SOIL SURVEY OF

Hill County, Texas

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

HOW TO USE

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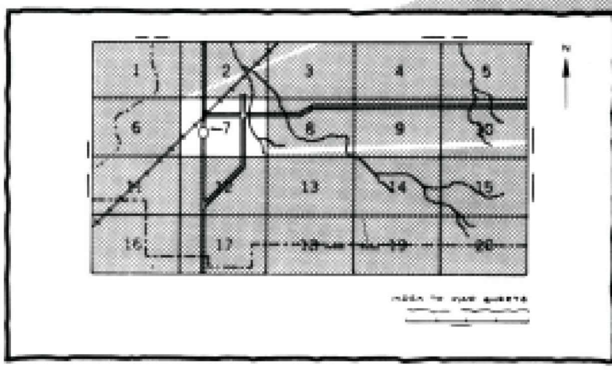

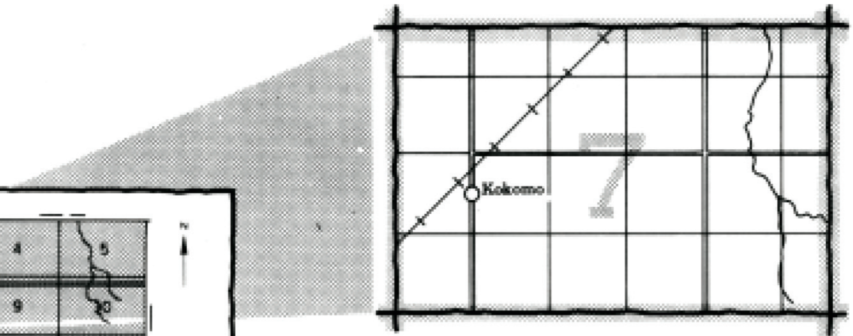

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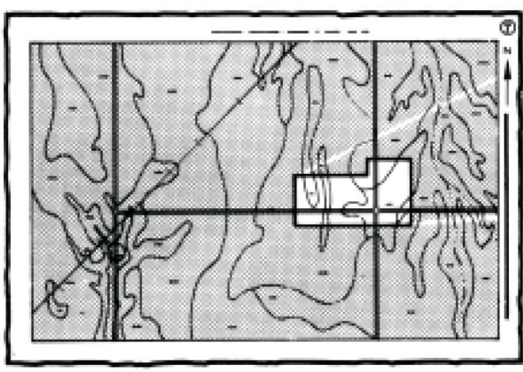

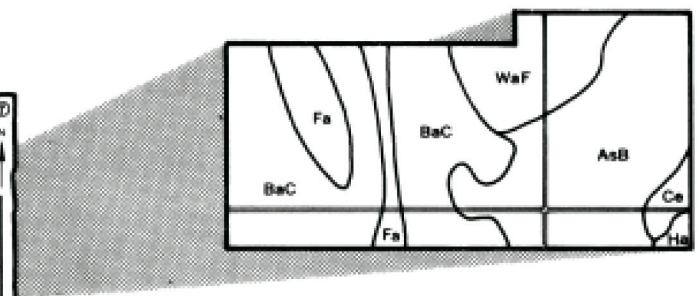

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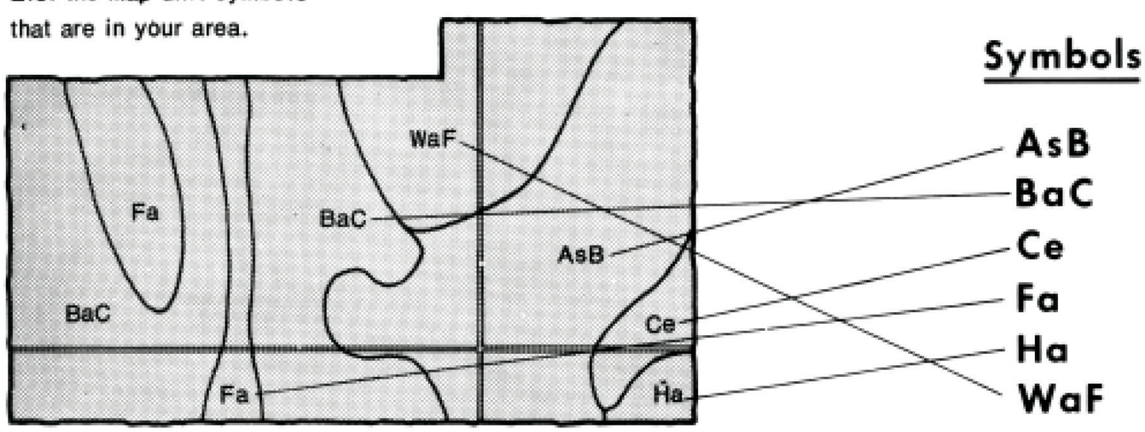
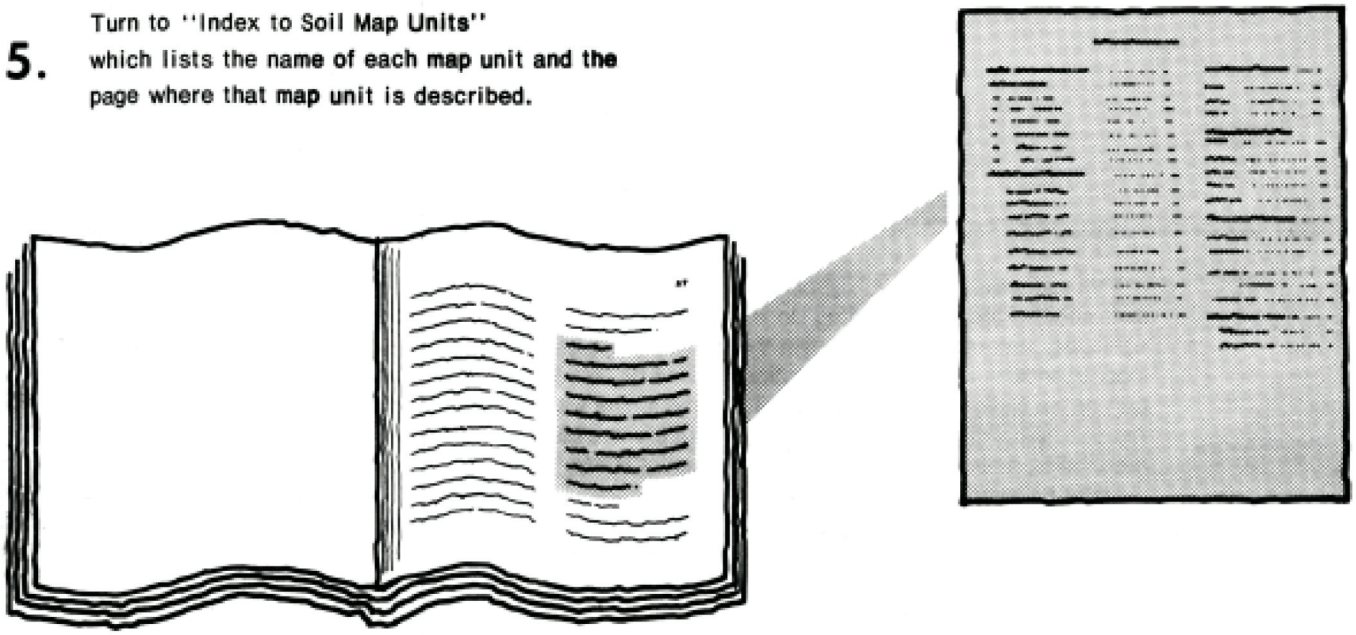
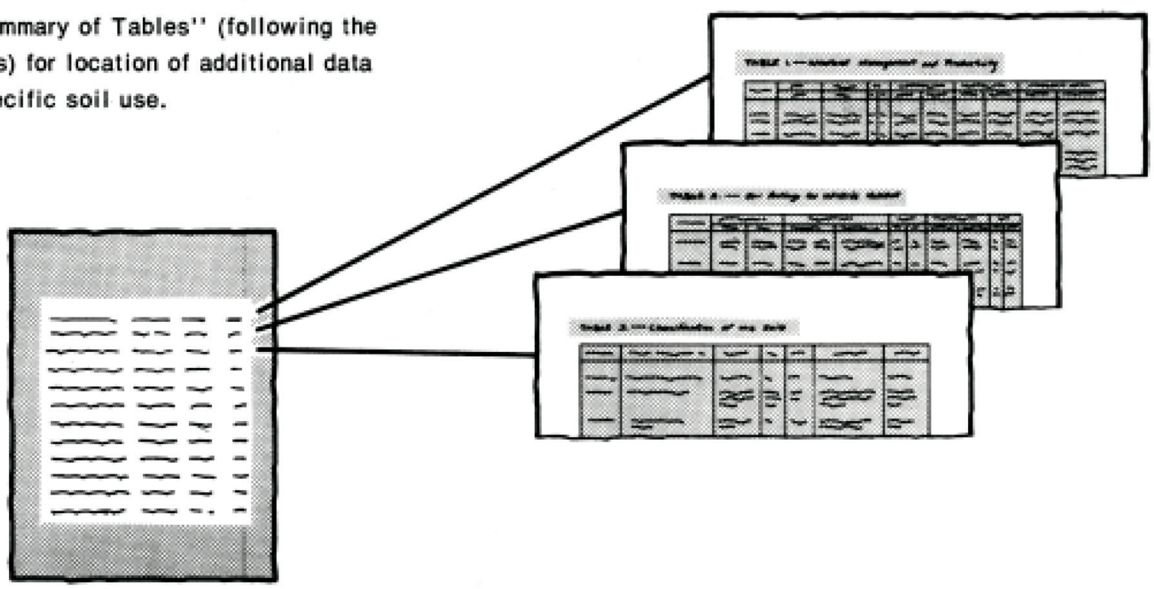


THIS SOIL SURVEY

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.



7. Consult "Contents" for parts of the publication that will meet your specific needs. This survey contains useful information for farmers or ranchers, foresters or agronomists; for planners, community decision makers, engineers, developers, builders, or homebuyers; for conservationists, recreationists, teachers, or students; to specialists in wildlife management, waste disposal, or pollution control.

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, usually the Agricultural Experiment Stations. In some surveys, other Federal and local agencies also contribute. The Soil Conservation Service has leadership for the Federal part of the National Cooperative Soil Survey. In line with Department of Agriculture policies, benefits of this program are available to all, regardless of race, color, national origin, sex, religion, marital status, or age.

Major fieldwork for this soil survey was completed in the period 1965-75. Soil names and descriptions were approved in 1975. Unless otherwise indicated, statements in the publication refer to conditions in the survey area in 1975. This survey was made cooperatively by the Soil Conservation Service and the Texas Agricultural Experiment Station. It is part of the technical assistance furnished to the Hill County-Blackland Soil and Water Conservation District.

Soil maps in this survey may be copied without permission, but any enlargement of these maps can cause misunderstanding of the detail of mapping and result in erroneous interpretations. Enlarged maps do not show small areas of contrasting soils that could have been shown at a larger mapping scale.

Cover: Grain sorghum on Houston Black clay, 1 to 3 percent slopes. The terraces drain into the waterway in the center.

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Foreword

The Soil Survey of Hill 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.

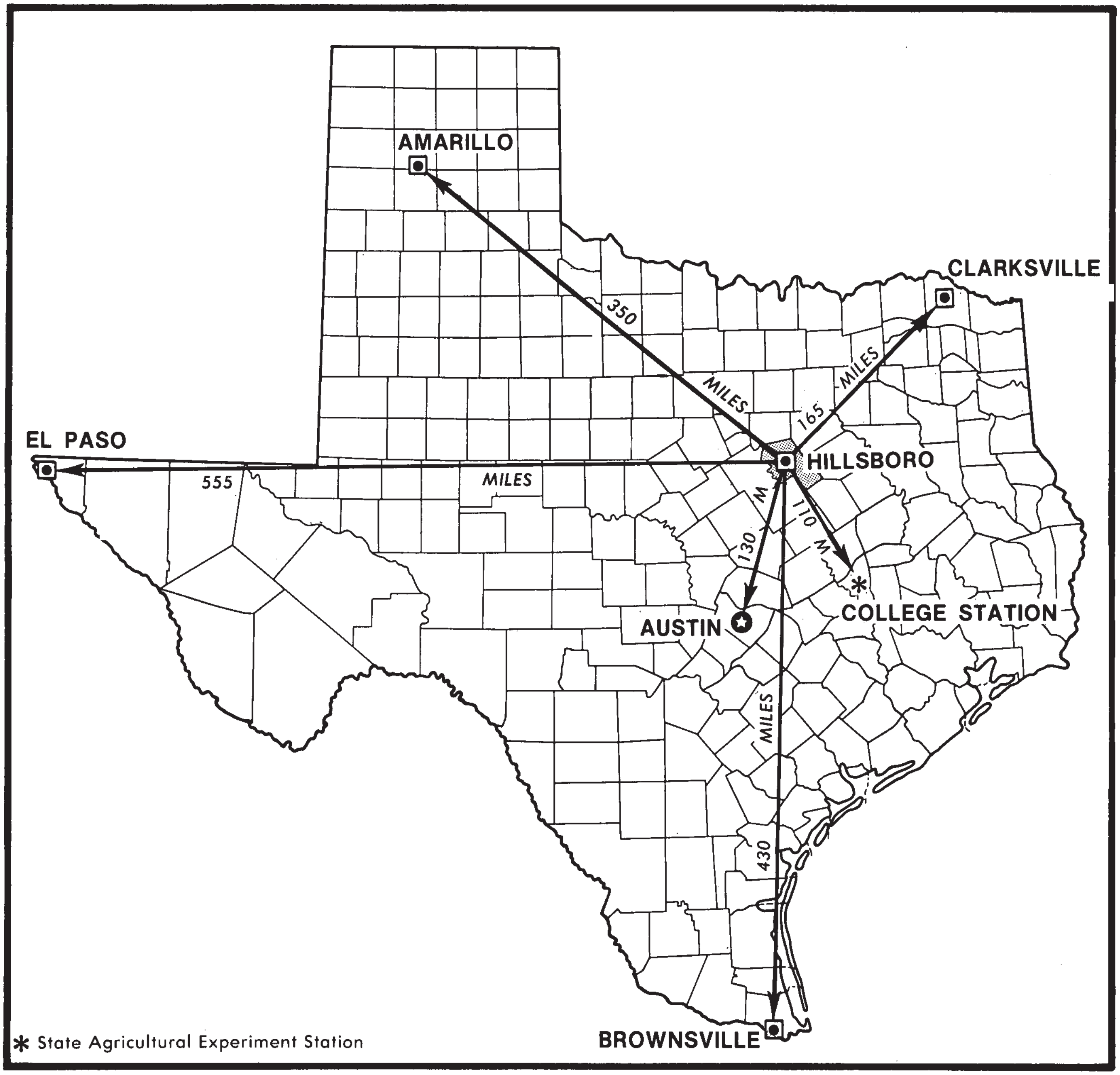
This soil survey has been prepared for many different users. Farmers, ranchers, and agronomists can use it to determine the potential of the soil and the management practices required for food and fiber production. Planners, community officials, engineers, developers, builders, and homebuyers can use 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. A high water table makes a soil poorly suited to basements or underground installations.

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 the survey area is described, and much information is given about each soil for specific uses. Additional information or assistance in using this publication can be obtained from the local office of the Soil Conservation Service or the Cooperative Extension Service.

This soil survey can be useful in the conservation, development, and productive use of soil, water, and other resources.

George C. Marks
State Conservationist
Soil Conservation Service



Location of Hill County in Texas.

SOIL SURVEY OF HILL COUNTY, TEXAS

By Charles A. Brooks, Soil Conservation Service

Fieldwork by Charles A. Brooks, Gerald W. Crenwelge,
Fred E. Minzenmayer, James M. Greenwade, Dennis D. Ressel,
Jesse D. Deshotels, III, and Fred B. Pringle, Soil Conservation Service

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

HILL COUNTY is in the Blackland Prairie, Grand Prairie, and East Cross Timbers Land Resource Areas in north-central Texas (see map on facing page). It is bounded on the west by Lake Whitney and the Brazos River; on the north by Johnson County; on the east by Ellis and Navarro Counties; and on the south by Limestone and McLennan Counties.

The area of Hill County is 657,920 acres. Elevation ranges from about 400 to 900 feet above sea level. Hillsboro, the county seat, is located on Interstate Highway 35, which runs through the central part of the county. In 1975, the population of Hill County was about 23,000, and of Hillsboro, about 7,200.

The first permanent settlers in the area now known as Hill County came in the 1830's and 1840's. Hill County was created from Navarro County on May 14, 1853, and named for Dr. George W. Hill, who had served as Secretary of War and Navy for the Republic of Texas. Hillsboro was surveyed during the fall of 1853.

The area is nearly level to rolling and well dissected by natural drainageways. About 46 percent of the county is used for general field crops, mainly grain sorghum, small grain, peanuts, and hay sorghums. About 32 percent is pasture, 13 percent is rangeland, 6 percent is urban land and water, and 3 percent is wooded. Most of the rangeland is in the northwestern part of the county in the Grand Prairie Land Resource Area.

The soils of Hill County formed under a cover of tall grasses. Most of the soils are dark and clayey and crack severely when dry. The major conservation problem is water erosion.

General nature of the county

This section provides general information about Hill County. It contains a brief discussion of the farming, natural resources, transportation, climate, and geology of the county.

Farming

Hill County supports general dryland farming, a mixture of production of cash crops and livestock. The early farmers grew mainly cotton on the deep blackland soils and raised beef cattle on the shallower soils that developed from limestone. The sandy soils in the East Cross Timbers Land Resource Area supported a mixture of livestock and field crops.

The main cash crops now grown are grain sorghum and cotton on the deep blackland soils and peanuts on the sandy soils in the East Cross Timbers Land Resource Area. Small grain is grown throughout the county. Hay from improved hay sorghums and from improved bermudagrass is produced throughout the county. There are several dairies in the county. About 300,000 turkeys are raised in the county each year.

About 80 percent of the land area in the county was in cultivation during the 1920's and 1930's. Much of the cultivated land was in cotton, the main cash crop at the time. Corn was grown for farm use and also as a cash crop. The horses and mules are used in farming operations. The extra areas, not needed for feed crops, were put in cotton, corn, or grain sorghum to be sold. These crops are still grown on the better land, and the marginal fields have been abandoned or planted to improved grasses. About 50 percent of the county is now used for cash crops. The farms are fully mechanized.

Natural resources

Soil is the most important natural resource in Hill County. The soils formed mainly from limestone and marl, and have high natural fertility. They produce good crops and pasture, which in turn, support strong, healthy livestock.

The main limestone formations in the county are the Austin Chalk, which crops out in the center of the county, and part of the Washita Group, which crops out in the northwestern part of the county. The Woodbine, Eagle Ford, and Ozan Formations underlie most of the county;

these formations consist of soft sandstone, shale, and marl.

There are about 10,000 acres of surface water in the major lakes in the county. Lake Whitney on the Brazos River is used to generate electric power and is used for recreation and flood control. Navarro Mills Reservoir extends into the southeastern part of the county. It is used as a water supply, for flood control, and for recreation. The Aquilla Reservoir, which is being constructed wholly in Hill County, will be used as a water supply for Hillsboro and for flood control and recreation.

One hundred and fourteen flood detention structures have been built or are being built in the county. These structures impound ponds of 14 to 40 acres. The ponds are used for flood control and recreation.

Transportation

A network of county, State, and Federal roads crosses Hill County. Interstate Highway 35, which runs north and south, divides just north of Hillsboro. The east fork leads north to Dallas, and the west fork, to Fort Worth. This highway leads south to Waco.

Most county roads have an all-weather surface of gravel. Some of the less-used roads have only a dirt surface, however, and can be used only during dry periods.

In 1975 the county contained 38 miles of Federal Interstate Highways, 137 miles of other Federal and State highways, 300 miles of paved Farm-to-Market roads, and 1,084 miles of county roads.

Three railroads pass through the county: one north and south through the center, one through the southeast corner, and one through the northwestern part.

Climate

Hill County is hot in summer but cool in winter, when an occasional surge of cold air causes a sharp drop in otherwise mild temperatures. Rainfall is uniformly distributed throughout the year, and it reaches a slight peak in spring. Annual total rainfall is normally adequate for cotton, feed grains, and small grains.

Table 1 gives data on temperature and precipitation for the survey area, as recorded at Hillsboro for the period 1951 to 1975. Table 2 shows probable dates of the first freeze in fall and the last freeze in spring. Table 3 provides data on length of the growing season.

In winter the average temperature is 47 degrees F, and the average daily minimum temperature is 36 degrees. The lowest temperature on record, which occurred at Hillsboro on February 2, 1951, is 2 degrees. In summer the average temperature is 83 degrees, and the average daily maximum temperature is 95 degrees. The highest recorded temperature, which occurred on July 26,1954, is 111 degrees.

Growing degree days, shown in table 1, are equivalent to "heat units." During the month, growing degree days accumulate by the amount that the average temperature each day exceeds a base temperature (50 degrees F). The normal monthly accumulation is used to schedule single or successive plantings of a crop between the last freeze in spring and the first freeze in fall.

Of the total annual precipitation, 19 inches, or 56 percent, usually falls in April through September, which includes the growing season for most crops. In 2 years out of 10, the rainfall in April through September is less than 14 inches. The heaviest 1-day rainfall during the period of record was 4.83 inches at Hillsboro on October 14, 1957. Thunderstorms occur on about 45 days each year; about 16 of these storms occur in summer.

Snowfall is rare; in 70 percent of the winters, there is no measureable snowfall. In 25 percent, the snowfall, usually of short duration, is more than 2 inches. The heaviest 1-day snowfall on record was more than 3 inches.

The average relative humidity in midafternoon is about 60 percent. Humidity is higher at night, and the average at dawn is about 85 percent. The prevailing wind is from the south. Average windspeed is highest, 13 miles per hour, in March.

Tornadoes and severe thunderstorms occur occasionally. These storms are local and of short duration, and the pattern of damage is variable and spotty.

Climatic data in this section were specially prepared for the Soil Conservation Service by the National Climatic Center, Asheville, North Carolina.

Geology

By DAVID L. DURLER, graduate student, Department of Geology, Baylor University.

Five major factors interact to produce soils. These are parent material, topography, climate, organic activity, and time. In Hill County, parent material appears to be the dominant control on soil formation. All soils are derived from parent rock by the process of weathering; thus, parent rock determines the limits of the chemical and mineral composition of the soil. Parent material also influences the topography. Rocks resistant to erosion are at the higher elevations, and less resistant types are at lower elevations. On the resulting steep slopes erosion is the dominant soil forming process and soil formation is retarded.

Local microclimatic variations also control soil development. These variations in the microclimate also affect animal and plant communities that are directly or indirectly dependent on soils.

In Hill County, there is a variety of rock types that exhibit varying chemical and textural characteristics significant to soil formation. In the paragraphs which follow, the various rock units which crop out in the county are described. The map units referred to in this section are map units on the general soil map; see the section "General soil map for broad land use planning" for a more thorough description of these map units.

Basically, the rock units in Hill County can be divided into two broad categories according to age: the Quaternary Period, with rocks less than 3 million years old, and the Cretaceous Period, with rocks 75 to 135 million years old.

Quaternary Period

Within Hill County, lithologic units of the Quaternary Period consist of river-deposited sediment, or alluvium, that is either very recent or late Pleistocene. These alluvial deposits can be broadly differentiated into two types: recent alluvial flood plain sediment and older fluviate terrace deposits.

The recent flood plain deposits are immediately adjacent to stream channels and make up the broad, narrow, flat areas on both sides of a stream channel. These fluvial deposits are along such major streams in Hill County as Aquilla, Hackberry, Ash, and White Rock Creeks. Such deposits also occur along the Brazos River below Whitney Dam; above this point the lake has for the most part covered these sediments. These deposits consist of unconsolidated, mixed sands, silts, and clays. Organic material is abundant. Former channels, meander scars, and point bars are indicative of lateral stream meandering. These alluvial deposits are the parent material for the soils in the Tinn-Pursley map unit. Such soils are considered immature and are susceptible to periodic flooding.

The older fluviate deposits are remnants of older river flood plains of Quaternary Age left as "steps" by more recent river downcutting. At the time of deposition, the drainage was higher topographically; therefore, terraces tend to occupy high areas near major trunk streams. In Hill County most of these deposits are associated with the Brazos River. Small terrace deposits occur along Aquilla, White Rock, Ash, and Hackberry Creeks. All stream terraces are progressively older with elevation; therefore, young terraces are more easily identified in the field due to lack of weathering, erosion and soil formation. Soils are better developed on the high, or older, terraces. These terraces consist largely of siliceous sands and gravel (quartz, chert, and quartzite). Limestone pebbles are more common on the lower terraces; this indicates a gradual change in source areas of deposited materials. The low lying terrace soils make up part of the Bastsil-Aquilla map unit. These soils tend to have a sandy surface horizon and a sandy clay loam subsoil.

Cretaceous Period

The dominant bedrock material in Hill County is of the Cretaceous Period. Structurally, the rocks or formations that crop out are in linear belts trending north-south or northeast-southwest; they increase in age from east to west. The eastern half of the county is situated on the Balcones Fault zone, a feature that stretches along an arc from near Uvalde through Waco to Dallas. The faults and fractures that are within this zone (and in Hill County) trend in a northeastly to southwestly direction and are normal, or gravity-type, structures; principal movement was down-to-the-east. Such faulting has influenced topography to some extent by affecting drainage patterns and soil formation. Movement along the fault zone has ceased. The rock units most affected by this ancient faulting are the Taylor Marl and Austin Chalk Formations.

The formations and groups within the Cretaceous Period are basically sandstone, shale, marl, chalk, and limestone. In descending order, they are the Taylor Marl Formation, Austin Chalk Formation, Eagle Ford Group, Woodbine Group, Washita Group, and Fredericksburg Group.

Taylor Marl. The entire eastern part of Hill County is underlain by the Taylor Marl Geologic Formation. Its western limit is along a line from south of Abbott to Brandon, where it contacts the Austin Chalk Formation. The formation is divided into four subdivisions, or members. These are, in descending order, the Upper Taylor, Pecan Gap Chalk, Wolfe City Sand, and the Lower Taylor. The upper two members underlie very small areas in the extreme eastern part of the county near Hubbard. They consist of chalky limestone or marl and clayey shale with some silt-sized quartz. The lower two members underlie most of the rest of the county. The Wolfe City Member, which is dominantly sandy clay with some hard sandstone lenses, forms a poorly defined, west-facing scarp at its contact with the Lower Taylor. The Lower Taylor is mostly composed of calcareous clay with silt-sized quartz and calcite.

Topographically, the areas underlain by the Taylor Marl Formation are mainly gently rolling prairies. Few streams are deeply incised, and flood plains are well developed. The sand lenses within the Wolfe City Member tend to cause a slightly more rolling terrain than that of the Lower Taylor. Fault-related fractures are common within the Taylor Marl, and some streams (for example, Cottonwood Creek) are fault controlled.

Heavy, clayey soils tend to develop on the Taylor Marl, where clay minerals are the dominant constituent. Such soils are in the Heiden-Ferris and Houston Black-Heiden-Altoga map units. The soils that developed on sandy parent material are tight and loamy; these soils are in the Normangee-Wilson-Crockett map unit.

Austin Chalk. The Austin Chalk Formation forms a west-facing escarpment in the east-central part of Hill County along a line from near Abbott to the Ellis County line northeast of Itasca. The outcrop belt is approximately 2 miles wide in the southern part of the county; it becomes progressively wider, until at the Ellis County line it is almost 8 miles wide. The Austin Chalk Formation is the most resistant to weathering in this part of the county. This is due to the chalky character of the rock, which is massive and hard. Interbedded with the chalk are marl units that are less resistant to weathering, causing ledges and overhanging outcrops. Upper and lower units of the Austin Chalk are mainly chalk interbedded with marl; the middle unit is mostly marl with chalk (*1*). Bentonite seams are in the Austin Chalk and are common in the lower unit. Faults and fractures are common within the Austin Chalk. They trend in a northeast-southwest direction and influence such stream patterns as the headwaters of Cobb Creek.

Soils on the Austin Chalk range from mature to immature. Most soils formed on the Austin Chalk are shallow and stony. Such soils are in the Eddy-Stephen-Austin map unit. Deep, heavy, clayey soils of the Austin-Houston Black map unit are in the vicinity of the Austin-Taylor contact.

Eagle Ford Group. The Eagle Ford Group outcrops within a belt that is roughly situated between Abbott and Aquilla in the southern part of the county and Covington and Files Valley in the northern part of the county; Hillsboro and Itasca are on this rock unit. The group can be differentiated into two formations, the South Bosque and the Lake Waco. The former is mostly shale with limestone flags in the lower part; the latter is also shaly but contains more interbedded limestone units. Bentonite seams occur in both formations but is less common in the Lake Waco unit. Rolling hills have developed on these formations; the thin limestone flags support the low hills. Stream incision within this outcrop belt is not deep, and flood plains are common.

The soils that have developed on this group are similar to those on the Taylor Marl. Such soils tend to have deep, mature profiles and belong to the Houston Black-Heiden-Altoga map unit.

In Hill County, the Eagle Ford Group, the Austin Chalk, and the Taylor Marl underlie the Texas Blackland Prairie Land Resource Area.

Woodbine Formation. The Woodbine Formation in Hill County outcrops along a relatively narrow belt adjacent to the maintrunk stream of Aquilla Creek. The terrain is a more rolling type prairie than that which occurs on the Eagle Ford. This more hilly topography is caused by the composition of the Woodbine, which is a friable to indurated sandstone that is transitional southward to a clay, and the Pepper Shale. Clay seams and sandy clay are more common in the southern portions of the Woodbine belt than in the northern. The sands tend to be fine grained and reddish brown with some concretions, while the interbedded shales are dark gray with yellow-brown weathering streaks. This formation is the eastern limit of the Grand Prairie Land Resource Area and is physiographically known as the East Cross Timbers Land Resource Area.

Soils on the Woodbine are those of the Gasil-Konsil-Crosstell and Silstid-Eufaula map units.

Washita Group. Below the Woodbine Formation and to the west, the Washita Group crops out as a relatively narrow belt from the Hill-Johnson County line north of Blum to the Hill-McLennan County line west of Tyson. This unit is rolling hills and gently sloping uplands; rounded bench terrain is common in areas of resistant rock. Relief is generally in tens of feet. This area, known as the Washita Prairie, is a subdivision of the Grand Prairie Land Resource Area. It is made up of the Del Rio and the Georgetown Formations. The Del Rio Formation is mostly clay with thin lenticular beds of highly calcareous siltstone and thin fossiliferous limestone flags. The Georgetown Formation consists of thin, wavy-bedded, and nodular limestone beds interbedded with silty, calcareous shales and clays. The area underlain by the Washita Group is poorly dissected and is made up of flat divides.

Soils in this group range from shallow to relatively deep, depending upon underlying rock units. Terrace and flood plain deposits cover much of this area. Some of the soils have developed in the deposits rather than from bedrock. Such shallow, stony soils as those of the Aledo-Somervell-Bolar map unit developed on resistant limestone ledges. Loamy soils of the Normangee-Wilson-Crockett map unit and sandy timbered soils of the Bastsil-Travis-Aquilla map unit developed on terrace and alluvial deposits deposited by the Brazos River.

Fredericksburg Group. Of the four formations within the Fredericksburg Group, only two crop out in Hill County. In descending order, these are Edwards Limestone (fig. 1) and Comanche Peak Limestone. They are in the extreme northwestern part of the county and form the prominent cliffs along the Brazos and Nolan Rivers. The Edwards Limestone caps the high bluffs, and the Comanche Peak Limestone forms the steep slopes below. Edwards Limestone is very resistant to weathering. It is massively bedded limestone with some alternating marl beds. The Comanche Peak is chiefly chalky, nodular, fossiliferous limestone in fairly massive beds. In most places it is overlain by Edwards Limestone. Dissection by streams is sharp, and steep valley walls are common in the Comanche Peake Limestone.

Soils developed on this group are mostly shallow and stony. Examples are the soils of the Aledo-Somervell-Bolar map unit. Because of the slow weathering of Edwards Limestone and Comanche Peak Limestone, soil formation is slow. The rate of erosion in many places exceeds the rate of soil development.

How this survey was made

Soil scientists made this survey to learn what kinds of soil are in the survey area, where they are, and how they can be used. The soil scientists went into the area knowing they likely would locate many soils they already knew something about and perhaps identify some they had never seen before. They observed the steepness, length, and shape of slopes; the size of streams and the general pattern of drainage; the kinds of native plants or crops; the kinds of rock; and many facts about the soils. They dug many holes to expose soil profiles. A profile is the sequence of natural layers, or horizons, in a soil; it extends from the surface down into the parent material, which has been changed very little by leaching or by the action of plant roots.

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.

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 other data have been assembled. The mass of detailed information then needs to be organized so that it is readily available to different groups of users, among them farmers, managers of rangeland, engineers, planners, developers and builders, homebuyers, and those seeking recreation.

General soil map for broad land use planning

The general soil map at the back of this publication shows, in color, map units that have a distinct pattern of soils and of relief and drainage. Each map unit is a unique natural landscape. Typically, a map unit consists of one or more major soils and some minor soils. It is named for the major soils. The soils making up one unit can occur in other units but in a different pattern.

The general soil map provides a broad perspective of the soils and landscapes in the survey area. It provides a basis for comparing the potential of large areas for general kinds of land use. Areas that are, for the most part, suited to certain kinds of farming or to other land uses can be identified on the map. Likewise, areas of soils 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.

The soils in the survey area vary widely in their potential for major land uses. Table 4 shows the extent of the map units shown on the general soil map and gives general ratings of the potential of each, in relation to the other map units, for major land uses. Soil properties that pose limitations to the use are indicated. The ratings of soil potential are based on the assumption that practices in common use in the survey area are being used to overcome soil limitations. These ratings reflect the ease of overcoming the soil limitations and the probability of soil problems persisting after such practices are used.

Each map unit is rated for *cultivated field crops, specialty crops, rangeland, urban uses*, and *recreation areas*. Cultivated field crops are those grown extensively by farmers in the survey area. Specialty crops include vegetables, fruits, and nursery crops grown on limited acreage and generally requiring intensive management. Rangeland refers to land in native grasses. Urban uses include residential, commercial, and industrial developments. Intensive recreation areas include campsites, picnic areas, ballfields, and other areas that are subject to heavy foot traffic. Extensive recreation areas include those used for nature study and as wilderness.

Deep to moderately deep, clayey prairie soils

This group makes up about 48 percent of the county. The major soils are in the Houston Black, Heiden, Altoga, Ferris, and Austin series. These are nearly level to moderately steep, moderately alkaline soils on the prairie. Slopes are mainly less than 3 percent but range to as much as 20 percent along the sides of drainageways.

The surface layer and underlying layers are clayey. Deep, wide cracks form in the surface layer when the soil is dry. Water enters the soil rapidly through the cracks, but when the soil is wet and the cracks have been sealed, water enters the soil very slowly. The underlying layers shrink and swell with wetting and drying. These soils are moderately well drained to well drained. They are very slowly permeable to moderately permeable.

These soils are used mainly as cropland. Cotton and grain sorghum are the main crops. Some livestock is produced in the more sloping areas.

1. Houston Black-Heiden-Altoga

Deep, nearly level to gently sloping, moderately alkaline clayey soils

This unit consists of dark, clayey soils. Slopes are mainly less than 3 percent. The Houston Black soils are less sloping than the other soils; the Heiden soils are in convex, smooth areas; and the Altoga soils are in more sloping areas.

This unit makes up about 37 percent of the county. It is about 41 percent Houston Black soils, 11 percent Heiden soils, 11 percent Altoga soils, and 37 percent minor soils.

Houston Black soils are very dark gray to dark gray, moderately alkaline clay to a depth of about 46 inches and grade to gray and mottled olive yellow, moderately alkaline clay below 46 inches. Shaly, moderately alkaline clay or clayey marl is between the depths of 70 and 100 inches.

Heiden soils are dark grayish brown, moderately alkaline clay to a depth of about 26 inches and grade to mottled dark grayish brown to light olive brown, moderately alkaline clay that extends to a depth of about 66 inches.

Altoga soils are olive gray, moderately alkaline silty clay to a depth of about 6 inches; olive to pale olive, moderately alkaline silty clay to a depth of about 37 inches; and yellowish, moderately alkaline silty clay below 37 inches.

Minor soils are the moderately deep, clayey Austin soils on low ridges; the deep, clayey Ferris soils on the sides of ridges; and the deep, loamy Lamar and Wilson soils on side slopes.

This unit makes up the smoother part of the area of deep and moderately deep, clayey, prairie soils. It is used mainly for general field crops and contains some of the larger farms in the county. Pastures are along streams and in small, sloping areas. Much of the unit is unfenced because it is used only for cultivated crops.

2. Heiden-Ferris

Deep, gently sloping to moderately sloping, moderately alkaline clayey soils

This unit consists of light colored to dark colored, clayey soils. Slopes average from 5 to 8 percent but range to as much as about 20 percent. Gullies and short natural drainageways are common and provide good surface drainage. Heiden soils are less sloping and smoother than Ferris soils. Ferris soils are generally more sloping and contain many small gullies, many of which cannot be crossed with farm machinery.

This unit makes up about 10 percent of the county. It is about 50 percent Heiden soils, 45 percent Ferris soils, and 5 percent other soils.

Heiden soils are dark grayish brown, moderately alkaline clay to a depth of about 19 inches and grade to light olive brown to pale olive, moderately alkaline clay that extends to a depth of about 66 inches.

Ferris soils are light olive brown, moderately alkaline clay to a depth of about 23 inches over pale olive, moderately alkaline clay. Mottled olive, moderately alkaline shaly clay is below a depth of 38 inches.

Minor soils are the deep, clayey Altoga soils on the sides of low ridges.

This unit is used mainly for pasture. Most of the area consists of old cropland that has been returned to pasture. Many of the old fields have been sodded to improved bermudagrass, and others are in native vegetation and weeds. Some of the smoother areas and less sloping fields are cultivated to general field crops and temporary hay crops.

3. Austin-Houston Black

Moderately deep to deep, gently sloping, moderately alkaline clayey soils

This unit consists of dark, clayey soils. Slopes range from 0 to 5 percent. The Austin soils are more sloping and better drained than Houston Black soils. Smoother areas are the deep Houston Black soils.

This unit makes up about 3 percent of the county. It is about 60 percent Austin soils, 35 percent Houston Black soils, and 5 percent minor soils.

Austin soils are dark grayish brown, moderately alkaline clay to a depth of about 15 inches and grade to grayish brown, moderately alkaline clay high in content of carbonates. Chalky marl is at a depth of about 33 inches.

Houston Black soils are very dark gray to dark gray, moderately alkaline clay to a depth of about 46 inches and grade to gray and mottled olive yellow, moderately alkaline clay that extends to a depth of about 70 inches.

Minor soils are the deep, clayey Branyon and Burleson soils on a similar landscape with Houston Black soils; the very shallow, loamy Eddy soils on low ridges; and the shallow, clayey Stephen soils on a similar landscape with Austin soils.

This unit is used for general field crops and for improved pasture. It is between an area of mainly stock farms to the west and an area of general farms to the east.

Deep, loamy, prairie soils

This group makes up about 11 percent of the county. The major soils are in the Normangee, Wilson, and Crockett series. These are nearly level to gently sloping, mildly alkaline to medium acid soils on the prairie. Slopes range from 0 to 5 percent.

These soils have a loamy surface layer and clayey underlying layers. Water enters the loamy surface layer readily but moves slowly through the underlying layers. The clayey layers shrink and swell with wetting and drying. These soils are moderately well drained to somewhat poorly drained. They are very slowly permeable.

Better areas are cultivated and used for general field crops. Other areas are used for livestock production. Some of the old fields no longer cultivated have been sodded to bermudagrass, and some have been allowed to grow native plants.

4. Normangee-Wilson-Crockett

Deep, nearly level to moderately sloping, medium acid to mildly alkaline loamy soils

This unit consists of dark colored to light colored soils that have a loamy surface layer over very slowly permeable, claypan layers. Reaction ranges from medium acid to mildly alkaline in the surface layer to moderately alkaline in the lower layers. Normangee soils have rapid runoff and contain many small gullies. Wilson soils occur in low areas; they have slow runoff and are somewhat poorly drained. Crockett soils are gently sloping.

This unit makes up about 11 percent of the county. It is about 40 percent Normangee soils, 25 percent Wilson soils, 25 percent Crockett soils, and 10 percent minor soils.

Normangee soils are pale brown, medium acid clay loam to a depth of about 5 inches. Yellowish brown and coarsely mottled dark grayish brown, slightly acid clay and light olive brown and brownish yellow, moderately alkaline clay extend to a depth of about 60 inches.

Wilson soils are dark gray, mildly alkaline clay loam to a depth of about 7 inches; very dark gray, mildly alkaline clay to a depth of about 42 inches; and olive gray, moderately alkaline clay that grades to coarsely mottled light olive brown and yellow, moderately alkaline clay below a depth of 57 inches.

Crockett soils are yellowish brown, slightly acid fine sandy loam to a depth of about 7 inches; coarsely mottled, reddish brown to olive yellow, medium acid clay to a depth of about 41 inches; and mottled grayish brown and olive yellow, moderately alkaline clay that grades to mottled gray and yellow, moderately alkaline clay below a depth of 60 inches.

Minor soils are the deep, loamy Axtell soils on stream terraces; the deep, clayey Burleson and Heiden soils on low ridges; and the shallow, clayey Stephen soils on a similar landscape with Austin soils.

This unit is used for general farming and livestock production. The area in the western part of the county is mainly cultivated to general field crops. In the eastern part of the county, only the nearly level soils in this unit, mostly Wilson soils, are cultivated. The more sloping soils are mainly old pastures that were once cultivated fields. Other areas have been sodded to improved bermudagrass for hay and grazing.

Very shallow to moderately deep, loamy and clayey prairie soils

This group makes up 20 percent of the county. The major soils are in the Aledo, Somervell, Bolar, Eddy, Stephen, and Austin series. These are gently sloping to moderately steep, moderately alkaline soils on the prairie. Slopes are mainly 1 to 5 percent, but they range to 20 percent.

These soils have a loamy and clayey surface layer over limestone or chalk. They are well drained. They are slowly permeable to moderately slowly permeable.

The shallow soils and sloping areas are used mainly for pasture, and the deeper soils are used for crops. The unit is mainly a livestock producing area, and there are a few large mining operations.

5. Aledo-Somervell-Bolar

Shallow to moderately deep, gently sloping to moderately steep, moderately alkaline loamy and clayey soils over hard limestone

This unit consists of dark, loamy and clayey soils. Slopes range from 1 to 20 percent. Aledo soils are on the higher ridges and steeper slopes very close to Somervell soils and other similar soils. Somervell soils are in banded patterns with Aledo soils. Bolar soils are in broad drainageways and on foot slopes in the unit.

This unit makes up about 9 percent of the county. It is about 20 percent Aledo soils, 17 percent Somervell soils, 14 percent Bolar soils, and 49 percent minor soils.

Aledo soils are dark grayish brown to pale brown, moderately alkaline gravelly clay loam to a depth of 18 inches and coarsely fractured, indurated limestone below.

Somervell soils are dark grayish brown, moderately alkaline gravelly clay loam to a depth of about 14 inches; grayish brown, moderately alkaline clay loam to a depth of about 27 inches; and mottled light gray, moderately alkaline clayey marl to a depth of about 36 inches. They are underlain by limestone bedrock.

Bolar soils are dark brown to dark grayish brown, moderately alkaline clay loam that grades to moderately alkaline clayey marl below a depth of 35 inches. Limestone bedrock is at a depth of 62 inches.

Minor soils are the moderately deep, loamy Lindy soils and the deep, loamy Sunev, Lamar, and Venus soils on foot slopes on uplands.

Aledo and Somervell soils are used mainly for range and wildlife habitat. Most of the large areas of Bolar soils are in fields and used for forage or grain crops or small grain. Small areas are used for range or wildlife habitat.

6. Eddy-Stephen-Austin

Very shallow to moderately deep, gently sloping to sloping, moderately alkaline loamy to clayey soils over chalk or chalky limestone

This unit consists of dark, loamy and clayey soils. Slopes average about 1 to 3 percent but range to about 8 percent along side slopes of drainageways and streams. The gravelly Eddy soils are on low ridges and the upper parts of side slopes to drainageways; they appear whitish on the landscape in plowed areas. The Stephen soils are adjacent to the Eddy soils. The Austin soils are in the lower areas along drainageways and on broad ridges; areas of Austin soils are usually dissected by small drainageways and streams.

This unit makes up about 9 percent of the county. It is about 40 percent Eddy soils, 28 percent Stephen soils, 22 percent Austin soils, and 10 percent minor soils.

Eddy soils are dark grayish brown, moderately alkaline gravelly clay loam about 9 inches thick over white chalk.

Stephen soils are dark grayish brown, moderately alkaline silty clay to a depth of 12 inches and grade to pale brown, moderately alkaline silty clay loam below. The soil is underlain by soft, well fractured chalky limestone at a depth of about 18 inches.

Austin soils are dark grayish brown, moderately alkaline clay to a depth of about 15 inches over grayish brown, moderately alkaline silty clay that grades to moderately alkaline chalky marl at a depth of about 33 inches. Chalky limestone bedrock is at a depth of about 54 inches.

Minor soils are the deep, clayey Houston Black soils on a similar landscape with Austin soils and the deep, loamy Sunev soils on foot slopes.

The shallow soils are used for pasture and small grain for grazing. They are well drained and desired locally as homesites. The deeper soils are used mainly for feed crops, small grain, and native pasture. Several fields have been sprigged to improved bermudagrass for hay and grazing. The less sloping areas are mostly in fields and are used for general field crops.

Deep, sandy and loamy savannah soils

This group makes up about 15 percent of the county. The major soils are in the Gasil, Konsil, Crosstell, Bastsil, Travis, Aquilla, Silstid, and Eufaula series. These are nearly level to strongly sloping, mildly alkaline to slightly acid soils on the prairie. Slopes range from 0 to 12 percent.

These soils have a surface layer of fine sand, loamy fine sand, or fine sandy loam. The underlying layers are mostly sandy clay loam but range from clay to fine sand. Most of these soils are well drained, and a few are somewhat excessively drained. Most of these soils are moderately permeable, but permeability ranges from very slow to rapid.

These soils are used mainly for general field crops, truck crops, and orchards. All peanuts produced in the county are grown on these soils. Many of the old fields have been sprigged to improved bermudagrass for pasture and hay.

7. Gasil-Konsil-Crosstell

Deep, nearly level to strongly sloping, mildly alkaline to slightly acid loamy soils

This unit consists of mostly light colored, loamy soils. Slopes are mostly 1 to 5 percent but range to 12 percent. In places there are small gullies. The gently sloping Gasil and Konsil soils are on uplands. The moderately steep Crosstell soils are on the higher ridges and low hills.

This unit makes up about 8 percent of the county. It is about 30 percent Gasil soils, 15 percent Konsil soils, 11 percent Crosstell soils, and 44 percent minor soils.

Gasil soils have a surface layer of brown to very pale brown, slightly acid fine sandy loam about 13 inches thick. The next layer is brownish yellow, medium acid sandy clay loam that has prominent coarse mottles of reddish yellow. It extends to a depth of 30 inches. This is underlain by mottled light gray, yellow, and red, strongly acid sandy clay loam to a depth of 78 inches or more.

Konsil soils have a surface layer of yellowish red, slightly acid fine sandy loam about 13 inches thick. The next layer is red, medium acid sandy clay loam to a depth of about 38 inches. This is underlain by coarsely mottled reddish yellow, red, and gray, strongly acid sandy clay loam.

Crosstell soils have a surface layer of dark brown, slightly acid fine sandy loam about 5 inches thick. The next layer to a depth of about 40 inches is yellowish red, reddish yellow, and reddish brown, strongly acid clay mottled with yellow and olive. The next layer is coarsely mottled pale olive, olive yellow, and light yellowish brown, moderately alkaline clay that grades at a depth of 46 inches to shaly clay.

Minor soils are the deep, loamy Axtell soils on stream terraces and the deep, loamy Normangee soils on side slopes.

Gasil and Konsil soils are used for general field crops and pasture. Many of the old fields have been sprigged to improved bermudagrass, and others have been allowed to revegetate with native plants and weeds. Most of the Crosstell soils are in scrub post oak and are used as pasture.

8. Bastsil-Travis-Aquilla

Deep, nearly level to gently sloping, slightly acid to mildly alkaline sandy to loamy soils

This unit consists of light colored fine sands, loamy fine sands, and fine sandy loams on stream terraces. Slopes range from 0 to 3 percent. Bastsil soils occupy the larger, smoother uplands mainly along the Brazos River. The gently sloping Travis soils are on uplands. The gently sloping Aquilla soils occupy smooth and slightly convex river terraces.

This unit makes up about 6 percent of the county. It is about 33 percent Bastsil soils, 22 percent Travis soils, 5 percent Aquilla soils, and 40 percent minor soils.

Bastsil soils are light brown, slightly acid loamy fine sand to a depth of about 16 inches; red, slightly acid sandy clay loam to a depth of about 31 inches; strong brown, slightly acid sandy clay loam to a depth of about 52 inches; and red, slightly acid sandy clay loam below.

Travis soils are brown, medium acid fine sandy loam to a depth of about 7 inches; red, strongly acid clay loam to a depth of about 50 inches; and coarsely mottled brownish yellow, gray, and yellowish red, medium acid clay loam below.

Aquilla soils are brown, mildly alkaline fine sand to a depth of about 14 inches and reddish yellow, mildly alkaline to light brown, neutral loamy fine sand that grades to red, slightly acid sandy clay loam below a depth of 60 inches.

Minor soils are the deep, loamy Bastrop soils on terraces along streams; the deep, sandy Eufaula soils on low ridges; and the deep, loamy Gasil soils and the deep, sandy Silstid soils on uplands.

These soils are used mainly for peanuts, watermelons, drilled feed crops for hay, and improved bermudagrass for pasture and hay. Several areas are used for the production of improved bermudagrass sprigs. A few areas are in post oak woods.

9. Silstid-Eufaula

Deep, gently sloping, slightly acid sandy soils

This unit consists of light colored, sandy soils. Slopes range from 1 to 5 percent. Silstid soils are gently sloping and are on uplands generally containing low saddles, low ridges, and knolls. They are marked by drainageways that are uncrossable with farm machinery. Eufaula soils are on low ridges that are the highest part of the area.

This unit makes up about 1 percent of the county. It is about 70 percent Silstid soils, 25 percent Eufaula soils, and 5 percent minor soils.

Silstid soils are dark brown to brown and light yellowish brown, slightly acid loamy fine sand to a depth of about 27 inches and reddish yellow to brownish yellow, slightly acid sandy clay loam to a depth of about 59 inches. The lower layer has yellowish red and reddish yellow mottles. Below is brownish yellow, medium acid sandy clay layered with ironstone and sandstone.

Eufaula soils are brown, neutral fine sand to a depth of about 6 inches. The next layer is pink to reddish yellow, medium acid loamy fine sand to a depth of about 60 inches; it contains thin bands of more clayey material. The next layer, to a depth of about 80 inches, is medium acid, brownish yellow sandy clay loam that contains thin bands of reddish yellow.

Minor soils are the deep, sandy Bastsil soils on high terraces and the deep, loamy Konsil soils on uplands.

These soils are used mainly for truck crops, feed crops, and sprigged pastures. Several areas are in post oak trees.

Deep, loamy and clayey alluvial soils

This group makes up about 6 percent of the county. The major soils are in the Pursley and Tinn series. Slopes are 0 to 1 percent. These soils swell and shrink with wetting and drying. They are somewhat poorly drained to well drained. They are moderately permeable to very slowly permeable.

Some areas of these soils are used as cropland, but potential is low because of flooding. The rest of the area is range.

10. Tinn-Pursley

Deep, nearly level, moderately alkaline loamy and clayey soils

This unit consists of dark, loamy to clayey soils on bottom lands. These soils are nearly level and are in long, narrow areas along the stream channel in larger flood plains. Pursley soils are flooded frequently. Tinn soils are more clayey and are flooded occasionally to frequently.

This unit makes up about 6 percent of the county. It is about 69 percent Tinn soils, 23 percent Pursley soils, and 8 percent minor soils.

