	Fair	Very poor.	Fair.

TABLE 12.--WILDLIFE HABITAT POTENTIALS--Continued

Soil name and map symbol	Potential for habitat elements						Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Wetland wildlife	Rangeland wildlife
Satin:									
47	Poor	Poor	Fair	Fair	Poor	Very poor.	Poor	Very poor.	Fair.
Ships:									
48	Good	Good	Fair	Fair	Poor	Poor	Good	Poor	Fair.
[1]49	Very poor.	Poor	Fair	Fair	Poor	Poor	Poor	Poor	Fair.
Silawa:									
50	Fair	Good	Good	Good	Poor	Very poor.	Good	Very poor.	Good.
51	Good	Good	Good	Good	Poor	Very poor.	Good	Very poor.	Good.
52	Fair	Good	Good	Good	Poor	Very poor.	Good	Very poor.	Good.
53	Fair	Good	Good	Good	Poor	Very poor.	Good	Very poor.	Good.
Silstid:									
54	Poor	Poor	Fair	Good	Poor	Very poor.	Poor	Very poor.	Fair.
Stephen:									
55	Fair	Good	Fair	Fair	Poor	Very poor.	Fair	Very poor.	Fair.
Tabor:									
56, 57	Fair	Good	Good	Good	Very poor.	Very poor.	Good	Very poor.	Good.
Trinity:									
58	Fair	Good	Fair	Fair	Poor	Fair	Fair	Poor	Fair.
59	Poor	Fair	Fair	Fair	Poor	Fair	Fair	Poor	Fair.
Weswood:									
60, 61	Good	Good	Fair	Good	Poor	Very poor.	Good	Very poor.	Fair.
[1]62	Fair	Good	Fair	Good	Poor	Very poor.	Fair	Very poor.	Fair.
Wilson:									
63, 64, 65, 66	Fair	Fair	Good	Fair	Fair	Fair	Fair	Fair	Fair.
67	Fair	Fair	Good	Fair	Poor	Poor	Fair	Poor	Fair.
Yahola:									
68	Good	Good	Good	Good	Poor	Very poor.	Good	Very poor.	Good.

[1]This map unit is made up of two or more dominant kinds of soil. See map unit description for the composition and behavior of the whole unit.

TABLE 13.--GARDENING AND LANDSCAPING

Soil series and map symbol	Flowers	Shrubs	Trees
Aledo:			
1	Canna, calendula, dahlia, chrysanthemum, iris, gladiolus, geranium, zinnia.	Barbados-cherry, bottlebrush, bridalwreath, goldflower, guava, oleander.	(2).
Altoga:			
2, [1]3, [1]4	Chrysanthemum, calendula, gladiolus, geranium, zinnia, petunia, verbena, canna.	Duranta, goldflower, briadalwreath, barbados-cherry, crapemyrtle, ligustrum, guava, jasmine.	Arborvitae, Arizona ash, live oak, magnolia, peach, pecan, plum, sycamore.
Austin:			
5, 6,	Gladiolus, petunia, iris, zinnia, larkspur, daylily, snapdragon, chrysanthemum.	Barbados-cherry, bottlebrush, bougainvillaea, bridalwreath, duranta, goldflower, guava, jasmine.	American elm, halepensis, live oak, magnolia, pecan, plum, arborvitae, sycamore.
Axtell:			
7, 8, 9, [1]10	Aster, canna, zinnia, dahlia, petunia, gladiolus, pansy, geranium.	Pyracantha, oleander, gardenia, butterflybush, camellia, barbados-cherry, jasmine.	Halepensis, live oak, magnolia, American elm, cedrus deodara, pecan, plum, sycamore.
Bastrop:			
11	Phlox, begonia, canna, petunia, geranium, iris, rose, narcissus.	Jasmine, hydrangea, camellia, oleander, goldflower, gardenia, pyracantha.	Arizona ash, cedrus deodara, American elm, Japanese black pine, magnolia, live oak, plum, pecan.
Blum Variant:			
12	Gladiolus, rose, petunia, pansy, stock, snapdragon, verbena, zinnia.	Bottlebrush, duranta, oleander, jasmine, butterflybush, gardenia, goldflower, pyracantha.	Cedrus deodara, Japanese black pine, pecan, arborvitae, Arizona ash, American elm, live oak, magnolia.
Branyon:			
13, 14	Marigold, petunia, zinnia, dahlia, calendula, chrysanthemum, geranium, iris.	Barbados-cherry, bottlebrush, bridalwreath, duranta, guava, goldflower, crapemyrtle, ligustrum.	Arborvitae, Arizona ash, American elm, halepensis, Japanese black pine, live oak, peach, plum.
Bunyan:			
15	Caladium, marigold, canna, hibiscus, dahlia, gladiolus.	Bottlebrush, bridalwreath, goldflower, duranta, oleander, hydrangea, jasmine, barbados-cherry.	Halepensis, arborvitae, Japanese black elm, Arizona ash, American elm, pecan, plum, peach.
Burleson:			
16, 17	Marigold, hibiscus, canna, gladiolus, daylily, pansy, petunia, zinnia.	Guava, crapemyrtle, bottlebrush, bridalwreath, ligustrum, duranta, panasgrass, goldflower.	Arizona ash, American elm, Japanese black pine, halepensis, arborvitae, peach, plum, pecan.
Chazos:			
18	Agapanthus, aster, caladium, canna, cornflower, gladiolus, hibiscus, hyacinth.	Azalea, oleander, mock-orange, barbados-cherry, guava, bouganvillaea, gardenia, butterflybush.	Capejasmine, cedrus deodara, flowering cherry, dogwood, American elm, plum, peach, pecan.