Tinn soils are very dark gray, moderately alkaline clay to a depth of about 38 inches; mottled gray and pale olive, moderately alkaline silty clay to a depth of about 60 inches; and mottled olive, olive gray, and olive yellow, moderately alkaline silty clay below.

Pursley soils are very dark gray, moderately alkaline clay loam to a depth of about 14 inches and brown, moderately alkaline sandy clay loam to a depth of about 26 inches. Pale brown, moderately alkaline fine sandy loam extends to a depth of about 46 inches; dark grayish brown, moderately alkaline sandy clay loam, to a depth of about 51 inches; and pale brown, moderately alkaline fine sandy loam, to a depth of about 57 inches. Below is dark grayish brown, moderately alkaline sandy clay loam.

Minor soils are the deep, loamy Gowen and Kemp soils and the deep, sandy and loamy Pulexas soils on flood plains.

Many large areas are flooded only occasionally and are used for cotton and grain sorghum. They produce good yields of summer crops but are too wet and cold for winter crops. The frequently flooded areas are used mainly for pasture. Improved bermudagrass has been sprigged in many areas, and it makes excellent yields. Most streams are well marked with woods along the channels, and patches of woods occur along most flood plains.

Soil maps for detailed planning

The map units shown on the detailed soil maps at the back of this publication represent the kinds of soil in the survey area. They are described in this section. The descriptions together with the soil maps can be useful in determining the potential of a soil and in managing it for food and fiber production; in planning land use and developing soil resources; and in enhancing, protecting, and preserving the environment. More information for each map unit, or soil, is given in the section "Use and management of the soils."

Preceding the name of each map unit is the symbol that identifies the soil on the detailed soil maps. Each soil description includes general facts about the soil and a brief description of the soil profile. In each description, the principal hazards and limitations are indicated, and the management concerns and practices needed are discussed.

The map units on the detailed soil maps represent an area on the landscape made up mostly of the soil or soils for which the unit is named. Most of the delineations shown on the detailed soil map are phases of soil series.

Soils that have a profile that is almost alike make up a *soil series*. Except for allowable differences in texture of the surface layer or of the underlying substratum, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement in the profile. A soil series commonly is named for a town or geographic feature near the place where a soil of that series was first observed and mapped. The Eddy series, for example, was named for the town of Eddy in adjacent McLennan County.

Soils of one series can differ in texture of the surface layer or in the underlying substratum and in slope, erosion, stoniness, salinity, wetness, or other characteristics that affect their use. On the basis of such differences, a soil series is divided into phases. The name of a *soil phase* commonly indicates a feature that affects use or management. For example, Axtell fine sandy loam, 0 to 1 percent slopes, is one of several phases within the Axtell series.

Some map units are made up of two or more dominant kinds of soil. Such map units in Hill County are called soil complexes and undifferentiated groups.

A *soil complex* consists of areas of two or more soils that are so intricately mixed or so small in size that they cannot be shown separately on the soil map. Each area includes some of each of the two or more dominant soils, and the pattern and proportion are somewhat similar in all areas. Chatt-Urban land complex is an example.

An *undifferentiated group* is made up of two or more soils that could be mapped individually but are mapped as one unit because there is little value in separating them. The pattern and proportion of the soils are not uniform. An area shown on the map has at least one of the dominant (named) soils or may have all of them. Pulexas soils, frequently flooded, is an undifferentiated group in this survey area.

Most map units include small, scattered areas of soils other than those that appear in the name of the map unit. Some of these soils have properties that differ substantially from those of the dominant soil or soils and thus could significantly affect use and management of the map unit. These soils are described in the description of each map unit. Some of the more unusual or strongly contrasting soils that are included are identified by a special symbol on the soil map.

Most mapped areas include places that have little or no soil material and support little or no vegetation. Such places are called *miscellaneous areas*; they are delineated on the soil map and given descriptive names. Pits is an example. Some of these areas are too small to be delineated and are identified by a special symbol on the soil map.

The acreage and proportionate extent of each map unit are given in table 5, and additional information on properties, limitations, capabilities, and potentials for many soil uses is given for each kind of soil in other tables in this survey. (See "Summary of tables.") Many of the terms used in describing soils are defined in the Glossary.

1—Aledo-Somervell gravelly clay loams, 2 to 8 percent slopes. This complex consists of shallow and moderately deep, gently sloping and sloping soils on benches of the side slopes of ridges. Areas are 50 to 150 feet wide. These soils are in alternating bands on the contour around ridges. Areas average about 70 acres.

Aledo soils make up about 50 percent of the map unit; Somervell soils, about 40 percent; and included soils, about 10 percent. These soils are in areas so intricately intermingled that separate mapping was not practical at the scale used.

Typically, the surface layer of the Aledo soils is dark grayish brown, moderately alkaline gravelly clay loam to a depth of about 4 inches over brown and pale brown, moderately alkaline very gravelly clay loam to a depth of about 18 inches. Below is limestone bedrock.

Aledo soils are well drained. Runoff is medium. Permeability is moderate, and available water capacity is very low. The root zone is limited by the limestone bedrock. The water erosion hazard is slight.

Typically, the surface layer of the Somervell soils is dark grayish brown, moderately alkaline gravelly clay loam about 14 inches thick. The next layer is grayish brown, moderately alkaline gravelly clay loam that extends to a depth of 27 inches. It grades to mottled light gray and yellow, moderately alkaline clayey marl underlain by limestone at a depth of about 36 inches.

Somervell soils are well drained. Runoff is rapid. Permeability is moderately slow, and available water capacity is low. The root zone is limited by the limestone bedrock. The water erosion hazard is slight.

Included with these soils in mapping are small areas of Bolar, Sunev, Hensley, and Lindy soils.

These soils are not suitable for cultivated crops or improved pastures. They are used mainly as range and for wildlife habitat. Potential is low for tall and mid native grasses. Good management includes proper stocking. With proper grazing, brush, cactus, and juniper can be controlled. Mesquite and weeds have invaded many areas that have been overgrazed.

These soils are well drained, and the bedrock provides a good support for building foundations. The shallow depth to limestone bedrock, however, makes the area difficult to excavate for sewage lines and septic tank absorption fields. This limitation can be overcome for many rural homes by locating the sewage disposal area on the contour bands where the soil is deeper. Where the soil is shallow to bedrock or where rock crops out, potential is low for landscaping of homesites. Capability subclass VIs; Aledo soils in Shallow range site, Somervell soils in Adobe range site.

2—Aledo-Somervell gravelly clay loams, 8 to 20 percent slopes. This complex consists of shallow and moderately deep, strongly sloping and steep soils on side slopes of ridges. These ridges are dissected by deep, sloping, small valleys that contain many short side drainageways having deep channels and wooded side slopes. The Aledo soils are mainly on the higher parts of slopes, and the Somervell soils are on side slopes along stream channels and on foot slopes. Mapped areas average about 150 acres.

Aledo soils make up about 40 percent of the map unit; Somervell soils, about 40 percent; and included soils, about 20 percent. These soils are in areas so intricately intermingled that separate mapping was not practical at the scale used.

Typically, the surface layer of the Aledo soils is dark grayish brown, moderately alkaline gravelly clay loam to a depth of about 4 inches over brown, moderately alkaline very gravelly clay loam to a depth of about 12 inches. Below is limestone bedrock.

Aledo soils are well drained. Runoff is medium. Permeability is moderate, and available water capacity is very low. The root zone is limited by the limestone bedrock. The water erosion hazard is moderate.

Typically, the surface layer of the Somervell soils is dark grayish brown, moderately alkaline gravelly clay loam about 14 inches thick. The next layer is grayish brown, moderately alkaline gravelly clay loam that extends to a depth of 27 inches. It grades to mottled light gray and yellow, moderately alkaline clayey marl underlain by limestone at a depth of about 36 inches.

Somervell soils are well drained. Runoff is rapid. Permeability is moderately slow, and available water capacity is low. Roots grow easily to a depth of 27 inches, but they are somewhat restricted below this depth by the clayey marl and by the hard limestone. The water erosion hazard is moderate.

Included with these soils in mapping are small areas of Bolar and Sunev soils. These well drained soils in the ravines that drain these areas are the steepest in the unit. On the foot slopes are included areas of a soil that is similar to Somervell soils. The steeper areas contain narrow bands, 20 to 40 feet wide, of rock outcrops.

These soils are not suitable for cultivated crops or improved pastures. They are mainly used for wildlife habitat and as range. They have low potential for tall and mid grasses. The wooded ravines provide cover for wildlife. Good management includes proper stocking and control of grazing. In places juniper limit grass production and harbor deer flies, preventing livestock from using these areas during the summer.

These soils are steep in some places and dissected with deep ravines that limit urban development. The limestone bedrock provides good support for foundations but makes the installation of sewage lines and septic tank absorption fields difficult. Capability subclass VIs; Aledo soils in Shallow range site, Somervell soils in Steep Adobe range site.

3—**Altoga silty clay, 1 to 3 percent slopes.** This deep, gently sloping soil is on low, broad ridges. The surface is convex and smooth. Mapped areas average about 15 acres.

Typically, the surface layer is dark grayish brown, moderately alkaline silty clay about 5 inches thick. The next layer is moderately alkaline silty clay. It is olive in the upper part and grades to light yellowish brown and pale yellow in the lower part. This soil is underlain by shale at a depth of about 80 inches.

This soil is well drained. Runoff is medium. Permeability is moderate, and available water capacity is high. The root zone is deep, but the clay content impedes the movement of air, water, and roots. The water erosion hazard is moderate.

Included with this soil in mapping are small areas of eroded Altoga silty clay and small areas of Houston Black and Heiden soils. Included soils make up less than about 10 percent of any mapped area.

This soil has medium potential for cotton and grain sorghum and high potential for winter crops such as wheat or oats. Keeping residue from these crops on the surface helps control erosion and adds organic material to the soil. Crops respond well to fertilization. Terraces, contour farming, and grassed waterways are needed to help control erosion.

Potential for pasture and range plants is high. Potential for wildlife habitat is medium.

This soil has low potential for most urban uses. It has high shrink-swell potential, a limitation for roads, streets, and building foundations. The permeability of the lower soil layers and of the underlying shale is so slow that specially designed septic tank filter fields are needed. Uncoated steel corrodes rapidly in this soil. Most landscaped areas require supplemental irrigation during summer. This soil contains free lime, which helps cause chlorosis in many plants. Plants that are adapted to limy soils are better suited than other plants. Capability subclass IIIe; Clay Loam range site.

4—**Altoga silty clay, 2 to 5 percent slopes, eroded.** This deep, gently sloping soil is in narrow bands on the contour along the sides of low ridges. The surface is convex and smooth. Mapped areas average about 23 acres.

Typically, the surface layer is olive gray, moderately alkaline silty clay about 6 inches thick. The next layer is moderately alkaline silty clay. It is olive in the upper part and grades to pale olive and yellow with depth.

This soil is well drained. Runoff is medium. Permeability is moderate, and available water capacity is high. The root zone is deep, but the clay content impedes the movement of roots, air, and water. The water erosion hazard is moderate.

Included with this soil in mapping are small areas of less sloping Altoga silty clay; more sloping, eroded areas of Altoga clay loam; and areas of Ferris, Heiden, and Lamar soils. Included soils make up less than about 20 percent of any mapped area.

This soil has medium potential as cropland. Crops on these soils respond well to fertilization. Using a cropping system that includes fertilized sorghum or small grain and returning residue from these crops to the soil helps maintain fertility and improve tilth. Keeping residue on the surface helps control erosion, and terraces and contour farming are also needed. Grassed waterways help safely remove runoff from the terraces.

Potential for pasture and range grasses is high. Potential for wildlife habitat is medium.

This soil has low potential for most urban uses. It has high shrink-swell potential, a limitation for streets, roads, and foundations. The internal drainage through the underlying shale is so slow that specially designed septic tank filter fields are needed. This soil is highly corrosive to uncoated steel. Capability subclass IIIe; Clay Loam range site.

5—Altoga clay loam, 5 to 8 percent slopes, eroded. This shallow, sloping soil is in narrow bands on side slopes. These bands are on the contour parallel to stream channels. Most of the slopes are short, 100 to 500 feet in length, and gullied. The gullies range from 4 to 10 feet in depth and have cut into the underlying shale. Mapped areas average about 42 acres.

Typically, the surface layer is light yellowish brown, moderately alkaline clay loam about 4 inches thick. The next layer is yellowish brown, moderately alkaline silty clay that grades to pale yellow. Moderately alkaline shaly silty clay is at a depth of about 19 inches.

This soil is well drained. Runoff is medium. Permeability is moderate, and available water capacity is low. This soil is droughty much of the year. It has a shallow root zone above the shaly silty clay. The water erosion hazard is severe.

Included with this soil in mapping are small areas of eroded, less sloping Altoga soils and small areas of Ferris soils. Included soils make up less than 20 percent of any mapped area.

Many areas of this soil are in idle cropland, and others have been converted to pasture. Potential as cropland is low. This soil needs continuous vegetative cover for erosion control. A few areas are in improved bermudagrass. Potential for pasture is medium. Pastures respond well to fertilization.

Potential for native range plants is high. Native vegetation consists of tall prairie grasses and a few ash, elm, and cedar trees. Potential for wildlife habitat is medium.

This soil has low potential for most urban uses and for rural homesites. It has high shrink-swell potential, and it has low strength for foundations. The internal drainage of the underlying shaly silty clay is too slow for septic tank absorption fields. The high lime content limits the selection of plants that can be used for landscaping. Capability subclass VIe; Clay Loam range site.

6—Aquilla fine sand, 1 to 3 percent slopes. This deep, gently sloping soil is on high river terraces. The surface is smooth and slightly convex, and a few areas are gently undulating. Areas average about 70 acres.

Typically, the surface layer is brown, mildly alkaline fine sand about 14 inches thick. The lower layers are reddish yellow, mildly alkaline fine sand over light brown, neutral loamy sand that grades to red, slightly acid sandy clay loam below a depth of 62 inches.

This soil is somewhat excessively drained but has a water table at a depth of 48 to 60 inches for several weeks during seasons of high rainfall. Runoff is slow. Permeability is moderately rapid, and available water capacity is low. This soil has a deep root zone. The water erosion hazard is slight.

Included with this soil in mapping are small areas of Bastrop, Bastsil, Eufaula, and Pulexas soils. Also included are areas of soils that have been subjected to severe soil blowing. Included soils make up less than 10 percent of any mapped area.

The soil has high potential for orchard crops, truck crops, and bermudagrass. It has low potential for general field crops where clean tillage is needed, although peanuts do well. Crops respond well to fertilization. A suitable cropping system provides a large amount of residue. When left on the surface after harvest and later plowed into the upper few inches of the soil, this residue helps maintain fertility and improve tilth. The seasonal water table is beneficial to pecan and fruit orchards. The soil is sandy and is blown easily until vegetation is established; continuous cover helps reduce soil blowing.

Potential for range and pasture plants is high. Potential for wildlife habitat is generally medium. The wooded areas that have an understory of many vines and low shrubs provide excellent cover for wildlife.

This soil has high potential for roads and streets. It has medium potential for septic tank filter field areas because of the seasonal water table and medium potential for most recreation uses, has low potential for playgrounds because of the sandy surface. Capability subclass IIIs; Deep Sand range site.

7—Austin silty clay, 1 to 3 percent slopes. This moderately deep, gently sloping soil is on low ridges underlain by chalk. It is on uplands. The surface is smooth and convex. Areas average 32 acres.

Typically, the surface layer is dark grayish brown, moderately alkaline silty clay about 15 inches thick. The next layer is grayish brown, moderately alkaline silty clay that extends to a depth of about 20 inches. Between depths of 20 and 33 inches is mottled light brownish gray and light yellowish brown, moderately alkaline silty clay. The next layer is very pale brown, moderately alkaline chalky marl that is underlain by coarsely fractured, white chalk at a depth of about 54 inches.

This soil is well drained. Runoff is medium or rapid. Permeability is moderately slow, and available water capacity is high. This soil has a moderately deep root zone, but the clay content impedes the movement of roots, air, and water. The water erosion hazard is moderate.

Included with this soil in mapping are small areas of eroded Austin silty clay and small areas of Houston Black and Stephen soils. Included soils make up less than about 12 percent of any mapped area.

This soil has high potential for most crops, except cotton, when good management practices are used. It is easy to maintain in good tilth, and it produces good yields of wheat, oats, grain sorghum, and grasses. Cotton tends to die from root rot fungus. Annual additions of crop residue are needed to improve soil structure and tilth. Leaving all residue from crops on the surface helps control erosion and adds organic matter to the soil. Crops respond well to fertilization. Terraces, contour farming, and grassed waterways are needed to help control erosion.

Potential is high for pasture and range plants. Potential for wildlife habitat is generally medium.

This soil has low potential for most urban development because of the high shrink-swell potential and the moderate depth over bedrock. Septic tank filter fields do not function properly in all areas of this soil because the effluent moves horizontally on the surface of the bedrock. Capability subclass IIIe; Clay Loam range site.

8—Austin silty clay, 2 to 5 percent slopes, eroded. This moderately deep, gently sloping soil is on uplands. Most areas are natural drainageways that are 5 to 20 feet wide and 4 to 6 feet deep. The sides of these natural drainageways have small gullies, many of which have cut to limestone. A few of the larger gullies are not crossable with farm machinery. Areas are mainly long and follow drainageways, and they average about 30 acres.

Typically, the surface layer is dark grayish brown, moderately alkaline silty clay about 16 inches thick. The next layer is brown, moderately alkaline silty clay that extends to a depth of about 34 inches. Below this to a depth of 42 inches is yellowish brown, moderately alkaline, partly weathered chalky marl. This is underlain by coarsely fractured, white chalk.

This soil is well drained. Runoff is medium or rapid. Permeability is moderately slow, and available water capacity is high. The root zone is moderately deep. The water erosion hazard is severe.

Included with this soil in mapping are small areas of Eddy, Houston Black, Stephen, Sunev, Venus, and Austin soils that have slopes of 1 to 2 percent. Included soils make up less than about 10 percent of any mapped area.

This soil is mainly used as cropland. It has medium potential for cultivated crops. Several areas are used for grain sorghum, but most are used for forage crops for livestock. Many areas are used for small grains such as oats or wheat. Crops respond well to fertilization. Using a cropping system that includes fertilized sorghum or small grain and returning residue from these crops to the soil helps maintain fertility and improve tilth. Keeping residue on the surface helps control erosion. Terraces, contour farming, and grassed waterways are needed.

Potential is high for improved pasture. Improved bermudagrass, improved bluestems, Kleingrass, and other grasses are suited. They respond well to fertilization. Potential is high for native range plants. Potential for wildlife habitat is medium.

This soil has low potential for most urban uses. The soil shrinks and swells with changes in moisture content, is corrosive to uncoated steel, has low strength, and is sloping. It is also moderately deep to bedrock. It is too clayey for most sanitary facilities, such as septic tank absorption fields and sanitary landfills. It is difficult to landscape; plants that are adapted to limy soils are best suited. Some areas, however, have esthetic value as homesites. Potential for recreation uses is low. The surface layer is too clayey, and most areas are too sloping for use as playgrounds. Capability subclass IVe; Clay Loam range site.

9—Axtell fine sandy loam, 0 to 1 percent slopes. This deep, nearly level soil is on stream terraces. Slopes are plane and average 0.5 percent. Areas average about 40 acres.

Typically, the surface layer is pale brown, medium acid fine sandy loam about 8 inches thick. The next layer extends to a depth of about 28 inches. It is red, very strongly acid clay and has light yellowish brown mottles. To a depth of about 52 inches is coarsely mottled yellowish brown, brown, and dark grayish brown, medium acid clay. Below this is coarsely mottled dark grayish brown, light olive brown, and reddish yellow, moderately alkaline clay.

This soil is moderately well drained. Runoff is slow. Permeability is very slow, and available water capacity is high. This soil has a deep root zone, but the clayey subsoil impedes the movement of roots, air, and water. The water erosion hazard is slight.

Included with this soil in mapping are small areas of more sloping Axtell soils and small areas of Blum, Crockett, and Mabank soils. Included soils make up less than about 5 percent of any mapped area.

This soil has medium potential for most field crops. It is somewhat droughty during summer and fall, and some areas remain wet during winter and early spring. If moisture is available, crops respond well to fertilization. A suitable cropping system provides a large amount of residue. When left on the surface, the residue helps control erosion, maintain fertility, and improve tilth. Cover crops and crop residue also prevent the surface from crusting.

Potential for pasture is high, for native range plants is medium, and for wildlife habitat is high.

This soil has low potential for most urban uses. Shrink-swell and low strength are concerns in construction of roads, streets, and foundations. The clayey layers prevent the proper functioning of septic tank filter fields. The very slow permeability, which causes the soil to remain wet following rainfall, restricts the use of this soil for recreation. Capability subclass IIIs; Claypan Savannah range site.

10—Axtell fine sandy loam, 1 to 3 percent slopes. This deep, gently sloping soil is on stream terraces. The surface is plane and convex, and areas average about 30 acres.

Typically, the surface layer is pale brown, medium acid fine sandy loam about 7 inches thick. The next layer extends to a depth of about 28 inches. It is red, very strongly acid clay. To a depth of about 52 inches is coarsely mottled yellowish brown, brown, and dark grayish brown, medium acid clay. Below this is coarsely mottled dark grayish brown, light olive brown, and reddish yellow, moderately alkaline clay.

This soil is moderately well drained. Runoff is medium. Permeability is very slow, and available water capacity is high. This soil has a deep root zone, but the clayey subsoil impedes root penetration. The water erosion hazard is moderate.

Included with this soil in mapping are small areas of Bastsil, Blum, Crockett, Gasil, and Travis soils. Also included are small areas of eroded Axtell soils. Included soils make up less than about 12 percent of any mapped area.

This soil has medium potential for most crops. Crops respond well to fertilization. Using a cropping system that includes fertilized sorghum or small grain and returning residue from these crops to the soil helps maintain fertility and improve tilth. Where the soil is cultivated, crop residue and cover crops are needed to help maintain organic matter content, prevent crusting, and reduce runoff and erosion. Terraces, contour farming, and grassed waterways are needed.

Potential for pasture is high, for native range plants is medium, and for wildlife habitat is high.

This soil has low potential for most urban uses. Shrink-swell and low strength are concerns in construction of roads, streets, and foundations. Septic tank filter fields do not function properly because of the clayey subsoil. The very slow permeability restricts the use of this soil as campsites and playgrounds. This soil is difficult to landscape for houses, public buildings, and parks. Capability subclass IIIe; Claypan Savannah range site.

11—Axtell fine sandy loam, 2 to 5 percent slopes, eroded. This deep, gently sloping soil is on eroded stream terraces. The surface is plane and convex, and most areas are marked by rills and shallow gullies. Pebbles and small stones are on the surface in many areas.

Typically, the surface layer is grayish brown, strongly acid sandy loam about 5 inches thick. The next layer is 3 inches of light brownish gray, medium acid fine sandy loam. Below this to a depth of 66 inches is strongly acid to alkaline clay mottled with reddish brown to olive.

This soil is moderately well drained. Runoff is rapid in clean-tilled areas and in areas from which the surface layer has been eroded. Permeability is very slow, and available water capacity is high. The root zone is deep, but roots are impeded by the clayey subsoil.

Included with this soil in mapping are small areas of Bastrop, Crosstell, Gasil, Konsil, and Normangee soils. Also included are small areas of less sloping Axtell soils. Included soils make up less than 5 percent of any mapped area.

In general, this soil has poor tilth and low potential as cropland. Using a cropping system that includes fertilized sorghum or small grain and returning residue from these crops to the soil helps maintain fertility and improve tilth. Keeping residue on the surface and using cover crops help control erosion. Crops respond well to fertilization. Contour farming, terracing, and grassed waterways are needed in cultivated areas.

Potential is medium for improved pasture grasses and for native range plants. Potential for wildlife habitat is generally high.

This soil has low potential for most urban uses. Shrink-swell potential and low strength restrict its use for roads, streets, and foundations. The clayey layers prevent the satisfactory operation of septic tank filter field systems. Slope and erosion restrict most types of recreation. Capability subclass IVe; Claypan Savannah range site.

12—Bastrop fine sandy loam, 3 to 5 percent slopes, eroded. This deep, gently sloping soil is on high terraces along major streams. It is on plane slopes that typically contain many small gullies. The gullies were formed by runoff from higher lying areas. Areas are long and narrow and average about 30 acres.

Typically, the surface layer is light brown, neutral fine sandy loam about 8 inches thick. The next layer is yellowish red and reddish yellow, moderately alkaline sandy clay loam that grades to massive, reddish yellow, moderately alkaline sandy clay loam at a depth of about 61 inches.

This soil is well drained. Runoff is medium. Permeability is moderate, and available water capacity is high. Plant roots can penetrate easily below the surface layer. The water erosion hazard is severe.

Included with this soil in mapping are small areas of Bastsil, Konsil, and Travis soils. Included soils make up less than about 10 percent of any mapped area.

This soil has medium potential as cropland and for improved pasture grasses such as bermudagrass. Soil tilth is easy to maintain, and the soil can be worked over a wide range of moisture content. Using cover crops and returning crop residue to the soil help prevent crusting and reduce runoff. Using a cropping system that includes fertilized sorghum or small grain and returning residue from these crops to the soil help maintain fertility and improve tilth. Terraces, contour farming, and grassed waterways are needed in cultivated areas.

Potential is medium for native range plants and generally medium for wildlife habitat.

This soil has medium to high potential for most urban uses. The sandy clay loam layers are not a major limitation for streets, roads, foundations, or ditches. This soil has medium potential for most recreation uses because of slope and erosion. Capability subclass IIIe; Sandy Loam range site.

13—Bastsil loamy fine sand, 0 to 3 percent slopes. This deep, nearly level to gently sloping soil is on high terraces along major streams. Areas average about 175 acres.

Typically, the surface layer is light brown, slightly acid loamy fine sand about 16 inches thick. The next layer is slightly acid sandy clay loam; it is red and grades to strong brown and red with depth. The soil is 80 inches thick or more.

This soil is well drained. Runoff is medium. Permeability is moderate, and available water capacity is medium. Roots penetrate the sandy clay loam layers easily. The water erosion hazard is slight.

Included with this soil in mapping are small areas of Aquilla, Eufaula, and Silstid soils. Also included are small areas of Bastsil fine sandy loam and small areas of soils that have been subjected to severe soil blowing and that have mounds of sand along fences. Included soils make up less than about 10 percent of any mapped area.

This soil has medium potential for most crops and high potential for grasses. It generally has a high level of organic matter where well managed. Some poorly managed fields are low in organic matter content; soil blowing, crusting, and poor tilth are concerns. Crops respond well to fertilization. A suitable cropping system provides a large amount of residue. When left on the surface, the residue helps control erosion, maintain fertility, and improve tilth.

This soil produces very high yields of improved bermudagrass and has high potential for truck crops and orchard crops. Potential for wildlife habitat is generally medium.

This soil has high potential for most urban uses and medium potential for most recreation uses. The sandy surface layer becomes loose and is subject to wind erosion during dry periods. It is too sandy and loose for some playgrounds that require a firm surface. Capability subclass IIIe; Loamy Sand range site.

14—Bastsil fine sandy loam, 0 to 3 percent slopes. This deep, nearly level to gently sloping soil is on terraces along major streams. Individual areas average about 50 acres.

Typically, the surface layer is light brown, slightly acid fine sandy loam about 13 inches thick. The next layer is slightly acid sandy clay loam. It is red in the upper part and light red in the lower part, and it extends to a depth of 80 inches or more.

This soil is well drained. Runoff is medium. Permeability is moderate, and available water capacity is high. The soil has a deep root zone, and plant roots can penetrate easily. The water erosion hazard is slight.

Included with this soil in mapping are small areas of Bastrop, Gasil, and Travis soils. Also included are small areas of Bastsil loamy fine sand. Included soils make up less than about 10 percent of any mapped area.

Most areas are used for peanuts, melons, and improved bermudagrass. Potential for these crops is high, and potential for general field crops is medium. Some poorly managed fields are low in organic matter content. Using a cropping system that includes fertilized sorghum or small grain and returning the residue from these crops to the soil help maintain fertility and improve tilth. Keeping residue on the surface helps control water erosion. Crops respond well to fertilization. Contour farming, terracing, and grassed waterways are needed.

Potential for range plants is high. Potential for wildlife habitat is generally medium.

This soil has high potential for most urban uses. It has only slight limitations for recreation uses, although in places the surface is too sandy for playgrounds that require a firm surface. Capability subclass IIe; Sandy Loam range site.

15—Birome-Rayex complex, 5 to 20 percent slopes. This complex of moderately deep and shallow, sloping to moderately steep soils is on narrow ridges and escarpments. The Birome soils are less sloping and are on the tops of ridges or on foot slopes. The Rayex soils are more sloping. Areas average about 35 acres.

Birome soils make up 60 percent of the map unit; Rayex soils, about 30 percent; and similar soils, sandstone outcrops, and exposed shale, the remaining 10 percent. These soils are in small areas so intricately intermingled that separate mapping was not practical at the scale used.

Birome soils typically have a surface layer of slightly acid, dark brown fine sandy loam about 8 inches thick. The next layer is red, strongly acid clay that extends to a depth of 26 inches over mottled red and very pale brown, strongly acid clay that extends to a depth of 37 inches. Below this is weakly cemented, coarsely fractured sandstone that contains thin strata of shaly clay.

Birome soils are well drained. Runoff is rapid. Permeability is moderately slow, and available water capacity is medium. Rooting depth is limited by the sandstone bedrock. The water erosion hazard is moderate.

Rayex soils typically have a surface layer of brown, neutral fine sandy loam about 8 inches thick. The next layer is red, strongly acid clay that is underlain with stratified sandstone, shale, and clay at a depth of about 16 inches.

Rayex soils are well drained. Runoff is rapid. Permeability is moderately slow, and available water capacity is very low. Rooting depth is limited by bedrock to about 16 inches. The water erosion hazard is moderate.

Included with these soils in mapping are Gasil, Silstid, and Travis soils; sandstone outcrops and exposed shale; and small areas of eroded soils. Also included are a few areas of soils having slopes as steep as 30 percent.

These soils have very low potential for cultivated crops because of shallow depth, presence of coarse fragments, and moderately steep slopes. A good cover of plants is needed to control erosion.

Potential is medium for such improved grasses as bermudagrass. Grasses respond well to fertilization. This soil has low potential for trees because of the shallow root zone. Potential for range plants is high. Potential for wildlife habitat is medium; wooded areas provide day cover for wildlife, but food sources are limited.

These soils have low potential for most urban uses and for rural homesites. The sandstone bedrock makes ditching and excavating difficult. Most areas are too sloping for roads, streets, sewage disposal, and homesites. Some areas are scenic, however, and houses can be built on adjacent soils that are better suited as building sites. This leaves the slopes wooded and protected from erosion. These soils erode readily when cleared unless they are sodded. Potential for recreation uses is low to medium. Capability subclass VIe; Sandstone Hills range site.

16—Blum loam, 0 to 2 percent slopes. This deep, nearly level to gently sloping soil is on old terraces and plane foot slopes and in shallow valley fill. Individual areas average about 30 acres.

Typically, the surface layer is dark brown and very dark grayish brown, medium acid to neutral loam about 19 inches thick. The next layer is grayish brown to light brownish gray, slightly acid clay loam and clay about 55 inches thick. It contains common mottles of olive brown, yellowish red, olive yellow, yellow, and reddish yellow. Below a depth of 74 inches is mottled grayish brown and yellow, moderately alkaline clay.

This soil is moderately well drained. Runoff is slow. Permeability is slow, and available water capacity is medium. The soil has a deep root zone, and plant roots can penetrate easily. The water erosion hazard is slight. The surface is ponded in places following heavy rainfall.

Included with this soil in mapping are small areas of Crockett, Culp, Mabank, and Wilson soils. Included soils make up less than about 10 percent of any mapped area.

This soil is mainly used as cropland. It has high potential for cotton and grain sorghum. Using a cropping system that includes fertilized sorghum or small grain and returning residue from these crops to the soil help maintain fertility and improve tilth. Keeping residue on the surface helps control water erosion. Crops respond well to fertilization. Contour farming, terracing, and grassed waterways are needed.

This soil produces excellent yields of improved bermudagrass. It has high potential for range and pasture plants. Potential for wildlife habitat is generally medium.

Potential is medium for most urban uses and for individual rural homesites. The soil has high shrink-swell potential and low strength. The internal drainage is so slow that specially designed septic tank filter fields are needed. This soil has high potential for recreation areas except playgrounds and camp areas, which are limited by the slow runoff. This soil is easy to landscape, and most adapted shrubs and grasses do well. Capability subclass IIw; Clay Loam range site.

17—Bolar clay loam, 1 to 3 percent slopes. This moderately deep, gently sloping soil occurs along natural drainageways on uplands. Individual areas average about 40 acres.

Typically, the surface layer is dark brown and dark grayish brown, moderately alkaline clay loam about 15 inches thick. Below this is light yellowish brown and olive yellow, moderately alkaline clay loam. Between depths of 35 and 62 inches is mottled light olive brown and very pale brown, moderately alkaline clayey marl. This layer contains many thin fragments of limestone below a depth of 35 inches. It is underlain by coarsely fractured limestone bedrock.

This soil is well drained. Runoff is medium to rapid. Permeability is moderate, and available water capacity is low. Plant roots penetrate easily to a depth of 35 inches. The water erosion hazard is moderate.

Included with this soil in mapping are small areas of Aledo, Denton, Lindy, Purves, and Somervell soils and areas of steeper Bolar soils. Included soils make up less than about 10 percent of any mapped area.

This soil has high potential for winter wheat or oats. It has good tilth and is easy to manage. It has medium potential for summer crops. Using a cropping system that includes fertilized sorghum or small grain and returning residue from these crops to the soil help maintain fertility and improve tilth. Keeping residue on the surface helps control water erosion. Crops respond well to fertilization. Contour farming, terracing, and grassed waterways are needed.

Potential is high for range plants. The soil produces high yields of the tall native grasses common to the county. Crops respond readily to fertilization, and the soil produces good yields of such improved grasses as bermudagrass and Kleingrass. Potential for wildlife habitat is medium.

This soil has medium potential for many types of urban development. The limestone bedrock is difficult to excavate. The soil is clayey and has moderate shrink-swell potential. Shrubs grow well and the soil is easy to landscape, but plants adapted to limy soils should be used. This soil has medium potential for recreation uses. The high clay content and moderate depth to rock are concerns in construction. Capability subclass IIe; Clay Loam range site.

18—Bolar clay loam, 3 to 8 percent slopes. This moderately deep, gently sloping to sloping soil occurs along natural drainageways on uplands. Individual areas average 37 acres.

Typically, the surface layer is dark brown and dark grayish brown, moderately alkaline clay loam about 15 inches thick. Below this is light yellowish brown and olive yellow, moderately alkaline clay loam. The next layer is moderately alkaline, clayey marl. It contains fragments of hard white limestone below a depth of 35 inches. Hard fractured limestone is at a depth of 62 inches.

This soil is well drained. Runoff is medium to rapid. Permeability is moderate, and available water capacity is low. Plant roots penetrate easily to a depth of 35 inches. The water erosion hazard is severe.

Included with this soil in mapping are small areas of Aledo, Somervell, and Sunev soils and areas of less sloping Bolar soils. Included soils make up less than about 15 percent of any mapped area.

This soil has medium potential for small grains. Crops respond well to fertilization. Returning crop residue to the soil helps maintain fertility, improve tilth, and control erosion. Terraces are needed to help control erosion, and grassed waterways are needed to remove excess runoff. The soil has low potential for summer crops because of its moderate depth. It is droughty during dry periods.

Potential is high for range plants. The soil produces high yields of the tall native grasses common to the county. Grasses respond readily to fertilization, and good yields of such improved grasses as bermudagrass and Kleingrass are attainable. Potential for wildlife habitat is medium.

This soil has medium potential for many types of urban development. The limestone bedrock is difficult to excavate. The soil is clayey and has moderate shrink-swell potential. Shrubs grow well and the soil is easy to landscape, but plants adapted to limy soils should be used. This soil has medium potential for recreation uses. The high clay content and moderate depth to bedrock are concerns in construction. Some areas are too sloping for many types of playgrounds. Capability subclass IVe; Clay Loam range site.

19—Bolar-Sunev complex, 3 to 5 percent slopes. This complex of moderately deep and deep, gently sloping soils is along drainageways and on foot slopes on uplands. Mapped areas are long and narrow and average about 85 acres.

This complex is about 40 percent Bolar soils, about 30 percent Sunev soils, and about 30 percent included soils. These soils are in areas so intricately intermingled that separate mapping was not practical at the scale used.

Typically, the surface layer of the Bolar soils is dark brown, moderately alkaline clay loam about 12 inches thick. The next layer is light yellowish brown, moderately alkaline clay loam that is underlain by hard limestone at a depth of about 38 inches.

Bolar soils are well drained. Runoff is medium. Permeability is moderate, and available water capacity is low. Rooting depth is limited by depth to bedrock. The water erosion hazard is moderate.

Typically, the surface layer of the Sunev soils is dark grayish brown, moderately alkaline clay loam about 16 inches thick. The next layer is grayish brown, moderately alkaline silty clay loam that extends to a depth of 34 inches. Below this is pale brown, moderately alkaline silty clay loam that extends to a depth of about 74 inches. It is underlain by limestone.

Sunev soils are well drained. Runoff is medium. Permeability is moderate, and available water capacity is medium. The soil has a deep root zone, and plant roots penetrate easily. The water erosion hazard is moderate.

Included with these soils in mapping are small areas of Aledo, Brackett, Denton, Hillco, Lamar, Somervell, and Venus soils. Included soils make up less than about 10 percent of any mapped area.

These soils are used mostly as range. A few areas are cultivated and used for wheat or oats, but potential as cropland is low. Leaving crop residue on the surface helps control erosion and adds organic matter to the soil. Crops respond well to fertilization. Terraces, contour farming, and grassed waterways are needed to help control erosion.

Potential is high for native range plants. The native grasses on these soils are a mixture of tall and mid grasses. Potential is medium for improved pasture grasses and for wildlife habitat.

These soils have medium potential for most urban uses. The long narrow areas, the drainageways, and the included soils that are shallow over limestone make construction difficult. These soils have medium potential for use as recreation areas because of slope and depth to bedrock. Capability subclass IIIe; Clay Loam range site.

20—Brackett-Rock outcrop complex, 5 to 30 percent slopes. This complex consists of shallow and very shallow, sloping to steep soils on uplands. These soils are on convex ridgetops and breaks of erosional landscapes. The soil and rock outcrops occur as narrow bands ranging from 10 to 50 feet in width. These bands are on the contour on the sides of ridges and small hills. Slopes average about 20 percent. Mapped areas average 22 acres.

This complex is about 35 percent Brackett soils and about 20 percent exposed limestone. The remaining 45 percent is soils that are similar to Brackett soils. The soils and rock outcrops are in areas so intricately intermingled that they could not be mapped separately at the scale used.

Typically, Brackett soils have a surface layer of dark grayish brown, moderately alkaline cobbly clay loam about 4 inches thick. The next layer is brown and olive yellow, moderately alkaline silty clay loam that extends to a depth of about 19 inches. This is underlain by very pale brown, moderately alkaline silty shale that grades to hard, fractured limestone at a depth of 37 inches.

Brackett soils are well drained. Runoff is rapid. Permeability is moderately slow, and available water capacity is very low. The soil is high in content of organic matter. The root zone is shallow. The water erosion hazard is severe.

About 25 percent of this map unit is included areas of soils ranging from 1 inch to 10 inches in thickness; these soils are covered with loose fragments of limestone as much as 12 inches in diameter, and they are stony in places. About 20 percent is included areas of soils that are similar to Brackett soils but that are 20 to 35 inches thick over the weathered shale.

These soils are not suitable as cropland or pasture because of the shallow depth. They have low potential for range plants and low potential for wildlife habitat.

These areas have low potential for urban or rural development. Moderately steep to steep slopes and rock outcrops are concerns in construction of sewage disposal systems and in excavation. These areas, however, are scenic; therefore, the esthetic value justifies for some the higher cost of development. Capability subclass VIIs; Steep Adobe range site.

21—Branyon clay, 0 to 1 percent slopes. This deep, nearly level soil is on smooth terraces. Individual areas average 200 acres.

Typically, the surface layer is very dark gray, moderately alkaline clay about 6 inches thick. The next layer, between depths of 6 and 58 inches, is very dark gray, moderately alkaline clay. Below this is gray, moderately alkaline clay.

This soil is moderately well drained. Runoff is slow. Permeability is very slow, and available water capacity is high. This soil has a deep root zone. The water erosion hazard is slight.

Included with this soil in mapping are small areas of Burleson, Chatt, Houston Black, and Krum soils. Included soils make up less than 10 percent of any mapped area.

This soil has a high potential for cotton, grain sorghum (fig. 2), and forage sorghum. It is difficult to till when wet, and it cracks severely during dry periods. Using a cropping system that includes fertilized sorghum or small grain and returning residue from these crops to the soil help maintain fertility, improve tilth, and prevent compaction. Crops respond well to fertilization. In places, diversion terraces are needed to control runoff from adjacent soils. In some fields grassed waterways are needed to provide safe outlets for the disposal of water from the diversion terraces.

This soil has high potential for grasses such as improved bermudagrass and Kleingrass as well as for native range plants. This soil has medium potential for wildlife habitat.

This soil has low potential for most urban uses. It has high shrink-swell potential and low strength. Excavations cave readily. Septic tank filter fields are restricted by the very slow internal drainage. The soil is easy to landscape with plants well adapted to limy soils. This soil has low potential as recreation areas. It is too clayey, and water tends to pond in flat areas for short periods following rains. Capability subclass IIw; Blackland range site.

22—Burleson clay, 0 to 1 percent slopes. This deep, nearly level soil is on smooth terraces. Individual areas average 40 acres.

Typically, the surface layer is very dark gray, medium acid clay about 7 inches thick. The next layer, to a depth of about 18 inches, is dark gray, medium acid clay. Below this to a depth of 44 inches is dark gray, mildly alkaline clay. The next layer is light yellowish brown, moderately alkaline clay that extends to a depth of 66 inches.

This soil is moderately well drained. Runoff is slow. Permeability is very slow, and available water capacity is high. The soil has a deep root zone, but the clay content impedes the movement of roots, air, and water. The water erosion hazard is slight.

Included with this soil in mapping are small areas of Branyon, Chatt, Houston Black, Krum, and Wilson soils and areas of more sloping Burleson soils. In many places, the material below a depth of 60 inches grades to calcareous clay containing gravel. Included soils make up less than about 10 percent of any mapped area.

This soil has high potential for cotton, grain sorghum, and hay crops. It has medium potential for fall seeded crops such as wheat or oats. A crust tends to form on the surface following rains. Water tends to pond to a depth of a few inches in some of the flatter areas following rains; this retards the growth of young plants and prevents cultivation. Using a cropping system that includes fertilized sorghum or small grain and returning residue from these crops to the soil help maintain fertility, improve tilth, and prevent crusting. Crops respond well to fertilization. In some places diversion terraces are needed to control runoff from adjacent soils. In some fields grassed waterways are needed to provide safe outlets for the disposal of water from the diversion terraces.

Potential is high for range and pasture grasses. Such grasses respond readily to fertilization. This soil has low potential for wildlife habitat.

This soil has low potential for most urban uses. It has very high shrink-swell potential and low strength. The internal drainage is very slow; this restricts the proper functioning of septic tank filter fields. The soil is too clayey for use as daily cover material for sanitary landfills. This soil has low potential for recreation. It is too clayey, and water tends to pond in flat areas for short periods following rains. Capability subclass IIw; Blackland range site.

23—Burleson clay, 1 to 3 percent slopes. This deep, gently sloping soil is on uplands and smooth terraces. Individual areas average about 30 acres.

The surface layer is very dark gray, medium acid clay about 6 inches thick. The next layer is dark gray, medium acid to mildly alkaline clay that extends to a depth of about 44 inches. Below this is light yellowish brown, moderately alkaline clay that extends to a depth of 66 inches.

This soil is moderately well drained. Runoff is medium. Permeability is very slow, and available water capacity is high. Water enters the soil rapidly when it is dry and cracked and very slowly when it is wet. This soil has a deep root zone, but the clay content impedes the movement of roots, air, and water. The water erosion hazard is moderate.

Included with this soil in mapping are small areas of Branyon, Chatt, Culp, Houston Black, Krum, Normangee, and Wilson soils and less sloping and more sloping Burleson soils. Included soils make up less than about 10 percent of any mapped area.

This soil is mainly used as cropland. It has high potential as cropland and produces good yields. It is clayey and has a narrow moisture range within which it can be tilled. It packs readily if tilled or traveled on when wet. Using a cropping system that includes fertilized sorghum and small grain and returning residue from these crops to the soil help maintain fertility and improve tilth. Keeping residue on the surface helps control water erosion. Contour farming, terracing, and grassed waterways are needed to remove excess runoff or runoff from adjacent soils.

Potential is high for use as improved pasture and range. Grasses respond well to fertilization and good management. The soil should not be grazed when wet because the clayey surface packs easily. It has low potential for wildlife habitat.

This soil has low potential for most urban uses. It has high shrink-swell potential, and this is a hazard for streets, roads, and foundations. The internal drainage is too slow for septic tank filter fields to function properly. The soil is too clayey for use as daily cover material for sanitary landfills. It has low strength and will not support traffic when wet. Potential is low for recreation areas. The soil is too clayey for use when wet; when dry it cracks too severely for use as playgrounds. Recreational facilities are difficult to maintain. Capability subclass IIe; Blackland range site.

24—Chatt clay, 1 to 3 percent slopes. This deep, gently sloping soil is on old terraces. Mapped areas average about 40 acres.

Typically, the surface layer is dark grayish brown to dark brown, moderately alkaline clay 17 inches thick. The next layer is reddish brown, moderately alkaline clay that extends to a depth of 27 inches. To a depth of 80 inches is reddish yellow, moderately alkaline clay and clay loam.

This soil is moderately well drained. Runoff is slow. Permeability is moderately slow, and available water capacity is high. The soil has a deep root zone. The water erosion hazard is moderate.

Included with this soil in mapping are small areas of Branyon, Culp, Krum, Houston Black, and Venus soils. Included soils make up about 10 percent of any mapped area.

This soil is used mainly as cropland (fig. 3). It has high potential for fall crops like wheat. It produces good yields of corn and grain sorghum. This soil is clayey and tends to pack if cultivated when wet. Using a cropping system that includes fertilized sorghum and small grain and returning residue from these crops to the soil help maintain fertility and improve tilth. Keeping residue on the surface helps control water erosion. Contour farming, terracing, and grassed waterways are needed.

Potential is high for improved grasses like bermudagrass and Kleingrass. These grasses respond readily to fertilization. Potential for range plants is high. This soil has medium potential for wildlife habitat.

This soil has low potential for most urban uses. It has high shrink-swell potential and low strength. The internal drainage is so slow that specially designed septic tank filter fields are needed. The soil is too clayey for use as cover material for sanitary landfills. This soil has low potential for recreational development because the surface layer is too clayey. Capability subclass IIe; Blackland range site.

25—Chatt-Urban land complex. These deep, gently sloping soils are on smooth terraces. Slopes range from 1 to 3 percent. Individual areas are rounded and average about 75 acres.

Chatt soils make up from 40 to 60 percent of the unit; Urban land, from 20 to 55 percent; and included soils, 25 percent or less. These soils are in areas so intricately intermingled that separate mapping was not practical at the scale used.

Typically, the surface layer of Chatt soils is dark grayish brown to dark brown, moderately alkaline clay 17 inches thick. The next layer is reddish brown, moderately alkaline clay that extends to a depth of 27 inches. The next layer is reddish yellow, moderately alkaline clay and clay loam that extends to a depth of 80 inches.

Chatt soils are well drained. Runoff is slow. Permeability is moderately slow, and available water capacity is high. The soil has a deep root zone, and plants develop roots easily into the lower layers. The water erosion hazard is moderate.

Urban land consists of soils that have been altered or covered by buildings or other urban structures. Classifying these soils is not practical. Most Urban land is covered by residences and business buildings; the soil surface is exposed in yards, alleys, and a few vacant lots. These exposed surfaces include remnants of Chatt soils that have been altered by cutting, filling, and grading. Areas that have fill material on top of the natural soil are common.

Included in mapping are small areas of Altoga, Heiden, Houston Black, Lamar, and Venus soils.

This unit has moderate to severe limitations for urban development. The clay texture and the associated high shrink-swell potential are the main limitations. Not assigned to a capability subclass or a range site.

26—Chickasha Variant fine sandy loam, 3 to 8 percent slopes. This deep, gently sloping and sloping soil is on uplands. Areas are irregularly shaped and occur near natural drainageways. They average about 30 acres.

Typically, the surface layer is dark grayish brown, medium acid fine sandy loam 9 inches thick. The next layer is dark grayish brown, medium acid sandy clay loam to a depth of 14 inches over brown, neutral sandy clay loam to a depth of 27 inches. Between depths of 27 and 32 inches is light olive brown, moderately alkaline clay loam, and between depths of 32 and 44 inches is mottled light olive brown and olive brown, moderately alkaline clay loam. Below this, the lower layers are mottled, moderately alkaline clayey shale.

This soil is well drained. Runoff is medium. Permeability is moderate, and available water capacity is high. The soil has a deep root zone, and plant roots penetrate easily. The water erosion hazard is severe.

Included with this soil in mapping are small areas of Blum, Crockett, Culp, Ferris, Heiden, and Lamar soils. Included soils make up less than 15 percent of any mapped area.

This soil is used mainly for pasture. It has low potential as cropland. In cultivated areas, a cropping system that includes high-residue crops is needed. Returning the residue of these crops to the soil helps maintain fertility and improve tilth. Crops respond well to fertilization. In cultivated areas, terraces, contour farming, waterways, and other erosion control structures are needed.

Potential is medium for native grasses and for improved grasses such as bermudagrass and Kleingrass.

This soil has medium potential for most urban uses. The subsurface layers are clayey and have low strength. Potential is high for recreation uses except where the slopes are too great for some types of playgrounds. Capability subclass IVe; Sandy Loam range site.

27—Coving-Vaughan complex, 0 to 2 percent slopes. This complex of deep, nearly level and gently sloping soils is in natural drainageways that have gently sloping sides. Mapped areas are long and narrow and contain water courses. They range from 100 to 500 feet in width and to about 3 miles in length. Mapped areas average about 40 acres.

About 65 percent of this unit is Coving soils, about 25 percent is Vaughan soils, and about 10 percent is other soils that are similar to Coving and Vaughan soils. These soils are closely associated in areas too intricately intermingled to be mapped separately at the scale used.

Typically, Coving soils have a surface layer of brown, neutral loamy fine sand about 7 inches thick. The next layer is pink, neutral loamy fine sand that extends to a depth of 28 inches. The next layer is mottled brown, reddish brown, and gray, medium acid loam extending to a depth of 46 inches. Below this is mottled very dark grayish brown, light yellowish brown, and gray, neutral clay loam grading to light olive gray and reddish yellow, mildly alkaline sandy clay loam.

Coving soils are somewhat poorly drained. Runoff is slow. Permeability is moderate, and available water capacity is medium. This soil has a deep root zone, and plant roots penetrate easily. This soil has a seasonal high water table. The water erosion hazard is slight.

Typically, Vaughan soils have a surface layer of very pale brown, slightly acid fine sandy loam about 8 inches thick. The next layer is light brownish gray, slightly acid fine sandy loam that extends to a depth of 17 inches. The next layer is gray, mottled, moderately alkaline sandy clay loam. Below this is light gray, mottled, moderately alkaline clay loam that extends to a depth of 70 inches or more.

Vaughan soils are poorly drained. Runoff is slow. Permeability is slow, and available water capacity is high. This soil has a deep root zone. It is saturated following rainy periods. The water erosion hazard is slight.

Included with these soils in mapping are small areas of Axtell, Crockett, Gasil, Mabank, and Silstid soils. Included soils make up less than about 10 percent of any mapped area.

These soils are used mainly for pasture. They have medium potential as cropland. Crops respond well to fertilization. A desirable cropping system includes plants that provide a large amount of residue. When left on the surface after harvest, the residue helps control erosion, maintain fertility, and improve tilth.

Potential is high for improved pasture. The extra moisture that the soil receives because of its low position on the landscape is beneficial to the grass during dry months. Potential for range plants is high, and potential for wildlife habitat is high.

These soils have low potential for most urban uses. The seasonal high water table limits its use for septic tank filter fields. The soils have low potential for recreation uses because of the flooding and the seasonal high water table. Capability subclass IIIw; Coving soils in Sandy range site, Vaughan soils in Sandy Loam range site.

28—Crockett fine sandy loam, 0 to 1 percent slopes. This deep, nearly level soil is on uplands. Most areas occur on low ridges and low foot slopes adjacent to small streams. Areas are oval and average about 24 acres.

Typically, the surface layer is brown, neutral fine sandy loam about 7 inches thick. The next layer is mottled reddish brown, brown, dark red, and reddish yellow, medium acid clay that extends to a depth of about 17 inches. The next layer is medium acid clay coarsely mottled with olive yellow, olive, reddish brown, and brown. Below a depth of 60 inches is moderately alkaline clay coarsely mottled with grayish brown, olive yellow, and light olive brown. This layer grades to shaly clay below a depth of 70 inches.

This soil is moderately well drained. Runoff is slow. Permeability is very slow, and available water capacity is high. This soil has a deep root zone, but plant roots have difficulty in penetrating the clay subsurface layers. The water erosion hazard is slight.

Included with this soil in mapping are small areas of more sloping Crockett soils and small areas of Axtell, Wilson, and Mabank soils. Included soils make up less than about 10 percent of any mapped area.

This soil has medium potential for most field crops, but it tends to become crusted. Crop residue and cover crops are needed to maintain a high level of organic matter. Crops respond well to fertilization. A good cropping system provides a large amount of residue, which helps control erosion, maintain fertility, and improve tilth. In places, grassed waterways and diversion terraces are needed to help remove excess runoff.

Potential is high for range plants and improved pasture grasses. Potential for wildlife habitat is high.

This soil has low potential for most urban uses. It has high shrink-swell potential and low strength. The infiltration rate of the clayey subsoil is so slow that specially designed septic tank filter fields are needed. This soil is poorly suited to most recreation uses because internal drainage is too slow and water stands in flat areas. Capability subclass IIIs; Claypan Prairie range site.

29—Crockett fine sandy loam, 1 to 3 percent slopes. This deep, gently sloping soil is on uplands. Most areas consist of low ridges and side slopes of ridges and average about 40 acres.

Typically, the surface layer is pale brown, slightly acid fine sandy loam about 7 inches thick. The next layer is coarsely mottled reddish brown, yellowish red, and brown, medium acid clay that extends to a depth of about 19 inches. The next layer is coarsely mottled olive yellow, grayish brown, and reddish yellow, medium acid clay that extends to a depth of about 41 inches. The next lower layer is mottled grayish brown and olive yellow, moderately alkaline clay that extends to a depth of about 60 inches. The underlying layer is mottled gray and yellow, moderately alkaline clay that grades to platy shale below a depth of 70 inches.

This soil is moderately well drained. Runoff is slow. Permeability is very slow, and available water capacity is high. The soil has a deep root zone, but plant roots have difficulty in penetrating the clay subsurface layers. The water erosion hazard is moderate.

Included with this soil in mapping are small areas of less sloping Crockett soils and small areas of Axtell, Wilson, Mabank, and Normangee soils. Included soils make up less than about 10 percent of any mapped area.

This soil has medium potential for most field crops, but the surface tends to become crusted. Crop residue and cover crops are needed to maintain a high level of organic matter and to keep the soil in good tilth. Crops respond well to fertilization. Using a cropping system that includes fertilized sorghum or small grain and returning residue from these crops to the soil helps maintain fertility and improve tilth. Keeping residue on the surface helps control erosion. Terraces, contour farming, and grassed waterways are needed.

Potential is high for range plants and improved pasture grasses. Potential for wildlife habitat is high.

This soil has low potential for most urban uses. It has high shrink-swell potential and low strength. It is poorly suited to septic tank filter fields because of the very slow permeability below the surface layer. The soil has low potential for most recreation uses. Capability subclass IIIe; Claypan Prairie range site.

30—Crockett-Wilson complex, 0 to 2 percent slopes. This complex of deep, nearly level to gently sloping soils is on uplands. These soils occur in a regular and repeating pattern of highs and lows. The Crockett soils, on the highs, are about half a foot higher than the Wilson soils. Individual areas are rounded or narrow bands about 50 feet across. Areas average about 40 acres.

The Crockett soils make up about 50 percent of the complex; Wilson soils, about 40 percent; and other soils, the remaining 10 percent. These soils are in areas so intricately intermingled that separate mapping was not practical at the scale used.

Typically, the surface layer of the Crockett soils is brown, neutral fine sandy loam about 7 inches thick. The next layer is mottled brown, grayish brown, and reddish brown, neutral clay that extends to a depth of about 19 inches. The next layer is grayish brown clay with mottles of brown and dark brown. It extends to a depth of about 45 inches; it is neutral in the upper part and moderately alkaline in the lower part. Below this is mottled light grayish brown, light yellowish brown, and olive yellow, moderately alkaline clay.

Crockett soils are well drained. Runoff is slow. Permeability is very slow, and available water capacity is high. The soil has a deep root zone, but plants have difficulty penetrating the clay layers. The water erosion hazard is slight.

Typically, the surface layer of the Wilson soils is gray, neutral clay loam about 5 inches thick. The next layer is very dark gray, mildly alkaline clay to a depth of about 17 inches over dark gray, moderately alkaline clay to a depth of about 53 inches. Below this is mottled pale olive and gray, moderately alkaline clay.

Wilson soils are somewhat poorly drained. Runoff is very slow. Permeability is very slow, and available water capacity is high. The soil has a deep root zone, but plants have difficulty penetrating the clay layers. The water erosion hazard is slight.

Included with these soils in mapping are small areas of Axtell, Blum, Burleson, Culp, and Normangee soils. Included soils make up about 10 percent of any mapped area.

These soils are used mainly as cropland and have high potential for this use. They are easy to cultivate. Crops respond well to fertilization. A good cropping system provides a large amount of residue, which helps maintain fertility and improve tilth.

Potential is high for range plants and improved pasture grasses. Potential for wildlife habitat is medium.

These soils have low potential for most urban uses. They are clayey and have high shrink-swell potential. The internal drainage is so slow that specially designed septic tank filter fields are needed. These soils are easy to landscape with grasses and shrubs. Potential is low for recreation uses. Capability subclass IIIw; Claypan Prairie range site.

31—Crosstell fine sandy loam, 5 to 12 percent slopes. This moderately deep, moderately steep soil is on uplands. Areas are mostly long and narrow and are on side slopes of higher ridges and low hills. They average about 40 acres.

Typically, the surface layer is dark brown, slightly acid fine sandy loam about 5 inches thick. The next layer, to a depth of about 38 inches, is yellowish red, reddish yellow, and reddish brown, strongly acid clay with mottles of yellow, and olive. The next layer is coarsely mottled pale olive, olive yellow, and light yellowish brown, moderately alkaline clay that grades at a depth of 46 inches to shaly clay.

This soil is well drained. Runoff is rapid. Permeability is very slow, and available water capacity is high. The soil has a moderately deep root zone, but plant roots have difficulty penetrating the clay layers. The water erosion hazard is severe.

Included with this soil in mapping are small areas of Axtell, Birome, Rayex, Gasil, and Normangee soils. Included soils make up less than about 10 percent of any mapped area.

This soil is used mainly for pasture. It has low potential as cropland. Maintaining plant cover helps control erosion. The soil has medium potential for range plants and improved pasture grasses. It has medium potential for wildlife habitat.

This soil has low potential for most urban uses. The infiltration rate is so slow that specially designed septic tank filter fields are needed. Shrink-swell potential is high. Esthetic value is low. Potential for most recreation uses is low. Capability subclass VIe; Claypan Savannah range site.

32—Culp clay loam, 1 to 3 percent slopes. This deep, gently sloping soil is on uplands and old high terraces. Areas average about 50 acres.

Typically the surface layer is dark grayish brown, neutral clay loam about 7 inches thick. The next layer, to a depth of about 18 inches, is dark grayish brown, slightly acid sandy clay loam with a few fine brownish mottles. The next layer is dark brown, mildly alkaline sandy clay with coarse distinct mottles of dark grayish brown. It extends to a depth of about 44 inches. Between depths of 44 and 57 inches is mottled light olive brown and dark grayish brown, moderately alkaline clay loam, and between depths of 57 and 73 inches is mottled light yellowish brown, olive yellow, and brownish gray, moderately alkaline clay loam.

This soil is moderately well drained. Runoff is slow. Permeability is slow, and available water capacity is high. The root zone is deep. The water erosion hazard is moderate.

Included with this soil in mapping are small areas of Blum, Branyon, Burleson, Crockett, Houston Black, Mabank, and Normangee soils. Included soils make up less than 10 percent of any mapped area.

This soil is used mainly as cropland. Potential as cropland is high. The soil is easy to manage, and crops need to be fertilized. Using a cropping system that includes fertilized sorghum and small grain and returning residue from these crops to the soil help maintain fertility and improve tilth. Leaving residue on the surface also helps control water erosion. Terracing, contour farming, and grassed waterways are needed.

Potential is high for pasture and for native range plants. Potential for wildlife habitat is medium.

This soil has low potential for most urban uses. It has high shrink-swell potential and low strength. It has medium potential for most recreation uses. Capability subclass IIe; Clay Loam range site.

33—Denton clay, 1 to 3 percent slopes. This moderately deep, gently sloping soil is on uplands. Areas occur along shallow drainageways and average about 30 acres.

Typically, the surface layer is dark grayish brown, moderately alkaline clay about 18 inches thick. The next layer is light brownish gray, moderately alkaline clay to a depth of about 29 inches; pale olive, moderately alkaline clay to a depth of 35 inches; and mottled white and pale brown, moderately alkaline clay loam to a depth of 39 inches. Below this is coarsely fractured, hard limestone bedrock.

This soil is well drained. Runoff is medium to rapid. Permeability is slow, and available water capacity is medium. The soil has a moderately deep root zone. The water erosion hazard is moderate.

Included with this soil in mapping are small areas of Bolar, Houston Black, Krum, and Purves soils. Included soils make up less than 10 percent of any mapped area.

This soil is used mainly as cropland, and some areas are in native grasses. This soil has high potential as cropland. Using a cropping system that includes fertilized sorghum and small grain and returning residue from these crops to the soil help maintain fertility and improve tilth. Keeping residue on the surface helps control water erosion. Contour farming, terracing, and grassed waterways are needed.

Potential is high for native range plants and improved pasture grasses. Potential is medium for wildlife habitat.

This soil has low potential for most urban uses. It has high shrink-swell potential. Permeability is too slow for septic tank filter fields to function properly. The limestone bedrock within a depth of 40 inches makes excavation difficult. The soil has medium potential for recreation uses. Capability subclass IIe; Clay Loam range site.

34—Eddy very gravelly clay loam, 1 to 3 percent slopes. This very shallow, gently sloping soil is on uplands. Most areas are long and oval and occur on low ridges. They average about 32 acres.

Typically, the surface layer is dark grayish brown, moderately alkaline very gravelly clay loam about 6 inches thick. The next layer, about 3 inches thick, is brown, moderately alkaline clay loam; thin fragments of chalk make up about 55 percent of this layer. The underlying material is thick bedded, coarsely fractured marine chalk.

This soil is well drained. Runoff is medium. Permeability is moderately slow, and available water capacity is very low. The root zone is limited to the soil above the chalk. The water erosion hazard is moderate.

Included with this soil in mapping are small areas of Austin and Stephen soils and small areas of more sloping Eddy soils. Included soils make up less than about 10 percent of any mapped area.

About half of the acreage of this soil is cropland, but the soil has low potential as cropland. Because the soil is shallow, close-growing crops are needed to help control erosion.

Potential is medium for native range plants and low for improved pasture grasses. Potential for wildlife habitat is low.

This soil has medium potential for urban development. The very shallow depth to bedrock makes excavation difficult. Potential is low for most recreation uses. Numerous chalk fragments as much as 3 inches in diameter are in the surface layer and hinder the use of the soil as a playground. Capability subclass IVs; Chalky Ridge range site.

35—Eddy very gravelly clay loam, 3 to 8 percent slopes. This very shallow, gently sloping and sloping soil is on uplands. Most areas are on the side slopes of ridges or small natural drainageways and average about 35 acres.

Typically, the surface layer is dark grayish brown, moderately alkaline very gravelly clay loam about 6 inches thick. The next layer is brown, moderately alkaline clay loam; thin fragments of chalk make up about 55 percent of this layer. Coarsely fractured white chalk occurs at a depth of about 9 inches; it becomes more massive below.

This soil is well drained. Runoff is medium to rapid. Permeability is moderately slow, and available water capacity is very low. This thin soil is droughty during summer. It has a limited root zone above the very shallow bedrock. The water erosion hazard is moderate.

Included with this soil in mapping are small areas of Austin, Stephen, and Sunev soils and small areas of less sloping Eddy soils. Included soils make up less than about 10 percent of any mapped area.

Many of the areas where this soil is less sloping are cropland, but the soil has low potential for cultivated crops and is best suited to permanent vegetation. The soil has low potential for improved pasture grasses and medium potential for range plants. Potential for wildlife habitat is low.

This soil has medium potential for most urban uses because of the very shallow depth to bedrock and the slope. Potential is low for most recreation uses. The surface layer contains numerous chalk fragments as much as about 3 inches across. Slope is a limiting feature for many kinds of playgrounds. Capability subclass VIe; Chalky Ridge range site.

36—Eufaula fine sand, 1 to 5 percent slopes. This deep, gently sloping soil is on low ridges on uplands. Individual areas are mostly oval and average about 65 acres.

Typically, the surface layer is brown, neutral fine sand to a depth of about 6 inches over pink, medium acid loamy fine sand to a depth of 26 inches. Between depths of 26 and 60 inches is reddish yellow, medium acid loamy fine sand that contains thin strata of reddish yellow soil. The next layer is brownish yellow, medium acid loamy fine sand that contains thin strata of reddish yellow sandy clay loam.

This soil is somewhat excessively drained. Runoff is very slow. Permeability is rapid, and available water capacity is low. Plant roots can penetrate easily below the surface layer. The water erosion hazard is slight.

Included with this soil in mapping are small areas of Bastsil, Konsil, and Silstid soils. Also included are blownout fields surrounded by mounds of sand. Included soils make up less than about 10 percent of any mapped area.

About half of the acreage of this soil is cropland. The soil is used mainly for forage crops, truck crops, and peanuts. It has medium potential for peanuts where good management is used and low potential for most other crops. Cover crops and crop residue are needed to add organic matter and control wind erosion. Crops respond well to fertilization. A suitable cropping system provides a large amount of residue. When left on the surface after harvest, crop residue helps control erosion, maintain fertility, and improve tilth.

Potential is medium for improved pasture grasses, but liberal applications of fertilizers are required. Potential is medium for native range plants and for wildlife habitat.

This soil has medium potential for most urban uses. It is well suited to septic tank filter fields, but seepage lowers the potential for sewage lagoons or trench type sanitary landfills. Potential is medium for recreation uses. The soil is too sandy for many types of playgrounds and for camp or picnic sites. Capability subclass IVs; Deep Sand range site.

37—Ferris clay, 5 to 12 percent slopes. This deep, sloping to strongly sloping soil is on uplands. Most areas are long and narrow and are on the side slopes of ridges. They average about 40 acres.

Typically, the surface layer is light olive brown, moderately alkaline clay about 9 inches thick. The next layer, extending to a depth of 38 inches, is light olive brown, moderately alkaline clay. The lower layers are mottled light olive brown, gray, and yellow, moderately alkaline shaly clay that becomes more shaly with depth.

This soil is well drained. Runoff is rapid after the cracks in the surface have been closed. Permeability is very slow, and available water capacity is high. The high clay content impedes root penetration. The water erosion hazard is severe.

Included with this soil in mapping are small areas of Altoga and Heiden soils and steeper Ferris soils that are severely eroded. Included soils make up less than about 10 percent of any mapped area.

About half of the acreage of this soil is cropland, but the soil has low potential for cultivated crops. This soil needs continuous vegetative cover to help control erosion. It has medium potential for improved pasture grasses but requires liberal applications of fertilizers to maintain dense cover and to produce satisfactory yields. It has medium potential for native range plants and generally medium potential for wildlife habitat.

This soil has low potential for most urban uses. It has high shrink-swell potential. Septic tank filter fields do not function well in this clayey soil. The more sloping areas are concerns in construction. This soil has low potential for recreation areas. It is too clayey and has very slow permeability. Capability subclass VIe; Eroded Blackland range site.

38—Ferris clay, 8 to 20 percent slopes, severely eroded. This deep, strongly sloping to moderately steep soil is on uplands along streams and natural drainageways. The surface is severely eroded; gullies are 5 to 15 feet deep and 20 to 40 feet across. Areas are long and narrow and average about 40 acres.

Typically, the surface layer is olive gray, moderately alkaline clay about 4 inches thick. The next layer is light olive brown, moderately alkaline clay about 5 inches thick. To a depth of 34 inches is olive yellow, moderately alkaline clay. Between depths of 34 and 60 inches is olive and light olive brown, moderately alkaline clay that grades to mottled yellow and light brownish gray shaly clay in the lower part.

This soil is well drained. Runoff is rapid when the soil is wet and surface cracks are closed. Permeability is very slow, and available water capacity is high. The root zone is deep, but high clay content impedes the movement of roots. The water erosion hazard is severe.

Included with this soil in mapping are small areas of Altoga soils and small areas of uneroded, generally less sloping Ferris soils. Included soils make up less than about 10 percent of any mapped area.

Most of this soil is old idle cropland that has been allowed to revegetate with native plants and weeds. The soil is not suitable for cultivation. These areas need a grass cover to control erosion.

Potential is low for improved pastures. Potential for native grasses is high, but these grasses are difficult to establish. Potential for wildife habitat is medium.

This soil has low potential for most urban uses. It shrinks and swells with changes in moisture content. Septic tank filter fields do not function well. This soil has low potential for recreation uses because of clay content and slope. Capability subclass VIe; Eroded Blackland range site.

39—Ferris-Heiden complex, 2 to 5 percent slopes. This complex of deep, gently sloping soils is on uplands. Ferris soils are in more rolling areas, including higher knolls and ridges. Heiden soils are in less sloping areas and in valleys along natural drainageways. Areas average about 50 acres.

About 45 percent of this unit is Ferris soils, 45 percent is Heiden soils, and 10 percent is other clayey soils that are similar to Ferris and Heiden soils. These soils are in areas so intricately intermingled or so small that separate mapping was not practical at the scale used.

Typically, Ferris soils have a surface layer of olive, moderately alkaline clay about 7 inches thick. To a depth of 42 inches is olive, moderately alkaline clay. Between depths of 42 and 66 inches is coarsely mottled light yellowish brown, grayish brown, and olive yellow, moderately alkaline shaly clay. At a depth of 66 inches, this layer grades to coarsely mottled light olive brown, olive yellow, and gray, moderately alkaline shaly clay.

Ferris soils are well drained. Runoff is rapid when the soil is wet and surface cracks have been closed. Permeability is very slow, and available water capacity is high. The soil has a deep root zone. The water erosion hazard is moderate.

Typically, Heiden soils have a surface layer of dark grayish brown, moderately alkaline clay about 6 inches thick. The next layer is olive gray, moderately alkaline clay that extends to a depth of 18 inches. To a depth of 48 inches is coarsely mottled olive gray and pale olive, moderately alkaline clay. Below this is coarsely mottled olive, olive yellow, and gray, moderately alkaline shaly clay.

Heiden soils are well drained. Runoff is rapid when the soil is wet and surface cracks are closed. Permeability is very slow, and available water capacity is high. The soil has a deep root zone; however, plant roots have difficulty in penetrating the clay layers. The water erosion hazard is moderate.

Included with these soils in mapping are small areas of Altoga soils and small areas of eroded soils. Included soils make up less than about 10 percent of any mapped area.

These soils have medium potential as cropland. Leaving all crop residue on the surface helps control erosion and adds organic material to the soil. Crops respond well to fertilization. Terraces, contour farming, and grassed waterways are needed to help control erosion.

Potential is high for native range plants and improved pasture grasses. Potential for wildlife habitat is generally medium.

These soils have low potential for most urban uses (fig. 4). They have high shrink-swell potential. Permeability is too slow for septic tank filter fields to function properly. These soils have low potential for most recreation uses. They are too clayey and too sloping for many types of developments. Capability subclass IIIe; Ferris soils in Eroded Blackland range site, Heiden soils in Blackland range site.

40—Gasil fine sandy loam, 1 to 3 percent slopes. This deep, gently sloping soil is on uplands. Areas average about 35 acres.

Typically, the surface layer is brown, slightly acid fine sandy loam about 7 inches thick. The next layer is very pale brown, slightly acid fine sandy loam 6 inches thick. To a depth of 23 inches is brownish yellow, medium acid sandy clay loam with red mottles, and to a depth of 30 inches is brownish yellow, medium acid sandy clay loam with coarse mottles of reddish yellow. Between depths of 30 and 78 inches is mottled light gray, yellow, red, reddish yellow, and white, strongly acid sandy clay loam. Ten to 75 percent of this layer is uncoated sand.

This soil is well drained. Runoff is slow. Permeability is moderate, and available water capacity is high. The soil has a deep root zone, and roots can penetrate the soil easily. The water erosion hazard is moderate.

Included with this soil in mapping are small areas of more sloping, eroded Gasil soils and small areas of Axtell, Bastsil, Coving, Vaughan, Crockett, and Silstid soils.

This soil is dominantly cropland. It has medium potential for most crops grown in the county. Peanuts are well adapted to this soil and are grown in many areas. Using a cropping system that includes fertilized sorghum or small grain and returning residue from these crops to the soil help maintain fertility and improve tilth. Keeping residue on the surface helps control water erosion. Crops respond well to fertilization. Contour farming, terracing, and grassed waterways are needed. This soil has high potential for many truck crops and orchard crops.

Potential is medium for improved pasture and high for wildlife habitat.

This soil has medium potential for most urban uses. Well designed tank filter fields function properly. This soil has high potential for most types of recreational development. Recreational facilities are easy to install. Capability subclass IIe; Sandy Loam range site.

41—Gasil fine sandy loam, 3 to 5 percent slopes, eroded. This deep, gently sloping soil is on uplands. Most areas contain small gullies. Many of the natural drainageways are gullied. In many places the surface layer has been eroded from low hills. Individual areas average about 35 acres.

Typically, the surface layer is brown, slightly acid fine sandy loam about 5 inches thick. The next layer is light brown, slightly acid fine sandy loam about 6 inches thick. Between depths of 11 and 21 inches is coarsely mottled brown and yellow, medium acid sandy clay loam, and to a depth of 36 inches is coarsely mottled reddish brown, pale brown, and brownish yellow, strongly acid sandy clay loam. Between depths of 36 and 51 inches is mottled yellow and gray, strongly acid sandy clay loam. Below this is mottled light gray, olive brown, and yellowish red, moderately alkaline clay.

This soil is well drained. Runoff is medium. Permeability is moderate, and available water capacity is high. The soil has a deep root zone, and roots can penetrate easily into the lower layers. The water erosion hazard is severe.

Included with this soil in mapping are small areas of less sloping Gasil soils and small areas of Axtell, Konsil, Normangee, and Silstid soils. Included soils make up less than about 10 percent of any mapped area.

About half of the acreage of this soil is cropland, but the soil has low potential as cropland. Using a cropping system that includes fertilized sorghum or small grain and returning residue to the soil help maintain fertility and improve tilth. Keeping residue on the surface helps control erosion. Crops respond well to fertilization. Terraces, contour farming, and grassed waterways are needed to help control erosion. This soil has medium potential for orchard crops and truck crops.

Potential is medium for improved pastures. The grass responds well to fertilization. Potential is high for native grasses and for wildlife habitat.

This soil has medium potential for most urban uses. Properly designed septic tank filter fields function well. This soil has high potential for most types of recreational development, but slope is limiting for some types of playgrounds. Capability subclass IIIe; Sandy Loam range site.

42—Gowen clay loam, frequently flooded. This deep, nearly level soil is on flood plains that are frequently flooded. Areas are long and narrow and are along streams that deposited loamy sediments. Individual areas average about 10 acres.

Typically, the surface layer is dark grayish brown and dark brown, moderately alkaline clay loam about 34 inches thick. Below this is yellowish brown, moderately alkaline clay loam to a depth of 46 inches over very dark grayish brown, moderately alkaline clay loam to a depth of 56 inches. Below this is coarsely mottled dark grayish brown, dark brown, light yellowish brown, and yellow, moderately alkaline heavy clay loam.

This soil is well drained. Runoff is slow to medium. Permeability is moderate, and available water capacity is high. The soil is flooded a few times each year, mainly during spring, but is subject to flooding at any time during the year. This soil has a deep root zone, and roots penetrate easily into lower layers. The water erosion hazard is slight.

Included with this soil in mapping are small areas of Kemp, Pulexas, Pursley, and Tinn soils. Included soils make up less than about 10 percent of any mapped area.

This soil is used mainly as pasture, although many areas are wooded and are suitable for only a limited amount of grazing. These areas contain ash, elm, cottonwood, pecan, and willow trees; a few oak trees; and many shrubs, vines, and other trees grown locally. The soil has low potential as cropland because of frequent flooding.

Potential is high for improved pastures. Grasses respond readily to fertilization. The flooding is not severe enough to damage the grass; in fact, the extra water is beneficial. Potential is high for native grasses and generally low for wildlife habitat.

This soil has low potential for urban and recreation uses. It is flooded too frequently to be used as homesites. The only suitable recreation activities on this soil are those not needing permanent facilities. Capability subclass Vw; Loamy Bottomland range site.

43—Heiden clay, 1 to 3 percent slopes. This deep, gently sloping soil is on uplands. It occurs on low ridges and foot slopes in the smoother portions of the landscape. Individual areas average about 48 acres.

Typically, the surface layer is dark grayish brown, moderately alkaline clay about 26 inches thick. The next layer, to a depth of about 38 inches, is mottled dark grayish brown and olive gray, moderately alkaline clay. To a depth of about 58 inches is light olive brown, moderately alkaline clay with diffused mottles of brownish yellow. Below a depth of 58 inches is light olive brown, moderately alkaline clay with yellow and dark grayish brown mottles. This layer becomes shaly with depth.

This soil is well drained. Runoff is rapid. Permeability is very slow, and available water capacity is high. This soil has a deep root zone, but the clay content impedes the penetration of roots. The water erosion hazard is moderate.

Included with this soil in mapping are small areas of Altoga, Austin, Ferris, Houston Black, Lamar, Venus, and Wilson soils. Included soils make up less than about 10 percent of any mapped area.

This soil is used mainly as cropland. It has high potential for all field crops common in the county, and cotton, corn, and grain sorghum yield well. Using a cropping system that includes fertilized sorghum and small grain and returning residue from these crops to the soil help maintain fertility and improve tilth. Keeping residue on the surface helps control water erosion. Contour farming, terracing, and grassed waterways are needed.

Potential is high for improved pasture grasses and for native range plants. Potential for wildlife habitat is medium.

This soil has low potential for most urban uses. It has high shrink-swell potential and low strength. Permeability is too slow for septic tank filter fields to function properly. Potential is low for most recreational development because the soil is too clayey. Capability subclass IIe; Blackland range site.

44—Heiden clay, 5 to 8 percent slopes. This deep, sloping soil is on uplands. It is on side slopes and broad, plane slopes. Individual areas average 50 acres.

The surface layer is dark gray and dark grayish brown, moderately alkaline clay about 17 inches thick. The next layer is grayish brown, moderately alkaline clay to a depth of about 32 inches over olive gray, moderately alkaline clay to a depth of about 62 inches. Below this is light olive brown clay that has gray mottles.

This soil is well drained. Runoff is rapid. Permeability is very slow, and available water capacity is high. This soil has a deep root zone, but the clay content impedes the penetration of roots. The water erosion hazard is severe.

Included with this soil in mapping are small areas of Chickasha Variant, Ferris, Lamar, and Venus soils. Included soils make up less than about 8 percent of any mapped area.

This soil is used mostly for native pasture. It has medium potential as cropland. Crops respond well to fertilization. Returning crop residue throughout most or all of the year helps maintain fertility, improve tilth, and control erosion. In cultivated areas, terraces, contour farming, and grassed waterways are needed to help control erosion.

This soil is well suited to grass. It has high potential for native range plants and medium potential for improved pasture grasses. Potential for wildlife habitat is medium.

This soil has low potential for most urban uses. It has high shrink-swell potential and low strength. Permeability is too slow for septic tank filter fields to function properly. This soil has low potential for most recreation uses. It is too clayey and too sloping for most types of playgrounds. Capability subclass IVe; Blackland range site.

45—Heiden-Urban land complex, 3 to 8 percent slopes. These deep, gently sloping and sloping soils are on uplands. Most areas are long and narrow and average about 100 acres. They occupy sloping drainageways or the side slopes above larger streams.

Heiden soils occupy 10 to 70 percent of the unit; Urban land, 20 to 80 percent; and included soils, 10 percent or less. The soils are in areas so intricately intermingled that separate mapping was not practical at the scale used.

Typically, Heiden soils have a surface layer of dark grayish brown and olive gray, moderately alkaline clay about 18 inches thick. The next layer, to a depth of about 48 inches, is coarsely mottled olive gray and pale olive, moderately alkaline clay. Below this is mottled olive, olive yellow, and gray, moderately alkaline clay that becomes shaly with depth.

Heiden soils are well drained. Runoff is rapid. Permeability is very slow, and available water capacity is high. The soil has a deep root zone, but the clay content impedes the penetration of roots. The water erosion hazard is severe.

Areas mapped as Urban land consist of works, structures, and disturbed areas that have so altered or obscured the soil that classification is not practical. The main works and structures are office buildings, warehouses, railroad yards, schools, churches, dwellings, garages, sidewalks, driveways, streets, and paved parking lots. Urban land also includes areas that have been disturbed by cutting, filling, or grading.

Included in mapping are small areas of Altoga, Ferris, Houston Black, and Lamar soils. Ferris soils, the most extensive, are more sloping than the others. Included soils make up less than about 10 percent of any mapped area.

These soils have moderate to severe limitations for urban development mainly because of the clay texture and the associated high shrink-swell potential. Not assigned to a capability subclass or a range site.

46—Hensley loam, 1 to 3 percent slopes. This shallow, gently sloping soil is on uplands. The surface is smooth and plane. Individual areas average about 30 acres.

Typically, the surface layer is yellowish red, neutral loam about 5 inches thick. The next layer, to a depth of about 12 inches, is reddish brown, neutral clay. Between depths of 12 and 18 inches is red, moderately alkaline clay. This is underlain by hard, white limestone bedrock.

This soil is well drained. Runoff is slow to moderate. Permeability is moderately slow, and available water capacity is very low. The water erosion hazard is moderate.

Included with this soil in mapping are small areas of Aledo, Somervell, Bolar, Denton, Lindy, Kopperl, and Purves soils. Included soils make up less than about 10 percent of any mapped area.

About half of the acreage of this soil is cropland, but the soil has low potential as cropland. Keeping residue from crops on the surface helps control water erosion and maintain or improve soil tilth. Crops respond well to fertilization.

Potential is low for improved pasture grasses and medium for native range plants. Areas in rangeland support the tall and mid grasses common in the county, and most also support a few live oak, cedar, and mesquite trees. Although potential for range plants is medium, livestock prefer to graze in areas of this soil than in areas of the adjacent soils. Potential for wildlife habitat is low.

This soil has low potential for most urban uses. The hard limestone bedrock within a depth of 20 inches makes excavation difficult. The layer of soil above the bedrock is too thin for pond reservoirs, septic tank filter fields, or sanitary landfills. This soil has medium potential for most recreation uses mainly because of the shallow depth to hard bedrock. Capability subclass IIIe; Redland range site.

47—Hillco clay loam, 1 to 3 percent slopes. This moderately deep, gently sloping soil is on uplands. Most areas are on low ridges. They are long and oval and average about 30 acres.

Typically, the surface layer is dark brown, moderately alkaline clay loam about 11 inches thick. The next layer is reddish brown, moderately alkaline clay loam that extends to a depth of about 16 inches. The next layer, to a depth of about 34 inches, is reddish yellow, moderately alkaline clay loam and gravelly clay loam. Between depths of 34 and 38 inches is light brown, moderately alkaline gravelly clay loam. Below this is hard, white limestone bedrock.

This soil is well drained. Runoff is medium. Permeability is moderate, and available water capacity is medium. The soil has a moderately deep root zone, and plant roots penetrate the soil easily. The water erosion hazard is moderate.

Included with this soil in mapping are small areas of Aledo, Bolar, Krum, Lindy, Somervell, and Sunev soils. Included soils make up less than about 10 percent of any mapped area.

This soil is used mainly as cropland. Potential as cropland is medium. The soil is droughty for crops that mature in late summer. It is friable and easy to till. Using a cropping system that includes fertilized sorghum and small grain and returning residue from these crops to the soil help maintain fertility and improve tilth. Keeping residue on the surface helps control water erosion. Contour farming, terracing, and grassed waterways are needed.

Potential is high for improved pasture grasses and for range plants. Yields of tall grasses, mid grasses, and forbs are good. Potential for wildlife habitat is medium.

This soil has medium potential for most urban uses. The hard bedrock at a depth of 20 to 40 inches makes excavation difficult. This soil has moderate potential for most types of recreation uses, mainly because of the limited depth over limestone bedrock. Capability subclass IIe; Clay Loam range site.

48—Houston Black clay, 0 to 1 percent slopes. This deep, nearly level soil is on uplands. Areas are rounded and average about 70 acres.

Typically, the surface layer is dark gray, moderately alkaline clay about 6 inches thick. The next layer is dark gray, moderately alkaline clay that extends to a depth of 46 inches. The next layer is olive gray, moderately alkaline clay that grades to olive below a depth of about 80 inches.

This soil is moderately well drained. Runoff is slow. Permeability is very slow, and available water capacity is high. Water enters the soil rapidly when the soil is dry and cracked but very slowly when the soil is moist. This soil has a deep root zone. The water erosion hazard is slight.

Included with this soil in mapping are small areas of Branyon, Burleson, Chatt, Culp, and Wilson soils and small areas of steeper Houston Black soils. Included soils make up less than about 10 percent of any mapped area.

This soil is dominantly used as cropland. It has high potential as cropland, and crops yield well. The main crops are cotton, grain sorghum, and wheat. Regular additions of crop residue help maintain organic matter content and control erosion. Using a cropping system that includes fertilized sorghum or small grain and returning residue from these crops to the soil help maintain fertility and improve tilth. Crops respond well to fertilization.

Potential is high for improved pasture. Improved bermudagrass, lovegrass, improved bluestems, and other grasses grow well. These grasses respond well to fertilization. This soil has high potential as range. The tall native grasses are well adapted to this soil. Potential for wildlife habitat is medium.

This soil has low potential for most urban uses. It has high shrink-swell potential and low strength. The internal drainage is too slow for septic tank filter fields to function properly. This soil has low potential for most recreation uses. It is too clayey for use as playgrounds or campsites when wet, and some areas pond water for several days following rains. Capability subclass IIw; Blackland range site.

49—Houston Black clay, 1 to 3 percent slopes. This deep, gently sloping soil is on uplands. Areas average 135 acres and range to as large as 1,500 acres.

The surface layer is dark gray, moderately alkaline clay about 6 inches thick. The next layer is very dark gray, moderately alkaline clay to a depth of 35 inches. The next layer, to a depth of about 60 inches, is dark gray, moderately alkaline clay grading to gray in the lower part. Below that is coarsely mottled brown, dark gray, brownish yellow, light yellowish brown, and olive yellow, moderately alkaline clay.

This soil is moderately well drained. Runoff is slow to rapid. Permeability is very slow, and available water capacity is high. Water enters the soil rapidly when the soil is dry and cracked but very slowly when it is moist. This soil has a deep root zone. The water erosion hazard is moderate.

Included with this soil in mapping are small areas of Austin, Branyon, Burleson, Chatt, Culp, Denton, Heiden, and Wilson soils and small areas of less sloping or more sloping Houston Black soils. Included soils make up less than about 10 percent of any mapped area.

This soil is dominantly cropland. It has high potential as cropland, and crops yield well (fig. 5). Using a cropping system that includes fertilized sorghum and small grain and returning residue from these crops to the soil help maintain fertility and improve tilth. Keeping residue on the surface helps control water erosion. Contour farming, terracing, and grassed waterways are needed.

Potential is high for improved pasture. Improved bermudagrass, lovegrass, and other grasses grow well. These grasses respond well to fertilization. Potential is high as range. The tall native grasses are well adapted to this soil. Potential for wildlife habitat is medium.

This soil has low potential for most urban uses. It has high shrink-swell potential and low strength. The internal drainage is too slow for septic tank filter fields to function properly. This soil has low potential for most recreation uses. It is too clayey for use as playgrounds or campsites when wet. Capability subclass IIe; Blackland range site.

50—Houston Black-Urban land complex, 0 to 3 percent slopes. These deep, nearly level to gently sloping soils are on uplands. Areas are rounded and average about 150 acres.

Houston Black soils make up from 20 to 60 percent of this unit; Urban land, from 25 to 80 percent; and other soils, from 10 to 15 percent. The soils are in areas too intricately intermingled to be mapped separately at the scale used.

Typically, the Houston Black soils have a surface layer of dark gray, moderately alkaline clay about 6 inches thick. The next layer is very dark gray, moderately alkaline clay that extends to a depth of 36 inches. The next layer is dark gray, moderately alkaline clay grading to gray in the lower part; it extends to a depth of about 56 inches. Below this is coarsely mottled brown, dark gray, brownish yellow, and olive yellow, moderately alkaline clay.

Houston Black soils are moderately well drained. Runoff is slow to rapid. Permeability is very slow, and available water capacity is high. Water enters the soil rapidly when the soil is dry and cracked but very slowly when it is moist. The soil has a deep root zone. The water erosion hazard is moderate.

Urban land consists of soils that have been altered or covered by buildings or other urban structures. Classifying these soils is not practical. Most urban land is covered by residences and business buildings. The soil surface is exposed in yards and alleys and in a few vacant lots. The exposed soil includes small areas of Houston Black soils that have been altered by cutting, filling, and grading. Fill material commonly covers the natural soil.

Included in mapping are small areas of Chatt, Heiden, Lamar, and Venus soils. Included soils make up less than about 15 percent of any mapped area.

These soils have severe limitations for urban development mainly because of the clay texture and the attendant high shrink-swell potential. Not assigned to a capability subclass or a range site.

51—Kemp loam, occasionally flooded. This deep, nearly level soil is on flood plains. Slopes range from 0 to 1 percent. Areas are long and narrow and parallel to the channel. They average about 30 acres.

Typically, the surface layer is dark grayish brown, medium acid loam about 5 inches thick. The next layer is grayish brown, neutral loam to a depth of about 19 inches over brown, medium acid sandy clay loam to a depth of 26 inches. Below this is gray, medium acid sandy clay loam that has dark brown, brown, gray, and reddish yellow mottles and that extends to a depth of about 44 inches. Below this is mottled light gray, gray, grayish brown, brownish yellow, gray, and reddish yellow, medium acid clay loam.

This soil is moderately well drained. Runoff is slow. The soil is flooded briefly about once every 2 or 3 years. Permeability is moderate, and available water capacity is high. The root zone is deep and easily penetrated by plant roots. The water erosion hazard is slight.

Included with this soil in mapping are small areas of Pulexas, Pursley, and Tinn soils. Included soils make up less than about 10 percent of any mapped area.

This soil is dominantly used as cropland. It occupies the better drained areas of the flood plain and is used for such cash crops as grain sorghum and cotton. It has high potential as cropland. High yields are obtained with average management. The soil can be tilled over a wide range of moisture content. Using a cropping system that includes fertilized sorghum or small grain and returning residue from these crops to the soil help maintain fertility and improve tilth. Crops on these soils respond well to fertilization.

Potential is high for improved pasture grasses and for native range plants. Potential for wildlife habitat is high.

This soil has low potential for most urban uses because of flooding. It also has low potential for recreation uses. Capability subclass IIw; Loamy Bottomland range site.

52—Konsil fine sandy loam, 3 to 5 percent slopes. This deep, gently sloping soil is on uplands. Areas average about 30 acres.

Typically, the surface layer is yellowish red, slightly acid fine sandy loam about 5 inches thick. The next layer is yellowish red, slightly acid fine sandy loam and sandy clay loam that extends to a depth of about 13 inches. The next layer is red, medium acid sandy clay loam that extends to a depth of 38 inches. Below this is coarsely mottled reddish yellow, gray, and red, strongly acid sandy clay loam.

This soil is well drained. Runoff is slow. Permeability is moderate and available water capacity is high. The soil has a deep root zone; roots penetrate easily below the surface layer. The water erosion hazard is moderate.

Included with this soil in mapping are small areas of Axtell, Bastrop, Gasil, and Travis soils. Included soils make up less than about 10 percent of any mapped area.

About half of the acreage of this soil is cropland, and a few areas are in orchards. The soil has medium potential as cropland. Using a cropping system that includes fertilized sorghum or small grain and returning residue to the soil help maintain fertility and improve tilth. Keeping residue on the surface helps control erosion. Crops respond well to fertilization. Terraces, contour farming, and grassed waterways are needed to help control erosion.

Potential is medium for improved grasses, which respond well to fertilization. Potential is high for range plants. Grasses are mid height and tall. Potential for wildlife habitat is high.

This soil has medium potential for most urban uses. Septic tank filter fields function well if properly designed. Permeability is too rapid for sewage lagoons. The soil has medium potential for recreation areas. The slope is too great in places for some types of playgrounds. Capability subclass IIIe; Sandy Loam range site.

53—Kopperl gravelly sandy loam, 1 to 3 percent slopes. This deep, gently sloping soil is on old high terraces. It occurs as remnant areas of broken terraces. Individual areas average about 45 acres.

Typically, the surface layer is dark brown, slightly acid gravelly sandy loam about 6 inches thick over reddish brown, slightly acid gravelly sandy loam about 8 inches thick. The next layer is yellowish red, neutral gravelly loam to a depth of about 26 inches. The next layer, to a depth of about 40 inches, is red, slightly acid gravelly clay loam with prominent mottles of brown. Below this is mottled brown and reddish yellow, neutral clay. It rests on hard white limestone at a depth of about 54 inches; the limestone is fractured in the upper 2 feet.

This soil is well drained. Runoff is slow. Permeability is moderately slow, and available water capacity is medium. The soil has a deep root zone, and plant roots can penetrate easily. The water erosion hazard is moderate.

Included with this soil in mapping are small areas of Aledo, Axtell, Bastrop, Gasil, Somervell, and Travis soils. Included soils make up less than about 10 percent of any mapped area.

This soil is unsuitable for use as cropland. It is difficult to cultivate because of the high content of gravel.

Potential is high for improved grasses, which respond well to fertilization. Potential is high for native range plants. The natural vegetation consists of post oak trees, a few live oak trees, and a few mesquite trees, and many grasses, forbs, and shrubs. Potential for wildlife habitat is medium.

This soil has medium potential for most urban uses. In places the limestone bedrock is shallow enough to hinder excavations. This soil has medium potential for recreation uses. The surface layer contains pebbles and small stones, which are limitations to the use of the soil for playgrounds. Capability subclass VIe; Sandy Loam range site.

54—Krum silty clay, 0 to 1 percent slopes. This deep, nearly level soil is on old high terraces. Individual areas average about 50 acres.

The surface layer is very dark gray, moderately alkaline silty clay about 5 inches thick over very dark gray, moderately alkaline silty clay about 13 inches thick. The next layer is brown, moderately alkaline silty clay. It has yellow mottles and extends to a depth of about 40 inches. Below this is coarsely mottled light brownish gray, brown, and yellow, moderately alkaline silty clay.

This soil is well drained. Runoff is slow. Permeability is moderately slow, and available water capacity is high. The soil has a deep root zone, and plant roots can penetrate easily. The water erosion hazard is slight.

Included with this soil in mapping are small areas of Branyon, Burleson, Chatt, Houston Black, and Venus soils. Included soils make up less than about 10 percent of any mapped area.

This soil is mainly used as cropland, and it has high potential as cropland. It is easy to till, and crops yield well. Using a cropping system that includes fertilized sorghum and small grain and returning the residue from these crops to the soil help maintain fertility and improve tilth.

Potential is high for improved grasses, which respond well to fertilization. Potential is high for native range plants. The soil produces good yields of mid and tall grasses. Potential for wildlife habitat is medium.

This soil has low potential for most urban uses. It has high shrink-swell potential and low strength. Permeability is too slow for septic tank filter fields to function well. Potential is low for most recreation uses. The soil is too clayey for use as playgrounds when wet. Capability subclass IIs; Clay Loam range site.

55—Lamar clay loam, 1 to 5 percent slopes. This deep, gently sloping soil is on uplands. Most areas are long and oval and average about 25 acres.

Typically, the surface layer is pale brown, moderately alkaline clay loam about 6 inches thick. The next layer is light olive brown, moderately alkaline clay loam to a depth of 13 inches and mottled light olive brown and yellow, moderately alkaline clay loam to a depth of 34 inches. The next layer is olive yellow, moderately alkaline clay loam to a depth of 46 inches. Below this is yellow, moderately alkaline clay loam.

This soil is well drained. Runoff is medium. Permeability is moderate, and available water capacity is high. The root zone is deep and easily penetrated by plant roots. The water erosion hazard is moderate.

Included with this soil in mapping are small areas of Altoga, Ferris, Heiden, and Venus soils. Included soils make up less than about 10 percent of any mapped area.

About half of the acreage of this soil is cropland. The soil has medium potential as cropland. It is easy to keep in good tilth with annual additions of crop residue, and it can be tilled over a wide range of moisture content. Leaving all residue on the surface helps control erosion and adds organic material to the soil. Crops respond well to fertilization. Terraces, contour farming, and grassed waterways are needed on these soils to help control erosion.

Potential is high for improved pasture. Grasses respond well to fertilization. Potential is high for range, and mid and tall grasses produce high yields. Potential for wildlife habitat is generally medium.

This soil has medium potential for most urban uses. Seepage occurs where the soil is used for farm ponds or sewage lagoons, but septic tank filter fields function satisfactorily on this soil. The soil has medium shrink-swell potential and low strength. Potential is medium for recreation uses. The surface is too clayey for use as playgrounds during wet periods. Capability subclass IIIe; Clay Loam range site.

56—Lamar clay loam, 3 to 5 percent slopes, eroded. This deep, gently sloping soil is on uplands. It contains many small gullies. Most areas are long and oval and average about 40 acres.

Typically, the surface layer is brown, moderately alkaline clay loam about 5 inches thick. The next layer is light olive brown, moderately alkaline sandy clay loam to a depth of 20 inches and mottled light olive brown and olive yellow, moderately alkaline sandy clay loam to a depth of about 38 inches. The next layer, to a depth of about 50 inches, is mottled light olive brown, olive yellow, and brown, moderately alkaline clay loam. Below this is brownish yellow, moderately alkaline sandy clay loam.

This soil is well drained. Runoff is rapid. Permeability is moderate, and available water capacity is high. This soil has a deep root zone, and plant roots can penetrate easily. The water erosion hazard is severe.

Included with this soil in mapping are small areas of Altoga, Ferris, Heiden, and Venus soils. Included soils make up less than about 10 percent of any mapped area.

Most of the acreage of this soil is used for pasture or is idle. A few areas are used for forage crops. This soil has medium potential as cropland. Crops respond well to fertilization. Using a cropping system that includes fertilized sorghum or small grain and returning residue from these crops to the soil help maintain fertility and improve tilth. Keeping residue on the surface helps control erosion. Terraces, contour farming, waterways, and other erosion control structures are needed in cultivated areas.

This soil is better suited to grasses than to crops and should be kept in sod to protect it from further damage by erosion. It has medium potential for improved pasture, and grasses responds readily to fertilization. Some areas contain many small gullies and need smoothing. Potential is high for native range plants. Potential for wildlife habitat is medium.

This soil has medium potential for most urban uses. Some of the more sloping and gullied areas need to be smoothed and leveled to be suitable as building sites. Seepage occurs when the soil is used for sewage lagoons, but septic tank filter fields function satisfactorily. This soil has medium potential for use as recreation areas. Most areas contain many small gullies, which make the soil poorly suited as playgrounds. Capability subclass IVe; Clay Loam range site.

57—**Lamar-Urban land complex, 1 to 5 percent slopes.** These deep, gently sloping soils are on uplands. Areas are long and narrow and are on side slopes of ridges. They average about 45 acres.

Lamar soils make up from 20 to 60 percent of this unit; Urban land, from 25 to 80 percent; and other soils, about 10 percent. The soils are in areas too intricately intermingled to be mapped separately at the scale used.

Typically, Lamar soils have a surface layer of brown, moderately alkaline clay loam about 5 inches thick. The next layer is light olive brown, moderately alkaline sandy clay loam that extends to a depth of about 45 inches. Below this is mottled light olive brown, olive yellow, and brown, moderately alkaline clay loam.

This soil is well drained. Runoff is rapid. Permeability is moderate, and available water capacity is high. This loamy soil has a deep root zone, and plant roots can penetrate easily. The water erosion hazard is moderate.

Areas mapped as Urban land consist of works, structures, and disturbed areas that have altered or obscured the soil so that classification is not practical. The main works and structures are office buildings, warehouses, railroad yards, schools, churches, dwellings, garages, sidewalks, driveways, streets, and paved parking lots. Urban land also includes areas that have been disturbed by cutting, filling, or grading.

Included in mapping are small areas of Altoga, Ferris, Heiden, and Venus soils. Included soils make up less than about 10 percent of any mapped area.

These soils have moderate suitability for urban development. The moderate shrink-swell potential and low strength are the main limitations. Not assigned to a capability subclass or a range site.

58—**Lindy clay loam, 1 to 3 percent slopes.** This moderately deep, gently sloping soil is on uplands. The surface is slightly convex. Individual areas average about 45 acres.

Typically, the surface layer is reddish brown, slightly acid clay loam about 7 inches thick. The next layer is reddish brown, slightly acid clay to a depth of about 15 inches and red, neutral clay to a depth of about 31 inches. The next layer is reddish brown, mildly alkaline clay that extends to a depth of about 36 inches. Below this is hard, white, fractured limestone with red clay in the seams.

This soil is well drained. Runoff is slow to moderate. Permeability is slow, and available water capacity is medium. The soil has a moderately deep root zone. The water erosion hazard is moderate.

Included with this soil in mapping are small areas of Bolar, Culp, Denton, Hensley, Hillco, and Purves soils. Included soils make up less than about 10 percent of any mapped area.

About half of the acreage of this soil is cropland. The soil has medium potential as cropland. The surface layer is loamy and easy to keep in good tilth with regular applications of crop residue. Clean-tilled areas become crusted and hard. Leaving all residue on the surface helps control erosion and adds organic material to the soil. Crops respond well to fertilization. Terraces and contour farming are needed to help control erosion.

Potential is medium for improved pasture grasses and high for native grasses. Areas in range support a mixture of tall grasses, mid grasses, and forbs. Grasses yield well on this soil. Potential for wildlife habitat is generally high.

This soil has low potential for most urban uses because of the moderate depth to hard limestone. Excavation is difficult. This soil has medium potential for use as recreation areas because of the moderate depth to bedrock. Capability subclass IIIe; Deep Redland range site.

59—**Mabank fine sandy loam, 0 to 2 percent slopes.** This deep, nearly level to gently sloping soil is on uplands. Individual areas average about 35 acres.

Typically, the surface layer is grayish brown, neutral fine sandy loam about 5 inches thick. The next layer is very dark gray, neutral clay to a depth of about 24 inches. The next layer is gray, moderately alkaline clay that has a few brownish yellow mottles and that extends to a depth of about 49 inches. Below this is light olive gray, moderately alkaline clay with coarse mottles of brownish yellow.

This soil is somewhat poorly drained. Runoff is very slow. Permeability is very slow, and available water capacity is high. This soil has a deep root zone, but plants have difficulty extending their roots into the dense, clayey layers. The water erosion hazard is slight.