See footnotes at end of table.

TABLE 13.--GARDENING AND LANDSCAPING

Soil series and map symbol	Flowers	Shrubs	Trees
Crockett: 19, 20, 21	Cornflower, aster, shasta daisy, agapanthus, hollyhock, caladium, zinnia, canna.	Bridalwreath, goldflower, hydrangea, barbados-cherry, camellia, gardenia,	American elm, magnolia, arborvitae, Japanese black pine, Arizona ash, pecan, plum, sycamore.
Desan: 22	Cornflower, caladium, hibiscus, agapanthus, gladiolus, aster, hyacinth, canna.	Butterflybush, mock-orange, bouganvillaea, barbados-cherry, gardenia, goldflower, bridalwreath, azalea.	FLowering crabapple, capejasmine, cedrus deodara, halepensis, dogwood, pecan, peach, plum.
Eddy: 23	Cornflower, amaryllis, hibiscus, hollyhock, aster, petunia, zinnia, scilla.	Guava, barbados-cherry, oleander, bottlebrush, bridalwreath, goldflower.	(2).
Ferris: [1]24	Cornflower, hollyhock, marigold, shasta daisy, hibiscus, daylily, petunia, gladiolus.	Panasgrass, crapemyrtle, gold flower, ligustrum, privet, bridalwreath, guava, duranta.	Japanese black pine, halepensis, American elm, Arizona ash, arborvitae, plum, peach, pecan.
Gaddy: 25, [1]26	Cornflower, agapanthus, canna, caladium, chrysanthemum, gladiolus, dahlia, marigold.	Oleander, bottlebrush, hydrangea, bridalwreath, jasmine, duranta, goldflower.	Arborvitae, Japanese black pine, live oak, plum, halepensis, sycamore, peach, pecan.
Gowen: 27, 28	Marigold, hollyhock, hibiscus shasta daisy, cornflower, zinnia, verbena, phlox.	Bougainvillaea, bridalwreath, duranta, goldflower, guava, jasmine, barbados-cherry, bottlebrush.	Sycamore, arborvitae, American elm, Japanese black pine, magnolia, pecan, plum, peach.
Heiden: 29, 30, 31, [1]32	Marigold, hibiscus, gladiolus, daylily, petunia, verbena, zinnia, chrysanthemum.	Panasgrass, ligustrum, crapemyrtle, guava, goldflower, duranta, bridalwreath, bottlebrush.	Magnolia, sycamore, live oak, arborvitae, Arizona ash, peach, plum, pecan.
Highbank: 33	Cornflower, shasta daisy, hibiscus, hollyhock, zinnia, marigold, petunia, canna.	Bottlebrush, duranta, oleander, bougainvillaea, goldflower, bridalwreath, guava, quince.	Halepensis, Japanese black pine, live oak, sycamore, magnolia, peach, plum, pecan.
Houston Black: 34, 35	Canna, chrysanthemum, dahlia, gladiolus, iris, petunia, zinnia, marigold.	Bridalwreath, duranta, goldflower, guava, crapemyrtle, ligustrum, panasgrass, privet.	Arborvitae, American elm, sycamore, live oak, halepensis, plum, pecan, peach.
Lewisville: 36, 37	Marigold, cornflower, petunia, shasta daisy, zinnia, hibiscus, gladiolus, hollyhock.	Jasmine, guava, ligustrum, crapemyrtle, bridalwreath, goldflower, barbados-cherry, duranta.	Halepensis, arborvitae, sycamore, Japanese black pine, American elm, pecan, plum, peach.

See footnotes at end of table.

TABLE 13.--GARDENING AND LANDSCAPING

Soil series and map symbol	Flowers	Shrubs	Trees
Lott: 38, 39	Zinnia, marigold, hibiscus, cornflower, gladiolus, petunia, hollyhock, shasta daisy.	Barbadoa-cherry, bottlebrush, bridalwreath, duranta, goldflower, guava, crapemyrtle, ligustrum.	Magnolia, sycamore, live oak, American elm, halepensis, plum, peach, pecan.
Normangee: 40, 41, 42	Aster, agapanthus, caladium, canna, cornflower, shasta daisy, hollyhock, zinnia.	Bottlebrush, goldflower, guava, bridalwreath, jasmine, pyracantha, oleander, bougainvillaea.	Cedrus deodara, Arizona ash, magnolia, American elm, sycamore, halepensis, plum, peach, pecan.
Ovan: 43, 44	Gladiolus, zinnia, petunia, marigold, hollyhock, hibiscus, shasta daisy, cornflower.	Privet, panasgrass, ligustrum, crapemyrtle, guava, goldflower, duranta, bridalwreath.	Halepensis, Arizona ash, live oak, magnolia, Japanese black pine, pecan, plum, peach.
Padina: 145	Hyacinth, canna, aster, hibiscus, gladiolus, agapanthus, caladium, cornflower.	Azalea, butterflybush, guava, camellia, gardenia, quince, pyrancantha, jasmine.	Cedrus deodara, halepensis, flowering cherry, capejasmine, dogwood, pecan, plum, peach.
Roetex: 46	Gladiolus, geranium, iris, larkspur, daylily, phlox, verbena, zinnia.	Bottlebrush, guava, crapemyrtle, bridalwreath, ligustrum, duranta, panasgrass, goldflower.	Japanese black pine, halepensis, American elm, Arizona ash, arborvitae, plum, peach, pecan.
Satin: 47	Hollyhock, gladiolus, hibiscus, zinnia, shasta daisy, petunia, cornflower, marigold.	Guava, privet, goldflower, panasgrass, duranta, ligustrum, bridalwreath, crapemyrtle.	Arborvitae, Japanese black pine, live oak, halepensis, sycamore, plum, pecan, peach.
Ships: 48, 149	Geranium, larkspur, phlox, zinnia, marigold, hibiscus, gladiolus, verbena.	Crapemyrtle, goldflower, bridalwreath, duranta, barbados-cherry, ligustrum, bottlebrush.	Sycamore, arborvitae, American elm, Japanese black pine, magnolia, plum, peach, pecan.
Silawa: 50, 51, 52, 53	Hibiscus, cornflower, caladium, agapanthus, hyacinth, gladiolus, canna, aster.	Butterflybush, oleander, camellia, pyracantha, mock-orange, bottlebrush, jasmine, bridalwreath.	Flowering crabapple, dogwood, live oak, cedrus deodara, capejasmine, peach, plum, pecan.
Silstid: 54	Canna, hibiscus, agapanthus, cornflower, hyacinth, aster, gladiolus, caladium.	Quince, jasmine, azalea, pyracantha, guava, goldflower, mock-orange, camellia.	Dogwood, flowering cherry, cedrus deodara, capejasmine, Arizona ash, plum, peach, pecan.
Stephen: 55	Aster, cornflower, petunia, amaryllis, zinnia, hibiscus, scilla, hollyhock.	Guava, bridalwreath, barbados-cherry, oleander, goldflower, bottlebrush.	(2).

TABLE 13.--GARDENING AND LANDSCAPING

Soil series and map symbol	Flowers	Shrubs	Trees

TABLE 14.--ENGINEERING PROPERTIES AND CLASSIFICATIONS

[The symbol < means less than; > means greater than. Absence of an entry means data were not estimated]