Included with this soil in mapping are small areas of Axtell, Blum, Burleson, Crockett, Normangee, and Wilson soils. Included soils make up less than about 10 percent of any mapped area.

This soil is dominantly used as cropland. It has medium potential for most field crops. It is level and easy to till, but it needs regular applications of crop residue. Crops respond well to fertilization. Using a cropping system that includes fertilized sorghum or small grain and returning the residue from these crops to the soil help maintain fertility and tilth.

Potential is high for improved pasture grasses and for native range plants. This soil has medium potential for use as wetland wildlife areas. The flatter areas pond water during rainy periods, providing rest and feeding areas for waterfowl. Otherwise, the soil generally has high potential for wildlife habitat.

This soil has low potential for most urban uses. The clayey layers have high shrink-swell potential and low strength. The internal drainage is too slow for septic tank filter fields to function properly. The soil has low potential for most recreation uses. It is too flat and clayey for use during wet periods. These areas pond water for several days following rains. Capability subclass IIIw; Claypan Prairie range site.

60—Normangee clay loam, 0 to 1 percent slopes. This deep, nearly level soil is on uplands. Individual areas average about 55 acres.

Typically, the surface layer is dark grayish brown, medium acid clay loam about 10 inches thick. The next layer is dark grayish brown, medium acid clay with mottles of reddish brown, olive yellow, and dark brown; it extends to a depth of about 38 inches. Below this is grayish brown, moderately alkaline clay.

This soil is moderately well drained. Runoff is slow. Permeability is very slow, and available water capacity is high. The soil has a deep root zone, but plant roots have difficulty penetrating the dense clayey layers. The water erosion hazard is slight.

Included with this soil in mapping are small areas of Axtell, Crockett, and Wilson soils and small areas of more sloping Normangee soils. Included soils make up less than about 10 percent of any mapped area.

This soil is dominantly cropland because it is nearly level and easy to cultivate. It has medium potential as cropland. High-residue crops are needed to provide organic matter to keep the soil in good tilth.

Potential is high for improved pastures. Fertilizer is needed to maintain high yields. Potential is medium for native range plants and usually medium for wildlife habitat.

This soil has low potential for most urban uses. It has high shrink-swell potential and low strength. It is too clayey for use as sanitary landfills. The internal drainage is too slow for septic tank filter fields to function properly. This soil has low potential for recreation uses. It is too clayey for use when wet. The flatter areas pond water following rains. Capability subclass IIIs; Claypan Prairie range site.

61—Normangee clay loam, 1 to 3 percent slopes. This deep, gently sloping soil is on uplands. Individual areas average about 60 acres.

Typically, the surface layer is brown, neutral clay loam about 5 inches thick. The next layer is brown, neutral clay to a depth of about 27 inches. To a depth of about 60 inches is brown, dark brown, and yellowish brown, moderately alkaline clay with mottles of olive and yellow in the lower part. Below this is coarsely mottled light yellowish brown, yellow, and brownish yellow, moderately alkaline clay.

This soil is moderately well drained. Runoff is medium. Permeability is very slow, and available water capacity is high. The soil has a deep root zone, but plant roots have difficulty penetrating the dense, clayey layers. The water erosion hazard is moderate.

Included with this soil in mapping are small areas of Axtell, Crockett, Heiden, and Wilson soils and small areas of less sloping and more sloping Normangee soils. Included soils make up less than about 10 percent of any mapped area.

This soil is dominantly cropland, and it has medium potential as cropland. With good management, crops produce average yields. Using a cropping system that includes fertilized sorghum or small grain and returning residue from these crops to the soil help maintain fertility and improve tilth. Keeping residue on the surface helps control erosion. Terraces, contour farming, and grassed waterways are needed.

Potential is high for improved pastures. Grasses yield well when fertilized. Potential is medium for native range plants and for wildlife habitat.

This soil has low potential for most urban uses. It has high shrink-swell potential and low strength. It is too clayey for use as sanitary landfills. The internal drainage is too slow for septic tank filter fields to function properly. Potential is low for recreation uses. The soil is too clayey for use when wet and becomes very hard when dry. Capability subclass IIIe; Claypan Prairie range site.

62—Normangee clay loam, 3 to 5 percent slopes. This deep, gently sloping soil is on uplands. Individual areas average about 40 acres.

Typically, the surface layer is pale brown, medium acid clay loam about 5 inches thick. The next layer is yellowish brown, slightly acid clay with dark grayish brown and olive yellow mottles; it extends to a depth of about 23 inches. The next layer is coarsely mottled light yellowish brown and brownish yellow, moderately alkaline clay to a depth of about 34 inches. Between depths of 34 and 40 inches is olive yellow, moderately alkaline clay with olive yellow mottles. The next layer is coarsely mottled light olive brown and brownish yellow, moderately alkaline clay to a depth of about 60 inches. Below this is mottled olive yellow and yellow, moderately alkaline clay.

This soil is moderately well drained. Runoff is rapid. Permeability is very slow, and available water capacity is high. The soil has a deep root zone, but plant roots have difficulty penetrating the dense, clayey layers. The water erosion hazard is severe.

Included with this soil in mapping are small areas of Axtell, Crockett, Ferris, Heiden, and Wilson soils and small areas of less sloping Normangee soils. Included soils make up less than about 10 percent of any mapped area.

This soil is dominantly pasture. Many fields previously cultivated have been allowed to revegetate naturally with weeds and grasses. This soil has medium potential for field crops. Crops respond well to fertilization. Using a cropping system that includes fertilized sorghum or small grain and returning residue from these crops to the soil help maintain fertility and improve tilth. Keeping residue on the surface helps control erosion. Terraces, contour farming, and grassed waterways are needed.

Potential is high for improved pastures. Grass is difficult to establish on this soil, but once established, it produces fairly well when fertilized. This soil has medium potential as range and for wildlife habitat. Most native areas support mesquite brush, annual weeds and grasses, and coarse bunchgrasses.

This soil has low potential for most urban uses. It has high shrink-swell potential. It is too clayey for use as sanitary landfills. The internal drainage is too slow for septic tank filter fields to function properly. Potential is low for recreation uses. The soil is too clayey for use when wet and becomes very hard when dry. Most areas are too slowly permeable for use as playgrounds. Capability subclass IVe; Claypan Prairie range site.

63—Pits. Pits are excavations ranging in size from 4 to about 400 acres and in depth from 10 to 30 feet. Rock, gravel, sand, and clay have been removed from the pits. Pits smaller than 4 acres have been identified on the soil maps by spot symbols.

The surface material in these pits is residual sand, gravel, rock, or clay and soils that were disturbed in excavation. These disturbed soils range from a few inches thick in places to piles 2 feet thick or more.

These areas are well drained to very poorly drained. Runoff is very rapid to ponded. Permeability is mostly moderate to very slow. Available water capacity and depth of the root zone depend on the thickness and kind of material present.

The largest pits are in areas from which limestone has been mined for use as commercial lime. Most rock pits remain open; no effort has been made to reclaim them.

Sand and gravel pits are in areas of Bastrop, Chatt, Kopperl, Krum, and Venus soils. The sand and gravel are removed for use as construction material. The sand and gravel pits can usually be smoothed and reclaimed.

Clay pits are along highways and railroads. The materials were removed for use as fill material. These pits are in areas of Houston Black, Branyon, Crockett, Ferris, Heiden, Normangee, and Wilson soils. They contain water most of the time. They could be smoothed, shaped, and revegetated or used as water areas.

These areas are unsuitable as cropland, pasture, or range. Potential for wildlife habitat ranges from low to high depending upon the condition of the residual materials in the pit.

Potential for urban uses is low. Potential for recreation uses is usually low, although some areas are ideal for certain kinds of recreation. Not assigned to a capability unit or a range site.

64—Pulexas loamy fine sand, 0 to 2 percent slopes. This deep, nearly level soil is along streams. Most areas are above the flood plain and average about 50 acres.

Typically, the surface layer is light yellowish brown, neutral loamy fine sand about 7 inches thick. The next layer is very pale brown, neutral loamy fine sand about 7 inches thick. The next layer, between depths of 14 and 80 inches, is reddish yellow, neutral sandy loam.

This soil is well drained. Runoff is slow. Permeability is rapid, and available water capacity is medium. The soil has a deep root zone, and plants can develop roots into the lower layers easily. The water erosion hazard is slight.

Included with this soil in mapping are small areas of Aquilla and Bastsil soils, small areas of frequently flooded Pulexas soils, and small areas of Ustifluvents. Included soils make up less than 10 percent of any mapped area.

This soil is dominantly cropland, and it has high potential as cropland. Crops well adapted to sandy soils, such as peanuts, melons, truck crops, and orchard crops, are grown. Using a cropping system that includes fertilized sorghum or small grain and returning residue from these crops to the soil help maintain fertility and improve tilth. Crop residue left on the surface prevents the soil from blowing and reduces erosion. Crops respond well to fertilization.

Potential is high for improved pasture grasses, which respond well to fertilization and good management. Potential is high as range. Tall and mid grasses grow well. Potential for wildlife habitat is high.

This soil has medium potential for most urban uses. Internal drainage is rapid, and seepage from sewage systems can contaminate the water table. Permeability is too rapid to locate sewage lagoons on the soil. Excavations cave readily. The soil is too sandy for most types of playgrounds and recreational activities. Capability subclass IIw; Loamy Bottomland range site.

65—Pulexas soils, frequently flooded. This deep, nearly level soil is on flood plains. It is flooded once or twice each year for periods of less than 2 days. Areas are long and narrow and are along the channels of streams that drain sandy areas. Individual areas average about 60 acres.

These soils have variable surface textures because of flooding. They are not uniform and do not occur in a regular pattern.

Typically, the surface layer is grayish brown, slightly acid fine sandy loam about 5 inches thick over brown, neutral fine sandy loam about 6 inches thick. The next layer is brown, neutral fine sandy loam to a depth of 34 inches and brown and grayish brown, neutral loamy fine sand to a depth of 76 inches.

This soil is well drained. Runoff is slow. Permeability is moderately rapid, and available water capacity is medium. This soil has a deep root zone, and plants can develop roots into the lower layers easily. The water erosion hazard is slight.

Included with these soils in mapping are small areas of Bastrop, Gasil, Gowen, Silstid, and Travis soils and small areas of nonflooded Pulexas soils. Included soils make up less than about 10 percent of any mapped area.

This soil is dominantly pasture, mostly wooded pasture. It has low potential as cropland because of flooding. It has high potential for improved pasture grasses, and it produces high yields. All grasses respond well to fertilization. The soil is flooded during most general rains, and hay crops are subject to loss or damage. It has high potential for range and generally medium potential for wildlife habitat. It provides food, water, and shelter for most types of wildlife.

This soil has low potential for most urban uses. It is flooded too often for houses, roads, or sewage systems. Potential is low for recreation uses because of the frequent flooding. Capability subclass Vw; Loamy Bottomland range site.

66—Pursley clay loam, frequently flooded. This deep, nearly level soil is on flood plains. It is flooded about two or three times each year. Slopes range from 0 to 1 percent. Areas are mostly long and narrow, are parallel to the channel, and average about 120 acres.

Typically, the surface layer is very dark gray, moderately alkaline clay loam about 14 inches thick. The next layer is brown, moderately alkaline sandy clay loam to a depth of about 26 inches. Between depths of 26 and 46 inches is pale brown, moderately alkaline fine sandy loam; between depths of 46 and 51 inches is dark grayish brown, moderately alkaline sandy clay loam; and between depths of 51 and 57 inches is pale brown, moderately alkaline fine sandy loam. Below this is dark grayish brown, moderately alkaline sandy clay loam.

This soil is well drained. Runoff is slow. Permeability is moderate, and available water capacity is high. The soil has a deep root zone, and plant roots can penetrate easily. The water erosion hazard is slight.

Included with this soil in mapping are small areas of Pulexas and Tinn soils. Included soils make up less than about 10 percent of any mapped area.

This soil is dominantly pasture. It is unsuitable as cropland because of frequent flooding. It has high potential for improved pasture; improved bermudagrass grows well and responds well to fertilization. The floodwater, which drains off within 1 or 2 days, helps the grass. This soil has high potential for native range plants. Potential for wildlife habitat is generally medium. Most channel areas support trees that provide protective cover for wildlife.

This soil has low potential for most urban uses. It is flooded too often for houses, roads, or sewage systems. It has low potential for recreation uses because of flooding. Capability subclass Vw; Loamy Bottomland range site.

67—Purves clay loam, 1 to 3 percent slopes. This shallow, gently sloping soil is on uplands. Areas average about 40 acres.

Typically, the surface layer is dark gray, moderately alkaline clay loam about 8 inches thick over dark grayish brown, moderately alkaline clay about 8 inches thick. The next layer is pale brown, moderately alkaline clay about 3 inches thick. The underlying limestone bedrock is fractured in the upper 30 inches and massive below.

This soil is well drained. Runoff is slow to moderate. Permeability is moderately slow, and available water capacity is very low. The soil has a shallow root zone because of the limestone bedrock. The water erosion hazard is moderate.

Included with this soil in mapping are small areas of Aledo, Bolar, Denton, Hensley, Lindy, and Somervell soils. Included soils make up less than about 10 percent of any mapped area.

This soil has medium potential as cropland. It needs regular additions of crop residue to add organic matter. Keeping residue from such crops as small grain and grain sorghum on the surface helps control water erosion and maintain or improve soil tilth. Crops respond well to fertilization. This soil is droughty for summer crops because it is shallow.

Potential is medium for improved pasture grasses, which respond well to fertilization and good management. Potential is medium for native range plants. Areas in native grasses contain a mixture of little bluestem, big bluestem, indiangrass, sideoats grama, and other grasses and forbs. Potential is low for wildlife habitat. The soil supports mostly native grasses that produce a limited amount of food and cover for wildlife.

This soil has low potential for most urban uses. The hard limestone bedrock within 20 inches of the surface limits use. Excavation is difficult. This soil has low potential for use as recreation areas. The shallow depth to bedrock and the clay loam surface texture are the main limitations. Capability subclass IIIe; Shallow range site.

68—Silstid loamy fine sand, 1 to 3 percent slopes. This deep, gently sloping soil is on uplands. Areas are irregularly shaped and average about 70 acres.

Typically, the surface layer is dark brown, slightly acid loamy fine sand about 8 inches thick over brown, slightly acid loamy fine sand about 7 inches thick. The next layer, to a depth of about 27 inches, is light yellowish brown, slightly acid loamy fine sand. Between depths of 27 and 44 inches is reddish yellow, slightly acid sandy clay loam with yellowish red mottles, and between depths of 44 and 59 inches is brownish yellow, medium acid sandy clay loam with reddish yellow mottles. Below is brownish yellow, medium acid sandy clay layered with ironstone and sandstone.

This soil is well drained. Runoff is slow. Permeability is moderate, and available water capacity is medium. The root zone is deep. Plant roots can penetrate easily. The water erosion hazard is slight. Soil blowing is a concern.

Included with this soil in mapping are small areas of Bastsil, Eufaula, and Gasil soils and small areas of less sloping and more sloping Silstid soils. Included soils make up less than about 10 percent of any mapped area.

This soil is used mainly as cropland. It has medium potential for cultivated crops. Peanuts, truck crops, and orchard crops are the main crops. Crop residue left on or near the soil surface reduces runoff and helps prevent soil blowing. Crops respond well to fertilization. A suitable cropping system provides a large amount of residue. When left on the surface after harvest and later plowed into the upper few inches of the soil, crop residue helps maintain fertility and improve tilth. Diversions and grassed waterways help remove excess water and reduce water erosion.

Potential for range is medium. Native plants are tall grasses and a few oaks. Potential is medium for improved pastures. Improved bermudagrasses, Kleingrass, and lovegrass are well suited to this soil (fig. 6). They respond readily to fertilization and good management. Potential is medium for wildlife habitat.

This soil has high potential for most urban uses. Septic tank filter fields and sanitary landfills function well, but water percolates too rapidly for use as sewage lagoons. This soil has low potential for use as recreation areas. The surface layer is too sandy. Capability subclass IIIs; Sandy range site.

69—Silstid loamy fine sand, 3 to 5 percent slopes. This deep, gently sloping soil is on uplands. Most areas contain small drainageways, and individual areas average 30 acres.

Typically, the surface layer is light yellowish brown, medium acid loamy fine sand about 7 inches thick over light brown, medium acid loamy fine sand about 16 inches thick. The next layer, to a depth of about 43 inches, is reddish yellow, medium acid sandy clay loam with yellowish red mottles. Below this is reddish yellow, medium acid sandy clay loam with many distinct mottles of red and yellowish red.

This soil is well drained. Runoff is slow. Permeability is moderate, and available water capacity is medium. The soil has a deep root zone, and plant roots can penetrate easily. The water erosion hazard is moderate. Soil blowing is a concern.

Included with this soil in mapping are small areas of Bastrop, Birome, Gasil, and Konsil soils and small areas of less sloping Silstid soils. Included soils make up less than about 10 percent of any mapped area.

About half of the acreage of this soil is cropland, but the soil has low potential for crops. A suitable cropping system provides a large amount of residue. When left on the surface after harvest and later plowed into the upper few inches of the soil, the residue helps maintain fertility, reduce runoff, protect the soil from blowing, and improve tilth. Melons and other truck crops grow best in less sloping areas.

Potential for range is medium. Native plants are tall grasses and a few oaks. This soil has medium potential for improved pasture. Improved bermudagrasses, Kleingrass, and lovegrass are well suited. They respond readily to fertilization and management. Potential for wildlife habitat is low.

This soil has high potential for most urban uses. Septic tank filter fields and sanitary landfills function well. Water percolates too rapidly for use as sewage lagoons. This soil supports traffic well and has low shrink-swell potential. It has low potential for use as recreation areas. The surface is too sandy. Capability subclass IVe; Sandy range site.

70—Stephen silty clay, 1 to 3 percent slopes. This shallow, gently sloping soil is on uplands. Areas average about 35 acres.

The surface layer is dark grayish brown, moderately alkaline silty clay about 5 inches thick over dark grayish brown, moderately alkaline silty clay about 7 inches thick. The next layer is pale brown, moderately alkaline silty clay loam that extends to a depth of about 18 inches. The underlying bedrock consists of thick beds of soft chalky limestone that can be chipped and cut with a spade.

This soil is well drained. Runoff is medium. Permeability is moderately slow, and available water capacity is very low. The soil has a shallow root zone (limited by bedrock). The water erosion hazard is moderate.

Included with this soil in mapping are small areas of Austin, Eddy, Houston Black, and Venus soils and small areas of other Stephen soils. In many places, small gullies have cut into the chalky bedrock. Included soils make up less than 10 percent of any mapped area.

This soil is used mainly as cropland. Most cultivated areas are used for small grain or forage crops. This soil has medium potential as cropland. The surface is difficult to keep in good tilth. It needs regular additions of crop residue to maintain organic matter content. Keeping residue on the surface helps control water erosion and maintain or improve soil tilth. Crops respond well to fertilization.

Potential is medium for improved pasture grasses, for native range plants, and for wildlife habitat. These areas produce only a limited amount of food and cover for wildlife.

This soil has medium potential for most urban uses. The surface layer is clayey and has high shrink-swell potential. The shallow depth to bedrock is also limiting. This soil has low potential for use as recreation areas. The shallow depth to bedrock hinders construction. The surface is too clayey for use as playgrounds. Capability subclass IIIe; Chalky Ridge range site.

71—Stephen silty clay, 3 to 5 percent slopes. This shallow, gently sloping soil is on uplands. Most areas contain shallow, sloping drainageways and average about 25 acres.

Typically, the surface layer is dark grayish brown, moderately alkaline silty clay about 5 inches thick over brown, moderately alkaline silty clay about 7 inches thick. The next layer is light yellowish brown, moderately alkaline gravelly clay loam. The underlying bedrock is coarsely fractured chalky limestone that can be chipped or cut with a spade.

This soil is well drained. Runoff is medium. Permeability is moderately slow, and available water capacity is very low. The soil has a shallow root zone (limited by bedrock). The water erosion hazard is severe.

Included with this soil in mapping are small areas of Austin, Eddy, Sunev, and Venus soils and small areas of less sloping Stephen soils. Included soils make up less than about 10 percent of any mapped area.

About half of the acreage of this soil is cropland. The soil has medium potential as cropland. Crops respond well to fertilization. Returning crop residue to the soil helps maintain fertility, improve tilth, and control erosion. Terraces are needed to help control erosion, and grassed waterways are needed to remove excess runoff. The soil is shallow and is droughty during the hotter part of the summer. About half of the acreage of this soil is cropland. It is best suited to close-growing crops that provide large amounts of residue.

Potential is medium for improved pasture grasses, for native range plants, and for wildlife habitat. These areas produce a limited amount of food and cover for wildlife.

This soil has medium potential for most urban uses. The shallow depth to bedrock limits its use for buildings. The surface layer is clayey and has high shrink-swell potential. This soil has low potential for use as recreation areas. The shallow depth to bedrock hinders construction. The surface is too clayey for use as playgrounds. Capability subclass IVe; Chalky Ridge range site.

72—Sunev clay loam, 5 to 15 percent slopes. This deep, sloping to moderately steep soil is on uplands. Most areas consist of foot slopes at the bases of ridges. Individual areas average about 40 acres.

Typically, the surface layer is dark grayish brown, moderately alkaline clay loam about 16 inches thick. The next layer is grayish brown, moderately alkaline silty clay loam to a depth of 34 inches over pale brown, moderately alkaline silty clay loam to a depth of 50 inches. Below this is very pale brown, moderately alkaline clay loam to a depth of about 80 inches.

This soil is well drained. Runoff is medium. Permeability is moderate, and available water capacity is medium. The soil has a deep root zone, and plant roots can penetrate easily. The water erosion hazard is severe.

Included with this soil in mapping are small areas of Austin, Eddy, and Venus soils. Included soils make up less than about 10 percent of any mapped area.

This soil is not suitable as cropland because of slope and the erosion hazard. It has a high potential for native range plants, and a natural vegetative cover needs to be maintained or improved to help control erosion. Most areas are in woods and are grazed by livestock, but these areas provide only a limited amount of grazing. Potential is medium for wildlife habitat and for improved pasture. Many areas have thick, brushy undercover that provides protective cover for game.

This soil has medium potential for most urban uses. Bedrock occurs within 60 inches of the surface in many places. This hinders the construction and functioning of septic tank filter fields and sewage lagoons. Slopes also restrict some urban uses. This soil has medium potential for use as recreation areas. It is too sloping and too clayey for many uses. Capability subclass VIe; Clay Loam range site.

73—Tinn clay, occasionally flooded. This deep, nearly level soil is on flood plains. It is flooded about once every 3 years. Areas are long and broad and slightly above the channels, sloughs, and depressional parts of flood plains. Individual areas average about 45 acres.

Typically, the surface layer is very dark gray and dark gray, moderately alkaline clay about 59 inches thick. Below this is dark grayish brown, moderately alkaline clay with mottles of yellowish brown, gray, grayish brown, brownish yellow, and olive yellow.

This soil is somewhat poorly drained. Runoff is very slow. Permeability is very slow, and available water capacity is high. This soil has a deep root zone. The water erosion hazard is slight.

Included with this soil in mapping are small areas of Branyon, Burleson, Gowen, Houston Black, Kemp, and Pursley soils and frequently flooded areas of Tinn soils. Included soils make up less than about 10 percent of any mapped area.

This soil is used mainly as cropland even though it is subject to flooding during heavier rains. It has high potential for most crops. Crops yield well. Using a cropping system that includes fertilized sorghum or small grain and returning residue from these crops to the soil help maintain fertility and improve tilth. Crops respond well to fertilization.

Potential is high for improved pasture grasses and native range plants. Flooding is of short duration and beneficial to the grasses in most places. Potential for wildlife habitat is medium.

This soil has low potential for most urban uses. It is subject to flooding, which limits its use for houses, roads, and septic tanks. The soil has low potential for use as recreation areas. It is too clayey and is subject to flooding. Capability subclass IIw; Clayey Bottomland range site.

74—Tinn clay, frequently flooded. This deep, nearly level soil is on flood plains. It is flooded about two or three times each year. Areas are long and narrow and parallel to the channel. They average about 250 acres.

Typically, the surface layer is dark gray and gray, moderately alkaline clay about 38 inches thick over mottled gray and pale olive, moderately alkaline silty clay about 22 inches thick. Below this is mottled olive, olive gray, and olive yellow, moderately alkaline silty clay.

This soil is somewhat poorly drained. Runoff is very slow. Permeability is very slow, and available water capacity is high. The soil has a deep root zone. The water erosion hazard is slight.

Included with this soil in mapping are small areas of Burleson, Gowen, Houston Black, Kemp, and Pursley soils and occasionally flooded areas of Tinn soils. Included soils make up less than about 10 percent of any mapped area.

This soil is used mainly as pasture. It is flooded too frequently to be suitable for cultivated crops. Most areas along the stream channel are wooded and have an understory of shrubs, grasses, and vines. This soil has high potential for improved pasture grasses and for range plants. The grasses respond to fertilization and produce excellent yields. This soil has medium potential for wildlife habitat. The channels, sloughs, and low areas contain water most of the time. The wooded areas and the old fields provide protective cover and food-producing plants for wildlife.

This soil has low potential for urban use. It is flooded too frequently and too severely for any type of building, sanitary landfill, septic tank filter field, sewage lagoon, street, or road. It has low potential for use as recreation areas because of flooding. Capability subclass Vw; Clayey Bottomland range site.

75—Travis fine sandy loam, 1 to 3 percent slopes. This deep, gently sloping soil is on uplands. Areas average about 30 acres.

Typically, the surface layer is brown, medium acid fine sandy loam about 7 inches thick. The next layer is red, strongly acid clay loam to a depth of 50 inches. Below this is coarsely mottled brownish yellow, gray, and yellowish red, medium acid clay loam.

This soil is well drained. Runoff is medium. Permeability is slow, and available water capacity is medium. This soil has a deep root zone, and plant roots can penetrate easily. The water erosion hazard is moderate.

Included with this soil in mapping are small areas of Axtell, Bastrop, Bastsil, Crockett, Gasil, Konsil, and Silstid soils. Included soils make up less than about 10 percent of any mapped area.

This soil is used mainly as cropland and has high potential as cropland. The fine sandy loam surface layer crusts in areas that are low in organic matter content. Using a cropping system that includes fertilized sorghum or small grain and returning residue from these crops to the soil help maintain fertility and improve tilth. Keeping residue on the surface helps control water erosion. Crops respond well to fertilization. Contour farming, terracing, and grassed waterways are needed. This soil is particularly suited to peanuts, orchard crops, and truck crops.

Potential is high for improved pasture grasses, which respond readily to fertilization and good management, and which yield well. Potential is also high for native range plants and for wildlife habitat.

This soil has medium potential for most urban uses. The upper layers are clayey and restrict drainage from septic tank filter fields. Shrink-swell potential is medium. This soil has high potential for use as recreation areas. Many areas have low slope gradient and are suitable as playgrounds without modification. The surface dries soon after rains. Capability subclass IIe; Sandy Loam range site.

76—Ustifluvents, 5 to 20 percent slopes. This map unit consists of sandy and loamy, sloping to moderately steep soils on bottom land. Most areas are dissected by short, lateral drainageways. Areas are long, narrow breaks that parallel the low terraces of major streams. They average less than 200 feet in width and 60 acres in size.

The composition of this map unit is more variable than that of others in the survey area. The soils are not uniform and occur in an irregular pattern on the landscape. The surface layer and underlying layers vary considerably in texture. Mapping has been controlled well enough, however, for the anticipated use of the areas involved.

These soils are excessively drained. Runoff is rapid. Permeability is rapid, and available water capacity is low. The root zone is deep. The water erosion hazard is severe.

Included with these soils in mapping are small areas of Aquilla, Bastsil, and Pulexas soils. Included soils make up less than 10 percent of any mapped area.

These soils are not suitable for cultivation because of slope and susceptibility to water erosion. They are used mainly as range, and potential for native range plants is medium. Yields of mid and tall grasses are moderate during favorable years. Potential for improved pasture grasses is medium. Improved bermudagrass is best suited. Potential for wildlife habitat is high. Trees, shrubs, vines, and grasses provide food and shelter for most types of wildlife. The principal wildlife foods are pecans, acorns, berries, and seeds.

These soils have low potential for most urban uses. Slope, flooding, seepage, and the sandy surface layer are the most limiting features. Potential for recreation uses is low. The surface layer is too sandy, and areas are too sloping. Some areas, however, are satisfactory for paths and trails. Capability subclass VIe; Sandy range site.

77—Venus loam, 1 to 3 percent slopes. This deep, gently sloping soil is on old stream terraces. Areas average about 35 acres.

Typically, the surface layer is dark grayish brown, moderately alkaline loam about 6 inches thick over dark brown, moderately alkaline loam about 8 inches thick. The next layer is yellowish brown and light yellowish brown, moderately alkaline clay loam to a depth of 46 inches. To a depth of 57 inches is brownish yellow, moderately alkaline sandy clay loam with light gray mottles, and to a depth of 68 inches is mottled light gray and brownish yellow, moderately alkaline sandy clay loam.

This soil is well drained. Runoff is slow. Permeability is moderate, and available water capacity is high. This soil has a deep root zone, and plants can develop roots into the lower layers easily. The water erosion hazard is moderate.

Included with this soil in mapping are small areas of Altoga, Austin, Bolar, Chatt, Chickasha, Culp, Heiden, Hillco, and Lamar soils. Included soils make up less than about 10 percent of any mapped area.

About half of the acreage of this soil is cropland. Most of it has been cultivated, but many areas have been planted to improved grasses and are now used as pasture. This soil has medium potential as cropland. It is droughty, and summer-grown crops do not yield well. The soil is easy to keep in good tilth with proper management. Fertilization is needed. Using a cropping system that includes fertilized sorghum and small grain and returning residue from these crops to the soil help maintain fertility and improve tilth. Leaving residue on the surface helps control water erosion. Terracing, contour farming, and grassed waterways are needed.

This soil has high potential as improved pasture. Grasses respond well to fertilization and good management.

This soil has medium potential for most urban uses. It has medium shrink-swell potential, which affects structures. Seepage limits its use for sewage lagoons. Some areas are underlain by strata of sand and gravel, which limit use of the soil as sanitary landfill sites because of the risk of contaminating the water table. This soil has high potential for use as recreation areas. It is gently sloping and well drained. Most types of recreation factilities can be constructed on it without difficulty. Capability subclass IIe; Clay Loam range site.

78—Venus loam, 3 to 5 percent slopes. This deep, gently sloping soil is on old stream terraces. Areas are mainly long and narrow and are on the contour above streams. Most areas contain short slopes and are cut with drainageways. Individual areas average about 25 acres.

Typically, the surface layer is dark grayish brown, moderately alkaline loam about 12 inches thick. The next layer is brownish yellow, moderately alkaline loam to a depth of 28 inches. The next layer is light yellowish brown, moderately alkaline clay loam to a depth of 56 inches. Below this is brownish yellow, moderately alkaline light clay loam.

This soil is well drained. Runoff is medium. Permeability is moderate, and available water capacity is high. This soil has a deep root zone, and plants can develop roots into the lower layers easily. The water erosion hazard is moderate.

Included with this soil in mapping are small areas of Altoga, Austin, Bolar, Chickasha, Ferris, Heiden, Lamar, and Sunev soils. Included soils make up less than about 10 percent of any mapped area.

About 40 percent of the acreage of this soil is cropland. Many areas that were once cultivated have now been planted to improved grasses. This soil has medium potential as cropland. It is droughty, and summer-grown crops do not yield well. The loamy surface layer is easy to keep in good tilth, but cultivated areas need regular additions of crop residue to maintain organic matter content and help control erosion. Crops respond well to fertilization. Terraces, contour farming, and grassed waterways are needed to help control erosion.

This soil has high potential for improved pasture. Grasses respond well to fertilization and produce well during early spring.

This soil has medium potential for most urban uses. It has medium shrink-swell potential, which affects structures. Seepage limits its use for sewage lagoons. Some areas are underlain with strata of sand and gravel, which limit use of the soil as sanitary landfill sites because of the risk of contaminating the water table. This soil has medium potential for use as recreation areas. It is too sloping for most types of playgrounds unless it is modified. Capability subclass IIIe; Clay Loam range site.

79—Wilson clay loam, 0 to 1 percent slopes. This deep, nearly level soil is on uplands and old stream terraces. Areas average about 35 acres.

Typically, the surface layer is gray, neutral clay loam about 6 inches thick. The next layer is dark gray, slightly acid clay loam to a depth of 13 inches. The next layer, between depths of 13 and 38 inches, is very dark gray, medium acid clay. The next layer is dark gray and gray, medium acid clay to a depth of 50 inches. Below this is olive gray and gray, moderately alkaline clay.

This soil is somewhat poorly drained. Runoff is very slow. In places the surface is flat to slightly depressional, and water ponds following rain. Permeability is very slow, and available water capacity is high. This soil has a deep root zone, but plant roots have difficulty penetrating the clayey subsurface layer. The water erosion hazard is slight.

Included with this soil in mapping are small areas of Burleson, Crockett, Houston Black, Mabank, and Normangee soils and small areas of more sloping Wilson soils. Included soils make up less than about 10 percent of any mapped area.

This soil is used mainly as cropland. Most areas are used for cash crops like cotton and grain sorghum. The soil has medium potential for most crops. Crops yield well when good management is used. The surface is difficult to keep in good tilth; it requires regular additions of crop residue to maintain organic matter content. Crops respond well to fertilization.

Potential is high for improved pasture. Grasses grow well and respond readily to fertilization and good management. Potential for native range plants is medium and for wildlife habitat is medium.

This soil has low potential for most urban uses. Many areas have very slow surface drainage, and some areas remain ponded following rains. The very slow internal drainage prevents septic tank filter fields from functioning properly. This soil has high shrink-swell potential and low strength. Excavations in this dense soil hold water well, making the soil well suited to sewage lagoon sites. This soil has low potential for recreation use. It is too clayey for use when wet. Some areas pond water following rains, and this limits their use. Capability subclass IIIw; Claypan Prairie range site.

80—Wilson clay loam, 1 to 3 percent slopes. This deep, gently sloping soil is on uplands and old stream terraces. Individual areas average about 30 acres.

Typically, the surface layer is dark gray, mildly alkaline clay loam about 7 inches thick. The next layer is very dark gray, mildly alkaline clay to a depth of 22 inches. The next layer, between depths of 22 and 42 inches, is very dark gray, neutral clay. The next layer is olive gray and dark gray, moderately alkaline clay to a depth of 57 inches. Below this is coarsely mottled light olive brown, yellow, and dark grayish brown, moderately alkaline clay.

This soil is somewhat poorly drained. Runoff is slow. Permeability is very slow, and available water capacity is high. This soil has a deep root zone, but plant roots have difficulty penetrating the dense layers below the surface layer. The water erosion hazard is moderate.

Included with this soil in mapping are small areas of Burleson, Crockett, Heiden, Houston Black, Mabank, and Normangee soils and small areas of less sloping Wilson soils. Included soils make up less than about 10 percent of any mapped area.

This soil is used mainly as cropland. Most areas are used for the cash crops cotton and grain sorghum. The soil has medium potential as cropland. Crops yield well under good management. They respond well to fertilization. Using a cropping system that includes fertilized sorghum or small grain and returning residue from these crops to the soil help maintain fertility and improve tilth. Keeping residue on the surface helps control erosion. Terraces, contour farming, and grassed waterways are needed.

Potential is high for improved pasture. Grasses grow well and respond readily to fertilization and good management. Potential for native range plants is medium and for wildlife habitat potential is medium.

This soil has low potential for most urban uses. It has high shrink-swell potential and low strength. Permeability is too slow for septic tank filter fields to function properly. This soil is well suited as sewage lagoon sites. This soil has low potential for recreation use. It is too clayey for use when wet. Capability subclass IIIe; Claypan Prairie range site.

81—Wilson-Heiden complex, 0 to 1 percent slopes. This complex consists of deep, nearly level soils on uplands. These soils occur in a pattern of lows and highs; the Wilson soils are in the lows, and the Heiden soils are on the highs. The difference in elevation between the highs and lows averages about 6 inches. The pattern repeats itself in about 50-foot intervals. Individual areas average 115 acres.

Wilson soils make up about 50 percent of the map unit; Heiden soils, about 40 percent; and other soils, the remaining 10 percent. The regular and repeating pattern of Wilson and Heiden soils is so intricate that separate mapping was not practical at the scale used.

Typically, the surface layer of the Wilson soils is gray, mildly alkaline clay loam 5 inches thick. The next layer is dark gray, mildly alkaline clay to a depth of 15 inches. The next layer is dark gray, moderately alkaline clay to a depth of 51 inches. Below this is mottled pale olive and gray, moderately alkaline clay.

Wilson soils are somewhat poorly drained. Runoff is very slow, and in places the surface is slightly depressional and water ponds following rains. Permeability is very slow, and available water capacity is high. This soil has a deep root zone, but plant roots have difficulty penetrating the dense layers below the surface layer. The water erosion hazard is slight.

Typically, the surface layer of Heiden soils is dark grayish brown, moderately alkaline clay 6 inches thick. The next layer is dark gray, moderately alkaline clay to a depth of 12 inches. The next layer is olive gray, very firm, moderately alkaline clay to a depth of 52 inches. Below this is mottled gray and pale olive, moderately alkaline clay.

Heiden soils are well drained. Runoff is medium. Permeability is very slow, and available water capacity is high. This soil has a deep root zone, but plant roots have difficulty penetrating the dense layers below the surface layer. The water erosion hazard is slight.

Included with these soils in mapping are small areas of Burleson, Culp, Ferris, Houston Black, Lamar, and Normangee soils. Included soils make up less than about 10 percent of any mapped area.

These soils are used mainly as cropland. They are nearly level and easy to cultivate. They have high potential as cropland. Crops yield well when good management is used. They respond well to fertilization. The soils need regular applications of crop residue to maintain organic matter content and help control erosion. Using a cropping system that includes fertilized sorghum or small grain and returning the residue to the soil help maintain fertility and improve tilth.

Potential is high for improved pasture. Grasses respond well to fertilization and good management. Potential for native range plants is high. Native tall and mid grasses produce well. Potential for wildlife habitat is generally medium.

These soils have low potential for most urban uses. Both soils are clayey and have high shrink-swell potential and low strength. The Heiden soils crack severely when dry. The Wilson soils occur in low areas and pond water following rains. Permeability is too slow for septic tank filter fields to function properly. These soils have low potential for recreation use. They are too clayey for use when wet, and water ponds in low areas. Capability subclass IIIw; Wilson soils in Claypan Prairie range site, Heiden soils in Blackland range site.

Use and management of the soils

The soil survey is a detailed inventory and evaluation of the most basic resource of the survey area—the soil. It is useful in adjusting land use, including urbanization, to the limitations and potentials of natural resources and the 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 and 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 very firm soil horizons that cause difficulty in excavation.

Health officials, highway officials, engineers, and many other specialists also can find useful information in this soil survey. The safe disposal of wastes, for example, is closely related to properties of the soil. Pavements, sidewalks, campsites, playgrounds, lawns, and trees and shrubs are influenced by the nature of the soil.

Crops and pasture

The major management concerns in the use of the soils for crops and pasture are described in this section. In addition, the system of land capability classification used by the Soil Conservation Service is explained and the estimated yields of the main crops and hay and pasture plants are presented for each soil.

This section provides information about the overall agricultural potential of the survey area and about the management practices that are needed. The information is useful to equipment dealers, land improvement contractors, fertilizer companies, processing companies, planners, 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.

About 300,000 acres in the survey area was used for crops in 1967, according to the Conservation Needs Inventory (*4*). This represents a decline of 180,000 acres from the cultivated acreage in 1958. Most of the formerly cultivated acreage, which is now mostly in improved pasture, consists of more sloping soils that are difficult to cultivate and that produce lower yields.

Water erosion is one of the major problems on cropland. The clayey blackland soils absorb water slowly and allow considerable runoff from clean-tilled fields. To minimize the erosion caused by water, field terraces and contour tillage are used.

Field terraces consist of a combination of ridges and channels built at right angles to the slope to divert and reduce the flow of water. The water drains to grassed waterways designed to carry it. The terraces are spaced to reduce the length of the slope and thereby reduce soil erosion. They are used on nonlevel, cultivated, clayey soils. Most of the fields in the county are terraced.

Contour farming is a continuation of the terrace system in this rainfall belt. The terraces provide a base for contour tillage (fig. 7). The rows are placed parallel to the terraces, and each row carries its own water to the waterway. This minimizes the movement of soil on sloping fields. The water is detained in each contour row or furrow and has more time to soak into the soil. The excess water drains slowly across the slope to the waterway.

Grassed waterways are used to carry runoff water down the slope. They are placed where needed to collect the water from terraces and other areas, and they conduct it down the slope without allowing it to cut gullies in the land. Their location and their size are determined to serve the terrace system (fig. 8). Then they are shaped to design and sodded to grass. Many are placed in natural drainageways along the slope and also serve as water outlets for the field terraces. Waterways, terraces, and contour tillage are interdependent. Each supports the others to make up a complete system.

Minimum tillage is desirable on the clayey soils in the county. This system reduces the traffic on these soils to the minimum required to produce each crop. These soils pack easily, especially if plowed or traveled on when moist. Where the soils are packed, the rate of infiltration of water is reduced and the rate of runoff is increased. Compacted soils have reduced air space, and plant roots have difficulty developing into the lower layers. Plants on compacted soils have a shallow root system and suffer from the effects of drought when the surface layer dries.

Crop residue management is important on the soils. When crop residue is shredded, left on the surface, and later plowed into the surface layer, it helps to hold water where it falls, slows runoff, and reduces soil movement. The residue shades the surface of the soil to keep it cool and reduce the loss of moisture. It provides organic matter to help maintain a high level of soil fertility. The blackland soils need an annual application of about 4,000 pounds per acre of crop residue to prevent soil deterioration. An ample supply of crop residue is essential in keeping the soil in good tilth.

Most of the soils used for cultivation have a medium to high level of natural fertility. They contain plenty of lime and potassium but are low in phosphate that is available to plants. The nitrogen level depends on the cropping history and soil management. Commercial fertilizers must be applied for top yields from these soils.

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 6. 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. Hay and pasture yields were estimated for the most productive varieties of grasses and legumes suited to the climate and the soil. A few farmers may be obtaining average yields higher than those shown in table 6.

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 residues, 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 6 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. Only the levels class and subclass are used in this soil survey. 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 that the main limitation is risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in only some parts of the United States, shows that the chief limitation is climate that is too cold or too dry.

In class I there are no subclasses because the soils of this class have few limitations. Class V contains only the subclasses indicated by *w*, *s*, or *c* because the soils in class V are subject to little or no erosion, though they have other limitations that restrict their use to pasture, rangeland, wildlife habitat, or recreation.

The acreage of soils in each capability class and subclass is indicated in table 7. All soils in the survey area except those named at a level higher than the series are 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 mapping unit in the section "Soil maps for detailed planning."

Rangeland

Rangeland supports a natural plant community of grasses, forbs, and shrubs valuable for grazing. In 1967, about 85,000 acres in the county was used as rangeland, according to the Conservation Needs Inventory (*4*). This acreage was used for the production of native vegetation and was grazed by domestic livestock and wildlife.

The rangeland is mainly in the northwestern part of the county. It consists of areas that are not well suited to improved grasses or to pasture management. Plowing, seeding, fertilizing, and mowing are impractical on these areas. The soils are mostly strongly sloping, shallow to bedrock, stony, or otherwise poorly suited to crops or improved pastures (fig. 9).

The acreage of rangeland in the county remains about static; there is very little change in land use. The range units are mostly cow-calf operations.

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 8 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 of predominately grasses, grasslike plants, forbs, or shrubs suitable for grazing or browsing. The following are explanations of column headings in table 8.

A *range site* is a distinctive kind of rangeland that differs from other kinds of rangeland in its ability to produce a characteristic natural plant community. Soils that produce a similar kind, amount, and proportion of range plants are grouped into range sites. For those areas where the relationship between soils and vegetation has been established, range sites can be interpreted directly from the soil map. Properties that determine the capacity of the soil to supply moisture and plant nutrients have the greatest influence on the productivity of range plants. Soil reaction, salt content, and a seasonal high water table are also important.

Potential production refers to the amount of vegetation that can be expected to grow annually on well managed rangeland that is supporting the potential natural plant 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.

Range management requires, 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.

Engineering

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 values can be used to (1) select potential residential, commercial, industrial, and recreational uses; (2) make preliminary estimates pertinent to construction in a particular area; (3) evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; (4) evaluate alternative sites for location of sanitary landfills, onsite sewage disposal systems, and other waste disposal facilities; (5) plan detailed onsite investigations of soils and geology; (6) find sources of gravel, sand, clay, and topsoil; (7) plan farm drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; (8) relate performance of structures already built to the properties of the kinds of soil on which they are built so that performance of similar structures on the same or a similar soil in other locations can be predicted; and (9) predict the trafficability of soils for cross-country movement of vehicles and construction equipment.

Data presented in this section are useful for land-use planning and for choosing alternative practices or general designs that will overcome unfavorable soil properties and minimize soil-related failures. Limitations to the use of these data, however, should be well understood. First, the data are generally not presented for soil material below a depth of 5 or 6 feet. Also, because of the scale of the detailed map in this soil survey, small areas of soils that differ from the dominant soil may be included in mapping. Thus, these data do not eliminate the need for onsite investigations, testing, and analysis by personnel having expertise in the specific use contemplated.

The information is presented mainly in tables. Table 9 shows, for each kind of soil, the degree and kind of limitations for building site development; table 10, for sanitary facilities; and table 12, for water management. Table 11 shows the suitability of each kind of soil as a source of construction materials.

The information in the tables, along with the soil map, the soil descriptions, and other data provided in this survey, can be used to make additional interpretations and to construct interpretive maps for specific uses of land.

Some of the terms used in this soil survey have a special meaning in soil science. Many of these terms are defined in the Glossary.

Building site development

The degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, and local roads and streets are indicated in table 9. A *slight* limitation indicates that soil properties generally are favorable for the specified use; any limitation is minor and easily overcome. A *moderate* limitation indicates that soil properties and site features are unfavorable for the specified use, but the limitations can be overcome or minimized through special planning and design. A *severe* limitation indicates that one or more soil properties or site features are so unfavorable or difficult to overcome that a major increase in construction effort, special design, or intensive maintenance is required. For some soils rated severe, such costly measures may not be feasible.

Shallow excavations are made for pipelines, sewerlines, communications and power transmission lines, basements, open ditches, and cemeteries. Such digging or trenching is influenced by soil wetness caused by a seasonal high water table; the texture and consistence of soils; the tendency of soils to cave in or slough; and the presence of very firm, dense soil layers, bedrock, or large stones. In addition, excavations are affected by slope of the soil and the probability of flooding. Ratings do not apply to soil horizons below a depth of 6 feet unless otherwise noted.

In the soil series descriptions, the consistence of each soil horizon is given, and the presence of very firm or extremely firm horizons, usually difficult to excavate, is indicated.

Dwellings and *small commercial buildings* referred to in table 9 are built on undisturbed soil and have foundation loads of a dwelling no more than three stories high. Separate ratings are made for small commercial buildings without basements and for dwellings with and without basements. For such structures, soils should be sufficiently stable that cracking or subsidence of the structure from settling or shear failure of the foundation does not occur. These ratings were determined from estimates of the shear strength, compressibility, and shrink-swell potential of the soil. Soil texture, plasticity and in-place density, soil wetness, and depth to a seasonal high water table were also considered. Soil wetness and depth to a seasonal high water table indicate potential difficulty in providing adequate drainage for basements, lawns, and gardens. Depth to bedrock, slope, and large stones in or on the soil are also important considerations in the choice of sites for these structures and were considered in determining the ratings. Susceptibility to flooding is a serious hazard.

Local roads and streets referred to in table 9 have an all-weather surface that can carry light to medium traffic all year. They consist of a subgrade of the underlying soil material; a base of gravel, crushed rock fragments, or soil material stabilized with lime or cement; and a flexible or rigid surface, commonly asphalt or concrete. The roads are graded with soil material at hand, and most cuts and fills are less than 6 feet deep.

The load supporting capacity and the stability of the soil as well as the quantity and workability of fill material available are important in design and construction of roads and streets. The classifications of the soil and the soil texture, density, and shrink-swell potential are indicators of the traffic supporting capacity used in making the ratings. Soil wetness, flooding, slope, depth to hard rock or very compact layers, and content of large stones affect stability and ease of excavation.

Sanitary facilities

Favorable soil properties and site features are needed for proper functioning of septic tank absorption fields, sewage lagoons, and sanitary landfills. The nature of the soil is important in selecting sites for these facilities and in identifying limiting soil properties and site features to be considered in design and installation. Also, those soil properties that affect ease of excavation or installation of these facilities will be of interest to contractors and local officials. Table 10 shows the degree and kind of limitations of each soil for such uses and for use of the soil as daily cover for landfills. It is important to observe local ordinances and regulations.

If the degree of soil limitation is expressed as *slight*, soils are generally favorable for the specified use and 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 tile or perforated pipe that distribute effluent from a septic tank into the natural soil. Only the soil horizons between the depths of 18 and 72 inches are evaluated for this use. The soil properties and site features considered are those that affect the absorption of the effluent and those that affect the construction of the system.

Properties and features that affect absorption of the effluent are permeability, depth to seasonal high water table, depth to bedrock, and susceptibility to flooding. Stones, boulders, and shallowness to bedrock interfere with installation. Excessive slope can cause lateral seepage and surfacing of the effluent. Also, soil erosion and soil slippage are hazards if absorption fields are installed on sloping soils.

In some soils, loose sand and gravel or fractured bedrock is less than 4 feet below the tile lines. In these soils the absorption field does not adequately filter the effluent, and ground water in the area may be contaminated.

On many of the soils that have moderate or severe limitations for use as septic tank absorption fields, a system to lower the seasonal water table can be installed or the size of the absorption field can be increased so that performance is satisfactory.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons have a nearly level floor and cut slopes or embankments of compacted soil material. Aerobic lagoons generally are designed to hold sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water. Soils that are very high in content of organic matter and those that have cobbles, stones, or boulders are not suitable. Unless the soil has very slow permeability, contamination of ground water is a hazard where the seasonal high water table is above the level of the lagoon floor. In soils where the water table is seasonally high, seepage of ground water into the lagoon can seriously reduce the lagoon's capacity for liquid waste. Slope, depth to bedrock, and susceptibility to flooding also affect the suitability of sites for sewage lagoons or the cost of construction. Shear strength and permeability of compacted soil material affect the performance of embankments.

Sanitary landfill is a method of disposing of solid waste by placing refuse in successive layers either in excavated trenches or on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of 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 soil is difficult. Seepage into the refuse increases the risk of pollution of ground water.

Ease of excavation affects the suitability of a soil for the trench type of landfill. A suitable soil is deep to bedrock and free of large stones and boulders. If the seasonal water table is high, water will seep into trenches.

Unless otherwise stated, the limitations in table 10 apply only to the soil material within a depth of about 6 feet. If the trench is deeper, a limitation of slight or moderate may not be valid. Site investigation is needed before a site is selected.

Daily cover for landfill should be soil that is easy to excavate and spread over the compacted fill in wet and dry periods. Soils that are loamy or silty and free of stones or boulders are better than other soils. Clayey soils may be sticky and difficult to spread; sandy soils may be subject to soil blowing.

The soils selected for final cover of landfills should be suitable for growing plants. Of all the horizons, the A horizon in most soils has the best workability, more organic matter, and the best potential for growing plants. Thus, for either the area- or trench-type landfill, stockpiling material from the A horizon for use as the surface layer of the final cover is desirable.

Where it is necessary to bring in soil material for daily or final cover, thickness of suitable soil material available and depth to a seasonal high water table in soils surrounding the sites should be evaluated. Other factors to be evaluated are those that affect reclamation of the borrow areas. These factors include slope, erodibility, and potential for plant growth.

Construction materials

The suitability of each soil as a source of roadfill, sand, gravel, and topsoil is indicated in table 11 by ratings of good, fair, poor, or unsuited. The texture, thickness, and organic-matter content of each soil horizon are important factors in rating soils for use as construction materials. Each soil is evaluated to the depth observed, generally about 6 feet.