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Aledo:											
1----------	0-5	Fine sandy loam	CL, GC, SC	A-2-4, A-4, A-6, A-2-6	0-20	50-95	45-90	30-90	30-70	25-40	10-20
	5-10	Very gravelly fine sandy loam, very gravelly loam.	GC, GM, SC	A-2-4, A-2-6	5-30	35-55	30-50	25-50	15-35	30-40	10-20
	10-12	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Altoga:											
2, [1]3, [1]4---------	0-25	Silty clay------	CL, CH	A-6, A-7-6	0	95-100	95-100	85-100	80-99	35-51	20-31
	25-80	Silty clay, silty clay loam, clay loam.	CL	A-6, A-7-6	0	95-100	95-100	85-100	65-99	30-48	15-30
Austin:											
5, 6----------	0-17	Silty clay------	CH, CL	A-7-6	0-5	95-100	90-100	80-100	75-95	45-65	25-40
	17-29	Silty clay, clay, silty clay loam.	CH, CL	A-7-6	0-5	95-100	90-100	80-100	75-95	45-65	22-38
	29-35	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Axtell:											
7, 8, 9----------	0-9	Fine sandy loam	SM, ML, SM-SC, CL-ML	A-2-4, A-4	0	90-100	80-100	75-95	28-60	<31	NP-7
	9-34	Clay, clay loam, sandy clay.	CL, CH	A-7-6	0-2	90-100	75-100	75-100	51-75	42-60	25-40
	34-80	Sandy clay loam, clay loam, clay.	CL, CH, SC	A-6, A-7-6	0-2	85-100	75-100	75-95	36-88	35-55	15-35
[1]10:											
Axtell part------	0-9	Fine sandy loam	SM, ML, SM-SC, CL-ML	A-2-4, A-4	0	90-100	80-100	75-95	28-60	<31	NP-7
	9-34	Clay, clay loam, sandy clay.	CL, CH	A-7-6	0-2	90-100	75-100	75-100	51-75	42-60	25-40
	34-80	Sandy clay loam, clay loam, clay.	CL, CH, SC	A-6, A-7-6	0-2	85-100	75-100	75-95	36-88	35-55	15-35
Crockett part----	0-9	Fine sandy loam	SM, ML, CL, SC	A-2, A-4, A-6	0-2	95-100	95-100	90-100	35-95	15-35	3-15
	9-53	Clay, clay loam, sandy clay.	CH, CL	A-7-6, A-6	0	85-100	80-100	75-100	65-91	36-60	22-40
	53-80	Clay loam, sandy clay loam, loam.	CL	A-6, A-7-6	0-5	90-100	85-100	75-100	51-90	30-45	11-30

See footnote at end of table.

TABLE 14.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct					Pct	
Bastrop:											
11	0-11	Fine sandy loam	ML, SM, CL-ML, SM-SC	A-4	0	95-100	80-100	80-100	36-70	18-25	2-7
	11-67	Sandy clay loam, clay loam, loam.	CL, SC	A-6	0	95-100	80-100	80-100	40-70	26-40	11-22
	67-80	Very gravelly sandy clay loam, very gravelly loamy fine sand.	GC, CL, SC	A-2-6, A-6	0-3	50-100	30-100	30-100	20-70	26-40	11-22
Blum Variant:											
12	0-15	Fine sandy loam	SM, SM-SC, CL-ML, ML	A-4	0	95-100	95-100	70-85	40-55	<26	NP-7
	15-20	Sandy clay loam	CL, SC	A-4, A-6	0	95-100	95-100	80-95	40-60	28-39	9-18
	20-38	Clay	CL, CH	A-7-6	0	95-100	95-100	90-100	75-95	44-57	25-35
	38-40	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Branyon:											
13, 14	0-80	Clay	CH	A-7-6	0	95-100	75-100	75-100	75-100	60-80	35-55
Bunyan:											
15	0-50	Fine sandy loam	SM-SC, SC, CL, CL-ML	A-4, A-6	0	100	95-100	70-95	40-75	20-35	3-16
	50-80	Stratified clay loam to fine sandy loam.	SC, CL, ML	A-4, A-6	0	100	95-100	80-100	40-95	20-40	8-25
Burleson:											
16, 17	0-37	Clay	CH, MH	A-7-6, A-7-5	0-2	83-100	80-100	80-100	80-95	51-80	27-55
	37-80	Clay, silty clay	CH, MH	A-7-6, A-7-5	0-1	95-100	80-100	75-95	70-95	51-80	30-55
Chazos:											
18	0-12	Loamy fine sand	SM, SM-SC, SP-SM	A-2-4, A-4, A-3	0	80-100	80-100	65-98	7-45	<25	NP-4
	12-34	Clay, sandy clay	CL, CH	A-7-6	0	90-100	90-100	90-100	51-85	42-60	24-42
	34-72	Clay, sandy clay loam, sandy clay.	CL, CH, SC, SM-SC	A-6, A-7-6, A-2	0	90-100	90-100	80-100	25-85	25-60	6-40
Crockett:											
19, 20, 21	0-9	Fine sandy loam	SM, ML, CL, SC	A-2, A-4, A-6	0-2	95-100	95-100	90-100	35-95	15-35	3-15
	9-53	Clay, clay loam, sandy clay.	CH, CL	A-7-6 A-6	0	85-100	80-100	75-100	65-91	36-60	22-40
	53-80	Clay loam, sandy clay loam, loam.	CL	A-6, A-7-6	0-5	90-100	85-100	75-100	51-90	30-45	11-30
Desan:											
22	0-54	Loamy fine sand	SM, SP-SM, SM-SC	A-2-4, A-3	0	98-100	95-100	85-100	8-28	<25	NP-5
	54-80	Sandy clay loam, fine sandy loam.	SC	A-2, A-4, A-6	0	98-100	95-100	90-100	25-50	20-36	8-20

See footnote at end of table.

TABLE 14.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Eddy:											
23----------	0-5	Gravelly clay loam.	GC	A-2, A-6	0-20	40-50	35-50	30-45	20-40	30-40	11-20
	5-9	Gravelly clay loam, very gravelly loam, very gravelly clay loam.	GC, GP-GC	A-2	0-60	20-50	15-45	10-38	8-35	30-40	11-20
	9-60	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Ferris:											
124:											
Ferris part------	0-60	Clay----------	CH	A-7-6	0	95-100	95-100	75-100	75-98	51-70	35-50
Heiden part------	0-21	Clay----------	CH	A-7-6	0	95-100	90-100	80-100	75-99	54-80	35-55
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

TABLE 14.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
Silawa:											
51, 52, 53	0-13	Fine sandy loam	SM, SM-SC, ML, CL-ML	A-4	0	80-100	80-100	70-100	40-60	<26	NP-7
	13-38	Sandy clay loam, fine sandy loam.	CL, SC	A-4, A-6	0	80-100	80-100	80-100	35-60	25-40	8-18
	38-59	Fine sandy loam, gravelly fine sandy loam, sandy clay loam.	CL, CL-ML, SC, SM-SC	A-4, A-6, A-2-4, A-2-6	0-2	45-100	45-100	38-100	18-60	21-34	4-14
	59-70	Loamy fine sand, gravelly loamy sand, fine sandy loam.	SM, SM-SC	A-2-4, A-4	0-2	45-100	45-100	38-100	12-40	<26	NP-7
Silstid:											
54	0-26	Loamy fine sand	SM, SP-SM	A-2-4	0	95-100	95-100	90-100	10-25	<25	NP-3
	26-56	Sandy clay loam, loam, fine sandy loam.	SC, CL, SM-SC, CL-ML	A-4, A-6, A-2-4, A-2-6	0	95-100	95-100	80-100	30-55	20-40	4-22
	56-80	Sandy clay loam, loam, fine sandy loam.	SC, CL, SM-SC, CL-ML	A-4, A-6, A-2-4, A-2-6	0	95-100	85-100	70-100	22-55	20-40	4-22
Stephen:											
55	0-15	Silty clay	CL, CH	A-7-6	0-5	95-100	90-100	85-100	80-90	45-66	22-42
	15-19	Variable	---	---	---	---	---	---	---	---	---
	19-28	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Tabor:											
56, 57	0-12	Fine sandy loam	ML, SM, CL-ML, SC-SM	A-4, A-2-4	0	85-100	75-100	70-100	30-55	<25	NP-7
	12-44	Clay	CH, CL	A-7-6	0	95-100	90-100	85-100	55-90	45-65	25-40
	44-70	Clay, clay loam, sandy clay loam.	CH, CL, SC	A-7-6 A-6	0	95-100	90-100	75-100	40-90	35-60	15-35
Trinity:											
58, 59	0-80	Clay	CH	A-7-6	0	100	98-100	85-100	80-99	55-90	30-60
Weswood:											
60	0-6	Silt loam	CL, CL-ML	A-4, A-6	0	100	100	95-100	70-95	20-35	4-15
	6-60	Silt loam, silty clay loam.	CL	A-6, A-7-6	0	100	100	90-100	70-98	30-46	11-26
61, [1]62	0-6	Silty clay loam	CL	A-6, A-7-6	0	100	100	90-100	75-98	30-50	11-30
	6-60	Silt loam, silty clay loam.	CL	A-6, A-7-6	0	100	100	90-100	70-98	30-46	11-26
Wilson:											
63, 64	0-6	Loam	CL, CL-ML	A-4, A-6	0	95-100	85-100	80-100	60-96	24-36	7-18
	6-39	Silty clay, clay, clay loam.	CL, CH	A-7-6, A-6	0	90-100	80-100	80-100	65-96	40-55	21-35
	39-80	Silty clay, clay	CL, CH	A-7-6, A-6	0	95-100	90-100	85-100	70-90	40-57	24-35
65, 66, 67	0-6	Silty clay loam	CL	A-4, A-6	0	95-100	85-100	80-100	60-96	25-36	8-20
	6-39	Silty clay, clay, clay loam.	CL, CH	A-7-6, A-6	0	90-100	80-100	80-100	65-96	40-55	21-35
	39-80	Silty clay, clay	CL, CH	A-7-6, A-6	0	95-100	90-100	85-100	70-90	40-57	24-35

See footnote at end of table.