Roadfill is soil material used in embankments for roads. Soils are evaluated as a source of roadfill for low embankments, which generally are less than 6 feet high and less exacting in design than high embankments. The ratings reflect the ease of excavating and working the material and the expected performance of the material where it has been compacted and adequately drained. The 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 horizons will be mixed during excavation and spreading. Many soils have horizons of contrasting suitability within their profile. The estimated engineering properties in table 15 provide specific information about the nature of each horizon. This information can help determine the suitability of each horizon for roadfill.

Soils rated *good* are coarse grained. They have low shrink-swell potential and few cobbles and stones. They are at least moderately well drained and have slopes of 15 percent or less. Soils rated *fair* have a plasticity index of less than 15 and have other limiting features, such as moderate shrink-swell potential, moderately steep slopes, wetness, or many stones. If the thickness of suitable material is less than 3 feet, the entire soil is rated *poor*.

Sand and *gravel* are used in great quantities in many kinds of construction. The ratings in table 11 provide guidance as to where to look for probable sources and are based on the probability that soils in a given area contain sizable quantities of sand or gravel. A soil rated *good* or *fair* has a layer of suitable material at least 3 feet thick, the top of which is within a depth of 6 feet. Coarse fragments of soft bedrock material, such as shale and siltstone, are not considered to be sand and gravel. Fine-grained soils are not suitable sources of sand and gravel.

The ratings do not take into account depth to the water table or other factors that affect excavation of the material. Descriptions of grain size, kinds of minerals, reaction, and stratification are given in the soil series descriptions and in table 15.

Topsoil is used in areas where vegetation is to be established and maintained. Suitability is affected mainly by the ease of working and spreading the soil material in preparing a seedbed and by the ability of the soil material to support plantlife. Also considered is the damage that can result at the area from which the topsoil is taken.

The ease of excavation is influenced by the thickness of suitable material, wetness, slope, and amount of stones. The ability of the soil to support plantlife is determined by texture, structure, and the amount of soluble salts or toxic substances. Organic matter in the A1 or Ap horizon greatly increases the absorption and retention of moisture and nutrients. Therefore, the soil material from these horizons should be carefully preserved for later use.

Soils rated *good* have at least 16 inches of friable loamy material at their surface. They are free of stones and cobbles, are low in content of gravel, and have gentle slopes. They are low in soluble salts that can limit or prevent plant growth. They are naturally fertile or respond well to fertilizer. They are not so wet that excavation is difficult during most of the year.

Soils rated *fair* are loose sandy soils or firm loamy or clayey soils in which the suitable material is only 8 to 16 inches thick or soils that have appreciable amounts of gravel, stones, or soluble salt.

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 preferred for topsoil because of its organic-matter content. This horizon is designated as A1 or Ap in the soil series descriptions. The absorption and retention of moisture and nutrients for plant growth are greatly increased by organic matter.

Water management

Many soil properties and site features that affect water management practices have been identified in this soil survey. In table 12 the degree of soil limitation and soil and site features that affect use are indicated for each kind of soil. This information is significant in planning, installing, and maintaining water control structures.

Soil and site limitations are expressed as slight, moderate, and severe. *Slight* means that the soil properties and site features are generally favorable for the specified use and that any limitation is minor and easily overcome. *Moderate* means that some soil properties or site features are unfavorable for the specified use but can be overcome or modified by special planning and design. *Severe* means that the soil properties and site features are so unfavorable and so difficult to correct or overcome that major soil reclamation, special design, or intensive maintenance is required.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have a low seepage potential, which is determined by permeability and the depth to fractured or permeable bedrock or other permeable material.

Embankments, dikes, and levees require soil material that is resistant to seepage, erosion, and piping and has favorable stability, shrink-swell potential, shear strength, and compaction characteristics. Large stones and organic matter in a soil downgrade the suitability of a soil for use in embankments, dikes, and levees.

Drainage of soil is affected by such soil properties as permeability; texture; depth to bedrock, hardpan, or other layers that affect the rate of water movement; depth to the water table; slope; stability of ditchbanks; susceptibility to flooding; salinity and alkalinity; and availability of outlets for drainage.

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to intercept runoff. They allow water to soak into the soil or flow slowly to an outlet. Features that affect suitability 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.

Gardening and landscaping

Suburban homeowners who want to landscape their homes need to know what kinds of soils their properties include and to what kinds of flowers, ground cover, vines, shrubs, and trees these soils are best suited. In some areas plants may be needed for erosion control as well as for esthetic purposes.

Soils well suited to yard and garden plants are those that have a deep root zone, a loamy texture, a balanced supply of plant nutrients, plenty of organic matter in various stages of decomposition, adequate available water capacity, good drainage, and a granular structure that allows free movement of water, air, and roots. The degree of acidity or alkalinity suitable for the particular plants to be grown is also important. For example, roses and most annual flowers, most vegetables, and most grasses generally grow best in soils that are neutral in reaction or only slightly acid. Azaleas, camellias, and similar plants need acid soils. Some plants grown on soils high in content of lime, such as the blackland soils, develop a condition called chlorosis, or yellowing of the leaves; however, many flowers, shrubs, and trees are well suited to the limy (calcareous) soils. Some of these flowers are Shasta daisies, hollyhocks, petunias, zinnias, and gladiolus. Crapemyrtle, pecan, and fruitless mulberry are some of the shrubs and trees adapted to these limy soils.

It is generally cheaper and more advisable to condition the native soil than to replace it with a manmade soil material. The soil should be tested and fertility needs determined for the plants to be grown. The most important amendment to the soil is organic matter. This may be cotton burs, peat moss, compost, rotted sawdust, or manure.

In some areas of the county the soils are so clayey or so poorly drained that it may be necessary to construct raised beds in order to grow flowers and some shrubs. Brick, tile, metal, cedar, or redwood makes good retainers along the edges of beds. Beds should be filled with good soil material with well balanced physical and chemical amendments.

All plants, whether grown in native soil or manmade soil, require careful maintenance, especially during the period of establishment. Good management practices include fertilizing, watering, weed control, and insect control.

Gardening and landscaping should be included in the basic planning of urban construction. Potential of the native soil for plants should be considered when selecting sites for urban construction. Also important is the protection of existing trees during construction. In wooded areas, large, healthy trees are a valuable asset to the property. These can be protected during construction and worked into the landscaping plan. For guidelines for the protection of existing trees, consult the Soil Conservation Service or the Agricultural Extension Service.

Town and country planning

Residential subdivision development and the accompanying extension of public utilities create a need for soils information somewhat different from the information needed for farming. Many people need soils information for individual residential tracts that are well beyond public utilities—for example, people who are building summer homes or recreational facilities.

Land appraisers, realtors, city planners, builders, and individuals need to have facts that help them know what sites are suitable for homes or other buildings and what areas are more suitable for other uses. Most soil properties that are important for town and country planning are also important for engineering. Information in the engineering sections (see the sections "Engineering" and "Engineering properties") of this soil survey, however, does not eliminate the need for more detailed onsite studies when soils are used intensively. Most soil map units contain areas of contrasting soils; these areas are too small to show separately on the soil map.

In this section site selection, foundations, sewage disposal systems, underground utility lines, erosion and runoff, and public health are described in terms of their effect on urban and residential development.

Site selection

When a site is selected for the construction of urban works and structures, the soil should be carefully studied. Planners, builders, and maintenance personnel have encountered costly failures that can be traced to mistakes made in selecting soils for proposed structures or to lack of information about the soils that were used. If a soil is poorly suited to an intended use, little can be done without great expense to change it. In some instances a structure can be designed to combat the limitations of the soil, but the problem must be known prior to construction.

One of the first considerations is whether a soil is subject to flooding. The alluvial Gowen, Pulexas, Pursley, and Tinn soils, for example, are subject to occasional or frequent flooding and have severe limitations as sites for permanent structures. They are better suited to green belts, sound barriers, wildlife habitat, hiking trails, bike trails, and picnic areas.

Other soil features that affect site selection are permeability, available water capacity, drainage, reaction (pH), corrosivity to steel and concrete, and hydrologic classification. Other factors include suitability as a septic tank absorption field; suitability as a site for foundations and low-cost streets and roads; erosion and runoff problems; potential for recreation uses; suitability for grasses, flowers, vines, shrubs, and trees; and the influence of soils on the general health of residents. Many of these soil properties, features, and interpretations are given in the engineering and recreation sections. Some of the more important are discussed in the following paragraphs.

Foundations

The soils of Hill County warrant special attention when considered as sites for foundations. In some parts of the survey area are clay soils, that have a high content of the mineral montmorillonite. These soils swell when wet and shrink and crack when dry. This action creates such pressure that walls and foundations crack unless, and sometimes even if, they are reinforced. This change in volume in a soil material as moisture content changes is called shrink-swell potential (see table 16).

Ferris, Heiden, Houston Black, and Burleson soils are most likely to cause shrink-swell damage. Other soils are also high in content of montmorillonite and can cause damage, especially where the surface layer has been removed. Soils likely to swell and shrink enough to damage foundations are those that have a high liquid limit and high plasticity index, or the soils classified as CH in the Unified system of classification (see tables 15 and 18.) Soils that are flooded, poorly drained, or have low strength or high corrosivity should also be given special attention.

Sewage disposal systems

Many new houses are being built annually in areas beyond municipal sewerlines. These houses must have onsite sewage disposal systems. The effectiveness of these systems depends largely on the absorptive capacity, permeability, percolation rate, wetness, flooding, seepage, and slope of the soils in the filter field.

The soils of Hill County generally have severe limitations as sites for septic tank absorption fields. Most soils of the survey area are clayey and therefore very slowly permeable. Others are poorly drained and wet for 1 or 4 months during the year.

In table 10 the soils are rated for sanitary facilities. By using the soil map to identify the soils and by referring to the ratings in table 10, a user of this soil survey can get a general idea of how well septic tank systems function in a selected area. It is nevertheless advisable to make a detailed inspection of the soils at the exact site that is to be used as a filter field.

Underground utility lines

Water mains, gas pipelines, communication lines, and sewer pipes buried in the soil can corrode and break unless protected against electrobiochemical reactions resulting from the inherent properties of the soil.

All metals corrode to some degree when buried in the soil, and some metals corrode more rapidly in some soils than in others. Corrosion potential depends on the physical, chemical, electrical, and biological characteristics of the soil. For example, concentrations of oxygen, concentrations of anaerobic bacteria, moisture content, design, construction, and such external factors as manmade electrical currents, influence corrosion potential. Corrosion is greatest where two dissimilar metals are connected, where metal structures are buried at varying depths, and where pipelines extend through different kinds of soils.

Measurements of electrical resistivity of a soil indicate probable corrosion potential. Electrical resistivity is the resistance of a soil to the flow of an electrical current when the soil is wetted to field capacity. It is measured in ohms per cubic centimeter. A low value indicates low resistance (or high conductivity) and high corrosion potential.

In soils that have high shrink-swell potential (see table 16), stress created by volume changes can break cast iron pipe. To prevent breakage, it may be necessary to cushion the pipes with sand.

Control of runoff and erosion

During urban construction, natural vegetation is generally removed and large areas are covered with pavement, concrete, and buildings. The amount of runoff from construction areas generally increases, and the pattern of runoff changes. Runoff after a heavy rain can be several times as great as when the same land was used for farming. The runoff concentrates in streets and gutters, instead of flowing into natural waterways, and results in flooding, erosion, and deposition of sediments on lower lying areas (see table 12).

The control of erosion and runoff begins at the planning and design stage, before plans become fixed and construction begins. With a good development plan, the problems brought on by soil erosion, runoff, and sedimentation can usually be avoided or lessened.

Special care is needed in planning and applying erosion-control and runoff-control measures. These measures should be designed to fit well with the esthetic surrounding of a homesite.

Public health

Soils have an influence on public health. Soils are used for sewage disposal, as sanitary landfills, in locating potential sites where disease-carrying insects can breed, and for providing adequate shelter. These and other uses affect public health.

Sewerlines, septic tank systems, and sewage lagoons should be located and constructed so that seepage or drainage from them cannot pollute water supplies. The stability of the soil is important in the location of sewage lines. If the gradeline is interrupted, the sewage system breaks down and a public health hazard results. Tables 16 and 18 provide information on shrink-swell potential, corrosion potential, and volumetric shrinkage that can be of value in locating pipelines and planning for the protection of pipelines against corrosion and breakage. Water wells, streams, and lakes can become contaminated by runoff from clogged filter fields, and rapid percolation of septic tank effluent can result in pollution of underground water. Seepage from sewage lagoons built on unsuitable soil material is another cause of pollution. Table 10 rates the soils of Hill County as sites for septic tank absorption fields and sewage lagoons.

Recreation

Hill County has good potential for recreation areas and facilities. It is 30 to 60 miles from Waco, Dallas, and Fort Worth and is easily accessible through a network of good highways. It contains about 10,000 surface acres of water in lakes larger than 40 acres; another lake, the Aquilla Reservoir, is scheduled for construction. The county has 114 detention structures impounding ponds of 15 to 40 acres, and about 7,000 farm ponds. These water areas provide areas for fishing, waterfowl hunting, skiing, boating, camping, and picnicking.

Upland game birds, waterfowl, small game, and white-tailed deer are hunted on private lands and around the Federally-owned reservoirs.

The soils of the survey area are rated in table 13 according to limitations that affect their suitability for recreation uses. The ratings are based on such restrictive soil features as flooding, wetness, slope, and texture of the surface layer. Not considered in these ratings, but important in evaluating a site, are location and accessibility of the area, size and shape of the area, the ability of the soil to support vegetation, access to water, potential water impoundment sites available, and either access to public sewerlines or capacity of the soil to absorb septic tank effluent. Soils subject to flooding are limited, in varying degree, for recreation use by the duration and intensity of flooding and the season when flooding occurs. Onsite assessment of height, duration, intensity, and frequency of flooding is essential in planning recreation facilities.

The degree of the limitation of the soils is expressed as slight, moderate, or severe. *Slight* means that the soil properties are generally favorable and that the limitations are minor and easily overcome. *Moderate* means that the limitations can be overcome or alleviated by planning, design, or special maintenance. *Severe* means that soil properties are unfavorable and that limitations can be offset only through costly soil reclamation, special design, intensive maintenance, limited use, or combination of these measures.

The information in table 13 can be supplemented by information in other parts of this survey. Especially helpful are interpretations for septic tank absorption fields, given in table 10, and interpretations for dwellings without basements and for local roads and streets, given in table 9.

Camp areas require such site preparation as shaping and leveling for tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils for this use have mild slopes and are not wet or subject to flooding during the period of use. The surface has few or no stones or boulders, absorbs rainfall readily but remains firm, and is not dusty when dry. Strong slopes and stones or boulders can greatly increase the cost of constructing camping sites.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for use as picnic areas are firm when wet, are not dusty when dry, are not subject to flooding 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 that are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding more than once during the annual period of use. They should have moderate slopes and have few or no stones or boulders on the surface.

Wildlife habitat

Soils directly affect the kind and amount of vegetation that is available to wildlife as food and cover, and they affect the construction of water impoundments. The kind and abundance of wildlife that populate an area depend largely on the amount and distribution of food, cover, and water. If any one of these elements is missing, is inadequate, or is inaccessible, wildlife either are scarce or do not inhabit the area.

If the soils have the potential, wildlife habitat can be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by helping the natural establishment of desirable plants.

In table 14, the soils in the survey area are rated according to their potential to support the main kinds of wildlife habitat in the area. This information can be used in planning for parks, wildlife refuges, nature study areas, and other developments for wildlife; selecting areas that are suitable for wildlife; selecting soils that are suitable for creating, improving, or maintaining specific elements of wildlife habitat; and determining the intensity of management needed for each element of the habitat.

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 the following paragraphs.

Grain and seed crops are seed-producing annuals used by wildlife. The major soil properties that affect the growth of grain and seed crops are depth of the root zone, texture of the surface layer, available water capacity, wetness, slope, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of grain and seed crops are corn, wheat, oats, and barley.

Grasses and legumes are domestic perennial grasses and herbaceous legumes that are planted for wildlife food and cover. Major soil properties that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, flood hazard, and slope. Soil temperature and soil moisture are also considerations. Examples of grasses and legumes are fescue, lovegrass, bromegrass, clover, and alfalfa.

Wild herbaceous plants are native or naturally established grasses and forbs, including weeds, that provide food and cover for wildlife. Major soil properties that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of wild herbaceous plants are bluestem, goldenrod, beggarweed, wheatgrass, and grama.

Hardwood trees and the associated woody understory provide cover for wildlife and produce nuts or other fruit, buds, catkins, twigs, bark, or foliage that wildlife eat. Major soil properties that affect growth of hardwood trees and shrubs are depth of the root zone, available water capacity, and wetness. Examples of native plants are oak, hickory, and blackberry.

Shrubs are bushy woody plants that produce fruit, buds, twigs, bark, or foliage used by wildlife or that provide cover and shade for some species of wildlife. Major soil properties that affect the growth of shrubs are depth of the root zone, available water capacity, salinity, and moisture. Examples of shrubs are forestiera and sumac.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites, exclusive 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, salinity, slope, and surface stoniness. Examples of wetland plants are cattails, sedges, rushes, and willows.

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 wildlife consists of cropland, pasture, meadows, and areas that are overgrown with grasses, herbs, shrubs, and vines. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. The kinds of wildlife attracted to these areas include bobwhite quail, dove, meadowlark, field sparrow, cottontail rabbit, and red fox.

Wetland wildlife consists of open, marshy or swampy, shallow water areas where water-tolerant plants grow. Some of the wildlife attracted to such areas are ducks, geese, herons, shore birds, muskrat, mink, and beaver (fig. 10).

Rangeland wildlife consists of areas of wild herbaceous plants and shrubs. Wildlife attracted to rangeland include jackrabbit, white-tailed deer (fig. 11), dove, cottontail rabbit, wild turkey, meadowlark, and lark bunting.

Soil properties

Extensive data about soil properties are summarized on the following pages. The two main sources of these data are the many thousands of soil borings made during the course of the survey and the laboratory analyses of selected soil samples from typical profiles.

In making soil borings during field mapping, soil scientists can identify several important soil properties. They note the seasonal soil moisture condition or the presence of free water and its depth. For each horizon in the profile, they note the thickness and color of the soil material; the texture, or amount of clay, silt, sand, and gravel or other coarse fragments; the structure, or the natural pattern of cracks and pores in the undisturbed soil; and the consistence of the soil material in place under the existing soil moisture conditions. They record the depth of plant roots, determine the pH or reaction of the soil, and identify any free carbonates.

Samples of soil material are analyzed in the laboratory to verify the field estimates of soil properties and to determine all major properties of key soils, especially properties that cannot be estimated accurately by field observation. Laboratory analyses are not conducted for all soil series in the survey area, but laboratory data for many soil series not tested are available from nearby survey areas.

The available field and laboratory data are summarized in tables. The tables give the estimated range of engineering properties, the engineering classifications, and the physical and chemical properties of each major horizon of each soil in the survey area. They also present data about pertinent soil and water features, engineering test data, and data obtained from physical and chemical laboratory analyses of soils.

Engineering properties

Table 15 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 15 gives information for each of these contrasting horizons in a typical profile. *Depth* to the upper and lower boundaries of each horizon is indicated. More information about the range in depth and about other properties in each horizon is given for each soil series in the section "Soil series and morphology."

Texture is described in table 15 in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in soil material that is less than 2 millimeters in diameter. "Loam," for example, is soil material that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If a soil contains gravel or other particles coarser than sand, an appropriate modifier is added, for example, "gravelly loam." Other texture terms are defined in the Glossary.

The two systems commonly used in classifying soils for engineering use are the Unified Soil Classification System (Unified) (*3*) and the system adopted by the American Association of State Highway and Transportation Officials (AASHTO) (*2*).

The *Unified* system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter, plasticity index, liquid limit, and organic-matter content. Soils are grouped into 15 classes—eight classes of coarse-grained soils, identified as GW, GP, GM, GC, SW, SP, SM, and SC; six classes of fine-grained soils, identified as ML, CL, OL, MH, CH, and OH; and one class of highly organic soils, identified as Pt. Soils on the borderline between two classes have a dual classification symbol, for example, CL-ML.

The *AASHTO* system classifies soils according to those properties that affect their use in highway construction and maintenance. In this system a mineral soil is classified in one of seven basic groups ranging from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines. At the other extreme, in group A-7, are fine-grained soils. Highly organic soils are classified in group A-8 on the basis of visual inspection.

When laboratory data are available, the A-1, A-2, and A-7 groups are further classified as follows: A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, and A-7-6. As an additional refinement, the desirability of soils as subgrade material can be indicated by a group index number. These numbers range from 0 for the best subgrade material to 20 or higher for the poorest. The AASHTO classification for soils tested in the survey area, with group index numbers in parentheses, is given in table 18. The estimated classification, without group index numbers, is given in table 15. Also in table 15 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. Range in liquid limit and plasticity index are estimated on the basis of test data from the survey area or from nearby areas and on observations of the many soil borings made during the survey.

In some surveys, the estimates are rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterberg limits extend a marginal amount across classification boundaries (1 or 2 percent), the classification in the marginal zone is omitted.

Physical and chemical properties

Table 16 shows estimated values for several soil characteristics and features that affect behavior of soils in engineering uses. These estimates are given for each major horizon, at the depths indicated, in the typical pedon of each soil. The estimates are based on field observations and on test data for these and similar soils.

Permeability is estimated on the basis of known relationships among the soil characteristics observed in the field—particularly soil structure, porosity, and gradation or texture—that influence the downward movement of water in the soil. The estimates are for vertical water movement when the soil is saturated. Not considered in the estimates is lateral seepage or such transient soil features as plowpans and surface crusts. Permeability of the soil is an important factor to be considered in planning and designing drainage systems, in evaluating the potential of soils for septic tank systems and other waste disposal systems, and in many other aspects of land use and management.

Available water capacity is rated on the basis of soil characteristics that influence the ability of the soil to hold water and make it available to plants. Important characteristics are content of organic matter, soil texture, and soil structure. Shallow-rooted plants are not likely to use the available water from the deeper soil horizons. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design of irrigation systems.

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 planned use of the soil will not tolerate large volume changes.

Risk of corrosion pertains to potential soil-induced chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to soil moisture, particle-size distribution, total acidity, and electrical conductivity of the soil material. The rate of corrosion of concrete is based mainly on the sulfate content, texture, and acidity of the soil. Protective measures for steel or more resistant concrete help to avoid or minimize damage resulting from the corrosion. Uncoated steel intersecting soil boundaries or soil horizons is more susceptible to corrosion than an installation that is entirely within one kind of soil or within one soil horizon.

Erosion factors are used to predict the erodibility of a soil and its tolerance to erosion in relation to specific kinds of land use and treatment (*6*). The soil erodibility factor (K) is a measure of the susceptibility of the soil to erosion by water. Soils having the highest K values are the most erodible. K values range from 0.10 to 0.64. To estimate annual soil loss per acre, the K value of a soil is modified by factors representing plant cover, grade and length of slope, management practices, and climate. The soil-loss tolerance factor (T) is the maximum rate of soil erosion, whether from rainfall or soil blowing, that can occur without reducing crop production or environmental quality. The rate is expressed in tons of soil loss per acre per year.

Soil and water features

Table 17 contains information helpful in planning land uses and engineering projects that are likely to be affected by soil and water features.

Hydrologic soil groups are used to estimate runoff from precipitation. Soils not protected by vegetation are placed in one of four groups on the basis of the intake of water after the soils have been wetted and have received precipitation from long-duration storms.

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 transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils that have a layer that impedes the downward movement of water or soils that have moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clay soils that have a high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

Flooding is the temporary covering of soil with water from overflowing streams, with runoff from adjacent slopes, and by tides. Water standing for short periods after rains or after snow melts is not considered flooding, nor is water in swamps and marshes. Flooding is rated in general terms that describe the frequency and duration of flooding and the time of year when flooding is most likely. The ratings are based on evidence in the soil profile of the effects of flooding, namely thin strata of gravel, sand, silt, or, in places, clay deposited by floodwater; irregular decrease in organic-matter content with increasing depth; and absence of distinctive soil horizons that form in soils of the area that are not subject to flooding. The ratings are also based on local information about floodwater levels in the area and the extent of flooding; and on information that relates the position of each soil on the landscape to historic floods.

The generalized description of flood hazards is of value in land-use planning and provides a valid basis for land-use restrictions. The soil data are less specific, however, than those provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

High water table is the highest level of a saturated zone more than 6 inches thick for a continuous period of more than 2 weeks during most years. The depth to a seasonal high water table applies to undrained soils. Estimates are based mainly on the relationship between grayish colors or mottles in the soil and the depth to free water observed in many borings made during the course of the soil survey. Indicated in table 17 are the depth to the seasonal high water table; the kind of water table, that is, perched, artesian, or apparent; and the months of the year that the water table commonly is high. Only saturated zones above a depth of 5 or 6 feet are indicated.

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 construction of basements is feasible and to determine how septic tank absorption fields and other underground installations will function. Also, a seasonal high water table affects ease of excavation.

Depth to bedrock is shown for all soils that are underlain by bedrock at a depth of 5 to 6 feet or less. For many soils, the limited depth to bedrock is a part of the definition of the soil series. The depths shown are based on measurements made in many soil borings and on other observations during the mapping of the soils. The kind of bedrock and its hardness as related to ease of excavation is also shown. Rippable bedrock can be excavated with a single-tooth ripping attachment on a 200-horsepower tractor, but hard bedrock generally requires blasting.

Engineering test data

Table 18 contains the results of engineering tests performed by the Texas Highway Department on some of the soils in Hill County. The table shows the depth to which sampling was done and the results of tests to determine particle-size distribution and other properties significant in soil engineering.

As moisture is removed, the soil shrinks and decreases in volume in direct proportion to the loss in moisture until a condition of equilibrium, called the *shrinkage limit,* is reached. At this point shrinkage stops, although additional moisture is removed. Shrinkage limit is reported as the percentage of moisture in ovendry soil.

Linear shrinkage is the decrease in one dimension of the soil mass that occurs when the moisture content is reduced from the liquid limit to the shrinkage limit. It is expressed as a percentage of the original dimension.

Shrinkage ratio is the volume change that results from the drying of soil material divided by the moisture loss caused by drying. It is expressed numerically.

Mechanical analysis shows the percentages, by weight, of soil particles that pass sieves of specified sizes. Sand and other coarser materials do not pass the No. 200 sieve as do the finer silt and clay particles.

Liquid limit and *plasticity index* indicate the effect of water on the strength and consistence of soil material. As the moisture content of a clayey soil is increased from a dry state, the material changes from solid to plastic. If the moisture content is further increased, the material changes from plastic to liquid. The plastic limit is the moisture content at which the soil material passes from solid to plastic. The liquid limit is the moisture content at which the material changes from plastic to liquid. The plasticity index is the numerical difference between the liquid limit and the plastic limit. It indicates the range of moisture content within which a soil material is plastic.

Classifications of the soils in the AASHTO and Unified systems of classification are based on data obtained by mechanical analyses and by tests to determine liquid limits and plastic limits.

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.

Characteristics of the soil and the material in which it formed are discussed for each series. Then a pedon, a small three-dimensional area of soil that is typical of the soil series in the survey area, is described. The detailed descriptions of each soil horizon follow standards in the Soil Survey Manual (*5*). Unless otherwise noted, colors described are for dry soil.

Following the pedon description is the range of important characteristics of the soil series in this survey area. Phases, or mapping units, of each soil series are described in the section "Soil maps for detailed planning."

Aledo series

The Aledo series consists of shallow, loamy soils on uplands. These soils are underlain by hard, coarsely fractured limestone at a depth of less than 20 inches. Slopes range from 2 to 20 percent.

Typical pedon of Aledo gravelly clay loam in an area of Aledo-Somervell gravelly clay loams, 2 to 8 percent slopes, from the intersection of Farm Road 67 and Farm Road 933 in Blum, northwest on Farm Road 933 to its intersection with Texas Highway 174 and county road, 1.4 miles north on county road, and 100 feet north in rangeland:

A11—0 to 4 inches; dark grayish brown (10YR 4/2) gravelly clay loam, very dark grayish brown (10YR 3/2) moist; strong fine subangular blocky and strong fine granular structure; hard, firm, sticky and slightly plastic; many fine roots; many medium pores; about 10 percent by volume fragments of limestone 6 inches long; few rounded smooth pebbles less than 2 inches in diameter; calcareous; moderately alkaline; clear wavy boundary.

A12—4 to 12 inches; brown (10YR 5/3) very gravelly clay loam, dark brown (10YR 4/3) moist; strong fine granular structure; hard, firm, sticky and slightly plastic; many fine roots; common medium pores; about 60 percent limestone fragments 6 to 12 inches long; calcareous; moderately alkaline; clear wavy boundary.

A13—12 to 18 inches; pale brown (10YR 6/3) very gravelly clay loam, brown (10YR 5/3) moist; strong fine granular structure; hard, firm, sticky and slightly plastic; few fine roots; about 80 percent limestone fragments 6 to 12 inches long; calcareous; moderately alkaline; abrupt wavy boundary.

R—18 to 19 inches; indurated, coarsely fractured limestone.

The solum ranges from 10 to 20 inches in thickness and rests on hard, coarsely fractured limestone. Coarse fragments of whitish limestone make up from 5 to 60 percent of the upper 12 inches and as much as about 80 percent of the lower part of the solum. Fragments are thin and range to as much as about 6 inches in width and 12 inches in length. Many pedons contain a few smooth chert pebbles. The calcium carbonate equivalent ranges from 40 to 65 percent.

The A horizon is dark grayish brown, brown, or pale brown.

Altoga series

The Altoga series consists of deep, clayey soils that formed in clayey marl. These soils are on uplands. Slopes range from 1 to 8 percent.

Typical pedon of Altoga silty clay, 2 to 5 percent slopes, eroded, from Hillsboro northwest on Texas Highway 171 to south edge of Covington, 0.6 mile northeast on dirt road, and 300 feet north of road in cropland:

Ap—0 to 6 inches; olive gray (5Y 5/2) silty clay, olive gray (5Y 4/2) moist; moderate fine subangular blocky structure; slightly hard, friable, sticky and slightly plastic; few fine roots; common fine and medium pores; few thin fragments of brown limestone; calcareous; moderately alkaline; clear smooth boundary.

B21—6 to 18 inches; olive (5Y 5/3) silty clay, olive (5Y 4/3) moist; weak medium subangular blocky structure; hard, friable, sticky and plastic; few fine roots; common medium pores; few vertical streaks of dark material from above; calcareous; moderately alkaline; gradual smooth boundary.

B22—18 to 24 inches; pale olive (5Y 6/4) silty clay, olive (5Y 5/4) moist; moderate medium subangular blocky structure; slightly hard, friable, sticky and plastic; few fine roots; common medium pores; few small soft bodies of calcium carbonate; calcareous; moderately alkaline; gradual smooth boundary.

B3ca—24 to 37 inches; pale olive (5Y 6/4) silty clay, olive (5Y 5/4) moist; common medium distinct olive yellow (5Y 6/6) mottles; weak medium subangular blocky structure; slightly hard, friable, sticky and plastic; common fine and medium soft bodies of calcium carbonate; common fine and medium weakly cemented concretions of calcium carbonate; calcareous; moderately alkaline; clear smooth boundary.

C1—37 to 52 inches; yellow (5Y 8/6) silty clay, yellow (5Y 7/6) moist; few fine faint pale yellow and yellow mottles; massive; slightly hard, friable, sticky and plastic; few soft bodies of lime; calcareous; moderately alkaline; clear smooth boundary.

C2—52 to 60 inches; coarsely mottled yellow (5Y 7/6, 7/8), olive yellow (5Y 6/6), and pale yellow (5Y 7/3) silty clay; massive; slightly hard, friable, sticky and plastic; calcareous; moderately alkaline.

The solum ranges from 35 to 60 inches in thickness and is less than 40 inches thick in most pedons. Calcium carbonate equivalent is 40 to 75 percent in the control section. Visible accumulations of secondary calcium carbonate are common in the 20- to 30-inch section in the B horizon. Content of noncarbonate clay ranges from 25 to 35 percent in the control section.

The Ap horizon is brown, light brownish gray, pale brown, yellowish brown, light yellowish brown, light olive brown, grayish brown, or olive gray. In places it is dark grayish brown in the upper 4 to 5 inches.

The B and Bca horizons are brown, grayish brown, yellowish brown, olive, light olive gray, light olive brown, or pale olive and have olive yellow mottles.

The C horizon is pale yellow, yellow, very pale brown, light yellowish brown, olive yellow, or yellowish brown and has grayish brown and yellowish mottles.

The Altoga soils in map unit 5 (Altoga clay loam, 5 to 8 percent slopes, eroded) are taxadjuncts to the Altoga series because the depth to weathered shale is slightly less than defined in the range for the series.

Aquilla series

The Aquilla series consists of deep, sandy soils on uplands. These soils formed in sandy sediments of old high terraces. Slopes range from 1 to 3 percent.

Typical pedon of Aquilla fine sand, 1 to 3 percent slopes, from the intersection of Farm Roads 933 and 1713, 5.5 miles west on Farm Road 1713 into McCown Park, 0.75 mile south on unimproved road, 0.25 mile east, 0.75 mile south, 1.25 miles west, and 100 feet north in corner of idle field:

Ap—0 to 7 inches; light brown (7.5YR 6/4) fine sand, brown (7.5YR 5/4) moist; single grained; loose, very friable; common fine roots; few fine organic stains; mildly alkaline; clear smooth boundary.

A1—7 to 14 inches; brown (7.5YR 5/4) fine sand, dark brown (7.5YR 4/4) moist; single grained; loose, very friable; many fine roots; mildly alkaline; gradual smooth boundary.

B1—14 to 26 inches; reddish yellow (7.5YR 6/6) fine sand, strong brown (7.5YR 5/6) moist; weak fine subangular blocky structure; loose, very friable; many fine roots; sand grains are coated; mildly alkaline; clear wavy boundary.

A21&B2t—26 to 49 inches; light reddish brown (5YR 6/4) loamy sand, reddish brown (5YR 5/4) moist; about 20 percent yellowish red (5YR 5/8), light reddish brown (5YR 6/4), and reddish brown (5YR 5/4) sandy loam lamellae 0.12 to 0.5 inch thick; single grained in the A21 part and weak fine subangular blocky structure in the B2t part; very friable; common fine roots; few medium smooth pebbles; neutral; gradual smooth boundary.

A22&B2t—49 to 62 inches; light brown (7.5YR 6/4) loamy sand, brown (7.5YR 5/4) moist; yellowish red (5YR 5/6) sandy loam lamellae 0.12 to 0.75 inch thick; single grained in the A22 part and weak fine subangular blocky structure in the B2t part; very friable; few fine roots; few medium smooth pebbles; neutral; gradual smooth boundary.

IIB2t—62 to 80 inches; red (2.5YR 5/6) sandy clay loam, red (2.5YR 4/6) moist; few fine faint mottles of reddish brown; moderate medium subangular blocky structure; friable; few fine roots; patchy clay films; small pockets of uncoated sand grains; about 10 percent medium smooth pebbles; slightly acid; gradual smooth boundary.

The solum ranges from 70 to more than 80 inches in thickness. It is underlain with gravelly sandy clay loam that is 40 to 60 percent, by volume, smooth pebbles. The solum is noncalcareous throughout and ranges from medium acid through mildly alkaline.

The Ap and A1 horizons are pink, very pale brown, light brown, pale brown, light yellowish brown, yellowish brown, brown, grayish brown, or reddish yellow.

The B1 horizon is yellowish brown, brownish yellow, reddish brown, light yellowish brown, or reddish yellow. It is fine sand or loamy fine sand.

The A2 part of the A2&Bt horizon is brown, light brown, reddish brown, light reddish brown, or pink. It is fine sand, loamy sand, or loamy fine sand. The Bt part of the A2&Bt horizon is thin lamellae that make up from 10 to 30 percent of the horizon. It is red, yellowish red, or reddish yellow. Texture is loamy fine sand, fine sandy loam, or sandy loam.

The IIB2t horizon is red, yellowish red, or reddish yellow. It is commonly sandy clay loam but ranges to fine sandy loam and is as much as about 20 percent smooth pebbles.

Austin series

The Austin series consists of moderately deep, clayey soils on uplands. These soils formed in calcareous, clayey material over chalky limestone bedrock. Slopes range from 1 to 5 percent.

Typical pedon of Austin silty clay, 1 to 3 percent slopes, east from Hillsboro on Texas Highway 22 to the western edge of Brandon, 0.9 mile north on county road, 1.5 miles southwest, and 100 feet north of road in a cultivated field:

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) silty clay, very dark grayish brown (10YR 3/2) moist; strong medium subangular blocky and strong medium granular structure; firm, sticky and plastic; many medium pores; few concretions of calcium carbonate; calcareous; moderately alkaline; clear smooth boundary.

A1—7 to 15 inches; dark grayish brown (10YR 4/2) silty clay, very dark grayish brown (10YR 3/2) moist; strong medium subangular blocky and strong medium granular structure; firm, sticky and plastic; common medium pores; few worm casts; few pressure faces on peds along lower boundary; few concretions of calcium carbonate; calcareous; moderately alkaline; gradual boundary.

B21ca—15 to 20 inches; grayish brown (10YR 5/2) silty clay, dark grayish brown (10YR 4/2) moist; few fine faint mottles of brown; strong coarse blocky and strong medium granular structure; firm, sticky and plastic; few pressure faces on peds; few worm casts; few vertical gray streaks 0.25 to 0.5 inch wide; few concretions of calcium carbonate; calcareous; moderately alkaline; gradual smooth boundary.

B22ca—20 to 33 inches; mottled light brownish gray (2.5Y 6/2) and light yellowish brown (10YR 6/4) silty clay, grayish brown (2.5Y 5/2) and yellowish brown (10YR 5/4) moist; few vertical gray streaks 0.25 inch to 1.5 inches wide; moderate fine granular structure; friable, sticky and slightly plastic; few worm casts; common soft bodies of calcium carbonate; few concretions of calcium carbonate; calcareous; moderately alkaline; clear wavy boundary.

C1r—33 to 54 inches; very pale brown (10YR 7/3, moist) chalky marl; platy rock structure; firm, slightly sticky and slightly plastic; few chalky limestone chips; calcareous; moderately alkaline; abrupt wavy boundary.

C2r—54 to 60 inches; white, coarsely fractured chalk.

The solum ranges from 20 to 40 inches in thickness. Depth to the fractured chalky limestone bedrock ranges from 30 to 70 inches and averages about 52 inches. Clay content ranges from 35 to 50 percent, and the calcium carbonate equivalent ranges from 40 to 70 percent. There are few to common thin limestone fragments.

The A horizon is dark brown, very dark brown, grayish brown, dark grayish brown, or very dark grayish brown.

The B21 horizon is grayish brown, dark grayish brown, light brownish gray, brown, yellowish brown, or light yellowish brown. The B22 horizon is light brownish gray, grayish brown, brown, or yellowish brown.

The C1r horizon is light gray, pale yellow, or light brownish gray and is underlain by the C2r horizon, which is whitish, coarsely fractured, chalky limestone with hardness of less than 3 on Mohs' scale.

Axtell series

The Axtell series consists of deep, loamy soils on uplands. These soils formed in clayey sediments. Slopes range from 0 to 5 percent.

Typical pedon of Axtell fine sandy loam, 1 to 3 percent slopes, from the center of the community of Aquilla, 1.1 miles south on Farm Road 933 to its intersection with Farm Road 1304, 3.2 miles southwest on Farm Road 1304 to its intersection with Farm Road 2114, 0.6 mile southwest and 0.2 mile west on Farm Road 2114 to its intersection with gravel road, 0.1 mile northwest on gravel road, and 100 feet southwest in cultivated field:

Ap—0 to 7 inches; pale brown (10YR 6/3) fine sandy loam, brown (10YR 5/3) moist; moderate coarse blocky structure that parts to weak fine platy; hard, friable, slightly sticky and nonplastic; many fine roots; few quartz pebbles; medium acid; abrupt smooth boundary.

B21t—7 to 28 inches; red (2.5YR 4/6) clay, dark red (2.5YR 3/6) moist; common medium distinct light yellowish brown (10YR 6/4) and yellowish brown (10YR 5/4), moist mottles; moderate medium blocky structure; extremely firm, sticky and plastic; few fine roots; few quartz pebbles; few dark brown concretions; common cracks 1/4 inch in width; common pressure faces and clay films; very strongly acid; gradual smooth boundary.

B22t—28 to 52 inches; coarsely mottled yellowish brown (10YR 5/6), brown (10YR 5/3), and dark grayish brown (2.5Y 4/2) clay; moderate coarse blocky structure; extremely hard, extremely firm, sticky and plastic; few fine roots in upper part; common fine slickensides; few clay films; few quartz pebbles; few dark brown concretions; few gypsum crystals; medium acid; gradual smooth boundary.

B3—52 to 66 inches; coarsely mottled dark grayish brown (2.5Y 4/2), light olive brown (2.5Y 5/4), and reddish yellow (7.5YR 6/6) clay; moderate coarse blocky structure; very hard, very firm, sticky and plastic; common pressure faces; sand grains on faces of peds; common concretions of calcium carbonate; few soft bodies of calcium carbonate; common gypsum crystals; few quartz pebbles; noncalcareous; moderately alkaline.

The A horizon ranges from 4 to about 14 inches in thickness but is about 7 inches thick in most places and averages less than 10 inches in thickness. Content of quartz and chert pebbles ranges from about 3 to 30 percent. The A horizon is slightly acid through strongly acid. It is light brown, pale brown, brown, dark brown, grayish brown, or dark grayish brown.

The B21t and B22t horizons have clay content of 35 to 50 percent. Most pedons contain a few calcium carbonate concretions below a depth of 40 inches. Colors are yellowish red, light reddish brown, or reddish yellow with coarse mottles of light brown, light yellowish brown, brownish yellow, dark grayish brown, or light olive brown in the lower part.

The B3 horizon contains common pressure faces and few to many gypsum crystals. It ranges from neutral through moderately alkaline and is noncalcareous. It is coarsely mottled dark grayish brown, light olive brown, olive yellow, reddish yellow, or strong brown.

Bastrop series

The Bastrop series consists of deep, loamy soils on uplands. These soils formed in loamy sediments on stream terraces. Slopes range from 3 to 5 percent.

Typical pedon of Bastrop fine sandy loam, 3 to 5 percent slopes, eroded, from the intersection of Farm Roads 933 and 2604, 1.7 miles west on Farm Road 2604, 0.35 mile north on gravel road, 0.5 mile west, 1.5 miles north on road that curves to west, 0.75 mile south, 0.5 mile south of old rock house and 0.25 mile north of old Fort Graham Headquarters building:

Ap—0 to 8 inches; light brown (7.5YR 6/4) fine sandy loam, dark brown (7.5YR 4/4) moist; weak fine granular structure; slightly hard, very friable; many fine roots; neutral; clear boundary.

B21t—8 to 22 inches; yellowish red (5YR 5/6) sandy clay loam, yellowish red (5YR 4/6) moist; moderate coarse subangular blocky structure; hard, firm; many fine roots; moderately alkaline; gradual smooth boundary.

B22t—22 to 61 inches; reddish yellow (5YR 6/8) sandy clay loam, yellowish red (5YR 5/8) moist; moderate coarse subangular blocky structure; hard, firm; common fine roots; moderately alkaline; gradual smooth boundary.

C—61 to 80 inches; reddish yellow (7.5YR 6/8) sandy clay loam, strong brown (7.5YR 5/8) moist; massive; hard, firm; moderately alkaline.

The solum ranges from 50 to 90 inches in thickness. It ranges from slightly acid through moderately alkaline and is noncalcareous throughout. Secondary lime, mainly in films and threads, is below a depth of 60 inches in some pedons.

The Ap horizon is reddish brown, yellowish brown, light brown, brown, strong brown, or grayish brown.

The B21t horizon is reddish brown or yellowish red sandy clay loam or clay loam. The B22t horizon is light reddish brown, reddish yellow, reddish brown, brown, or strong brown sandy clay loam or clay loam.

The C horizon generally contains more sand than the B22t horizon. It contains concretions and small soft bodies of calcium carbonate below a depth of 60 inches in some pedons.

Bastsil series

The Bastsil series consists of deep, sandy or loamy soils on uplands. These soils formed in loamy sediments on stream terraces. Slopes range from 0 to 3 percent.

Typical pedon of Bastsil loamy fine sand, 0 to 3 percent slopes, from the intersection of Farm Roads 933 and 1713 about 2 miles north of Whitney, 5.5 miles southwest on Farm Road 1713 into McCown Park, 0.5 mile south on unimproved road, 0.05 mile east, 0.6 mile south, 0.25 mile west, 0.15 mile south, and 375 feet west in old field pasture:

A1—0 to 6 inches; light brown (7.5YR 6/4) loamy fine sand, brown (7.5YR 4/4) moist; single grained; loose, very friable; many fine and very fine roots; few siliceous pebbles; slightly acid; clear smooth boundary.

A2—6 to 16 inches, light brown (7.5YR 6/4) loamy fine sand, brown (7.5YR 5/4) moist; single grained; loose, very friable; many fine and very fine roots; few coarse roots; few siliceous pebbles; slightly acid; abrupt smooth boundary.

B21t—16 to 31 inches; red (2.5YR 4/6) sandy clay loam, dark red (2.5YR 3/6) moist; common medium to coarse faint yellowish red (5YR 4/6) mottles; weak coarse prismatic structure parting to moderate medium and coarse subangular blocky; very hard, friable; common fine roots; many fine pores; few worm casts; common thin patchy clay films on faces of peds and bridging sand grains; few siliceous pebbles; slightly acid; gradual wavy boundary.

B22t—31 to 43 inches; strong brown (7.5YR 5/6) sandy clay loam, strong brown (7.5YR 5/6) moist; common fine and medium faint yellowish red (5YR 5/6, 5/8) mottles; moderate coarse prismatic structure parting to weak and moderate medium and coarse subangular blocky; very hard, friable; common fine roots; many fine and very fine pores; few worm casts; common clay films on faces of peds and bridging sand grains; few siliceous pebbles; few black masses as much as 1 centimeter across; slightly acid; gradual wavy boundary.

B23t—43 to 52 inches; strong brown (7.5YR 5/6) sandy clay loam, strong brown (7.5YR 5/6) moist; common medium distinct dark red (2.5YR 3/6) mottles in interior of peds; moderate coarse prismatic structure parting to weak and moderate medium and coarse subangular blocky; extremely hard, friable; common fine roots; many fine and very fine pores in strong brown part; common thin patchy clay films on faces of prisms and bridging sand grains; few smooth, rounded siliceous pebbles; slightly acid; gradual irregular boundary.

Bt&A'2—52 to 80 inches; red (2.5YR 4/6) matrix of sandy clay loam, red (2.5YR 4/6) moist with light gray (10YR 7/2) clayey coatings 1 to 4 millimeters thick on faces of peds; common medium and coarse faint red (10R 4/6) mottles in interior of peds; few medium distinct strong brown (7.5YR 5/6) mottles; moderate and strong coarse prismatic structure parting to weak medium prismatic and coarse blocky; extremely hard, firm; prisms coated with films of light gray (10YR 7/2) uncoated sand grains 1 millimeter thick; common fine roots in light gray areas, no roots in red areas; common very fine pores in light gray areas, no pores in red areas; few siliceous pebbles; slightly acid.

The solum ranges from 60 to 90 inches or more in thickness. Quartz pebbles range from few to common throughout the solum. Reaction ranges from strongly acid through mildly alkaline.

The A horizon is fine sandy loam or loamy fine sand and ranges from 10 to 20 inches in thickness. It is reddish brown, light brown, light reddish brown, yellowish red, reddish yellow, brown, pinkish gray, pink, or pale brown.

The B2t horizon is sandy clay loam or clay loam, and the control section ranges from 18 to 35 percent clay. The B2t horizon is red, reddish brown, light red, reddish yellow, yellowish red, brown, or strong brown.

Birome series

The Birome series consists of moderately deep, loamy soils on uplands. These soils are underlain with weakly cemented, fractured sandstone stratified with shaly clay. Slopes range from 5 to 20 percent.

Typical pedon of Birome fine sandy loam in an area of Birome-Rayex complex, 5 to 20 percent slopes, 11.25 miles west from Hillsboro on Texas Highway 22, 1.1 miles north on dirt road, 0.7 mile east to crest of ridge, and 100 feet north of road in wooded area on east-facing slope:

A1—0 to 5 inches; dark brown (10YR 4/3) fine sandy loam, dark brown (10YR 3/3) moist; weak coarse blocky structure parting to weak fine granular; platy surface crust 1/4 to 1/2 inch in thickness; hard, friable; many fine roots; few pebbles of ironstone and sandstone; slightly acid; gradual boundary.

A2—5 to 8 inches; very pale brown (10YR 7/3) fine sandy loam, pale brown (10YR 6/3) moist; weak fine granular structure; loose, friable; many fine and few coarse roots; many pebbles of ironstone and sandstone; medium acid; clear smooth boundary.

B21t—8 to 26 inches; red (2.5YR 5/6) clay, red (2.5YR 4/6) moist; strong medium blocky structure; extremely hard, extremely firm, plastic; many coarse roots; few fine pores; prominent clay films on faces of peds; few pebbles and small platy fragments of sandstone; strongly acid; gradual smooth boundary.

B22t—26 to 33 inches; mottled red (2.5YR 5/8) and very pale brown (10YR 7/4) clay, red (2.5YR 4/8) and light yellowish brown (10YR 6/4) moist; strong medium blocky structure; extremely hard, extremely firm, plastic; many coarse roots; clay films on faces of peds; many platy fragments of sandstone ranging to about 6 inches across; strongly acid; gradual wavy boundary.

B3—33 to 37 inches; mottled very pale brown (10YR 7/4) and reddish yellow (5YR 6/8) sandy clay; moderate coarse blocky structure; extremely hard, extremely firm, plastic; few coarse roots; clay films on faces of peds; many platy fragments of sandstone; strongly acid; clear irregular boundary.

Cr—37 to 80 inches; weakly cemented, fractured sandstone that is stratified with shaly clay at a depth of about 50 inches. These fragments range from 8 to 12 inches in thickness and are fractured about 12 to 36 inches apart. The shaly clay is in thin strata and in the vertical cracks in the upper part of the horizon. The amount of sandstone fragments decreases with depth. Few roots penetrate the fractures.

The solum ranges from 20 to 40 inches in thickness over weakly cemented, fractured sandstone. Clay content of the control section ranges from 35 to 50 percent.

The A horizon ranges from 5 to 16 inches in thickness. Ironstone pebbles and thin fragments of sandstone ranging up to about 6 inches in cross section cover from 0 to 20 percent of the surface. The A horizon is medium acid through neutral. It is pinkish gray, light reddish brown, very pale brown, dark brown, or brown.

The B21t horizon is red, yellowish red, reddish brown, or brown. It is medium acid or strongly acid. Angular and flat ironstone and sandstone fragments 2 millimeters to 3 inches across make up as much as 10 percent of this horizon. The B21t horizon is clay or clay loam.

The B22t horizon is mottled red, reddish brown, yellowish red, very pale brown, reddish yellow, light yellowish brown, or pale brown. Gravel content ranges to about 20 percent. The B22t horizon is medium acid or strongly acid.

The B3 horizon is mottled reddish yellow, red, reddish brown, yellowish red, pale brown, or light yellowish brown. Gravel content ranges to about 40 percent. Reaction is medium acid or strongly acid.

The Cr horizon is fractured, weakly cemented sandstone strata interbedded with shale and clay. It is mottled red, gray, and yellow. Hardness of the fractured sandstone is less than 3 on Mohs' scale. Reaction is medium acid or strongly acid.

Blum series

The Blum series consists of deep, loamy soils on uplands. These soils formed in loamy and clayey sediments that are high in content of calcium carbonate. Slopes are 0 to 2 percent. These soils are on old terraces or colluvial foot slopes and valley fill.

Typical pedon of Blum loam, 0 to 2 percent slopes, 3.25 miles northwest from Aquilla on Farm Road 933, 0.85 mile northwest and northeast on dirt road, 0.65 mile northwest 0.4 mile southwest, and 400 feet southeast of road in cropland:

Ap—0 to 5 inches; dark brown (10YR 4/3) loam, dark brown (10YR 3/3) moist; moderate fine granular structure; hard, friable; common fine roots; common fine pores; few fine quartz pebbles; medium acid; abrupt smooth boundary.