TABLE 14.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Yahola:											
68----------	0-10	Fine sandy loam	SM, SC, ML, CL	A-4	0	100	95-100	90-100	36-85	<30	NP-10
	10-37	Fine sandy loam, loam.	SM, SC, ML, CL	A-4	0	100	95-100	90-100	36-85	<30	NP-10
	37-80	Fine sandy loam, loam, loamy fine sand.	SM, SC, ML, CL	A-4, A-2	0	100	95-100	90-100	15-85	<30	NP-10

[1]This map unit is made up of two or more dominant kinds of soil. See map unit description for the composition and behavior of the whole unit.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS

[Dashes indicate data were not available. The symbol < means less than. The erosion tolerance factor

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

			Available water	Soil	Shrink-swell	Risk of corrosion		Erosion factors
						Uncoated		

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Permea-bility	Available water capacity	Soil reaction	Shrink-swell potential	Risk of corrosion: Uncoated steel	Risk of corrosion: Concrete	Erosion factors: K	Erosion factors: T
	In	In/hr	In/in	pH					
Padina:									
145	0-49	6.0-20	0.05-0.08	5.6-7.3	Very low	Low	Low	0.17	5
	49-80	0.2-0.6	0.14-0.18	5.1-6.5	Low	High	Moderate	0.24	
Roetex:									
46	0-12	<0.06	0.14-0.19	7.4-8.4	Very high	High	Low	0.32	5
	12-54	<0.06	0.14-0.19	7.9-8.4	Very high	High	Low	0.32	
	54-62	<0.06	0.14-0.19	7.9-8.4	Very high	High	Low	0.32	
Satin:									
47	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

TABLE 16.--SOIL AND WATER FEATURES

[Absence of an entry indicates the feature is not a concern. The definitions of "flooding" and "water table" in the Glossary explain the terms "rare," "brief," and "perched." The symbol > means greater than]

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness
					Ft			In	
Aledo:									
1	C	None	---	---	>6.0	---	---	8-12	Hard
Altoga:									
2, [1]3, [1]4	C	None	---	---	>6.0	---	---	>60	---
Austin:									
5, 6	C	None	---	---	>6.0	---	---	20-40	Rippable
Axtell:									
7, 8, 9	D	None	---	---	>6.0	---	---	>60	---
[1]10:									
Axtell part	D	None	---	---	>6.0	---	---	>60	---
Crockett part	D	None	---	---	>6.0	---	---	>60	---
Bastrop:									
11	B	None	---	---	>6.0	---	---	>60	---
Blum Variant:									
12	C	None	---	---	2.5-3.5	Perched	May-Sep	34-39	Hard
Branyon:									
13, 14	D	None	---	---	>6.0	---	---	>60	---
Bunyan:									
15	B	Frequent	Brief	Oct-May	>6.0	---	---	>60	---
Burleson:									
16, 17	D	None	---	---	>6.0	---	---	>60	---
Chazos:									
18	C	None	---	---	>6.0	---	---	>60	---
Crockett:									
19, 20, 21	D	None	---	---	>6.0	---	---	>60	---
Desan:									
22	A	None	---	---	>6.0	---	---	>60	---
Eddy:									
23	C	None	---	---	>6.0	---	---	3-9	Rippable
Ferris:									
[1]24:									
Ferris part	D	None	---	---	>6.0	---	---	>60	---
Heiden part	D	None	---	---	>6.0	---	---	>60	---
Gaddy:									
25, [1]26	A	Common	Very brief	Sep-Mar	>6.0	---	---	>60	---
Gowen:									
27, 28	B	Common	Brief	Sep-May	>6.0	---	---	>60	---
Heiden:									
29, 30, 31	D	None	---	---	>6.0	---	---	>60	---
[1]32:									
Heiden part	D	None	---	---	>6.0	---	---	>60	---

See footnote at end of table.

TABLE 16.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness
					Ft			In	
Heiden:									
[1]32:									
Ferris part-----	D	None--------	---	---	>6.0	---	---	>60	---
Highbank:									
33----------	C	Common------	Very brief	Oct-Mar	>6.0	---	---	>60	---
Houston Black:									
34, 35----------	D	None--------	---	---	>6.0	---	---	>60	---
Lewisville:									
36, 37----------	B	None--------	---	---	>6.0	---	---	>60	---
Lott:									
38, 39----------	C	None--------	---	---	>6.0	---	---	40-60	Rippable
Normangee:									
40, 41, 42-------	D	None--------	---	---	>6.0	---	---	>60	---
Ovan:									
43, 44----------	D	Common------	Brief-----	Mar-Jun	>6.0	---	---	>60	---
Padina:									
[1]45----------	B	None--------	---	---	3.0-6.0	Perched	Oct-May	>60	---
Roetex:									
46----------	D	Common------	Long------	Oct-May	1.0-3.0	Apparent	Oct-May	>60	---
Satin:									
47----------	C	None--------	---	---	>6.0	---	---	>60	---
Ships:									
48, [1]49----------	D	Rare to common.	Brief-----	Oct-May	>6.0	---	---	>60	---
Silawa:									
50, 51, 52, 53---	B	None--------	---	---	>6.0	---	---	>60	---
Silstid:									
54----------	A	None--------	---	---	>6.0	---	---	>60	---
Stephen:									