A11—5 to 14 inches; dark brown (10YR 4/3) loam, dark brown (10YR 3/3) moist; few fine faint mottles and streaks of yellowish brown; moderate medium subangular blocky structure; hard, firm; few fine roots; few medium pores; few quartz pebbles; neutral; gradual smooth boundary.

A12—14 to 19 inches; very dark grayish brown (10YR 3/2) loam, very dark brown (10YR 2/2) moist; few fine faint streaks and mottles of dark brown; moderate medium blocky structure; hard, firm; few fine roots; few fine pores; few quartz pebbles; slightly acid; gradual wavy boundary.

B21t—19 to 36 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; common medium faint mottles of olive brown (2.5Y 4/4) and common medium distinct mottles of yellow (10YR 7/8) and brownish yellow (10YR 6/8); moderate coarse blocky structure; very hard, very firm; few fine roots; few fine pores; few discontinuous clay films; few pressure faces; few black concretions; few quartz pebbles; slightly acid; gradual smooth boundary.

B22t—36 to 52 inches; light brownish gray (10YR 6/2) clay, grayish brown (10YR 5/2) moist; common medium prominent mottles of reddish yellow (7.5YR 7/8), yellowish red (5YR 5/8), yellow (2.5Y 7/8), and olive yellow (2.5Y 6/8); moderate coarse blocky structure; extremely hard, extremely firm; few fine black concretions; few quartz pebbles; slightly acid; gradual smooth boundary.

B23t—52 to 74 inches; mottled grayish brown (2.5Y 5/2) and light yellowish brown (2.5Y 6/4) clay; weak medium blocky structure; extremely hard, very firm; common pitted concretions of calcium carbonate; few fine black concretions; calcareous; moderately alkaline; gradual smooth boundary.

Cca—74 to 80 inches; mottled grayish brown (2.5Y 5/2) and yellow (10YR 7/8) clay; massive; very hard, very firm; common soft masses and many fine concretions of calcium carbonate; common fine black concretions; calcareous; moderately alkaline.

The solum ranges from 60 to about 90 inches in thickness.

The Ap horizon is brown, dark brown, grayish brown, or dark grayish brown. A gray crust is on the surface in places. Texture is loam. Reaction is medium acid through mildly alkaline, and the soil is noncalcareous.

The A11 and A12 horizons are very dark grayish brown, dark grayish brown, dark brown, or grayish brown. In places they contain a few fine mottles of yellowish brown, dark brown, yellowish red, reddish yellow, olive yellow, or grayish brown. Reaction is medium acid through mildly alkaline, and the soil is noncalcareous. The combined thickness of the A horizons is less than 20 inches.

The B21t horizon has matrix colors of grayish brown or olive gray with common fine and medium mottles of dark grayish brown, gray, brownish yellow, yellow, yellowish red, reddish brown, pink, olive brown, and olive yellow. The texture is clay or clay loam, and clay content is 35 to 50 percent in the upper 20 inches. Reaction is slightly acid or neutral.

The B22t and B23t horizons have matrix colors of light brown, light brownish gray, grayish brown, or gray with common to many fine and medium mottles of dark reddish gray, olive yellow, yellowish red, reddish yellow, light olive brown, and yellow. They are clay or clay loam. Reaction ranges from slightly acid through moderately alkaline, and the lower part of the B23t horizon is calcareous.

The Cca horizon is gray and has mottles as described in the B22t and B23t horizons. It is clay or clay loam. Reaction is mildly alkaline or moderately alkaline, and the horizon is calcareous. Most pedons contain small bodies of soft calcium carbonate.

Bolar series

The Bolar series consists of moderately deep, loamy soils on uplands. These soils formed in marl and interbedded limestone. Slopes range from 1 to 8 percent.

Typical pedon of Bolar clay loam, 3 to 8 percent slopes, from the intersection of Farm Road 933 and Texas Highway 174 north of Blum; 0.5 mile northwest on gravel road, and 200 feet southwest of road in cropland:

Ap—0 to 7 inches; dark brown (10YR 4/3, 3/3 moist) clay loam; moderate coarse blocky and fine granular structure; hard, firm, plastic; few roots; many medium pores; few pebbles of limestone; few small shells; few concretions of calcium carbonate; calcareous; moderately alkaline; clear smooth boundary.

A1—7 to 15 inches; dark grayish brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) moist; strong medium subangular blocky and fine granular structure; hard, firm, plastic; few fine roots; common medium pores; many concretions of calcium carbonate; many small shells and pebbles of limestone; calcareous; moderately alkaline; gradual smooth boundary.

B21ca—15 to 26 inches; light yellowish brown (2.5Y 6/4) clay loam, light olive brown (2.5Y 5/4) moist; strong medium granular structure; hard, firm, slightly plastic; few fine roots; common medium pores; common shells; many pebbles of limestone; common concretions of calcium carbonate; many small soft bodies of calcium carbonate; calcareous; moderately alkaline; gradual smooth boundary.

B22ca—26 to 35 inches; olive yellow (2.5Y 6/6) clay loam, light olive brown (2.5Y 5/6) moist; strong medium granular structure; hard, firm, slightly plastic; few fine roots; many medium pores; common soft bodies of calcium carbonate; common concretions of calcium carbonate; common pebbles of limestone and small shells; calcareous; moderately alkaline; gradual smooth boundary.

Cr—35 to 62 inches; mottled light olive brown (2.5Y 5/4) and very pale brown (10YR 7/3) clayey marl; massive; very hard, very firm, plastic; about 60 percent clayey marl and 40 percent chalky marl and weathered limestone; calcareous; moderately alkaline; clear wavy boundary.

R—62 to 80 inches; hard slabs of fractured limestone and thin seams of clayey marl.

The solum ranges from 20 to 40 inches in thickness. Interbedded limestone is at a depth of about 36 inches, and coarsely fractured limestone bedrock is at a depth of about 60 inches. These soils are calcareous throughout. There are few to common pebbles of limestone and small marine shells. Reaction is moderately alkaline, and the clay content of the control section ranges from 20 to 35 percent.

The Ap and A1 horizons are dark brown, grayish brown, dark grayish brown, or very dark grayish brown.

The B2ca horizons are light yellowish brown, brown, yellowish brown, light olive brown, or olive yellow. Texture includes loam, clay loam, or silty clay loam. There are few to common bodies of soft calcium carbonate.

The Cr horizon is mottled pale brown, brown, yellowish brown, light olive brown, or olive brown clayey marl, chalky marl, or weathered limestone.

Brackett series

The Brackett series consists of shallow, loamy soils formed in interbedded soft limestone and marly earth. Slopes range to as much as about 30 percent, and the topography is usually benched with alternate bands of hard and soft material.

Typical pedon of Brackett cobbly clay loam, in an area of Brackett-Rock outcrop complex, 5 to 30 percent slopes, from the entrance to the Chisholm Trail Park on Texas Highway 174, 0.25 mile north through the park, 0.4 mile east; site is on a ridgetop in a weedy area:

A1—0 to 4 inches; dark grayish brown (10YR 4/2) cobbly clay loam, very dark grayish brown (10YR 3/2) moist; strong fine granular structure; hard, friable; many roots; many medium pores; about 30 percent limestone fragments; few worm casts; calcareous; moderately alkaline; clear wavy boundary.

B21ca—4 to 14 inches; brown (10YR 5/3) silty clay loam, dark brown (10YR 4/3) moist; few medium mottles of very pale brown (10YR 7/4); strong fine granular structure; hard, firm; many fine roots; common medium pores; many concretions of calcium carbonate; many threads of soft calcium carbonate; calcareous; moderately alkaline; gradual smooth boundary.

B22ca—14 to 19 inches; olive yellow (2.5Y 6/6) silty clay loam, light olive brown (2.5Y 5/6) moist; few mottles of very pale brown (10YR 7/4); strong medium subangular blocky structure; hard, friable; many fine roots; common medium pores; many concretions of calcium carbonate; common masses of soft calcium carbonate; calcareous; moderately alkaline; gradual smooth boundary.

Cr—19 to 37 inches; very pale brown (10YR 7/3) silty shale, pale brown (10YR 6/3) moist; platy rock structure; hard, friable; many fine roots; many platelike fragments of limestone; common soft bodies of calcium carbonate; calcareous; moderately alkaline; clear wavy boundary.

R—37 to 60 inches; hard fractured slabs and chunks of limestone.

The solum ranges from 10 to 20 inches in thickness. Content of coarse fragments of limestone as much as 5 inches across ranges to as much as about 35 percent, by volume. Calcium carbonate equivalent, excluding fragments coarser than 3 inches, ranges from 40 to 80 percent. The solum is calcareous and moderately alkaline. Texture ranges from loam to clay loam. Noncarbonate clay content ranges from 10 to 30 percent.

The A horizon is dark grayish brown, light brownish gray, grayish brown, light yellowish brown, pale brown, very pale brown, or light gray.

The Bca horizons are brown, olive yellow, very pale brown, grayish brown, yellowish brown, light brownish gray, pale brown, light yellowish brown, or pale yellow.

The Cr horizon is very pale brown, light brownish gray, pale yellow, or white silty shale.

Branyon series

The Branyon series consists of deep, calcareous, clayey soils that formed in fine textured sediments on nearly level, old terrace positions. Slopes range from 0 to 1 percent.

Typical pedon of Branyon clay, 0 to 1 percent slopes, east from Hillsboro on Texas Highway 22 to Brandon, 1.0 mile east on dirt road on south side of abandoned railroad, 0.75 mile southeast to corners in road system, 100 feet south in cropland. The pedon described is a microlow:

Ap—0 to 6 inches; very dark gray (10YR 3/1) clay, black (10YR 2/1) moist; thin dark grayish brown (10YR 4/2) surface crust; moderate medium subangular blocky and medium granular structure; very hard, very firm, plastic; few fine roots; few fine pores; calcareous; moderately alkaline; abrupt smooth boundary.

A12—6 to 42 inches; very dark gray (10YR 3/1) clay, black (10YR 2/1) moist; strong angular blocky structure; extremely hard, extremely firm, plastic; few fine roots; few fine pores; prominent slickensides in lower part; common black concretions; common concretions of calcium carbonate; calcareous; moderately alkaline; gradual smooth boundary.

A13—42 to 58 inches; very dark gray (10YR 3/1) clay, black (10YR 2/1) moist; strong medium angular blocky structure; very hard, extremely firm, plastic; common black concretions; common concretions of calcium carbonate; common slickensides; calcareous; moderately alkaline; gradual smooth boundary.

AC—58 to 70 inches; gray (10YR 5/1) and dark brown (10YR 4/3) clay, dark gray (10YR 4/1) and dark brown (10YR 3/3) moist; moderate coarse blocky and medium granular structure; very hard, firm, plastic; many concretions of calcium carbonate; many black concretions; few soft bodies of calcium carbonate; common slickensides; calcareous; moderately alkaline.

The solum ranges from 60 to more than 80 inches in thickness. The texture is clay, and clay content ranges from 45 to 60 percent in the control section. There are few to common pebbles. Reaction is moderately alkaline throughout. These soils are calcareous throughout. Large slickensides and parallepipeds are common from the upper part of the A horizon through the AC horizon. There are few to many black concretions and concretions of calcium carbonate below the plow layer. Soft bodies of calcium carbonate occur below a depth of about 50 inches.

The A horizon ranges from dark gray or very dark gray to black. The AC horizon is pale brown, grayish brown, or gray and has few to common mottles in shades of brown, yellow, and olive.

Burleson series

The Burleson series consists of deep, nearly level, clayey soils on old stream terraces. These soils formed in alkaline, clayey sediments. Slopes are less than 3 percent.

Typical pedon of Burleson clay, 0 to 1 percent slopes, 0.5 mile west and north on county road from the intersection of Farm Roads 310 and 933 in Aquilla, 300 feet southwest of road corner, in cropland:

Ap—0 to 7 inches; very dark gray (5Y 3/1) clay; thin dark gray (5Y 4/1) crust about 0.25 inch in thickness; moderate coarse blocky and thin platy structure; very hard, very firm, plastic; few fine roots; few very fine pores; few dark brown concretions; medium acid; abrupt smooth boundary.

A12—7 to 18 inches; dark gray (5Y 4/1) clay, very dark gray (5Y 3/1) moist; strong coarse blocky structure; extremely hard, extremely firm, plastic; sand on faces of peds; clay skins on peds; few dark concretions; medium acid; gradual smooth boundary.

A13—18 to 44 inches; dark gray (5Y 4/1) clay, very dark gray (5Y 3/1) moist; strong coarse blocky structure; extremely hard, extremely firm, plastic; common slickensides; common concretions of calcium carbonate; common dark brown concretions; mildly alkaline; gradual smooth boundary.

AC—44 to 66 inches; light yellowish brown (2.5Y 6/4) clay, light olive brown (2.5Y 5/4) moist; streaks of olive yellow (2.5Y 6/6) and very dark gray (5Y 3/1); strong coarse blocky structure; extremely hard, extremely firm, plastic; common slickensides; common concretions of calcium carbonate; common dark brown concretions; moderately alkaline.

The solum ranges from 40 to 70 inches in thickness. The texture is clay; clay content ranges from 40 to 60 percent. Some pedons have a thin surface crust, 1 to 3 inches thick, of clay loam. Pressure faces and intersecting slickensides are common below a depth of 20 inches. When the soil is dry, cracks as much as 3 inches wide extend to a depth of about 60 inches. Reaction is medium acid through moderately alkaline, and the soil is noncalcareous above the lower part of the AC horizon. Most pedons contain a few chert pebbles. Untilled areas have a weakly developed gilgai pattern. The pattern has been destroyed by tillage in other areas but is evident in ditches dug in cultivated areas. Content of dark brown concretions ranges from few to common throughout the solum. Concretions of calcium carbonate occur below a depth of about 36 inches.

The A horizon is gray, dark gray, or very dark gray. Chroma is less than 2.

The AC horizon is light yellowish brown, light brownish gray, grayish brown, or olive. It has diffused olive yellow, yellow, and pale olive mottles.

Chatt series

The Chatt series consists of deep, clayey soils formed in ancient alluvium on high terraces. Slopes are 1 to 3 percent.

Typical pedon of Chatt clay, 1 to 3 percent slopes, south from Hillsboro on Interstate Highway 35 to Chatt Road overpass, 0.5 mile east on Chatt Road, 1.65 miles south on Old Abbott Road, 0.3 mile east on dirt road across railroad, 1,000 feet south in field and about 50 feet east of railroad right-of-way:

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) clay, very dark grayish brown (10YR 3/2) moist; moderate medium blocky and fine granular structure; very hard, firm, plastic; few fine roots; few fine pores; few rounded quartz pebbles; calcareous; moderately alkaline; clear smooth boundary.

A1—8 to 17 inches; dark brown (7.5YR 4/2) clay, dark brown (7.5YR 3/2) moist; strong coarse subangular blocky structure; very hard, firm, plastic; few fine roots; common medium pores; few dark worm casts; a few small pressure faces in lower part; few quartz pebbles; few concretions of calcium carbonate; calcareous; moderately alkaline; gradual smooth boundary.

B21—17 to 27 inches; reddish brown (5YR 5/4) clay, reddish brown (5YR 4/4) moist; strong fine and medium subangular blocky structure; very hard, firm, plastic; few fine roots; few medium pores; few dark brown channels and worm casts; few small slickensides that do not intersect; few concretions of calcium carbonate; few quartz pebbles; calcareous; moderately alkaline; gradual smooth boundary.

B22ca—27 to 49 inches; reddish yellow (7.5YR 6/6) clay, strong brown (7.5YR 5/6) moist; moderate medium subangular blocky structure; very hard, firm, plastic; few fine roots; few dark reddish brown clay balls as much as 1 inch in diameter; common soft bodies of calcium carbonate; common concretions of calcium carbonate; few quartz pebbles; calcareous; moderately alkaline; gradual smooth boundary.

B23ca—49 to 80 inches; reddish yellow (7.5YR 6/6) clay loam, strong brown (7.5YR 5/6) moist; weak fine subangular blocky structure; hard, firm, slightly plastic; few dark reddish brown clay balls as much as 1 inch in diameter; common concretions of calcium carbonate; common quartz pebbles; calcareous; moderately alkaline; gradual smooth boundary.

The solum ranges from 40 to more than 60 inches in thickness. Total clay content of the control section ranges from 40 to 60 percent. Content of silicate clay exceeds 35 percent. The weighted calcium carbonate equivalent of the control section ranges from 40 to 55 percent. Content of visible soft bodies of calcium carbonate ranges from 5 to 20 percent of the soil mass between depths of 30 and more than 50 inches. Content of pebbles less than 0.75 inch in diameter ranges from 0 to 15 percent. Pressure faces and small slickensides are common.

The Ap and A1 horizons are dark grayish brown, dark brown, dark gray, very dark gray, very dark grayish brown, or reddish brown. They are calcareous and moderately alkaline. They range from 12 to 18 inches in thickness.

The B21 horizon is reddish brown, yellowish red, reddish yellow, brown, or strong brown. It is moderately alkaline and is noncalcareous in many pedons.

The B22ca and B23ca horizons are reddish yellow, brown, or strong brown. They are calcareous and moderately alkaline.

The Cca horizon, where present, is mottled light gray, light brownish gray, yellow, and brownish yellow. It is calcareous and moderately alkaline. In places it is underlain by strata of sand and gravel.

Chickasha Variant

The Chickasha Variant consists of deep, loamy soils that formed in loamy sediments high in content of lime. These soils are on uplands and have slopes that range from 3 to 8 percent. This series differs from the Chickasha series in having calcium carbonates at a depth shallower than defined in the range for the Chickasha series.

Typical pedon of Chickasha Variant fine sandy loam, 3 to 8 percent slopes, from intersection of Texas Highways 31 and 171 in Hubbard, 2.5 miles west on Texas Highway 31, on the south side of the road in meadow area on west side of the Hubbard City Lake, 500 feet south of Texas Highway 31 near a lone post oak tree on an east-facing slope supporting native grass:

A1—0 to 9 inches; dark grayish brown (10YR 4/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine subangular blocky structure; hard, friable, slightly sticky; many fine roots; few organic stains; few worm casts; medium acid; clear smooth boundary.

B21t—9 to 14 inches; dark grayish brown (10YR 4/2) sandy clay loam, very dark grayish brown (10YR 3/2) moist; many fine distinct mottles of brownish yellow (10YR 6/6); weak fine subangular blocky structure; hard, firm, sticky and slightly plastic; many fine roots; common medium pores; organic stains on peds; few worm casts; common clay films; medium acid; gradual smooth boundary.

B22t—14 to 27 inches; brown (10YR 5/3) sandy clay loam, dark brown (10YR 4/3) moist; few medium distinct mottles of olive yellow (2.5Y 6/6); weak medium subangular blocky structure; very hard, very firm, sticky and plastic; many fine roots; common fine pores; common clay films on peds; small pressure faces; few very fine threads of calcium carbonate in lower part; neutral; gradual smooth boundary.

B31ca—27 to 32 inches; light olive brown (2.5Y 5/4) clay loam, olive brown (2.5Y 4/4) moist; weak coarse blocky structure; hard, firm, plastic; common clay films and pressure faces; common soft bodies of calcium carbonate; calcareous; moderately alkaline; gradual smooth boundary.

B32ca—32 to 44 inches; coarsely mottled light olive brown (2.5Y 5/4) and olive brown (2.5Y 4/4) clay loam; weak coarse blocky structure; hard, firm, plastic; many clay films and small pressure faces; common soft bodies of calcium carbonate; calcareous; moderately alkaline; gradual smooth boundary.

C1r—44 to 76 inches; coarsely mottled light olive gray (5Y 6/2) and olive yellow (5Y 6/6) clayey shale; thin platy structure; very hard, firm, plastic; common soft bodies of calcium carbonate; calcareous; moderately alkaline; gradual smooth boundary.

C2r—76 to 80 inches; mottled light olive gray (5Y 6/2) and olive yellow (5Y 6/6) clayey shale, olive (5Y 5/6) dry; thin platy structure; hard, firm, plastic; common soft bodies of calcium carbonate; calcareous; moderately alkaline.

The solum ranges from 40 to 80 inches in thickness. Bodies of soft calcium carbonate occur at a depth of 30 inches.

The A horizon is dark grayish brown, dark brown, or grayish brown, and dark reddish gray in some eroded areas. Texture is fine sandy loam. The A horizon averages about 9 inches in thickness. It is noncalcareous. Reaction is generally slightly acid or medium acid but ranges through moderately alkaline.

The B21t and B22t horizons are brown or dark grayish brown with mottles of light yellowish brown, olive yellow, light olive brown, pale olive, and yellow. Texture ranges from sandy clay loam to clay loam, and clay skins are few to common. There are few to common concretions of calcium carbonate in the lower part of the B22t horizon. Reaction ranges from medium acid through neutral.

The B31ca horizon is light olive brown or olive brown clay loam or sandy clay loam. It contains common soft bodies of calcium carbonate at a depth of about 30 inches. There are few to common clay skins and pressure faces. Reaction is mildly alkaline or moderately alkaline.

The B32ca horizon contains coarse mottles of light olive brown, grayish brown, olive brown, and olive yellow. It has the same ranges in texture and reaction as the B31ca horizon.

The Clr horizon is coarsely mottled clayey shale. It is light gray, olive gray, olive, and olive yellow. It contains common soft bodies of calcium carbonate, is calcareous, and is moderately alkaline.

Coving series

The Coving series consists of deep, sandy soils on uplands. These soils formed in shallow drainageways which have received recent sediments. These shallow drainageways have low gradients and nearly level to gently sloping side slopes. Slopes range up to about 4 percent but generally are less than 2 percent.

Typical pedon of Coving loamy fine sand in an area of Coving-Vaughan complex, 0 to 2 percent slopes, from the intersection of Farm Road 933 and Texas Highway 22 in Whitney, 4.5 miles north on Farm Road 933 to second road to the east, 2.7 miles east, site is on north side of road in sloping drainageway in idle cropland:

Ap—0 to 7 inches; brown (7.5YR 5/4) loamy fine sand, dark brown (7.5YR 4/4) moist; weak coarse blocky structure parting to fine granular; soft, very friable; many fine roots; common very dark brown stains; neutral; clear smooth boundary.

A2—7 to 28 inches; pink (7.5YR 7/4) loamy fine sand, light brown (7.5YR 6/4) moist; massive; loose, very friable; many fine roots; common very dark brown stains; neutral; gradual smooth boundary.

B21t—28 to 46 inches; common coarsely mottled brown (7.5YR 5/4), reddish brown (5YR 5/4), and gray (10YR 5/1) loam; moderate coarse subangular blocky structure; soft, very friable, sticky; many fine roots; clay films on surfaces of peds; medium acid; gradual wavy boundary

B22t—46 to 66 inches; mottled very dark grayish brown (10YR 3/2), light yellowish brown (10YR 6/4), and gray (10YR 6/1) clay loam; moderate coarse subangular blocky structure; very friable; few fine roots; clay films on surfaces of peds; common black concretions; neutral.

B3—66 to 76 inches; light olive gray (5Y 6/2) sandy clay loam, olive gray (5Y 5/2) moist; many medium distinct mottles of reddish yellow (7.5YR 6/8, moist) and strong brown (7.5YR 5/8, moist); weak coarse subangular blocky structure; very friable; few fine roots; ped surfaces have thin coatings of uncoated sand and silt; few soft black concretions; mildly alkaline.

The solum ranges from 60 to more than 80 inches in thickness. Clay content of the upper 20 inches of the Bt horizon ranges from 18 to 30 percent. The soil is medium acid through mildly alkaline and is noncalcareous.

The A and A2 horizons range from 20 to 40 inches in combined thickness. The Ap horizon is brown or light brown. The A2 horizon is pink, light brown, or grayish brown and contains mottles of browns and grays in some pedons.

The B21t horizon has textures ranging from loam to sandy clay loam. It is mottled brown, reddish brown, gray, light brown, pale brown, brownish yellow, yellow, and red.

The B22t horizon has textures of sandy clay loam or clay loam. It is mottled gray, light gray, light olive brown, olive yellow, very dark grayish brown, light yellowish brown, brownish yellow, yellow, reddish yellow, and red.

The B3 horizon has textures of sandy clay loam, clay loam, or sandy clay. It is mottled light olive gray, gray, light gray, brown, brownish yellow, and reddish yellow.

Crockett series

The Crockett series consists of deep, loamy soils that formed in clayey material on uplands. Slopes are 0 to 3 percent.

Typical pedon of Crockett fine sandy loam, 1 to 3 percent slopes, from Texas Highway 31 in Mount Calm, 0.65 mile north on dirt road, 0.25 mile west, and 100 feet south of road in old field pasture:

Ap—0 to 7 inches; pale brown (10YR 6/3) fine sandy loam, dark yellowish brown (10YR 4/4) moist; very pale brown (10YR 7/3) surface crust; weak medium blocky structure; hard, friable; few fine roots; few pebbles; slightly acid; abrupt wavy boundary.

B21t—7 to 19 inches; coarsely mottled reddish brown (5YR 4/4), dark reddish brown (5YR 3/4, moist), reddish yellow (5YR 6/8), yellowish red (5YR 5/8, moist), and brown (10YR 5/3; 10YR 4/3, moist) clay; moderate coarse blocky structure; extremely hard, extremely firm, plastic; few fine roots; few very fine pores; cracks 0.25 inch wide in upper part; medium acid; gradual smooth boundary.

B22t—19 to 41 inches; coarsely mottled olive yellow (2.5Y 6/6), yellow (10YR 7/8), grayish brown (10YR 5/2), and reddish yellow (5YR 6/8) clay; moderate coarse blocky structure; extremely hard, extremely firm, plastic; few fine roots; common slickensides; few black concretions; medium acid; gradual smooth boundary.

B3ca—41 to 60 inches; mottled grayish brown (2.5Y 5/2) and olive yellow (2.5Y 6/6) clay; moderate coarse blocky structure; extremely hard, extremely firm, plastic; few fine roots; common slickensides; few black concretions; 20 to 30 percent by volume soft bodies and concretions of calcium carbonate; calcareous; moderately alkaline; gradual smooth boundary.

C—60 to 70 inches; mottled gray (N 6/0), and yellow (2.5Y 7/8, 10YR 7/6) clay; thin platy structure; extremely hard, extremely firm, plastic; few soft bodies of calcium carbonate; becomes platy and shaly in lower part; calcareous; moderately alkaline.

The solum ranges from 40 to 60 inches in thickness. Concretions of calcium carbonate are below a depth of 40 inches. Black concretions are below a depth of about 12 inches in some pedons, and gypsum crystals and soft bodies of calcium carbonate are below a depth of 40 inches in some.

The A horizon is fine sandy loam less than 10 inches thick in more than half of the pedons. It ranges from medium acid through neutral. It is light brown, pale brown, brown, or dark brown. It has an abrupt lower boundary, but in some troughs under areas having a thicker surface layer, it has a clear boundary.

The B21t horizon is mottled reddish brown, reddish yellow, brown, and dark red. It is clay or clay loam and has clay content of 35 to 50 percent. It is slightly acid or medium acid, and some pedons contain a few pebbles.

The B22t horizon is mottled olive yellow, olive, reddish brown, light olive brown, yellow, brownish yellow, grayish brown, and reddish yellow clay. It is slightly acid or medium acid.

The B3ca horizon is mottled grayish brown, olive yellow, and light olive brown. The content of soft calcium carbonate in this horizon ranges to as much as about 30 percent. Clay content ranges from 35 to 50 percent, and the amount of pebbles ranges to as much as about 3 percent in some pedons. The soil is calcareous in many pedons, and reaction ranges from slightly acid through moderately alkaline.

The C horizon has texture ranging from sandy clay loam to shaly clay. It is mottled gray, yellow, brownish yellow, and light olive brown. It is calcareous in about half of the pedons, and reaction is mildly alkaline or moderately alkaline.

Crosstell series

The Crosstell series consists of deep, loamy soils on uplands. These soils formed in clayey material underlain by shale. Slopes range from 5 to 12 percent.

Typical pedon of Crosstell fine sandy loam, 5 to 12 percent slopes, from the intersection of Texas Highway 22 and Farm Road 3050, 2 miles west of Peoria, 4.5 miles north on Farm Road 3050, and about 0.75 mile west of road in wooded area:

A1—0 to 5 inches; dark brown (7.5YR 4/2) fine sandy loam, dark brown (7.5YR 3/2) moist; thin light brown (7.5YR 6/4) surface crust; moderate coarse blocky structure; slightly hard, very friable, sticky; many fine roots, few large roots; slightly acid; abrupt wavy boundary.

B21t—5 to 16 inches; reddish yellow (5YR 6/6) clay, yellowish red (5YR 5/6) moist; common medium distinct mottles of yellow (10YR 7/6); moderate coarse blocky structure; very hard, very firm, very plastic; few medium roots; few fine pores; prominent clay films on faces of peds; many cracks; strongly acid; gradual smooth boundary.

B22t—16 to 28 inches; yellowish red (5YR 5/6) clay; yellowish red (5YR 4/6) moist; common fine distinct mottles of yellow; moderate coarse blocky structure; extremely hard, extremely firm, very plastic; few medium roots; prominent clay films and pressure faces; few black concretions; few chert pebbles; many cracks; strongly acid; gradual smooth boundary.

B23t—28 to 38 inches; reddish brown (5YR 5/4) clay; reddish brown (5YR 4/4) moist; common fine distinct mottles of pale olive; moderate coarse blocky structure; extremely hard, extremely firm, very plastic; few coarse roots; common clay films; common black concretions; common slickensides; many cracks; few chert pebbles; medium acid; gradual smooth boundary.

B3—38 to 46 inches; coarsely and prominently mottled pale olive (5Y 6/4), olive yellow (5Y 6/6), and light yellowish brown (10YR 6/4) clay; moderate coarse blocky structure; extremely hard, extremely firm, very plastic; common clay films and pressure faces; few black concretions; few gypsum crystals; moderately alkaline; gradual smooth boundary.

C1—46 to 54 inches; prominently and coarsely mottled olive (5Y 5/4), olive yellow (5Y 5/6), light brownish gray (2.5Y 6/2), and light yellowish brown (10YR 6/4) shaly clay; extremely hard, extremely firm, very plastic; few black concretions as much as 5 millimeters across; few gypsum crystals; few pebbles; moderately alkaline; gradual smooth boundary.

Cr—54 to 70 inches; mottled gray (N 6/0) and brownish yellow (10YR 6/8) shale; extremely hard, extremely firm, very plastic; few bodies of segregated iron; few soft bodies of calcium carbonate; many gypsum crystals; few pebbles; moderately alkaline; matrix is noncalcareous.

The solum ranges from 40 to 60 inches in thickness.

The A horizon ranges from 4 to 8 inches in thickness. The horizon is noncalcareous, and reaction ranges from medium acid through mildly alkaline. The A horizon is brown, pinkish gray, light brown, dark grayish brown, grayish brown, yellowish brown, light brownish gray, pale brown, or light yellowish brown. Thw lower boundary is abrupt in most places, but in some troughs it is clear.

Clay content in the B21t and B22t horizons ranges from 40 to 60 percent. These horizons are reddish brown, light reddish brown, red, brown, strong brown, or reddish yellow and are mottled with yellow, dark grayish brown, and olive. They are strongly acid through moderately alkaline. Most pedons are noncalcareous, but a few are calcareous below a depth of about 30 inches. Black concretions are common in the lower part.

The B23t and B3 horizons have about the same range in color as the B21t and B22t horizons but include mottles of pale olive, olive yellow, and light yellowish brown. There are few to common black concretions and gypsum crystals. These horizons range from medium acid in the upper part through moderately alkaline in the lower part.

The C horizons are coarsely mottled olive, olive yellow, light brownish gray, gray, and brownish yellow. They are stratified clay, shale, and weakly cemented sandstone. They are neutral through moderately alkaline. Black concretions and gypsum crystals are common, and a few soft bodies of calcium carbonate occur in the lower part below a depth of about 60 inches.

Culp series

The Culp series consists of deep, loamy soils on uplands. These soils formed in loamy and clayey sediments on old high terraces. Slopes range from 1 to 3 percent.

Typical pedon of Culp clay loam, 1 to 3 percent slopes, from the intersection of Texas Highway 22 and Farm Road 1947 in Peoria, 1 block south on Farm Road 1947, 1.0 mile east on rock road to iron bridge, 0.5 mile east from bridge, 0.5 mile south onto field road, and 100 feet east of field road in cropland and 100 feet from south end of field:

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) moist; moderate coarse blocky structure; hard, friable; few fine roots; few medium pores; few smooth quartz pebbles as much as about 0.5 inch in diameter; neutral; clear smooth boundary.

B21t—7 to 18 inches; dark grayish brown (10YR 4/2) sandy clay loam, very dark brown (10YR 2/2) moist; few fine faint brown mottles; moderate coarse blocky structure; hard, firm, plastic; few fine roots; few fine pores; common clay films on faces of peds; few smooth quartz pebbles as much as about 0.5 inch in diameter; slightly acid; gradual smooth boundary.

B22t—18 to 44 inches; dark brown (10YR 4/3) sandy clay, dark brown (10YR 3/3) moist; coarse distinct mottles of dark grayish brown (2.5Y 4/2); strong coarse blocky structure; very hard, extremely firm, plastic; prominent clay films on faces of peds; few fine black concretions; few smooth quartz pebbles as much as about 0.5 inch in diameter; mildly alkaline; gradual smooth boundary.

B23t—44 to 57 inches; mottled light olive brown (2.5Y 5/4) and dark grayish brown (2.5Y 4/2) clay loam; strong coarse blocky structure; very hard, extremely firm, plastic; common clay films on faces of peds; many fine concretions of calcium carbonate; a few black concretions; few smooth quartz pebbles as much as about 0.5 inch in diameter; calcareous; moderately alkaline; gradual wavy boundary.

B3ca—57 to 73 inches; mottled light yellowish brown (2.5Y 6/4), olive yellow (2.5Y 6/6), and brownish gray (10YR 4/2) clay loam; strong coarse blocky structure; very hard, very firm, plastic; common concretions of calcium carbonate; few soft masses of calcium carbonate; few black concretions; few smooth quartz pebbles as much as about 0.5 inch in diameter; calcareous; moderately alkaline; clear smooth boundary.

The solum ranges from 50 to more than 80 inches in thickness. Reaction ranges from neutral through moderately alkaline. There are few to common pebbles throughout the pedon.

The A horizon ranges from 5 to 14 inches in thickness. It is dark brown, dark grayish brown, or very dark grayish brown.

The B21t horizon is very dark gray, dark gray, dark grayish brown, very dark grayish brown, dark brown, dark reddish brown, or dark reddish gray and is mottled with reddish yellow, reddish brown, brown, or light yellowish brown. It is clay, clay loam, or sandy clay loam.

The B22t horizon is dark brown, dark grayish brown, olive, very dark grayish brown, brown, or yellowish brown and is mottled with reddish yellow, dark brown, grayish brown, or light olive brown. It is clay, sandy clay, or clay loam.

The B23t horizon is mottled light olive brown, olive, dark grayish brown, or olive yellow. It is clay, sandy clay, or clay loam.

The B3ca horizon is mottled light yellowish brown, olive yellow, brownish gray, olive brown, light olive brown, or dark grayish brown. It is clay, sandy clay, or clay loam.

Denton series

The Denton series consists of moderately deep, clayey soils formed in shallow valleys on uplands. These soils developed in calcareous material underlain by limestone or interbedded marls. Slopes are 1 to 3 percent.

Typical pedon of Denton clay, 1 to 3 percent slopes, 4.0 miles south from Blum on Farm Road 933, 3.0 miles west on rock road, 0.5 mile south of road in native grass area:

A11—0 to 11 inches; dark grayish brown (10YR 4/2) clay, very dark grayish brown (10YR 3/2) moist; strong coarse blocky and medium granular structure; very hard, very firm, plastic; many fine roots; many medium pores; few concretions of calcium carbonate; calcareous; moderately alkaline; gradual smooth boundary.

A12—11 to 18 inches; dark grayish brown (10YR 4/2) clay, very dark grayish brown (10YR 3/2) moist; moderate coarse blocky structure; very hard, very firm, plastic; many fine roots; common medium pores; few pressure faces; few small shells; few chips of limestone; calcareous; moderately alkaline; gradual smooth boundary.

Bca—18 to 29 inches; light brownish gray (10YR 6/2) clay, grayish brown (10YR 5/2) moist; strong coarse subangular blocky and medium granular structure; very hard, very firm, plastic; many fine roots; common fine pores; few small concretions of calcium carbonate; few black concretions; few fine pebbles; calcareous; moderately alkaline; gradual smooth boundary.

B3ca—29 to 35 inches; pale olive (5Y 6/3) clay, olive (5Y 5/3) moist; common medium faint mottles of light yellowish brown (2.5Y 6/4); moderate coarse subangular blocky structure; very hard, very firm, plastic; common fine roots; common concretions of calcium carbonate; few black concretions; few pressure faces; few snail shells; calcareous; moderately alkaline; clear wavy boundary.

Cca—35 to 39 inches; coarsely mottled white (10YR 8/2) and pale brown (10YR 6/3) clay loam; thin plates; hard, firm; calcareous; moderately alkaline; clear wavy boundary.

R—39 to 50 inches; hard fractured limestone.

The solum ranges from 22 to 40 inches in thickness. It is underlain by limestone interbedded with marly clays. The soil is calcareous clay. There are few to common fragments of limestone smaller than 3 inches in cross section. Content of carbonates in the Bca horizon ranges from 15 to 40 percent of the fine earth material.

The A horizon is brown, dark brown, or dark grayish brown and has combined thickness of as much as about 30 inches.

The Bca horizon is light brownish gray, dark grayish brown, dark brown, or brown.

The B3ca horizon is pale olive, olive, pale brown, grayish brown, light brownish gray, or light yellowish brown.

The Cca horizon is mottled white and pale brown clay loam, silty clay, or clay.

The Denton series as mapped in Hill County is a taxadjunct to the Denton series in that the calcium carbonate equivalent is slightly higher than defined in the range for the series.

Eddy series

The Eddy series consists of very shallow, clay loam soils that formed in soft, chalky limestone on uplands. These thin soils are very gravelly and contain many platy fragments of chalk. Slopes range from 1 to 8 percent.

Typical pedon of Eddy very gravelly clay loam, 3 to 8 percent slopes, from the intersection of Interstate Highway 35E and Farm Road 934, 4.15 miles north on Farm Road 934, 1.2 miles east on rock road, on north side of road on west-facing slope:

A1—0 to 6 inches; dark grayish brown (10YR 5/2) very gravelly clay loam, very dark grayish brown (10YR 4/2) moist; strong medium granular structure; hard, friable, sticky and plastic; many fine roots; many fine pores; common worm casts; about 35 percent by volume of platy to subangular fragments of hard chalk as much as 3 inches in cross section; calcareous; moderately alkaline; abrupt irregular boundary.

A&C—6 to 9 inches; platy fragments of chalk, about 45 percent of the horizon is fine clay loam filling the interstices. The fine earth is brown (7.5YR 5/2) grading to light brown (7.5YR 6/4) in the lower part; strong fine granular structure; hard, friable, sticky; many fine roots between the platy chalk fragments; calcareous; moderately alkaline; diffuse lower boundary.

Cr—9 to 60 inches; white (10YR 8/2) thick bedded marine chalk consisting of alternating hard and soft layers. The hard layers are coarsely fractured.

The solum ranges from 4 to 10 inches in thickness. It is 40 to 60 percent, by volume, thin fragments of chalky limestone. These fragments are mainly less than about 3 inches in cross section, and most are less than 1 inch across. Clay content ranges from 18 to 35 percent and is about 30 percent in most pedons. The soil is calcareous and moderately alkaline. The chalk fragments and chalky bedrock range from 1 to less than 3 on Mohs' scale. The bedrock is coarsely fractured in most areas.

The A horizon is dark grayish brown, brown, grayish brown, or strong brown and grades to light brown, light brownish gray, or pale brown in the A&C horizon. The chalky C horizon is white, but individual fragments are stained in some pedons.

Eufaula series

The Eufaula series consists of deep, sandy soils on uplands. These soils formed in thick beds of sandy sediments. Slopes range from 1 to 5 percent.

Typical pedon of Eufaula fine sand, 1 to 5 percent slopes, from Woodbury 3.0 miles west, 2.5 miles north, 0.5 mile east on field road, and 0.25 mile north in wooded area:

A11—0 to 6 inches; brown (10YR 5/3) fine sand, dark brown (10YR 4/3) moist; single grained; loose, very friable; many fine and coarse roots; partly decomposed leaf mold and organic stains; few snail shells; neutral; clear smooth boundary.

A12—6 to 26 inches; pink (7.5YR 7/4) loamy fine sand, brown (7.5YR 5/4) moist; single grained; loose, very friable; many fine roots; medium acid; gradual smooth boundary.

A2&B21t—26 to 60 inches; reddish yellow (7.5YR 7/6) loamy fine sand, strong brown (7.5YR 5/6) moist (A2); reddish yellow (5YR 6/6) lamellae (B2t); single grained; loose, very friable; many fine and coarse roots; medium acid; gradual smooth boundary.

B22t—60 to 80 inches; brownish yellow (10YR 6/6) loamy fine sand, yellowish brown (10YR 5/6) moist; reddish yellow (7.5YR 6/8) discontinuous lamellae of sandy clay loam; single grained; slightly hard, very friable; few coarse roots; medium acid; gradual smooth boundary.

The solum ranges from 72 to more than 100 inches in thickness.

The A11 or A12 horizons are brown, dark brown, dark grayish brown, pale brown, very pale brown, light yellowish brown, or brownish yellow. They are medium acid through neutral.

The A2&B21t horizon is reddish yellow, brown, light brown, or strong brown. It is fine sand or loamy fine sand and has thin lamellae. It is medium acid or slightly acid.

The B22t horizon is brownish yellow, yellowish brown, reddish brown, or reddish yellow. It is medium acid or slightly acid.

Ferris series

The Ferris series consists of deep, clayey soils on uplands. These soils formed in calcareous marine sediments of shaly clay. Slopes range from 2 to 20 percent.

Typical pedon of Ferris clay, 5 to 12 percent slopes, in the center of a microdepression, from the intersection of Farm Road 308 and Texas Highway 171 in Malone, 3.65 miles north on Farm Road 308, 0.1 mile southwest, 1.3 miles northwest on a county road, and 100 feet east in a cultivated field:

Ap—0 to 4 inches; light olive brown (2.5Y 5/4) clay, olive brown (2.5Y 4/4) moist; moderate coarse blocky and fine granular structure; very hard, very firm, plastic; few fine roots; few fine pores; few concretions of calcium carbonate; many cracks; calcareous; moderately alkaline; abrupt smooth boundary.

A1—4 to 9 inches; light olive brown (2.5Y 5/4) clay, olive brown (2.5Y 4/4) moist; strong coarse blocky structure; very hard, very firm, plastic; few fine roots; few fine pores; few concretions of calcium carbonate; many cracks; calcareous; moderately alkaline; gradual smooth boundary.

AC1—9 to 22 inches; light olive brown (2.5Y 5/4) clay, olive brown (2.5Y 4/4) moist; few faint olive yellow (2.5Y 6/8) mottles; moderate coarse blocky structure; very hard, very firm, plastic; few fine roots; few black concretions; few concretions of calcium carbonate; slickensides in lower part; calcareous; moderately alkaline; gradual smooth boundary.

AC2—22 to 38 inches; light olive brown (2.5Y 5/4) clay, olive brown (2.5Y 4/4) moist; few medium faint olive yellow (2.5Y 6/8) mottles; moderate coarse blocky structure; very hard, extremely firm, plastic; few black concretions; few concretions of calcium carbonate; few soft bodies of calcium carbonate; few gypsum crystals; common large slickensides; calcareous; moderately alkaline; gradual smooth boundary.

C1—38 to 60 inches; mottled light olive brown (2.5Y 5/4), gray (N 6/0), and yellow (2.5Y 7/8) shaly clay; massive; very hard, very firm, plastic; many soft bodies of calcium carbonate; few black concretions; few gypsum crystals; calcareous; moderately alkaline; gradual smooth boundary.

The solum ranges from 30 to 65 inches in thickness. Clay content ranges from 40 to 60 percent in the control section. There are few to common thin fragments of brown limestone. Content of calcium carbonates ranges to as much as 35 percent in the lower part of the AC horizon and in the C horizon, and there are few to many gypsum crystals. Prominent slickensides are common. The soil is calcareous throughout and moderately alkaline.

The A horizon is light olive brown, olive, pale olive, olive gray, or grayish brown. Some pedons have a very dark grayish brown surface layer less than about 6 inches thick.

The AC horizon is grayish brown, olive gray, olive, yellowish brown, light olive brown, olive yellow, brownish yellow, or yellow.

The C horizon is similar to the AC horizon in color but also has coarse mottles of olive gray and yellow.

Gasil series

The Gasil series consists of deep, loamy soils that formed in weathered beds of loamy material and interbedded sandstone on uplands. Slopes are 1 to 5 percent.

Typical pedon of Gasil fine sandy loam, 1 to 3 percent slopes, from Hillsboro, 8.0 miles west on Texas Highway 22, 4.5 miles north on Farm Road 3050, and about 150 feet east of road on south-facing slope in old field:

Ap—0 to 7 inches; brown (10YR 5/3) fine sandy loam, dark brown (10YR 4/3) moist; moderate coarse subangular blocky and granular structure; friable, slightly sticky; few fine roots; few pebbles; slightly acid; clear smooth boundary.

A2—7 to 13 inches; very pale brown (10YR 7/4) fine sandy loam, light yellowish brown (10YR 6/4) moist; moderate fine granular structure; friable, slightly sticky; few fine roots; few pebbles; slightly acid; clear smooth boundary.

B21t—13 to 23 inches; brownish yellow (10YR 6/8) sandy clay loam, yellowish brown (10YR 5/8) moist; few medium prominent red (10YR 5/6, 2.5YR 5/6) mottles; weak fine subangular blocky structure; firm, slightly plastic; few fine roots; common medium pores; few patchy clay films; few pebbles; medium acid; gradual smooth boundary.

B22t—23 to 30 inches; brownish yellow (10YR 6/8) sandy clay loam; prominent coarse mottles of reddish yellow (7.5YR 6/8, 5YR 6/6); weak fine subangular blocky structure; firm, slightly plastic; few fine roots; few medium pores; few patchy clay films; uncoated sand grains on faces of peds; sand flows are light gray and less clayey than redder areas; medium acid; gradual smooth boundary.

B23t&A'2—30 to 55 inches; mottled light gray (10YR 7/2), yellow (10YR 7/6), and red (10YR 5/6) sandy clay loam; weak prismatic structure in upper part becoming strong coarse prismatic in lower part; firm, slightly plastic; few fine roots; tongues and streaks of A'2 material as much as 1 inch wide make up from 10 to 20 percent of the volume; few red concretions; roots follow gray sand tonguing; few ironstone pebbles; few siliceous pebbles; strongly acid; gradual smooth boundary.

B24t&A'2—55 to 78 inches; mottled reddish yellow (5YR 6/8), white (10YR 8/2), and red (10R 5/6) sandy clay loam; weak fine subangular blocky structure; friable, sticky; about 50 to 75 percent is A'2 horizon; few fragments of red soft sandstone; strongly acid; clear wavy boundary.

The solum ranges from 60 to more than 100 inches in thickness. The combined thickness of the A and A2 horizons is less than 20 inches. Texture is fine sandy loam.

The A horizon is noncalcareous and ranges from slightly acid through mildly alkaline. Pebbles of ironstone range from few to common to this horizon. The A horizon is brown, pale brown, light yellowish brown, yellowish brown, dark yellowish brown, and very pale brown.

The B2t horizon is sandy clay loam or light sandy clay loam. Clay content is 18 to 30 percent in the control section. The B21t and B22t horizons are brownish yellow, yellowish brown, brown, strong brown, reddish yellow, light yellowish brown, very pale brown, or yellow with mottles of red, reddish yellow, yellowish red, and brown. They are slightly acid through strongly acid. Clay films range from patchy to many. Content of pebbles ranges to about 5 percent in some pedons. There are few to common pockets and strata of clean sand.

The B23t&A'2 and B24t&A'2 horizons are sandy clay loam. They are medium acid or strongly acid. The B23t&A'2 horizon is mottled light gray, yellow, and red, and the B24t&A'2 horizon is mottled reddish yellow, white, and red. A'2 material makes up from 10 to 20 percent of the B23t horizon and from 50 to 75 percent of the B24t horizon.

The IIC horizon, where present, is light brownish gray and has coarse mottles of yellow. It is medium acid or strongly acid.

Gowen series

The Gowen series consists of deep, loamy soils. These nearly level soils formed in noncalcareous loamy sediments in flood plains throughout the county. Slopes range from 0 to 1 percent.

Typical pedon of Gowen clay loam, frequently flooded, from Peoria 2.0 miles south on Farm Road 1947, 2.0 miles west, 0.5 mile south, and about 0.5 mile east of road in wooded flood plain:

A11—0 to 23 inches; dark grayish brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) moist; moderate coarse blocky structure; hard, firm, slightly plastic; many large roots; many fine pores; moderately alkaline; gradual smooth boundary.

A12—23 to 34 inches; dark brown (10YR 4/3) clay loam, dark brown (10YR 3/3) moist; moderate coarse blocky structure; hard, firm, sticky and slightly plastic; many large roots; many fine pores; moderately alkaline; gradual smooth boundary.

C1—34 to 46 inches; yellowish brown (10YR 5/4) clay loam, dark yellowish brown (10YR 4/4) moist; massive; thin bedding planes; hard, firm, slightly plastic; few large roots; moderately alkaline; gradual smooth boundary.

C2—46 to 56 inches; very dark grayish brown (10YR 3/2) clay loam, very dark brown (10YR 2/2) moist; thin bedding planes; hard, firm, slightly plastic; few large roots; moderately alkaline; clear wavy boundary.

IIC—56 to 70 inches; coarsely mottled dark grayish brown (10YR 4/2), dark brown (10YR 4/3), light yellowish brown (10YR 6/4), and yellow (10YR 7/6) clay loam; massive; hard; moderately alkaline.

The surface horizons range from 24 to 50 inches in thickness. Clay content in the control section ranges from 22 to 35 percent.

The A11 horizon is dark grayish brown, very dark grayish brown, dark gray, grayish brown, dark brown, or brown. It is neutral through moderately alkaline and is noncalcareous. Texture is clay loam.

The A12 horizon is dark brown, brown, or strong brown. It is noncalcareous and ranges from neutral through moderately alkaline. Texture is loam or clay loam.

The C1 and C2 horizons are noncalcareous loam or clay loam. They range from neutral through moderately alkaline. These horizons are yellowish brown, dark yellowish brown, dark brown, or very dark grayish brown.

The IIC horizon is coarsely mottled dark grayish brown, dark brown, light yellowish brown, and yellow clay loam or light clay. It is noncalcareous and is neutral through moderately alkaline.

Heiden series

The Heiden series consists of deep, clayey soils that formed in calcareous marine sediments on uplands. Slopes range from 1 to 8 percent.

Typical pedon of Heiden clay, 1 to 3 percent slopes, 2.55 miles northwest from Malone on Texas Highway 171, 1.2 miles west on gravel road, and 100 feet north of road in cropland:

Ap—0 to 6 inches; dark grayish brown (10YR 4/2) clay, very dark grayish brown (10YR 3/2) moist; moderate coarse blocky structure; very hard, very firm, plastic; few fine roots; few fine pores; thin gray surface crust; few medium pebbles; few concretions of calcium carbonate; calcareous; moderately alkaline; abrupt smooth boundary.

A12—6 to 26 inches; dark grayish brown (2.5Y 4/2) clay, very dark grayish brown (2.5Y 3/2) moist; few streaks of dark grayish brown (10YR 4/2); moderate coarse blocky structure; very hard, very firm, plastic; few fine roots; few fine pores; common pressure faces; few medium pebbles; few concretions of calcium carbonate; calcareous; moderately alkaline; gradual smooth boundary.

AC1—26 to 38 inches; mottled dark grayish brown (2.5Y 4/2) and olive gray (5Y 5/2) clay; moderate coarse blocky structure; very hard, very firm, plastic; few fine roots; common coarse slickensides; many fine concretions of calcium carbonate; common black concretions; few gypsum crystals; calcareous; moderately alkaline; gradual smooth boundary.

AC2—38 to 58 inches; light olive brown (2.5Y 5/4) clay, olive brown (2.5Y 4/4) moist; few streaks of dark grayish brown (10YR 4/2) and brownish yellow (10YR 6/6); moderate coarse blocky structure; very hard, very firm, plastic; common coarse slickensides; many concretions of calcium carbonate; common black concretions; common soft bodies of calcium carbonate; few gypsum crystals; calcareous; moderately alkaline; gradual smooth boundary.

C—58 to 66 inches; light olive brown (2.5Y 5/4) clay, olive brown (2.5Y 4/4) moist; many fine distinct mottles of yellow and few medium distinct mottles of dark grayish brown (2.5Y 4/2); massive; very hard, very firm, plastic; calcareous; moderately alkaline.

These soils consist of a series of microknolls, or ridges, and microdepressions, or valleys. The combined thickness of the A and AC horizons ranges from 40 to 65 inches. The solum is thinnest on the knolls and thickest in the depressions. This pattern of microhighs and microlows is rounded in the less sloping areas and becomes elongated and oriented with the slope in the more rolling areas. Clay content in the control section is 40 to 60 percent. There are few to common concretions of calcium carbonate. There are few to many black concretions and gypsum crystals in the lower part of the AC horizon. There are few to common prominent slickensides and parallelepipeds below the surface layer, and few to common soft bodies of calcium carbonate below a depth of about 40 inches. Some pedons contain few to many thin chips of brown limestone.

The Ap horizon is dark grayish brown, grayish brown, olive gray, or dark gray. Where chroma is less than 1.5, the surface layer is less than 12 inches thick. The Ap horizon is calcareous and moderately alkaline in most pedons, but it is noncalcareous and mildly alkaline in a few.

The A12 horizon is dark grayish brown, olive gray, or grayish brown. It is more olive than the Ap horizon and in some pedons contains dark soil from the surface in seams where old cracks have become filled.

The AC1 and AC2 horizons are grayish brown, light olive brown, olive brown, olive, or olive gray, with or without yellowish or olive mottles.

The C horizon is light olive brown and is mottled in places with yellow, olive yellow, light olive gray, gray, pale olive, olive, and dark grayish brown.

Hensley series

The Hensley series consists of shallow, clayey soils on uplands. These soils formed over hard, coarsely fractured limestone. Slopes are 1 to 3 percent.

Typical pedon of Hensley loam, 1 to 3 percent slopes, from the intersection of Farm Roads 67 and 3049, which is about 2 miles southeast of Blum, 2.3 mile south on Farm Road 3049, and about 100 feet east of road in cropland:

Ap—0 to 5 inches; yellowish red (5YR 5/6) loam, yellowish red (5YR 4/6) moist; reddish brown (5YR 5/4) surface crust 1/4 to 1/2 inch thick; weak fine granular structure; hard, friable, sticky; few fine roots; many ironstone pebbles; neutral; clear boundary.

B21t—5 to 12 inches; reddish brown (2.5YR 4/4) clay, dark reddish brown (2.5YR 3/4) moist; strong coarse blocky structure; hard, very firm, plastic; few fine pores; few fine roots; few small pebbles of ironstone in upper part and few limestone fragments in lower part; neutral; gradual boundary.

B22t—12 to 18 inches; red (2.5YR 4/6) clay, dark red (2.5YR 3/6) moist; moderate fine blocky structure; hard, firm, plastic; few fragments of limestone; mildly alkaline; abrupt boundary.

R—18 to 30 inches; indurated hard limestone bedrock.

The solum ranges from 10 to 20 inches in thickness. It is underlain with hard, white, coarsely fractured limestone. There are few to common pebbles of ironstone and thin fragments of white limestone.

The Ap horizon is dark reddish gray, reddish brown, or brown. It is loam. It is noncalcareous and is slightly acid through mildly alkaline.

The B21t horizon is reddish brown, dark reddish brown, red, or dark red. Clay content is 35 to 50 percent. This horizon is noncalcareous and is neutral or mildly alkaline.

The B22t horizon is red, dark red, or reddish brown. Clay content is 40 to 55 percent. This horizon is noncalcareous and is neutral through moderately alkaline.

The R horizon consists of coarsely fractured, white, indurated limestone bedrock having hardness of more than 3 on Mohs' scale.

Hillco series

The Hillco series consists of moderately deep, loamy soils on uplands. These soils formed in calcareous clayey materials over hard indurated limestone. Slopes are less than about 3 percent.

Typical pedon of Hillco clay loam, 1 to 3 percent slopes, about 16 miles northwest of Hillsboro, 13.5 miles north from Whitney on Farm Road 933, 0.5 mile west on field road, and 50 feet south of road in a field:

Ap—0 to 4 inches; dark brown (7.5YR 4/2) clay loam, dark brown (7.5YR 3/2) moist; moderate medium subangular blocky structure parting to fine granular; very hard, firm, slightly plastic; many fine roots; few concretions of calcium carbonate; few siliceous pebbles; calcareous; moderately alkaline; clear smooth boundary.

A1—4 to 11 inches; dark brown (7.5YR 4/2) clay loam, dark brown (7.5YR 3/2) moist; moderate medium blocky and thin platy structure; very hard, firm, slightly plastic; few fine roots; few concretions of calcium carbonate; few siliceous pebbles; calcareous; moderately alkaline; gradual smooth boundary.

B21ca—11 to 16 inches; reddish brown (5YR 4/4) clay loam, dark reddish brown (5YR 3/4) moist; moderate medium subangular blocky structure; very hard, firm, plastic; few fine roots; few concretions of calcium carbonate; few pebbles; calcareous; moderately alkaline; gradual smooth boundary.

B22ca—16 to 25 inches; reddish yellow (5YR 6/6) clay loam, yellowish red (5YR 5/6) moist; strong fine granular structure; hard, friable, slightly plastic; few fine roots; few concretions of calcium carbonate; few black concretions; few siliceous pebbles; calcareous; moderately alkaline; gradual smooth boundary.

B23ca—25 to 34 inches; reddish yellow (5YR 6/8) gravelly clay loam, yellowish red (5YR 5/8) moist; many medium distinct mottles of pinkish white (5YR 8/2), pinkish gray (5YR 7/2) moist; moderate fine granular structure; hard, friable, very sticky; common concretions of calcium carbonate; few limestone pebbles; few siliceous pebbles; calcareous; moderately alkaline; gradual smooth boundary.

B3&R—34 to 38 inches; light brown (7.5YR 6/4) gravelly clay loam, brown (7.5YR 5/4) moist; many medium distinct mottles of yellow (10YR 7/8, moist); strong fine granular structure; hard, friable, sticky; hard white limestone fragments 2 to 4 inches thick; many concretions of calcium carbonate; calcareous; moderately alkaline; clear wavy boundary.

R—38 to 50 inches, white limestone.

The solum ranges from 20 to 40 inches in thickness. It is underlain by limestone bedrock at a depth of 20 to 40 inches. Some pedons have a Cca horizon. The soil is moderately alkaline. The A horizon and the upper part of the B horizon are noncalcareous in some pedons. Pebbles are common in most pedons. The underlying limestone has a hardness of more than 3 on Mohs' scale. In most places the upper 2 to 3 feet of the bedrock consists of fractured, rippable slabs. Below this the slabs are thicker and have fewer fractures. Calcium carbonate equivalent averages about 50 percent in the control section. Noncarbonatic clay content of the control section ranges from 18 to 35 percent.

The Ap and A1 horizons are dark brown, dark reddish brown, reddish brown, dark grayish brown, or very dark grayish brown. They are clay loam or silty clay loam.

The B horizons include reddish brown, reddish gray, dark reddish gray, reddish yellow, brown, dark brown, and dark yellowish brown.

Pedons having B3ca and Cca horizons are pinkish white, reddish yellow, brown, very pale brown, pale brown, and light yellowish brown when dry. Bodies of soft calcium carbonate are common in the B3ca and Cca horizons.

Houston Black series

The Houston Black series consist of deep, clayey soils on uplands. These soils formed in thick beds of marl. Slopes are less than about 3 percent.

Typical pedon of Houston Black clay, 1 to 3 percent slopes, in a microlow, from the intersection of Texas Highway 171 and Farm Road 308 in Malone, 3.65 miles north on Farm Road 308, 1.2 miles west on county road, and 100 feet north of road in cropland:

Ap—0 to 6 inches; dark gray (10YR 4/1) clay, very dark gray (10YR 3/1) moist; weak fine subangular blocky and granular structure; very hard, very firm, plastic; many fine roots; few fine pores; few concretions of calcium carbonate; calcareous; moderately alkaline; clear smooth boundary.

A12—6 to 19 inches; very dark gray (10YR 3/1) clay, black (10YR 2/1) moist; few brown streaks; moderate medium subangular blocky structure; very hard, very firm, plastic; many fine roots; few fine pores; few concretions of calcium carbonate; few black concretions; calcareous; moderately alkaline; gradual smooth boundary.

A13—19 to 26 inches; very dark gray (10YR 3/1) clay, black (10YR 2/1) moist; dark gray (10YR 4/1) streaks; moderate medium blocky structure; extremely hard, extremely firm, plastic; few fine roots; few slickensides; few concretions of calcium carbonate; few black concretions; calcareous; moderately alkaline; gradual smooth boundary.

A14—26 to 35 inches; very dark gray (10YR 3/1) clay, black (10YR 2/1) moist; common medium faint dark gray (10YR 4/1) mottles; moderate medium blocky structure; extremely hard, extremely firm, plastic; many fine roots; few slickensides; common concretions of calcium carbonate; few black concretions; calcareous; moderately alkaline; gradual smooth boundary.

A15—35 to 46 inches; dark gray (10YR 4/1) clay, very dark gray (10YR 3/1) moist; moderate coarse blocky structure; extremely hard, extremely firm, plastic; few fine roots; many soft masses of calcium carbonate; few concretions of calcium carbonate; few slickensides; calcareous; moderately alkaline; gradual smooth boundary.

A16—46 to 60 inches; gray (10YR 5/1) clay, dark gray (10YR 4/1) moist; weak coarse blocky structure; very hard, very firm, plastic; streaks of very dark gray (10YR 3/1); few slickensides; many threads of powery gypsum; few soft masses and few concretions of calcium carbonate; calcareous; moderately alkaline; gradual smooth boundary.

AC—60 to 70 inches; coarsely mottled brown (10YR 5/3), dark gray (10YR 4/1), brownish yellow (10YR 6/8), light yellowish brown (2.5Y 6/4), and olive yellow (2.5Y 6/6) clay when moist; weak coarse blocky structure; very hard, very firm, plastic; common soft masses of calcium carbonate; few gypsum crystals; calcareous; moderately alkaline.

The A and AC horizons have a combined thickness of 60 to more than 100 inches. When the soil is dry, it has cracks ranging from 0.4 inch to 4.0 inches in width at a depth of 20 inches. Intersecting slickensides begin at a depth of about 18 inches. Clay content in the control section ranges from 50 to 60 percent. These soils contain microdepressions and microknolls at repeated cycles of 10 to 24 feet. The soil is calcareous and moderately alkaline, but a few of the microdepressions are noncalcareous in the upper 12 inches. The extremes of amplitude, or waviness, of the boundary between the A and AC horizons range from about 20 to 40 inches from the center of the microdepression to the center of the microknoll. The vertical variation between the microdepression and microknoll ranges from 3 to 18 inches in native areas that have not been smoothed. Chroma is less than 1.5 to a depth of 30 to 50 inches in the center of the microdepression and between depths of 10 and 18 inches in the center of the microknoll. These soils contain few to many small calcium carbonate concretions and black concretions. Pebbles range from none to many.

The A horizon is dark gray, very dark gray, black, or gray.

The AC horizon is grayish brown, dark grayish brown, olive, or yellow; in places it is mottled with gray, brown, olive, brownish yellow, light yellowish brown, olive yellow, or yellow.

Kemp series

The Kemp series consists of deep, loamy soils on flood plains. These soils formed in recent loamy sediments over older soils having an argillic horizon.

Typical pedon of Kemp loam, occasionally flooded; from Hillsboro west on Texas Highway 22 to Peoria; 1.5 miles south on Farm Road 1947, 1.8 miles west on gravel road, 1.6 miles south, and 200 feet east in cropland:

Ap—0 to 5 inches; dark grayish brown (10YR 4/2) and dark gray (10YR 4/1) loam, very dark grayish brown (10YR 3/2) and very dark gray (10YR 3/1) moist; moderate coarse subangular blocky and fine granular structure; hard, friable; many fine roots; few medium pores; medium acid; abrupt smooth boundary.

A12—5 to 19 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 4/2) moist; few streaks of dark gray (10YR 4/1); moderate coarse subangular blocky and fine granular structure; hard, friable; many fine roots; common medium pores; few worm casts; neutral; gradual smooth boundary.

C—19 to 26 inches; brown (10YR 5/8) sandy clay loam, yellowish brown (10YR 5/4) moist; common fine distinct mottles of brown (7.5YR 5/4), reddish yellow (7.5YR 6/6), and reddish brown (5YR 5/4); strong medium subangular blocky structure; hard, firm, sticky; few fine roots; few medium pores; few black concretions; dark faces of peds turn brown on crushing; medium acid; clear smooth boundary.

Ab—26 to 44 inches; gray (10YR 5/1) sandy clay loam, dark gray (10YR 4/1) moist; common medium distinct mottles of dark brown (10YR 4/3), gray (N 6/0), brown (7.5YR 5/4), and reddish yellow (7.5YR 6/6); moderate medium subangular blocky structure; very hard, friable; many black concretions; thin sand coating on ped faces; medium acid; gradual smooth boundary.

B2tb—44 to 66 inches; mottled light gray (10YR 7/1), gray (10YR 6/1), grayish brown (2.5Y 5/2), brownish yellow (10YR 6/8), gray (N 6/0), and reddish yellow (5YR 6/6) clay loam; strong medium blocky structure; very hard, very firm, plastic; few black concretions; prominent clay films on faces of peds; medium acid.

The thickness of recent sediments over the buried soil that contains the argillic horizon ranges from 20 to 40 inches. Clay content in the control section ranges from 18 to 27 percent. The recent sediments range from medium acid through neutral, and the buried soil ranges from medium acid through moderately alkaline. Not all pedons contain an Ab horizon.

The Ap and A12 horizons are dark grayish brown, light grayish brown, brown, or grayish brown. They contain fine mottles of light brownish gray, dark grayish brown, and grayish brown. In pedons having colors darker than 3.5 when moist, the A horizon is less than 7 inches thick.

The C horizon is light gray, brown, grayish brown, pale brown, very pale brown, or light yellowish brown. It is mottled in shades of gray, brown, and yellow. Texture ranges from fine sandy loam to sandy clay loam.

The Ab horizon is gray and is mottled with dark brown, gray, brown, reddish yellow, and strong brown. Texture is fine sandy loam, loam, or sandy clay loam.

The B2b horizon is mottled in shades of brown, yellow, and gray. It is sandy clay loam, clay loam, or sandy clay and contains prominent clay skins on faces of peds. There are few to common black concretions.

Konsil series

The Konsil series consists of deep, loamy soils on uplands. These soils formed in weathered beds of loamy material and interbedded sandstone. Slopes are convex and range from 3 to 5 percent.

Typical pedon of Konsil fine sandy loam, 3 to 5 percent slopes, 1.5 miles north from Peoria on county road, 0.95 mile west, on the south side of road in an old field:

Ap—0 to 5 inches; yellowish red (5YR 5/8) fine sandy loam, yellowish red (5YR 4/8) moist; weak coarse blocky and granular structure; loose, very friable; few fine roots; few siliceous pebbles; slightly acid; clear boundary.

A2&B—5 to 13 inches; yellowish red (5YR 5/6) fine sandy loam and sandy clay loam, yellowish red (5YR 4/6) moist; weak coarse blocky and granular structure; slightly hard, very friable, slightly sticky; few fine roots; few fine pebbles; slightly acid; clear smooth boundary.

B21t—13 to 24 inches; red (2.5YR 4/6) sandy clay loam, dark red (2.5YR 3/6) moist; strong coarse blocky structure; hard, firm, plastic; few fine roots; common medium pores; few pebbles; clay films on peds; medium acid; gradual smooth boundary.

B22t—24 to 38 inches; red (2.5YR 5/6) sandy clay loam, red (2.5YR 4/6) moist; strong coarse blocky structure; hard, firm, plastic; few fine and medium pores; few clay films; medium acid; gradual smooth boundary.

B23t—38 to 46 inches; coarsely mottled reddish yellow (7.5YR 6/6) and red (2.5Y 5/8) sandy clay loam; strong coarse blocky structure; hard, firm, plastic; few pebbles; strongly acid; gradual smooth boundary.

B3—46 to 64 inches; coarsely mottled reddish yellow (7.5YR 6/6), gray (N 6/0), and red (2.5YR 5/8) sandy clay loam; strong coarse blocky structure; hard, firm, slightly plastic; few pebbles; strongly acid; gradual smooth boundary.

The solum ranges from 60 to 100 inches in thickness. The A horizon is less than 20 inches in thickness. Clay content in the control section is 18 to 33 percent. The control section is noncalcareous throughout.

The Ap horizon is yellowish red, reddish yellow, or reddish brown fine sandy loam. It is slightly acid through mildly alkaline.

The A2&B horizon is yellowish red or reddish yellow. It is fine sandy loam grading to sandy clay loam. It is slightly acid or neutral.

The B21t and B22t horizons are red or yellowish red sandy clay loam. They are medium acid.

The B23t horizon is coarsely mottled reddish yellow, red, and yellowish red. It is medium acid or strongly acid.

The B3 horizon is coarsely mottled reddish yellow, red, and gray. It is medium acid or strongly acid.

Kopperl series

The Kopperl series consists of deep, gravelly, loamy soils. These soils formed in old alluvium on broken high terraces. In places they occur as old terrace remnants on limestone ridges. Slopes range from 1 to 3 percent.

Typical pedon of Kopperl gravelly sandy loam, 1 to 3 percent slopes, 8.5 miles north from Whitney on Farm Road 933, 6.0 miles west on first road north of Huron to entrance to Stiner Valley Ranch, and 500 feet north of cattle guard:

A11—0 to 6 inches; dark brown (7.5YR 4/2; 7.5YR 3/2, moist) gravelly sandy loam; weak fine subangular blocky and granular structure; very friable, nonsticky; many fine roots; few organic stains; many rounded chert pebbles; slightly acid; gradual smooth boundary.

A12—6 to 14 inches; reddish brown (5YR 5/4) gravelly sandy loam, dark reddish brown (5YR 3/4) moist; weak fine granular structure; very friable, nonsticky; many fine roots; many rounded chert pebbles; slightly acid; gradual smooth boundary.

B21t—14 to 26 inches; yellowish red (5YR 5/6) gravelly loam, yellowish red (5YR 4/6) moist; moderate medium subangular blocky structure; very friable, sticky; many fine roots; common continuous clay films; many rounded chert pebbles; neutral; gradual smooth boundary.

B22t—26 to 40 inches; red (2.5YR 5/6) gravelly clay loam, red (2.5YR 4/6) moist; few prominent mottles of strong brown (7.5YR 5/6) and brown (10YR 5/3); moderate medium subangular blocky structure; very firm, plastic; many fine roots; common continuous clay films; few dark red ironstone nodules; many rounded pebbles; slightly acid; gradual smooth boundary.

B23t—40 to 54 inches; mottled brown (10YR 5/3) and reddish yellow (7.5YR 6/6) clay; strong coarse blocky structure; very firm, plastic; few woody roots; common continuous clay films; few limestone fragments as much as 2 feet in diameter; prominent slickensides; common pebbles; neutral; abrupt wavy boundary.

R—54 to 60 inches; hard white limestone. Upper 2 feet contain fractured flat fragments, lower depths are massive.

The solum ranges from 40 to 60 inches in thickness. In places it is underlain with fractured, hard limestone. The soil is noncalcareous. It ranges from slightly acid through mildly alkaline in the A horizon and from strongly acid through neutral in the B21t and B22t horizons. Pebbles consist mostly of rounded chert and make up from 20 to 50 percent, by volume, of the soil. There are few to many chunks of hard, white limestone in the lower part of the Bt horizon.

The A11 horizon is dark brown, dark grayish brown, grayish brown, pale brown, very pale brown, light brown, brown, light reddish brown, or reddish brown. The A12 horizon is reddish brown, light reddish brown, brown, or light brown.

The B21t and B22t horizons are yellowish red, red, light brown, brown, strong brown, reddish yellow, reddish brown, or light red. The B22t horizon has common mottles of strong brown or brown. The B21t horizon is gravelly loam or gravelly clay loam. The B22t horizon is gravelly clay loam, very gravelly clay loam, gravelly clay, or very gravelly clay.

The B23t horizon is the same color as the upper part of the Bt horizon but is generally mottled with brown, reddish yellow, and strong brown. It is clay or gravelly clay and is slightly acid through mildly alkaline. It is calcareous in the lower part in some pedons.

The R layer is white, hard limestone that is fractured in the upper 10 to 30 inches and massive below.

Krum series

The Krum series consists of deep, clayey soils that formed in thick beds of unconsolidated, calcareous sediments on old high terraces and valley fills. Slopes are less than 1 percent.

Typical pedon of Krum silty clay, 0 to 1 percent slopes, from the intersection of Texas Highway 22 and graveled county road in Brandon, 1.25 miles south on gravel road, and 200 feet west of road in cropland:

Ap—0 to 5 inches; very dark gray (10YR 3/1) silty clay, black (10YR 2/1) moist; grayish brown (10YR 5/2) surface crust; moderate medium blocky structure; firm, plastic; few fine roots; few fine pores; many fine concretions of calcium carbonate; calcareous; moderately alkaline; clear wavy boundary.

A1—5 to 18 inches; very dark gray (10YR 3/1) silty clay, black (10YR 2/1) moist; many brown (10YR 5/3) worm casts; moderate fine subangular blocky structure; very hard, very firm, plastic; few fine roots; few fine pores; many fine concretions of calcium carbonate; many very fine pebbles; calcareous; moderately alkaline; gradual smooth boundary.

B2ca—18 to 40 inches; brown (10YR 5/3) silty clay, dark brown (10YR 4/3) moist; common coarse distinct mottles of yellow (10YR 7/6); dark grayish brown (10YR 4/2) worm channels and vertical streaks; strong fine subangular blocky structure; hard, very firm, plastic; common small slickensides; prominent clay skins on ped surfaces; common concretions of calcium carbonate; many fine pebbles; calcareous; moderately alkaline; gradual smooth boundary.

B3ca—40 to 70 inches; coarsely mottled light brownish gray (10YR 6/2), brown (10YR 5/3), and yellow (10YR 7/6) silty clay; strong fine subangular blocky structure; hard, very firm, plastic; patchy clay films; many concretions of calcium carbonate; common soft bodies of calcium carbonate; calcareous; moderately alkaline.

The solum ranges from 38 to 70 inches in thickness. When the soil is dry, cracks as wide as 1.2 inches extend to a depth of about 48 inches. The clay content of the control section ranges from 40 to 60 percent. Content of pebbles ranges from 0 to about 10 percent, and calcium carbonate equivalent ranges from 5 to 25 percent. The soil is mildly alkaline or moderately alkaline, and most pedons are calcareous.

The A horizon is very dark gray, dark grayish brown, grayish brown, dark gray, brown, or dark brown.

The B2ca horizon is brown, grayish brown, pale brown, yellowish brown, light yellowish brown, light brown, or reddish brown. Some pedons have yellowish mottles.

The B3ca horizon is coarsely mottled light brownish gray, brown, and yellow.

Krum silty clay, 0 to 1 percent slopes, is a taxadjunct to the Krum series in that the B horizon contains high chroma mottles, which are excluded from the range defined for the series.

Lamar series

The Lamar series consists of deep, loamy soils that formed in calcareous, loamy sediments on uplands. Slopes are convex and range from 1 to 5 percent.

Typical pedon of Lamar clay loam, 1 to 5 percent slopes, from the intersection of Texas Highways 22 and 171 in Hillsboro, 7.6 miles north on Texas Highway 171 to the first county road north of Mayfield, 0.9 mile west, and 400 feet south of road in cropland on west-facing slope:

Ap—0 to 6 inches; pale brown (10YR 6/3) clay loam, brown (10YR 5/3) moist; strong coarse blocky and granular structure; hard, friable, very sticky; few roots; common medium pores; few worm casts; few small thin fragments of brown limestone; calcareous; moderately alkaline; clear smooth boundary.

B21—6 to 13 inches; light olive brown (2.5Y 5/4) clay loam, olive brown (2.5Y 4/4) moist; moderate coarse blocky and medium granular structure; hard, friable, very sticky; few fine roots; few concretions of calcium carbonate; common medium pores; medium platy structure in the upper part; calcareous; moderately alkaline; gradual smooth boundary.

B22—13 to 34 inches; mottled light olive brown (2.5Y 5/4) and yellow (2.5Y 7/8) clay loam; moderate coarse blocky and medium granular structure; hard, firm, slightly plastic; few roots; few fine pores; common concretions of calcium carbonate; few soft bodies of calcium carbonate in lower part; calcareous; moderately alkaline; gradual smooth boundary.

B3—34 to 46 inches; olive yellow (2.5Y 6/6) light clay loam, light olive brown (2.5Y 5/6) moist; moderate coarse blocky structure; hard, friable, sticky; common soft bodies of calcium carbonate; common pitted concretions of calcium carbonate; calcareous; moderately alkaline; gradual smooth boundary.

C—46 to 80 inches; yellow (2.5Y 7/8) clay loam, olive yellow (2.5Y 6/8) moist; massive; hard, friable, sticky; common soft bodies of calcium carbonate; calcareous; moderately alkaline.

The solum ranges from 20 to 50 inches in thickness. The surface texture is clay loam, and clay content is 18 to 35 percent in the control section. Calcium carbonate equivalent is less than 40 percent. The soil is dominantly calcareous and moderately alkaline, but some pedons are noncalcareous and neutral.

The Ap horizon is pale brown, dark grayish brown, light brownish gray, brown, dark yellowish brown, or olive brown.

The B21 horizon is light olive brown, light yellowish brown, dark grayish brown, brown, pale brown, or light brownish gray.

The B22 horizon is mottled light olive brown, olive yellow, yellow, or brownish yellow.

The B3 horizon is olive yellow, light olive brown, brownish yellow, or yellowish brown.

The C horizon is yellow, olive yellow, light brownish gray, brown, dark yellowish brown, or brownish yellow.

Lindy series

The Lindy series consists of moderately deep, loamy soils that formed over limestone on uplands. The limestone bedrock is strongly cemented. Slopes are 1 to 3 percent.

Typical pedon of Lindy clay loam, 1 to 3 percent slopes, from the intersection of Farm Roads 67 and 3049, 0.5 mile east on Farm Road 67, on north side of road about 400 feet north of farmstead in cropland:

Ap—0 to 7 inches; reddish brown (5YR 5/4) clay loam, reddish brown (5YR 4/4) moist; thin platy pink (5YR 7/3) surface crust; moderate coarse blocky structure; very hard, firm, slightly plastic; many fine roots; few fine pores; many ironstone pebbles; few small fragments of white hard limestone on surface; slightly acid; clear smooth boundary.

B21t—7 to 15 inches; reddish brown (2.5YR 4/4) clay, dark reddish brown (2.5YR 3/4) moist; moderate coarse blocky structure; very hard, very firm, plastic; many prominent clay films; few ironstone pebbles; fine roots; few fine pores; slightly acid; gradual smooth boundary.

B22t—15 to 31 inches; red (2.5YR 4/6) clay, dark red (2.5YR 3/6) moist; moderate coarse blocky structure; very hard, very firm, plastic; many fine roots; few fine pores; prominent clay films on peds; few ironstone pebbles; neutral; gradual smooth boundary.

B23t—31 to 36 inches; reddish brown (2.5YR 5/4) clay; reddish brown (2.5YR 4/4) moist; moderate coarse blocky structure; very hard, very firm, plastic; few roots; common ironstone pebbles; few small slabs and fragments of hard white limestone in lower part; mildly alkaline; clear wavy boundary.

R—36 to 44 inches; hard white fractured limestone slabs with thin layers of red clay between slabs. The upper sides are smooth, and the lower sides are slightly rough but without prounced pendants. Hardness of the limestone is more than 3 on Mohs' scale.

The solum ranges from 20 to 40 inches in thickness. The average depth to limestone bedrock is 36 inches. The upper 30 inches of the limestone is coarsely fractured slabs; below are massive, thick layers. The limestone has hardness of more than 3 on Mohs' scale. There are few to numerous ironstone pebbles and fragments of white limestone. The limestone fragments are most common in the lower part of the solum. The solum is noncalcareous and ranges from slightly acid through mildly alkaline, and acidity decreases with increasing depth. Clay content of the control section ranges from 35 to 60 percent.

The Ap horizon is reddish brown, dark grayish brown, dark brown, or brown.

The B2t horizons are reddish brown, red, dark reddish brown, brown, or yellowish red.

Mabank series

The Mabank series consists of deep, nearly level to gently sloping, loamy soils formed in marine sediments on uplands. Slopes are 0 to 2 percent.

Typical pedon of Mabank fine sandy loam, 0 to 2 percent slopes, from the intersection of Texas Highways 22 and 171 in Hubbard, 3.7 miles southeast on Texas Highway 171, 0.2 mile southwest on county road, and 100 feet south of road in cropland:

Ap—0 to 5 inches; grayish brown (10YR 5/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; massive; hard, friable, sticky; few fine roots; few fine pores; few pebbles; neutral; abrupt wavy boundary.

B21tg—5 to 24 inches; very dark gray (10YR 3/1) clay, black (10YR 2/1) moist; few coarse gray (10YR 5/1) mottles in lower part; weak coarse angular blocky structure; very hard, very firm, plastic; few fine roots; common pressure faces; common clay films; neutral; clear smooth boundary.

B22tg—24 to 49 inches; gray (5Y 6/1) clay, gray (5Y 5/1) moist; few medium brownish yellow (10YR 6/8) mottles in lower part; weak coarse angular blocky structure; extremely hard, extremely firm, plastic; few fine roots; common clay films; common pressure faces; few black concretions; common gypsum crystals; moderately alkaline; clear smooth boundary.

B23tg—49 to 65 inches; light olive gray (5Y 6/2) clay, olive gray (5Y 5/2) moist; common coarse mottles of brownish yellow (10YR 6/8); weak coarse angular blocky structure; extremely hard, extremely firm, plastic; few pitted concretions of calcium carbonate; few black concretions; few gypsum crystals; moderately alkaline.

The solum ranges from 60 to more than 80 inches in thickness. Hard, pitted concretions of calcium carbonate are below a depth of 18 inches. The upper part of the B2t horizon to a depth of 24 inches has cracks 0.4 inch wide for a total of 90 to 180 days out of the year. Clay content in the control section is 35 to 50 percent. The solum is noncalcareous.

The Ap horizon is grayish brown, dark grayish brown, dark gray, very dark gray, gray, or light brownish gray. It is fine sandy loam and ranges to 11 inches in thickness. It is medium acid through neutral and has an abrupt boundary.

The B21tg horizon is very dark gray or dark gray and contains common pressure faces. It is medium acid through mildly alkaline.

The B22tg and B23tg horizons are light olive gray, grayish brown, light brownish gray, light gray, or gray and have a few fine mottles of brownish yellow, brown, light olive brown, light yellowish brown, or reddish brown. These horizons are neutral through moderately alkaline.

Normangee series

The Normangee series consists of deep, clayey soils formed in alkaline marine sediments on uplands. Slopes range from 0 to 5 percent.

Typical pedon of Normangee clay loam, 3 to 5 percent slopes, 3.15 miles west from Peoria on Texas Highway 22, 0.7 mile north on county road, and 0.3 mile west of road in old pasture:

Ap—0 to 5 inches; pale brown (10YR 6/3) clay loam, brown (10YR 5/3) moist; moderate coarse blocky structure parting to fine granular; very hard, very firm, sticky; few roots; few fine pores; few worm casts; few pebbles; narrow cracks to surface; medium acid; clear smooth boundary.

B21t—5 to 23 inches; yellowish brown (10YR 5/4) clay, dark yellowish brown (10YR 4/4) moist; coarse mottles of dark grayish brown (2.5Y 4/2) and olive yellow (5Y 6/6); strong coarse blocky structure; extremely hard, extremely firm, plastic; many fine roots; few fine pores; clay films; common dark worm channels; few fine pebbles; common cracks; slightly acid; gradual smooth boundary.

B22t—23 to 34 inches; coarsely mottled light yellowish brown (2.5Y 6/4) and brownish yellow (10YR 6/6) clay; strong coarse blocky structure; extremely hard, extremely firm, plastic; few fine roots; prominent clay films; few worm channels; few cracks; few concretions of calcium carbonate; few black concretions in lower part; moderately alkaline; gradual smooth boundary.

B23t—34 to 40 inches; olive yellow (2.5Y 6/6) clay, light olive brown (2.5Y 5/6) moist; moderate coarse blocky structure; extremely hard, extremely firm, plastic; few medium faint mottles of olive yellow (2.5Y 6/6); few concretions of calcium carbonate; prominent clay films and pressure faces; moderately alkaline; gradual smooth boundary.

B24t—40 to 60 inches; coarsely mottled light olive brown (2.5Y 5/4) and brownish yellow (10YR 6/6) clay; strong coarse blocky structure; extremely hard, extremely firm, plastic; common clay films; common concretions of calcium carbonate; common black concretions; many soft bodies of calcium carbonate; moderately alkaline; gradual smooth boundary.

Cca—60 to 80 inches; mottled olive yellow (2.5Y 6/6) and yellow (2.5Y 7/8) clay; thin platy structure; extremely hard, extremely firm, plastic; about 20 percent soft calcium carbonate; few clay films; common concretions of calcium carbonate; few pebbles; few sandstone fragments; moderately alkaline.

The solum ranges from 40 to 60 inches in thickness. Secondary carbonates are common below a depth of 28 inches. Clay content in the control section is 40 to 55 percent. The soil has a prominent pattern of narrow cracks when dry.

The Ap horizon is pale brown, dark grayish brown, dark brown, brown, or yellowish brown clay loam. Reaction ranges from medium acid through neutral. The Ap horizon is hard or very hard when dry. The boundary is clear.

The B21t horizon is yellowish brown, reddish brown, or brown with mottles of dark grayish brown, olive yellow, reddish brown, red, yellowish red, dark brown, pale brown, very pale brown, grayish brown, or yellowish brown. Worm casts and the fillings in old cracks commonly have chroma of 2. Reaction is medium acid through neutral.

The B22t, B23t, and B24t horizons are browns and olives with mottles of light yellowish brown, brownish yellow, olive yellow, light olive brown, or reddish yellow. They are slightly acid through moderately alkaline. Some pedons are calcareous in the lower part.

The Cca horizon is mottled olive yeloow, yellow, gray, olive gray, olive brown, or yellowish brown. It is clay, clay loam, or weathered shale. It is moderately alkaline, and some pedons are calcareous.

Pulexas series

The Pulexas series consists of deep, sandy soils on flood plains along small streams. Slopes are as much as about 2 percent.

Typical pedon of Pulexas fine sandy loam in an area of Pulexas soils, frequently flooded, from the intersection of Texas Highway 171 and Farm Road 934 in Osceola, 3.5 miles west on Farm Road 934 to Aquilla Creek bottom and 400 feet south of road in pastureland:

A11—0 to 5 inches; grayish brown (10YR 5/2) fine sandy loam, dark grayish brown (10YR 4/2) moist; moderate coarse blocky structure; hard, very friable, slightly sticky; many fine roots; organic stains on peds; slightly acid; clear smooth boundary.

A12—5 to 11 inches; brown (10YR 5/3) fine sandy loam, dark brown (10YR 4/3) moist; moderate medium platy structure; hard, very friable, slightly sticky; many fine roots; neutral; clear smooth boundary.

C1—11 to 34 inches; brown (10YR 5/3) fine sandy loam, dark brown (10YR 4/3) moist; few medium faint pale brown (10YR 6/3) mottles; moderate thin bedding planes; loose, very friable; neutral; clear smooth boundary.

C2—34 to 60 inches; brown (10YR 5/3) loamy fine sand, dark brown (10YR 4/3) moist; moderate thin bedding planes; loose, very friable; neutral; clear smooth boundary.

C3—60 to 76 inches; grayish brown (10YR 5/2) loamy fine sand, dark grayish brown (10YR 4/2) moist; moderate thin bedding planes; loose, very friable; neutral; clear smooth boundary.

Average clay content of the 10- to 40-inch control section is less than 18 percent. Reaction in the upper 40 inches ranges from medium acid through neutral.

The A horizon is light brownish gray, grayish brown, brown, pale brown, yellowish brown, or light yellowish brown. Texture is fine sandy loam and loamy fine sand. The A horizon ranges to about 24 inches in thickness.

The C horizon is brown, grayish brown, light brownish gray, yellowish brown, light yellowish brown, or pale brown. It contains mottles of gray and brown in the lower part. Below a depth of 40 inches, the texture ranges from loam to loamy fine sand. Bedding planes range from none to many.

Pursley series

The Pursley series consists of deep, nearly level, loamy soils that formed in calcareous, loamy sediments on flood plains. Slopes are less than 1 percent.

Typical pedon of Pursley clay loam, frequently flooded, from the intersection of Texas Highway 22 and Farm Road 1947 in Peoria, 1.5 miles south on Farm Road 1947, 1.25 miles west on county road to Aquilla Creek bottom, and 50 feet north of road in pastureland:

A1—0 to 14 inches; very dark gray (10YR 3/1) clay loam, black (10YR 2/1) moist; strong fine and medium granular structure in the upper 3 inches and moderate fine and medium subangular blocky structure below; hard, firm, very sticky and plastic; many fine roots; common medium pores; common worm casts; calcareous; moderately alkaline; clear smooth boundary.

B2—14 to 26 inches; brown (10YR 5/3) sandy clay loam, dark brown (10YR 4/3) moist; weak medium subangular blocky structure; hard, firm, sticky and slightly plastic; common fine roots; common medium pores; few worm casts; calcareous; moderately alkaline; clear smooth boundary.

C1—26 to 46 inches; pale brown (10YR 6/3) fine sandy loam, pale brown (10YR 6/3) moist; massive; hard, friable, slightly sticky; few fine roots; few bedding planes; calcareous; moderately alkaline; clear smooth boundary.

C2—46 to 51 inches; dark grayish brown (10YR 4/2) sandy clay loam, very dark grayish brown (10YR 3/2) moist; massive; hard, firm, sticky; few bedding planes; calcareous; moderately alkaline; clear smooth boundary.

C3—51 to 57 inches; very pale brown (10YR 7/3) fine sandy loam, pale brown (10YR 6/3) moist; massive; hard, friable, slightly sticky; few bedding planes; calcareous; moderately alkaline; clear smooth boundary.

C4—57 to 62 inches; dark grayish brown (10YR 4/2) sandy clay loam, very dark grayish brown (10YR 3/2) moist; massive; calcareous; moderately alkaline.

These thick alluvial soils have clay content of 18 to 35 percent in the control section. They are calcareous throughout. Bedding planes are present within 40 inches of the surface.

The A horizon is dark grayish brown, dark brown, brown, grayish brown, or very dark grayish brown.

The B2 horizon is yellowish brown, brown, pale brown, or dark yellowish brown. Texture is clay loam or sandy clay loam.

The C horizon is pale brown, grayish brown, olive gray, dark grayish brown, or olive. Texture is fine sandy loam, sandy clay loam, clay loam, or loam.

Purves series

The Purves series consists of shallow, clayey soils on uplands. These soils formed over interbedded hard limestone and marls. Slopes are less than 3 percent.

Typical pedon of Purves clay loam, 1 to 3 percent slopes, from the intersection of Farm Roads 933 and 934, 3,000 feet south on Farm Road 933 to first county road, 1.0 mile west, and 1,000 feet south of road in rangeland:

A11—0 to 8 inches; dark gray (10YR 4/1) clay loam, very dark gray (10YR 3/1) moist; strong medium subangular blocky and fine granular structure; hard, firm, plastic; many fine roots; few fine pores; shiny ped faces; few fragments of limestone; calcareous; moderately alkaline; gradual smooth boundary.

A12—8 to 16 inches; dark grayish brown (10YR 4/2) clay, very dark grayish brown (10YR 3/2) moist; strong medium subangular blocky and fine granular structure; hard, firm, plastic; many fine roots; common medium pores; few fragments of limestone; shiny ped faces; calcareous; moderately alkaline; gradual smooth boundary.

A&R—16 to 19 inches; pale brown (10YR 6/3) clay, brown (10YR 5/3) moist; strong fine granular structure; hard, firm, plastic; many fragments of limestone; few fine roots; calcareous; moderately alkaline; clear wavy boundary.

R—19 to 30 inches; hard broken slabs of limestone.

The solum ranges from 10 to 20 inches in thickness. It is clay loam, and clay content is 35 to 50 percent in the control section. It is as much as about 35 percent, by volume, fragments of hard limestone. The soil is calcareous and moderately alkaline throughout. The underlying limestone bedrock has a hardness of more than 3 on Mohs' scale. The upper 30 inches consists of fractured slabs and chunks; below are massive, thick beds with few fractures.

Rayex series

The Rayex series consists of shallow, loamy soils on uplands. These soils are underlain by weakly cemented, coarsely fractured sandstone at a depth of less than 20 inches. Slopes range from 5 to 20 percent.

Typical pedon of Rayex fine sandy loam, from an area of Birome-Rayex complex, 5 to 20 percent slopes, 12.0 miles west from Hillsboro on Texas Highway 22, 3.5 miles north on Farm Road 3050, 1.4 miles west on dirt road, and 50 feet south of road in an area of scrub post oak trees on an east-facing slope:

A1—0 to 8 inches; brown (7.5YR 5/4) fine sandy loam, dark brown (7.5YR 4/4) moist; massive; slightly hard, very friable; many fine roots, few coarse roots; many fine pebbles of ironstone: few thin fragments of sandstone 4 to 5 inches in cross section; neutral; clear wavy boundary.

B2t—8 to 16 inches; red (2.5YR 5/6) clay, red (2.5YR 4/6) moist; strong fine blocky structure; very hard, very firm, plastic; few coarse roots; continuous clay films on faces of peds; common angular and subrounded fragments of ironstone; strongly acid; gradual irregular boundary.

Cr—16 to 30 inches; reddish brown (5YR 5/4) stratified sandstone, shale, and clay. Fragments of sandstone and ledges are 8 to 12 inches thick and have vertical cracks 12 to 36 inches apart. The shale and clay strata are 0.5 inch to 2 inches thick; flat fragments of sandstone are coated with clay; roots penetrate the cracks; strongly acid.

The solum ranges from 10 to 20 inches in thickness. Ironstone pebbles and sandstone fragments ranging from 4 inches to 4 feet in diameter cover from 2 to 20 percent of the surface.

The A horizon is pink, very pale brown, brown, grayish brown, or dark brown. It is medium acid through neutral.

The B2t horizon is red, reddish brown, or yellowish red. Clay content ranges from 35 to 50 percent. The B2t horizon is medium acid through very strongly acid.

The Cr horizon is fractured, reddish, weakly cemented sandstone interbedded with red, brown, and gray shale and clay. It is slightly acid through strongly acid.

Silstid series

The Silstid series consists of deep, loamy soils formed in beds of sandy or loamy materials and interbedded sandstones. These soils are on uplands. Slopes are 1 to 5 percent.

Typical pedon of Silstid loamy fine sand, 1 to 3 percent slopes, from the intersection of Texas Highway 22 and Farm Road 933 in Whitney, 9.0 miles north on Farm Road 933, 4.0 miles east on county road, 1.2 miles south, and 100 feet west of road in an old field:

Ap—0 to 8 inches; dark brown (10YR 4/3) loamy fine sand, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; very friable; common fine roots; organic stains; few fine pebbles; slightly acid; clear smooth boundary.

A1—8 to 15 inches; brown (7.5YR 5/4) loamy fine sand, dark brown (7.5YR 4/4) moist; single grained; very friable; many fine roots; few fine pebbles; slightly acid; clear wavy boundary.

A2—15 to 27 inches; light yellowish brown (10YR 6/4) loamy fine sand, yellowish brown (10YR 5/4) moist; single grained; very friable; many fine roots; about 5 percent by volume sandstone pebbles as much as 0.5 inch across; slightly acid; clear smooth boundary.

B21t—27 to 44 inches; reddish yellow (7.5YR 6/6) sandy clay loam, strong brown (7.5YR 5/6) moist; dark brown (7.5YR 4/4, moist) ped coatings; common medium distinct mottles of yellowish red (5YR 5/6; 5YR 4/6, moist); moderate medium subangular blocky structure; friable; many fine roots; common medium pores; patchy clay films; 15 to 20 percent by volume ironstone and sandstone pebbles as much as 2 inches in diameter; ironstone pebbles confined to upper part of horizon; ped faces contain uncoated sand grains; few black concretions; slightly acid; gradual smooth boundary.

B22t—44 to 59 inches; brownish yellow (10YR 6/6) sandy clay loam, yellowish brown (10YR 5/6) moist; common fine distinct reddish yellow mottles; common small pockets and streaks of dark red (10YR 3/6, moist) sandy loam; few fine distinct mottles of light gray that become more abundant with depth; weak medium prismatic structure parting to moderate medium subangular blocky; friable; few fine pores; patchy clay films; peds and prism faces covered with uncoated sand grains; uncoated sand in old root channels; medium acid; gradual smooth boundary.

B3&R—59 to 74 inches; brownish yellow (10YR 6/6) sandy clay layered with ironstone and sandstone; massive; firm.

The solum ranges from 60 to more than 80 inches in thickness. It is slightly acid or medium acid. The surface layer is loamy fine sand. Clay content in the control section ranges from 18 to 32 percent. The loamy fine sand A horizon is 20 to 40 inches thick.

The Al horizon is grayish brown, brown, pale brown, very pale brown, yellowish brown, dark brown, light yellowish brown, dark yellowish brown, or light brown. Ironstone and sandstone pebbles range from none to many.

The A2 horizon is light yellowish brown, very pale brown, light brown, or pale brown. Ironstone and sandstone pebbles range from few to common.

The B2t horizon is reddish yellow, brownish yellow, yellow, yellowish red, yellowish brown, or strong brown. It contains reddish mottles throughout and pockets of light gray clean sand in the lower part.

The B3&R layer has colors about the same as those in the B2t horizon. It contains bands of sandy clay and layers of ironstone and sandstone.

Somervell series

The Somervell series consists of moderately deep, loamy soils containing gravel. These soils are on uplands. They formed in clayey marl over limestone. Slopes range from 2 to 20 percent.

Typical pedon of Somervell gravelly clay loam in an area of Aledo-Somervell gravelly clay loams, 8 to 20 percent slopes, from the intersection of Texas Highway 22 and Farm Road 933 in Whitney, 11.2 miles north on Farm Road 933, 6.1 miles west on county road, and 80 feet south of road in rangeland:

A1—0 to 14 inches; dark grayish brown (10YR 4/2) gravelly clay loam, very dark grayish brown (10YR 3/2) moist; strong fine granular structure; hard, firm, sticky and slightly plastic; many fine roots; many medium pores; about 40 percent by volume limestone fragments as much as 10 inches long; calcareous; moderately alkaline; gradual smooth boundary.

B2ca—14 to 27 inches; grayish brown (10YR 5/2) gravelly clay loam, dark grayish brown (10YR 4/2) moist; strong fine granular structure; hard, firm, slightly plastic; many fine roots; common medium pores; about 20 percent limestone fragments about 10 inches long in upper part; common concretions of calcium carbonate; calcareous; moderately alkaline; gradual smooth boundary.

Cca—27 to 36 inches; mottled light gray (5Y 7/2) and yellow (5Y 7/6) clayey marl, light olive gray (5Y 6/2) and olive yellow (5Y 6/6) moist; massive; hard, firm, plastic; few fine roots; few medium pores; calcareous; moderately alkaline; clear wavy boundary.

R—36 to 60 inches; thin white fragments of fractured limestone with seams of clayey marl in upper part. Fractured bedrock in lower part. Hardness of the limestone exceeds 3 on Mohs' scale.

The solum ranges from 20 to 40 inches in thickness. Depth to limestone bedrock ranges from 24 to 40 inches. Coarse fragments of limestone make up from 35 to 50 percent of the A1 and B2ca horizons and as much as about 85 percent of the upper part of the Cca horizon. These are thin fragments of hard white limestone that range to as much as about 10 inches in length. Reaction is moderately alkaline, and calcium carbonate equivalent ranges from 40 to 70 percent.

The A horizon is dark grayish brown, dark brown, or brown.

The B2ca horizon is light brownish gray, grayish brown, or brown.

The texture of the Cca horizon ranges from clayey marl to gravelly clay loam. It has coarse, distinct to faint mottles of light brownish gray to yellow.

Stephen series

The Stephen series consists of shallow, clayey soils that formed in interbedded chalk, chalky marl, or rubble of soft limestone. These soils are on uplands. Slopes are as much as about 5 percent.

Typical pedon of Stephen silty clay, 1 to 3 percent slopes, from the intersection of Interstate Highway 35E and Farm Road 934, 4.6 miles north on Farm Road 934, 0.25 mile east on county road, and about 400 feet north of road in cropland:

Ap—0 to 5 inches; dark grayish brown (10YR 4/2) silty clay, very dark grayish brown (10YR 3/2) moist; strong coarse subangular blocky and granular structure; very hard, very firm, plastic; many fine roots; common fine limestone pebbles; calcareous; moderately alkaline; clear smooth boundary.

A1—5 to 12 inches; dark grayish brown (10YR 4/2) silty clay, very dark grayish brown (10YR 3/2) moist; strong coarse subangular blocky and granular structure; very hard, very firm, plastic; many fine roots; many small fragments of soft chalky limestone; calcareous; moderately alkaline; clear wavy boundary.

AC—12 to 18 inches; pale brown (10YR 7/3) silty clay loam, brown (10YR 6/3) moist; moderate fine granular structure; hard, firm, slightly plastic; about 80 percent soft chalky limestone fragments; calcareous; moderately alkaline; clear wavy boundary.

Cr—18 to 40 inches; whitish, soft, chalky, fractured limestone bedrock.

The solum ranges from 10 to 20 inches in thickness. The chalky limestone bedrock has a hardness of less than 3 on Mohs' scale and can be cut with a spade. The solum is calcareous and moderately alkaline.

The A horizon is dark grayish brown, dark brown, brown, grayish brown, or very dark grayish brown. It is silty clay, and clay content is 35 to 50 percent. Fragments of chalky limestone make up as much as about 35 percent, by volume, of the A horizon.

Sunev series

The Sunev series consists of deep, loamy soils formed on high stream terraces or colluvial foot slopes. These soils are high in content of calcium carbonates and have slopes of as much as about 15 percent.

Typical pedon of Sunev clay loam, 5 to 15 percent slopes, from the intersection of Interstate Highway 35W and Farm Road 66, 5.0 miles east on Farm Road 66 to Files Valley, 0.75 mile south on county road, and 50 feet east of the road in wooded ravine:

A1—0 to 16 inches; dark grayish brown (2.5Y 4/2) clay loam, very dark grayish brown (2.5Y 3/2) moist; strong fine granular structure; very hard, firm, slightly plastic; many fine roots; common fine pores; few pebbles; few concretions of calcium carbonate; organic stains; many worm casts; calcareous; moderately alkaline; gradual smooth boundary.

B21ca—16 to 34 inches; grayish brown (10YR 5/2) silty clay loam, dark grayish brown (10YR 4/2) moist; strong fine granular structure; very hard, firm; many fine roots; common medium pores; many concretions of calcium carbonate; many threads of soft calcium carbonate; calcareous; moderately alkaline; gradual smooth boundary.

B22ca—34 to 50 inches; pale brown (10YR 6/3) silty clay loam, brown (10YR 5/3) moist; strong fine granular structure; very hard, firm; many fine roots; common medium pores; many concretions of calcium carbonate; calcareous; moderately alkaline; gradual smooth boundary.