TABLE 17.--ENGINEERING AND TEST DATA

[Tests made by Texas Highway Department]

Soil name	Report No. 72-	Depth	Shrinkage: Limit	Shrinkage: Lineal	Shrinkage: Ratio	Mechanical analysis[1]: Percentage passing sieve--: 1 3/4 in	1 1/4 in	7/8 in	5/8 in	3/8 in	No. 4 (4.7 mm)	No. 10 (2.0 mm)	No. 40 (0.42 mm)	No. 60 (0.25 mm)	No. 200 (0.074 mm)	Percentage smaller than--: 0.05 mm	0.005 mm	0.002 mm	Liquid limit	Plasticity index	Classification[2]: AASHTO[3]	Unified[4]
		In																	Pct			
Chazos loam, fine sand, 1 to 5 percent slopes.	152-R	0-16	17	2.2	1.76	100	100	100	100	100	100	100	91	71	27	19	2	1	20	4	A-2-4(0)	SM-SC
	153-R	6-12	15	1.3	1.83	100	100	100	100	100	100	99	96	74	28	20	2	0	17	3	A-2-4(0)	SM
	154-R	12-22	11	15.9	1.98	100	100	100	100	100	100	99	96	86	65	61	42	41	46	29	A-7-6(15)	CL
	155-R	22-34	13	15.4	1.97	100	100	100	100	100	100	100	97	88	67	61	45	43	46	29	A-7-6(15)	CL
	156-R	34-41	13	15.2	1.99	100	100	100	100	100	100	100	97	88	66	60	39	37	46	31	A-7-6(15)	CL
	157-R	41-72	11	17.3	2.06	100	100	100	100	100	100	100	97	89	68	63	39	36	48	35	A-7-6(16)	CL
	131-R	0-7	15	0.6	1.87	100	100	100	100	100	100	99	92	77	45	34	6	3	16	2	A-4(2)	SM
	132-R	12-22	11	17.4	2.01	100	100	100	100	100	100	99	95	88	72	67	47	44	50	31	A-7-6(17)	CL or CH
	133-R	41-61	13	13.6	1.99	100	100	100	100	100	100	99	93	84	63	56	33	28	40	27	A-6(12)	CL
Lott silty clay, 1 to 3 percent slopes.	121-R	5-15	10	17.9	2.02	100	100	100	99	99	99	99	97	95	84	73	40	27	50	31	A-7-6(18)	CL or CH
	122-R	15-30	14	14.9	1.95	100	100	100	100	99	98	96	95	94	87	84	58	43	46	29	A-7-6(16)	CL
	123-R	30-47	14	12.6	1.90	100	100	100	100	100	99	98	97	96	91	88	63	40	40	23	A-6(13)	CL
	124-R	47-80	13	11.8	1.94	100	100	100	100	100	100	100	99	99	96	93	75	49	37	22	A-6(13)	CL
Ovan silty clay, frequently flooded.	144-R	0-29	14	18.0	1.95	100	100	100	100	100	100	100	100	100	99	94	58	40	55	36	A-7-6(19)	CH
	145-R	29-46	13	17.5	1.97	100	100	100	100	100	100	100	100	100	98	91	53	27	52	34	A-7-6(18)	CH
	146-R	46-80	12	16.5	1.98	100	100	100	100	100	100	100	99	98	90	84	54	39	49	32	A-7-6(18)	CL
Satin clay loam, 1 to 5 percent slopes.	139-R	0-5	14	19.8	1.90	100	100	100	97	95	89	82	71	65	55	47	24	16	64	38	A-7-6(14)	CH
	140-R	5-11	10	24.7	2.00	100	97	94	89	80	57	33	22	21	17	14	8	5	77	46	A-2-7(1)	SC
	141-R	11-18	10	26.6	1.98	100	100	96	94	87	63	30	19	19	15	14	8	5	87	51	A-2-7(0)	SC
	142-R	18-34	12	28.2	2.01	100	87	85	79	71	54	34	24	23	20	18	13	10	97	67	A-2-7(1)	SC
	143-R	34-80	11	16.8	2.06	100	100	100	100	100	100	99	99	99	97	95	75	51	45	30	A-7-6(17)	CL
Ships clay:	137-R	6-34	13	22.4	1.98	100	100	100	100	100	100	100	100	100	99	97	85	66	70	47	A-7-6(20)	CH
	138-R	34-54	13	22.0	1.97	100	100	100	100	100	100	100	100	100	100	100	87	69	69	45	A-7-6(20)	CH

[1]Mechanical analyses according to the AASHTO Designation T 88 (1). Results by this procedure frequently may differ somewhat from results that would have been obtained by the soil survey procedure of the Soil Conservation Service (SCS). In the AASHTO procedure, the fine material is analyzed by the hydrometer method and the various grain-size fractions are calculated on the basis of all the material, including that coarser than 2 mm in diameter. In the SCS soil survey procedure, the fine material is analyzed by the pipette method and the material coarser than 2 mm in diameter is excluded from calculations of grain-size fractions. The mechanical analyses used in this table are not suitable for use in naming textural classes for soil.

[2]Unified and AASHTO Classification made by Soil Conservation Service personnel.

[3]Based on Standard Specifications for Highway Materials and Methods of Sampling and Testing (Pt. 1, Ed. 8): The Classification of Soils and Soil-Aggregate Mixtures for Highway Construction Purposes, AASHTO Designation M 145-49 (1).

[4]Based on the Unified Soil Classfication System, Technical Memorandum No. 3-357, Volume 1, Waterways Experiment Station, Corps of Engineers, March 1953. (2)

TABLE 18.--CLASSIFICATION OF THE SOILS

[An asterisk in the first column indicates a taxadjunct to the series. See "Soil Series and Morphology" for a description of those characteristics of this taxadjunct that are outside the range of the series]

Soil name	Family or higher taxonomic class
Aledo	Loamy-skeletal, carbonatic, thermic Lithic Haplustolls
Altoga	Fine-silty, carbonatic, thermic Typic Ustochrepts
Austin	Fine-silty, carbonatic, thermic Entic Haplustolls
Axtell	Fine, montmorillonitic, thermic Udertic Paleustalfs
Bastrop	Fine-loamy, mixed, thermic Udic Paleustalfs
Blum Variant	Fine, mixed, thermic Aquic Argiustolls
Branyon	Fine, montmorillonitic, thermic Udic Pellusterts
*Bunyan	Fine-loamy, mixed, nonacid, thermic Typic Ustifluvents
Burleson	Fine, montmorillonitic, thermic Udic Pellusterts
Chazos	Fine, mixed, thermic Aquic Paleustalfs
Crockett	Fine, montmorillonitic, thermic Udertic Paleustalfs
Desan	Loamy, siliceous, thermic Grossarenic Paleustalfs
Eddy	Loamy-skeletal, carbonatic, thermic, shallow Typic Ustorthents
Ferris	Fine, montmorillonitic, thermic Udorthentic Chromusterts
Gaddy	Sandy, mixed, thermic Typic Ustifluvents
Gowen	Fine-loamy, mixed, thermic Cumulic Haplustolls
Heiden	Fine, montmorillonitic, thermic Udic Chromusterts
Highbank	Fine, mixed, thermic Fluventic Ustochrepts
Houston Black	Fine, montmorillonitic, thermic Udic Pellusterts
Lewisville	Fine-silty, mixed, thermic Typic Calciustolls
Lott	Fine-silty, carbonatic, thermic Entic Haplustolls
Normangee	Fine, montmorillonitic, thermic Vertic Haplustalfs
Ovan	Fine, montmorillonitic, thermic Udic Chromusterts
Padina	Loamy, siliceous, thermic Grossarenic Paleustalfs
Roetex	Fine, mixed, thermic Udertic Haplustolls
Satin	Clayey-skeletal, montmorillonitic, thermic Udic Argiustolls
Ships	Very-fine, mixed, thermic Udertic Haplustolls
Silawa	Fine-loamy, siliceous, thermic Ultic Haplustalfs
Silstid	Loamy, siliceous, thermic Arenic Paleustalfs
Stephen	Clayey, mixed, thermic, shallow Entic Haplustolls
Tabor	Fine, montmorillonitic, thermic Udertic Paleustalfs
Trinity	Very-fine, montmorillonitic, thermic Typic Pelluderts
Weswood	Fine-silty, mixed, thermic Fluventic Ustochrepts
Wilson	Fine, montmorillonitic, thermic Vertic Ochraqualfs
Yahola	Coarse-loamy, mixed (calcareous), thermic Typic Ustifluvents

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