C1ca—50 to 80 inches; very pale brown (10YR 7/3) clay loam, pale brown (10YR 6/3) moist; common coarse mottles of pink (7.5YR 7/4); weak fine granular structure; very hard, firm; common soft bodies of calcium carbonate; many pebbles; many concretions of calcium carbonate; calcareous; moderately alkaline; abrupt wavy boundary.

The solum ranges from 40 to 70 inches in thickness. Calcium carbonate equivalent in the 10- to 40-inch control section ranges from 40 to 70 percent. The silicate clay content of the control section ranges from 18 to 35 percent, and content of carbonate clay ranges from 2 to 60 percent. Content of limestone pebbles ranges from 0 to about 15 percent. Depth to chalky limestone bedrock ranges from 60 to more than 100 inches. The solum is calcareous and moderately alkaline throughout.

The A horizon is dark grayish brown, very dark grayish brown, dark brown, grayish brown, or brown clay loam.

The Bca horizon is grayish brown, brown, pale brown, very pale brown, dark yellowish brown, or light yellowish brown. Some pedons contain brownish and yellowish mottles. The Bca horizon is loam, clay loam, or silty clay loam.

The Cca horizon is very pale brown or reddish yellow and has pinkish mottles in many pedons. It is clay loam, silty clay loam, loam, or fine sandy loam.

The Cr horizon, where present, is white chalky limestone. Hardness is less than 3 on Mohs' scale.

Tinn series

The Tinn series consists of deep, clayey soils on flood plains. These soils formed in calcareous, clayey alluvium. Slopes are less than 1 percent.

Typical pedon of Tinn clay, frequently flooded, from the intersection of Texas Highway 171 and Farm Road 308 in Malone, 4.5 miles north on Farm Road 308 to flood plain of White Rock Creek, and 100 feet west of road in meadow:

A11—0 to 16 inches; dark gray (10YR 4/1) clay, very dark gray (10YR 3/1) moist; moderate coarse blocky and granular structure; very hard, very firm, plastic; many fine roots; few fine pores; few fine pebbles; calcareous; moderately alkaline; gradual smooth boundary.

A12—16 to 38 inches; gray (5Y 5/1) clay, very dark gray (5Y 3/1) moist; moderate coarse blocky structure; very hard, very firm, plastic; many fine roots; few fine pores; common shiny pressure faces on peds; common small slickensides; calcareous; moderately alkaline; gradual smooth boundary.

A13—38 to 60 inches; mottled gray (5Y 5/1) and pale olive (5Y 6/3) silty clay, dark gray (5Y 4/1) and olive (5Y 5/3) moist; moderate coarse blocky structure; very hard, very firm, plastic; many fine roots; few fine pores; few bedding planes; sand and silt coats on horizontal faces of bedding planes; calcareous; moderately alkaline; gradual smooth boundary.

C—60 to 80 inches; mottled olive (5Y 4/4, 5Y 5/4), olive gray (5Y 4/2, 5Y 5/2), and olive yellow (5Y 6/6) silty clay; massive; very hard, very firm, plastic; few fine roots; prominent bedding planes containing silt and sand grains on horizontal faces; calcareous; moderately alkaline.

These thick soils are calcareous and are mildly alkaline or moderately alkaline. The clay content of the control section ranges from 40 to 60 percent. Concretions of calcium carbonate range from none to many. Some pedons are underlain by gravel and sand at a depth of more than 40 inches. Pressure faces and small slickensides are below a depth of about 20 inches.

The A11 and A12 horizons are dark gray, very dark gray, gray, or black clay.

The A13 horizon is mottled dark gray, gray, olive, and pale olive and contains bedding planes.

The C horizon is mottled olive, olive gray, olive yellow, very dark gray, and yellowish brown. It contains prominent bedding planes.

Travis series

The Travis series consists of deep, loamy soils formed on old high terraces in clayey sediments. Slopes are generally less than 3 percent.

Typical pedon of Travis fine sandy loam, 1 to 3 percent slopes, from Peoria, 0.75 mile west on Texas Highway 22, 1.0 mile northwest on county road, and 0.25 mile southwest of road in cropland:

Ap—0 to 7 inches; brown (7.5YR 5/4) fine sandy loam, dark brown (7.5YR 4/4) moist; pink (5YR 7/4) surface crust; weak fine granular structure; loose, friable; few roots; few siliceous pebbles; medium acid; clear wavy boundary.

B21t—7 to 50 inches; red (2.5YR 4/6) clay loam, dark red (2.5Y 3/6) moist; moderate medium blocky structure; hard, firm, plastic; few fine roots; few medium pores; thin coating of clean sand on peds; many clay skins; few pebbles; strongly acid; gradual smooth boundary.

B22t—50 to 70 inches; coarsely mottled brownish yellow (10YR 6/8), gray (10YR 6/1), and yellowish red (5YR 5/8) clay loam; weak coarse blocky structure; hard, firm, plastic; thin coating of clean sand on peds; few black concretions; medium acid.

The solum ranges from 50 to 70 inches in thickness. The boundary between the A and B horizons is abrupt, and the B horizon contains more than 20 percent clay than the A horizon. The clay content of the Bt horizon ranges from 35 to 50 percent.

The A horizon is brown, light brown, dark brown, strong brown, or yellowish brown fine sandy loam. Content of siliceous pebbles ranges from 0 to about 10 percent. Reaction is medium acid through neutral.

The B21t horizon is red, weak red, or reddish brown clay, sandy clay, or clay loam. It is medium acid or strongly acid.

The B22t horizon is coarsely mottled brownish yellow, gray, yellowish red, reddish brown, and light red. It is medium acid or slightly acid.

Vaughan series

The Vaughan series consists of deep, loamy soils that formed in concave, shallow drainageways. Slopes generally are less than 2 percent.

Typical pedon of Vaughan fine sandy loam in an area of Coving-Vaughan complex, 0 to 2 percent slopes, 7.5 miles west from Hillsboro on Texas Highway 22, 3.25 miles north on Farm Road 3050, 0.6 mile north and 0.3 mile east on sand road, and 310 yards east of road in an old field:

Ap—0 to 8 inches; very pale brown (10YR 7/3) fine sandy loam, pale brown (10YR 6/3) moist; single grained; loose, very friable; many fine roots; slightly acid; clear smooth boundary.

A2—8 to 17 inches; light brownish gray (10YR 6/2) fine sandy loam, grayish brown (10YR 5/2) moist; few fine faint brownish yellow mottles; weak coarse blocky structure parting to single grained; soft, very friable; many fine roots; slightly acid; abrupt smooth boundary.

B21t—17 to 41 inches; gray (10YR 6/1) sandy clay loam, gray (10YR 5/1) moist; common coarse distinct mottles of yellow (10YR 7/6) and olive yellow (2.5Y 6/6); moderate coarse blocky structure; very hard, very firm, plastic; common fine and very fine pores; few fine roots; clay films on faces of peds; few small cracks; few black concretions; moderately alkaline; gradual smooth boundary.

B22t—41 to 56 inches; gray (10YR 6/1) sandy clay loam, gray (10YR 5/1) moist; many medium distinct mottles of yellow (10YR 7/6) and light yellowish brown (2.5Y 6/4); moderate coarse blocky structure; very hard, very firm, plastic; few fine roots; few fine and very fine pores; clay films on faces of peds; common black concretions; moderately alkaline; gradual smooth boundary.

B3—56 to 70 inches; light gray (10YR 7/1) clay loam, gray (10YR 6/1) moist; many medium distinct mottles of light yellowish brown (2.5Y 6/4); weak coarse blocky structure; very hard, very firm, plastic; few fine roots; clay films on peds; many concretions of calcium carbonate; many soft bodies of calcium carbonate; common gypsum crystals; many black concretions; moderately alkaline.

The solum ranges from 60 to more than 80 inches in thickness.

The A horizon is very pale brown, light gray, light brown, pale brown, or light brownish gray. It has fine mottles of brownish yellow, yellowish brown, and pale brown in the lower part. Texture ranges from fine sandy loam to loamy fine sand. The A horizon is noncalcareous and is medium acid through mildly alkaline. The combined thickness of the Ap and A2 horizons is less than 20 inches.

The B21t and B22t horizons are clay loam or sandy clay loam; clay content is 28 to 35 percent. These horizons are noncalcareous and neutral through moderately alkaline. Clay films range from few to common. Most pedons have many prominent black concretions. The B21t and B22t horizons are gray, dark gray, dark grayish brown, or grayish brown with mottles of yellow, brownish yellow, light yellowish brown, light olive brown, dark gray, dark grayish brown, and dark brown.

The B3 horizon is light gray, gray, or light brownish gray with mottles of light yellowish brown, light olive brown, light brownish gray, brown, and yellowish brown. It is sandy clay loam or clay loam. The B3 horizon has few to common soft black concretions and few to common small bodies of soft calcium carbonate. It is noncalcareous and mildly alkaline or moderately alkaline.

Venus series

The Venus series consists of deep, loamy soils that formed in thick beds of unconsolidated, calcareous sediments. These soils are on old stream terraces. Slopes are generally less than about 5 percent.

Typical pedon of Venus loam, 1 to 3 percent slopes, from the courthouse in Hillsboro, 2.7 miles west on Texas Highway 22, 0.85 mile southeast and 0.5 mile southwest on county road to Union Bluff Community Center, 1.0 mile southwest to west side of Jack's Branch, and 200 feet north of road in an old orchard:

Ap—0 to 6 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; strong coarse subangular blocky and medium granular structure; friable, sticky; many fine roots; common medium pores; worm casts; few concretions of calcium carbonate; calcareous; moderately alkaline; clear smooth boundary.

A1—6 to 14 inches; dark brown (10YR 4/3) loam, dark brown (10YR 3/3) moist; strong medium subangular blocky and medium granular structure; firm, slightly plastic; many fine roots; common medium pores; few concretions of calcium carbonate; many worm casts; calcareous; moderately alkaline; gradual smooth boundary.

B21ca—14 to 29 inches; yellowish brown (10YR 5/4) clay loam, dark yellowish brown (10YR 4/4) moist; strong fine granular structure; firm, slightly plastic; many fine roots; common medium pores; few worm casts; few quartz pebbles; many concretions of calcium carbonate; calcareous; moderately alkaline; gradual smooth boundary.

B22ca—29 to 46 inches; light yellowish brown (10YR 6/4) clay loam, yellowish brown (10YR 5/6) moist; many medium distinct yellow (10YR 7/8) mottles; weak fine granular structure; firm, sticky; few medium roots, common fine roots; many quartz pebbles; common concretions of calcium carbonate; calcareous; moderately alkaline; gradual smooth boundary.

B23ca—46 to 57 inches; brownish yellow (10YR 6/8) sandy clay loam, yellowish brown (10YR 5/8) moist; common coarse distinct mottles of light gray (10YR 7/2); weak fine granular structure; friable, sticky; few fine roots; few fine pores; common pebbles; many concretions of calcium carbonate; few clay balls; many small, 2-inch diameter pockets of sandy material; gray areas contain a few uncoated sand grains; calcareous; moderately alkaline; gradual smooth boundary.

B24ca—57 to 68 inches; mottled light gray (10YR 7/2) and brownish yellow (10YR 6/8) sandy clay loam; weak fine granular structure; friable, sticky; few fine roots; common pebbles; few concretions of calcium carbonate; calcareous; moderately alkaline.

The solum is 40 to 70 inches thick. Organic matter content decreases regularly with depth. Calcium carbonate equivalent in the B2ca horizon ranges to as much as 40 percent. Noncarbonatic clay content in the control section ranges from 18 to 30 percent. Most pedons are calcareous and moderately alkaline. Most contain a few quartz pebbles, and some are underlain by strata of sand and gravel at a depth of 3 to 8 feet.

The A horizon is dark grayish brown, dark brown, brown, grayish brown, or very dark grayish brown loam.

The upper part of the B2ca horizon is yellowish brown, light yellowish brown, brown, grayish brown, light brownish gray, or pale brown. Texture is clay loam or sandy clay loam. The lower part of the B2ca horizon is brownish yellow and has light gray, yellow, brownish yellow, yellowish brown, grayish brown, and brown mottles. It is clay loam or sandy clay loam.

Wilson series

The Wilson series consists of deep, clayey soils that formed in alkaline alluvium over marine clay. These soils are on uplands and old stream terraces. Slopes are less than 3 percent.

Typical pedon of Wilson clay loam, 1 to 3 percent slopes, from the intersection of Farm Road 339 and Texas Highway 31 in Mount Calm, 1.0 mile north on Farm Road 339, and about 100 feet west of road in cropland:

Ap—0 to 7 inches; dark gray (10YR 4/1) clay loam, very dark gray (10YR 3/1) moist; dark brown (10YR 4/3) streaks; moderate coarse subangular blocky structure; very hard, firm, plastic; many fine roots; few fine pores; mildly alkaline; abrupt smooth boundary.

B21tg—7 to 22 inches; very dark gray (10YR 3/1) clay, black (10YR 2/1) moist; dark grayish brown (10YR 4/2) streaks in old filled cracks; moderate coarse blocky structure; extremely hard, extremely firm, plastic; common fine roots; few fine pores; pressure faces; mildly alkaline; gradual smooth boundary.

B22tg—22 to 42 inches; very dark gray (10YR 3/1) clay, black (10YR 2/1) moist; common medium mottles of gray (N 5/0); moderate coarse blocky structure; extremely hard, extremely firm, plastic; few pebbles; common black concretions; common large slickensides; neutral; gradual smooth boundary.

B3g—42 to 57 inches; olive gray (5Y 5/2) and dark gray (5Y 4/1) clay, olive gray (5Y 4/2) and very dark gray (5Y 3/1) moist; moderate coarse blocky structure; extremely hard, extremely firm, plastic; common concretions of calcium carbonate; common gypsum crystals; few fine pebbles; common large slickensides; calcareous; moderately alkaline; gradual smooth boundary.

C—57 to 70 inches; coarsely mottled light olive brown (2.5Y 5/4), yellow (2.5Y 7/8), and dark grayish brown (2.5Y 4/2) clay; massive; extremely hard, extremely firm, plastic; few concretions of calcium carbonate; few soft black concretions; common large slickensides in upper part; calcareous; moderately alkaline.

The solum ranges from 40 to 75 inches in thickness. Cracks 0.4 inch to more than 0.8 inch wide extend from the top of the Bt horizon to a depth of 24 inches or more. Clay content in the control section ranges from 35 to 50 percent.

The A horizon is dark gray, very dark gray, very dark grayish brown, dark grayish brown, grayish brown, gray, or black clay loam. It is less than 10 inches thick in more than half of the pedon but it is as much as 15 inches thick in subsoil troughs. This horizon is medium acid through mildly alkaline.

The B21tg and B22tg horizons are very dark gray, dark gray, or black. Some pedons contain a few brownish, yellowish, and grayish mottles. Texture is clay or silty clay. These horizons are noncalcareous and are medium acid through mildly alkaline. Pebbles and black concretions range from none to many.

The B3g horizon is olive gray, dark gray, gray, grayish brown, or light olive gray. It is clay or silty clay. Gypsum crystals and concretions of calcium carbonate range from none to many. The B3g horizon is calcareous in most pedons and is neutral through moderately alkaline.

The C horizon is mottled light olive brown, yellow, dark grayish brown, gray, yellowish red, or brown clay or silty clay. It is neutral through moderately alkaline. It is calcareous in most pedons.

Classification of the soils

The system of soil classification currently used was adopted by the National Cooperative Soil Survey in 1965. Readers interested in further details about the system should refer to "Soil taxonomy" (*7*).

The system of classification has six categories. Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. In this system the classification is based on the different soil properties that can be observed in the field or those that can be inferred either from other properties that are observable in the field or from the combined data of soil science and other disciplines. The properties selected for the higher categories are the result of soil genesis or of factors that affect soil genesis. In table 19, the soils of the survey area are classified according to the system. Categories of the system are discussed in the following paragraphs.

ORDER. Ten soil orders are recognized as classes in the system. The properties used to differentiate among orders are those that reflect the kind and degree of dominant soil-forming processes that have taken place. Each order is identified by a word ending in *sol.* An example is Entisol.

SUBORDER. Each order is divided into suborders based primarily on properties that influence soil genesis and are important to plant growth or that are selected to reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Fluvent (*Fluv*, meaning river, plus *ent*, from Entisol).

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 Ustifluvents (*Usti*, meaning burnt horizons, plus *fluvent*, the suborder of Entisols that are on flood plains).

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 the great groups but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Typic* identifies the subgroup that is thought to typify the great group. An example is Typic Ustifluvents.

FAMILY. Families are established within a subgroup on the basis of similar physical and chemical properties that affect management. Among the properties considered in horizons of major biological activity below plow depth are particle-size distribution, mineral content, temperature regime, thickness of the soil penetrable by roots, consistence, moisture equivalent, soil slope, and permanent cracks. A family name consists of the name of a subgroup and a series of adjectives. The adjectives are the class names for the soil properties used as family differentiae. An example is coarse-loamy, mixed, nonacid, thermic Typic Ustifluvents.

SERIES. The series consists of soils that formed in a particular kind of material and have horizons that, except for texture of the surface soil or of the underlying substratum, are similar in differentiating characteristics and in arrangement in the soil profile. Among these characteristics are color, texture, structure, reaction, consistence, and mineral and chemical composition.

Formation of the soils

In this section the factors of soil formation are discussed and related to the formation of the soils in Hill County.

Factors of soil formation

The characteristics of a soil at any given point are determined by (1) the physical and mineral composition of the parent materials; (2) the climate under which the soil material has accumulated and existed since accumulation; (3) the plant and animal life on and in the soil; (4) the relief, or lay of the land; and (5) the length of time the forces of soil development have acted on the soil material.

Climate and vegetation are active factors of soil genesis. They act on the parent material that has accumulated through the weathering of rocks and slowly change it into a natural body with genetically related horizons. The effects of climate and vegetation are conditioned by relief. The parent material also affects the kind of profile that can be formed and, in extreme cases, determines it almost entirely. Finally, time is needed for the changing of the parent material into a soil profile. It may be much or little, but some time is always required for horizon differentiation. Usually a long time is required for the development of distinct horizons.

The factors of soil genesis are so closely interrelated in their effects on the soil that few generalizations can be made regarding the effect of any one unless conditions are specified for the other four.

Parent material

Parent material refers to the unconsolidated mass from which soil develops. The soils of Hill County developed mainly from eight different kinds of parent material. These are divided into two broad geological categories according to age. The Quaternary Period contains the recent deposits in flood plains and the fluvial deposits on terrace positions along the Brazos River (*8*).

In the flood plains throughout the county are recent deposits of Holocene Age (*8*). These deposits have washed from the local area. These alluvial soils continue to receive sediments and continue their development in the new material. The Tinn and Pursley soils are examples.

The fluvial deposits along the Brazos River consist of older deposits of Pleistocene Age (*8*). The soils on these old, high stream terraces have advanced enough in development to contain an argillic horizon. The Bastsil and Bastrop soils are examples.

Material of the Cretaceous Period was deposited about 75 to 135 million years ago (*8*). Six groups in the county—Fredricksburg Group, Washita Group, Woodbine Formation, Eagle Ford Shale, Austin Chalk, and Taylor Marl—are of the Cretaceous Period. These groups are listed as they occur from west to east across the county.

The Fredricksburg Group is in the northwestern part of the county. It is composed of two members, the Edwards and Comanche Peak Limestone. In this area the topography is rolling hills and ridges with thin soils containing many small stones of limestone. The limestone bedrock is hard, exceeding 3 on Mohs' scale (*9*), and is many feet thick. The area contains thin soils on the steeper slopes and on the ridges and thicker soils in the natural drainageways and on the gently sloping foot slopes. These calcareous soils developed from limestone and had a vegetative cover of prairie grasses. Aledo and Somervell soils are common in the more sloping areas, and Bolar soils are in the gently sloping areas and in the natural drainageways.

The Washita Group is adjacent to the Fredricksburg Group on the east. This is a long, narrow area extending from north to south and about 3 to 5 miles wide. It is an old valley fill area containing mainly Ferris, Heiden, Normangee, and Wilson soils. These soils are underlain with thick beds of calcareous material. This area is nearly level to gently sloping. Surface drainage is slow.

The Woodbine Formation is parallel to and just east of the Washita Group. It is a narrow band of sandy soil and averages about 5 miles in width. These sandy soils are underlain by thick beds of friable to indurated sandstone containing strata of clay and shale. This is the East Cross Timbers Land Resource Area in the county and contains such soils as those of the Gasil and Silstid series. It is a wooded savannah with gently sloping ridges, shallow valleys, and low hills. The area is well drained and has many natural drainageways.

The Eagle Ford Shale is east of the Woodbine Formation and west of the Austin Chalk. It is in a gently sloping valley that averages about 10 miles in width. It contains deep, calcareous soils containing thin fragments of brown limestone. These soils developed under a cover of tall grasses. Altoga, Ferris, Heiden, and Houston Black soils are among the soils in this area.

The Austin Chalk Formation is east of the Eagle Ford Shale and ranges from 2 to 8 miles in width. It is about 100 to 200 feet higher than the valley containing the Eagle Ford Shale. The topography is gently sloping with many natural drainageways. The soils on the ridges and knolls are mostly thin and gravelly. Eddy soils are common on these sites, and Stephen and Austin soils are on foot slopes and in natural drainageways. The chalky limestone bedrock is at a depth of 4 to 40 inches (fig. 12). These soils are calcareous and contain many small fragments of chalk. They developed under a vegetative cover of prairie grasses and in thick beds of marine chalk.

Taylor Marl, or the Ozan Formation, underlies the eastern part of the county. The marl is similar to the shale of the Eagle Ford Formation, and many of the soils that developed in these materials are of the same series as those that formed in the Eagle Ford. The topography ranges from nearly level to rolling. This area has many natural drainagways having eroded sides. The soils are mostly deep, calcareous clays that are underlain by marls. These soils developed under a vegetative cover of tall grasses and in thick beds of calcareous material. The major soils in this area are Branyon, Burleson, Heiden, Houston Black, and Wilson soils in the nearly level to gently sloping areas and Ferris, Heiden, and Normangee soils in the more rolling areas.

Climate

Climate has an effect on the development of soils. The present climate of Hill County is subhumid continental. The major climatic factors affecting soil development are precipitation and temperature.

Enough precipitation falls in Hill County during most years to leach the soils. Shallow soils and some of the sandier soils are leached several times during the year. Some of the deep soils having high clay content crack severely when dry. These cracks catch the water from rains and funnel it to the lower layers. This enables these soils to become wet to lower depths than they would without the shrink-swell and cracking action.

Rains can occur at any time throughout the year, and short, dry spells or droughts can occur during any season.

The temperature is mild enough during most of the year for micro-organisms in the soil to function. These contribute to soil development through decomposing organic materials. The top few inches of the soil can freeze for a day or two at a time a few times each winter, but this is the extent of soil freezing in the county and is of only minor importance in soil development.

Summer temperatures are high, and the surfaces of clean-tilled fields or other bare soil areas become rather hot. This limits the activity of micro-organisms in the surface layers. When this part of the soil becomes dry and hot, these organisms cannot function.

Plant and animal life

The plant and animal life in and on the soil ranges from microscopic organisms to trees and large animals. These are important factors in soil development in that they contribute to the gain or loss in organic matter, nitrogen, and other plant nutrients. They affect the structure and porosity of the soil. They affect the intake of water and the aeration of the soil.

Grass is the major item that has influenced soil development in Hill County. The area was originally in tall grasses, which provided large amounts of residue and added organic matter to the soils. The roots extended into the lower layers and fed on minerals. The mature grasses left a deposit of lime and other minerals on the surface each year. The decayed roots left channels that increased the movement of water and air through the soil. Earthworms and soil micro-organisms fed on the decomposing organic matter and left their residues distributed throughout the soil.

The processes of soil development are well balanced under natural conditions. On rangeland and well-managed improved pastures, these processes are rather stable; however, on cropland and pastures that are grazed severely, these processes are disrupted. On cropland these processes are dependent on the cropping system to supply organic matter.

Relief

Relief influences soil development through its effect on drainage and runoff. The degree of profile development depends mainly on the average amount of moisture in the soil if other factors are equal. Nearly level soils absorb more moisture and ordinarily have better developed profiles than steeper soils. Furthermore, many of the steeper soils erode almost as fast as they form.

Relief also affects the kind and amount of vegetation on a soil. Slopes facing north and east receive less direct sunlight than those facing south and west, and they lose less moisture through evaporation. As a result, the vegetation is denser on slopes facing north and east.

Soils that are nearly level or slightly concave are likely to be darker than sloping soils because they receive more moisture, produce more vegetation, and consequently contain more organic matter, which imparts a darker color.

Time

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

The soils in Hill County range from young to old. The young soils have very little profile development, and the older soils have well expressed soil horizons.

The soils on bottom lands are examples of young, undeveloped soils. Nearly level to gently sloping soils that have been in place for long periods normally show the greatest profile development. In Hill County examples of these soils are those of the Axtell and Culp series.

Many steep, shallow soils have been in the process of development as long as the well-developed, nearly level soils. Geologic erosion, however, has removed the effects of soil formation on the shallow soils, and such soils have not reached an equilibrium with their environment. Here, relief is the dominant soil-forming factor rather than time. Aledo and Brackett soils are examples.

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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.

Association, soil. A group of soils geographically associated in a characteristic repeating pattern and delineated as a single unit.

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 commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as—

	Inches
Very low	0 to 3
Low	3 to 6
Medium	6 to 9
High	More than 9

Base saturation. The degree to which material having base exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, K), expressed as a percentage of the exchange capacity.

Bedding planes. Fine stratifications, less than 5 millimeters thick, in unconsolidated alluvial, eolian, lacustrine, or marine sediments.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bottom land. The normal flood plain of a stream, subject to frequent flooding.

Calcareous soil. A soil containing enough calcium carbonate (commonly with magnesium carbonate) to effervesce (fizz) visibly when treated with cold, dilute hydrochloric acid. A soil having measurable amounts of calcium carbonate or magnesium carbonate.

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.

Coarse fragments. Mineral or rock particles up to 3 inches (2 millimeters to 7.5 centimeters) in diameter.

Coarse textured (light textured) soil. Sand or loamy sand.

Colluvium. Soil material, rock fragments, or both moved by creep, slide, or local wash and deposited at the bases of steep slopes.

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.

Compressible. Excessive decrease in volume of soft soil under load.

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.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is 40 or 80 inches (1 or 2 meters).

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

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

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

Decreasers. The most heavily grazed climax range plants. Because they are the most palatable, they are the first to be destroyed by overgrazing.

Depth to rock. Bedrock at a depth that adversely affects the specified use.

Drainage class (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:

Excessively drained.—Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.

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."

Drainage, surface. Runoff, or surface flow of water, from an area.

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 alkali. Excess exchangeable sodium. The resulting poor physical properties restrict the growth of plants.

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.

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.

Field moisture capacity. The moisture content of a soil, expressed as a percentage of the ovendry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity, normal moisture capacity,* or *capillary capacity.*

Fine textured (heavy textured) soil. Sandy clay, silty clay, and clay.

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.

Foot slope. The inclined surface at the base of a hill.

Forage. Plant material used as feed by domestic animals. Forage can be grazed or cut for hay.

Forb. Any herbaceous plant not a grass or a sedge.

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.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock up to 3 inches (2 millimeters to 7.5 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material from 15 to 50 percent, by volume, rounded or angular rock fragments, not prominently flattened, up to 3 inches (7.5 centimeters) in diameter.

Ground water (geology). Water filling all the unblocked pores of underlying material below the water table, which is the upper limit of saturation.

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.

Gypsum. Hydrous calcium sulphate.

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.

Humus. The well decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups. Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered, but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

Impervious soil. A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

Increasers. Species in the climax vegetation that increase in amount as the more desirable plants are reduced by close grazing. Increasers commonly are the shorter plants and the less palatable to livestock.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Invaders. On range, plants that encroach into an area and grow after the climax vegetation has been reduced by grazing. Generally, invader plants are those that follow disturbance of the surface.

Leaching. The removal of soluble material from soil or other material by percolating water.

Light textured soil. Sand and loamy sand.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Low strength. Inadequate strength for supporting loads.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is greater than that of organic soil.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Miscellaneous areas. Areas that have little or no natural soil, are too nearly inaccessible for orderly examination, or cannot otherwise be feasibly classified.

Moderately coarse textured (moderately light textured) soil. Sandy loam and fine sandy loam.

Moderately fine textured (moderately heavy textured) soil. Clay loam, sandy clay loam, and silty clay loam.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms are as follows: abundance—*few, common,* and *many;* size—*fine, medium,* and *coarse;* and contrast—*faint, distinct,* and *prominent.* The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium,* from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse,* more than 15 millimeters (about 0.6 inch).

Munsell notation. A designation of color by degrees of the three single variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color of 10YR hue, value of 6, and chroma of 4.

Neutral soil. A soil having a pH value between 6.6 and 7.3.

Nutrient, plant. Any element taken in by a plant, essential to its growth, and used by it in the production of food and tissue. Plant nutrients are nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, zinc, and perhaps other elements obtained from the soil; and carbon, hydrogen, and oxygen obtained largely from the air and water.

Pan. A compact, dense layer in a soil. A pan impedes the movement of water and the growth of roots. The word "pan" is commonly combined with other words that more explicitly indicate the nature of the layer; for example, *hardpan, fragipan, claypan, plowpan,* and *traffic pan.*

Parent material. The great variety of unconsolidated organic and mineral material in which soil forms. Consolidated bedrock is not yet parent material by this concept.

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation. The downward movement of water through the soil.

Percs slowly. The slow movement of water through the soil adversely affecting the specified use.

Permeability. The quality that enables the soil to transmit water or air, measured as the number of inches per hour that water moves through the soil. Terms describing permeability are *very slow* (less than 0.06 inch), *slow* (0.06 to 0.20 inch), *moderately slow* (0.2 to 0.6 inch), *moderate* (0.6 to 2.0 inches), *moderately rapid* (2.0 to 6.0 inches), *rapid* (6.0 to 20 inches), and *very rapid* (more than 20 inches).

Phase, soil. A subdivision of a soil series or other unit in the soil classification system based on differences in the soil that affect its management. A soil series, for example, may be divided into phases on the bases of differences in slope, stoniness, thickness, or some other characteristic that affects management. These differences are too small to justify separate series.

pH value. (See Reaction, soil). A numerical designation of acidity and alkalinity in soil.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from a semisolid to a plastic state.

Plowpan. A compacted layer formed in the soil directly below the plowed layer.

Productivity (soil). The capability of a soil for producing a specified plant or sequence of plants under a specified system of management. Productivity is measured in terms of output, or harvest, in relation to input.

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

Range (or rangeland). Land that, for the most part, produces native plants suitable for grazing by livestock; includes land supporting some forest trees.

Range condition. The health or productivity of forage plants on a given range, in terms of the potential productivity under normal climate and the best practical management. Condition classes generally recognized are—*excellent, good, fair,* and *poor.* The classification is based on the percentage of original, or assumed climax vegetation on a site, as compared to what has been observed to grow on it when well managed.

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 pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degree of acidity or alkalinity is expressed as—

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

Regolith. The unconsolidated mantle of weathered rock and soil material on the earth's surface; the loose earth material above the solid rock. Soil scientists regard as soil only the part of the regolith that is modified by organisms and other soil-building forces. Most engineers describe the whole regolith, even to a great depth, as "soil."

Relief. The elevations or inequalities of a land surface, considered collectively.

Rill. A steep sided channel resulting from accelerated erosion. A rill is generally a few inches deep and not wide enough to be an obstacle to farm machinery.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Rooting depth. Shallow root zone. The soil is shallow over a layer that greatly restricts roots. See Root zone.

Root zone. The part of the soil that can be penetrated by plant roots.

Runoff. The precipitation discharged in stream channels from a drainage area. The water that flows off the land surface without sinking in is called surface runoff; that which enters the ground before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Saline soil. A soil containing soluble salts in an amount that impairs growth of plants. A saline soil does not contain excess exchangeable sodium.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone. Sedimentary rock containing dominantly sand-size particles.

Seepage. The rapid movement of water through the soil. Seepage adversely affects the specified use.

Series, soil. A group of soils, formed from a particular type of parent material, having horizons that, except for the texture of the A or surface horizon, are similar in all profile characteristics and in arrangement in the soil profile. Among these characteristics are color, texture, structure, reaction, consistence, and mineralogical and chemical composition.

Shale. Sedimentary rock formed by the hardening of a clay deposit.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and runoff water.

Shrink-swell. The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Site index. A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75 feet.

Slickensides. Polished and grooved surfaces produced by one mass sliding past another. In soils, slickensides may occur at the bases of slip surfaces on the steeper slopes; on faces of blocks, prisms, and columns; and in swelling clayey soils, where there is marked change in moisture content.

Slick spot. Locally, a small area of soil having a puddled, crusted, or smooth surface and an excess of exchangeable sodium. The soil is generally silty or clayey, is slippery when wet, and is low in productivity.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

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* (0.05 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.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter.

Stony. Refers to a soil containing stones in numbers that interfere with or prevent tillage.

Stratified. Arranged in strata, or layers. The term refers to geologic material. Layers in soils that result from the processes of soil formation are called horizons; those inherited from the parent material are called strata.

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

Stubble mulch. Stubble or other crop residue left on the soil, or partly worked into the soil, to provide protection from soil blowing and water erosion after harvest, during preparation of a seedbed for the next crop, and during the early growing period of the new crop.

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

Substratum. The part of the soil below the solum.

Subsurface layer. Technically, the A2 horizon. Generally refers to a leached horizon lighter in color and lower in content of organic matter than the overlying surface layer.

Surface soil. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Taxadjuncts. Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use or management.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that it can soak into the soil or flow slowly to a prepared outlet without harm. A terrace in a field is generally built so that the field can be farmed. A terrace intended mainly for drainage has a deep channel that is maintained in permanent sod.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, 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.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt, silt loam, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

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.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

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

Valley fill. In glaciated regions, material deposited in stream valleys by glacial melt water. In nonglaciated regions, alluvium deposited by heavily loaded streams emerging from hills or mountains and spreading sediments onto the lowland as a series of adjacent alluvial fans.

Variant, soil. A soil having properties sufficiently different from those of other known soils to justify a new series name, but the limited geographic soil area does not justify creation of a new series.

Water table. The upper limit of the soil or underlying rock material that is wholly saturated with water.

Water table, apparent. A thick zone of free water in the soil. An apparent water table is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil.

Water table, artesian. A water table under hydrostatic head, generally beneath an impermeable layer. When this layer is penetrated, the water level rises in an uncased borehole.

Water table, perched. A water table standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

Well graded. Refers to a soil or soil material consisting of particles well distributed over a wide range in size or diameter. Such a soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

Illustrations

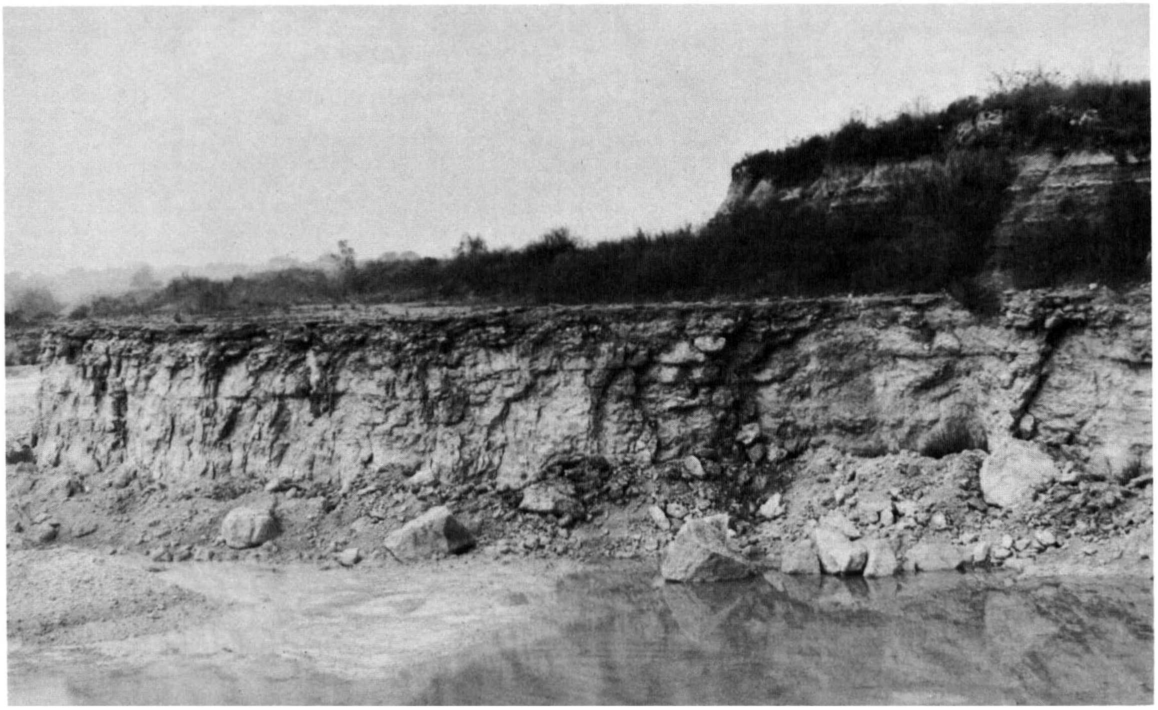

Figure 1.—Active limestone pit in an area of the Edwards Limestone. The soils are Aledo-Somervell gravelly clay loams, 2 to 8 percent slopes.

Figure 2.—Milo (grain sorghum) on Branyon clay, 0 to 1 percent slopes.

Figure 3.—Cotton and milo (grain sorghum) are two of the main crops on Chatt clay, 1 to 3 percent slopes.

Figure 4.—Cut-bank slippage in an area of the Ferris-Heiden complex, 2 to 5 percent slopes.

Figure 5.—Milo (grain sorghum) on Houston Black clay, 1 to 3 percent slopes.

Figure 6.—Bales of Coastal bermudagrass hay on Silstid loamy fine sand, 1 to 3 percent slopes.

Figure 7.—Contour tillage on Houston Black clay, 1 to 3 percent slopes.

Figure 8.—Improved bermudagrass waterway for a terrace system on Houston Black clay, 1 to 3 percent slopes.

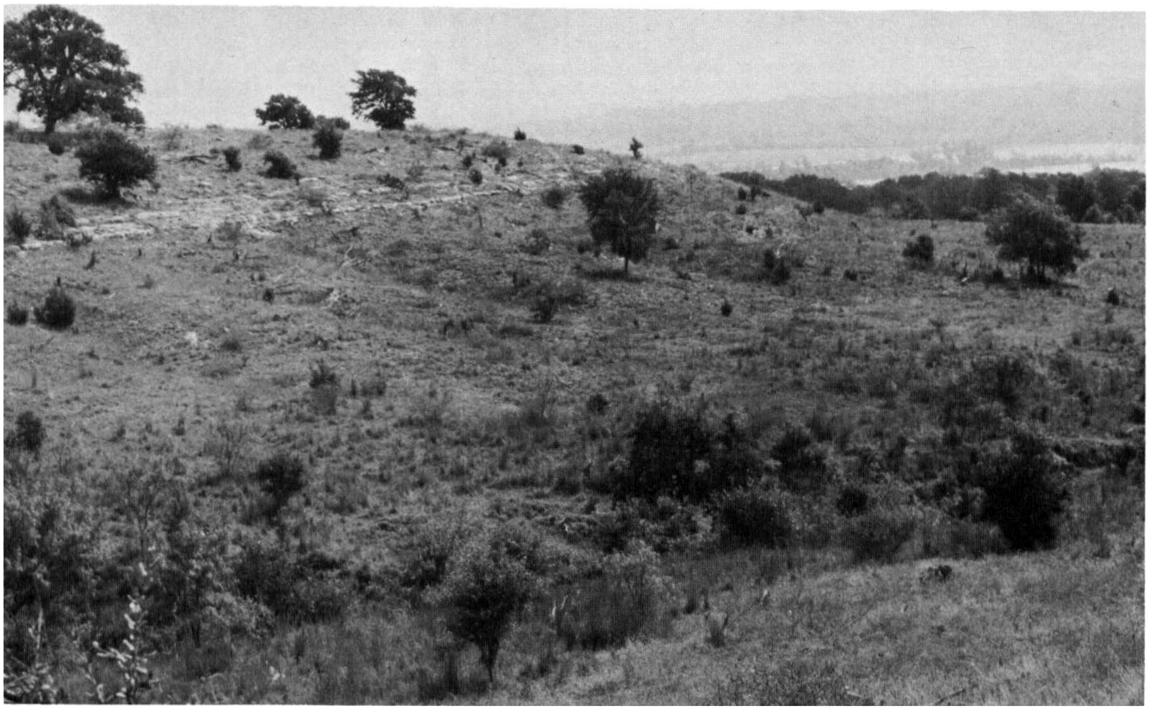

Figure 9.—Area of Aledo-Somervell gravelly clay loams, 2 to 8 percent slopes. These soils are in the Shallow range site.

Figure 10.—This willow tree near a detention dam is being cut by beavers.

Figure 11.—Area of Aledo-Somervell gravelly clay loams, 8 to 20 percent slopes. These soils are in the Shallow range site. This area supports white-tailed deer.

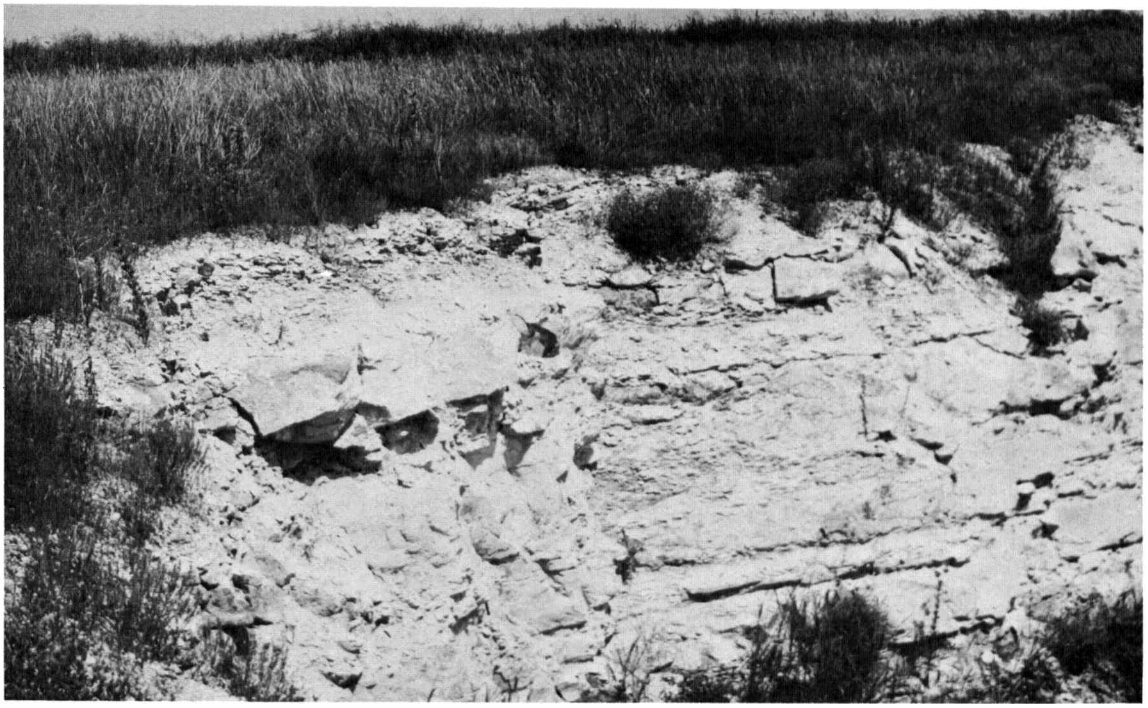

Figure 12.—Rock pit in an area of Eddy gravelly clay loam, 1 to 3 percent slopes, showing the Austin Chalk bedrock under this shallow soil.

Tables

TABLE 1.--TEMPERATURE AND PRECIPITATION DATA

Month	Temperature[1]						Precipitation[1]				
	Average daily maximum	Average daily minimum	Average	2 years in 10 will have-- Maximum temperature higher than--	2 years in 10 will have-- Minimum temperature lower than--	Average number of growing degree days[2]	Average	2 years in 10 will have-- Less than--	2 years in 10 will have-- More than--	Average number of days with 0.10 inch or more	Average snowfall
	F	F	F	F	F	Units	In	In	In		In
January----	56.6	33.7	45.2	81	11	67	1.89	.56	2.96	4	.7
February---	60.6	37.0	48.8	85	17	93	2.33	1.12	3.31	5	.5
March------	68.4	43.9	56.2	89	24	257	1.99	.69	3.02	4	.1
April------	77.0	54.3	65.7	93	32	471	3.97	1.95	5.61	5	.0
May--------	83.8	62.2	73.0	95	44	713	4.78	2.67	6.49	6	.0
June-------	91.5	69.6	80.6	100	55	918	3.20	1.12	4.86	4	.0
July-------	96.0	73.2	84.6	105	63	1,073	1.92	.32	3.12	3	.0
August-----	96.5	72.5	84.5	106	61	1,070	1.86	.40	2.99	3	.0
September--	89.5	66.2	77.9	102	49	837	3.27	1.04	5.04	4	.0
October----	80.0	55.2	67.6	94	36	546	3.91	1.08	6.17	4	.0
November---	67.7	43.3	55.5	86	23	199	2.69	.74	4.26	4	.0
December---	59.9	36.2	48.1	81	15	90	2.32	.91	3.45	4	.0
Year-----	77.3	53.9	65.6	106	9	6,334	34.13	26.54	41.27	50	1.3

[1]Recorded in the period 1951-75 at Hillsboro, Tex.

[2]A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (50 F).

TABLE 2.--FREEZE DATES IN SPRING AND FALL

Probability	Temperature[1]		
	24 F or lower	28 F or lower	32 F or lower
Last freezing temperature in spring:			
1 year in 10 later than--	March 13	March 24	April 9
2 years in 10 later than--	March 5	March 16	April 1
5 years in 10 later than--	February 17	March 1	March 16
First freezing temperature in fall:			
1 year in 10 earlier than--	November 15	November 9	October 29
2 years in 10 earlier than--	November 25	November 17	November 4
5 years in 10 earlier than--	December 13	December 2	November 14

[1]Recorded in the period 1951-75 at Hillsboro, Tex.

TABLE 3.--GROWING SEASON LENGTH

Probability	Daily minimum temperature during growing season[1]		
	Higher than 24 F	Higher than 28 F	Higher than 32 F
	Days	Days	Days
9 years in 10	274	248	214
8 years in 10	282	258	224
5 years in 10	298	276	242
2 years in 10	314	294	261
1 year in 10	322	304	271

[1]Recorded in the period 1951-75 at Hillsboro, Tex.

TABLE 4.--POTENTIALS AND LIMITATIONS OF MAP UNITS ON THE GENERAL SOIL MAP FOR SPECIFIED USES

Map unit	Extent of area	Cultivated field crops	Specialty crops	Rangeland	Urban uses	Recreation areas
	Pct					
1. Houston Black-Heiden-Altoga	35	High	Medium: too clayey.	High	Low: shrink-swell, low strength.	Low: too clayey.
2. Heiden-Ferris	10	Medium: slope.	Low: too clayey.	High	Low: shrink-swell, low strength.	Low: too clayey.
3. Austin-Houston Black	3	High	Medium: too clayey.	High	Low: shrink-swell, low strength.	Low: too clayey.
4. Normangee-Wilson-Crockett	11	Medium: slow runoff.	Medium: too clayey.	High	Low: shrink-swell, low strength.	Low: too clayey.
5. Aledo-Somervell-Bolar	10	Low: depth to rock, slope, small stones.	Low: depth to rock, small stones.	Low: depth to rock, small stones.	Low: depth to rock.	Low: depth to rock.
6. Eddy-Stephen-Austin	10	Low: depth to rock.	Low: depth to rock.	Medium: depth to rock.	Low: depth to rock.	Medium: depth to rock.
7. Gasil-Konsil-Crosstell	8	Medium: moderate fertility.	High	High	Medium: low strength.	Medium: sandy surface.
8. Bastsil-Travis-Aquilla	6	Medium: too sandy.	High	High	Medium: wetness.	Low: too sandy.
9. Silstid-Eufaula	1	Medium: too sandy.	High	Medium: too sandy.	High	Low: too sandy.
10. Tinn-Pursley	6	Low: floods.	Low: floods.	High	Low: floods.	Low: floods.

TABLE 5.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
1	Aledo-Somervell gravelly clay loams, 2 to 8 percent slopes	17,300	2.6
2	Aledo-Somervell gravelly clay loams, 8 to 20 percent slopes	7,300	1.1
3	Altoga silty clay, 1 to 3 percent slopes	15,200	2.3
4	Altoga silty clay, 2 to 5 percent slopes, eroded	9,800	1.5
5	Altoga clay loam, 5 to 8 percent slopes, eroded	3,200	0.5
6	Aquilla fine sand, 1 to 3 percent slopes	2,200	0.3
7	Austin silty clay, 1 to 3 percent slopes	7,600	1.2
8	Austin silty clay, 2 to 5 percent slopes, eroded	19,100	2.9
9	Axtell fine sandy loam, 0 to 1 percent slopes	1,100	0.2
10	Axtell fine sandy loam, 1 to 3 percent slopes	3,100	0.5
11	Axtell fine sandy loam, 2 to 5 percent slopes, eroded	1,600	0.2
12	Bastrop fine sandy loam, 3 to 5 percent slopes, eroded	1,400	0.2
13	Bastsil loamy fine sand, 0 to 3 percent slopes	11,000	1.7
14	Bastsil fine sandy loam, 0 to 3 percent slopes	2,100	0.3
15	Birome-Rayex complex, 5 to 20 percent slopes	4,100	0.6
16	Blum loam, 0 to 2 percent slopes	3,500	0.5
17	Bolar clay loam, 1 to 3 percent slopes	2,700	0.4
18	Bolar clay loam, 3 to 8 percent slopes	4,400	0.7
19	Bolar-Sunev complex, 3 to 5 percent slopes	3,400	0.5
20	Brackett-Rock outcrop complex, 5 to 30 percent slopes	5,200	0.8
21	Branyon clay, 0 to 1 percent slopes	7,200	1.1
22	Burleson clay, 0 to 1 percent slopes	3,200	0.5
23	Burleson clay, 1 to 3 percent slopes	1,300	0.2
24	Chatt clay, 1 to 3 percent slopes	3,000	0.5
25	Chatt-Urban land complex	500	0.1
26	Chickasha variant fine sandy loam, 3 to 8 percent slopes	1,000	0.2
27	Coving-Vaughan complex, 0 to 2 percent slopes	4,100	0.6
28	Crockett fine sandy loam, 0 to 1 percent slopes	2,100	0.3
29	Crockett fine sandy loam, 1 to 3 percent slopes	14,700	2.2
30	Crockett-Wilson complex, 0 to 2 percent slopes	2,800	0.4
31	Crosstell fine sandy loam, 5 to 12 percent slopes	5,500	0.8
32	Culp clay loam, 1 to 3 percent slopes	4,700	0.7
33	Denton clay, 1 to 3 percent slopes	800	0.1
34	Eddy very gravelly clay loam, 1 to 3 percent slopes	15,300	2.3
35	Eddy very gravelly clay loam, 3 to 8 percent slopes	11,700	1.8
36	Eufaula fine sand, 1 to 5 percent slopes	1,700	0.3
37	Ferris clay, 5 to 12 percent slopes	8,500	1.3
38	Ferris clay, 8 to 20 percent slopes, severely eroded	18,800	2.9
39	Ferris-Heiden complex, 2 to 5 percent slopes	53,400	8.1
40	Gasil fine sandy loam, 1 to 3 percent slopes	7,400	1.1
41	Gasil fine sandy loam, 3 to 5 percent slopes, eroded	7,100	1.1
42	Gowen clay loam, frequently flooded	3,200	0.5
43	Heiden clay, 1 to 3 percent slopes	29,100	4.4
44	Heiden clay, 5 to 8 percent slopes	4,300	0.7
45	Heiden-Urban land complex, 3 to 8 percent slopes	1,100	0.2
46	Hensley loam, 1 to 3 percent slopes	2,200	0.3
47	Hillco clay loam, 1 to 3 percent slopes	2,400	0.4
48	Houston Black clay, 0 to 1 percent slopes	22,500	3.4
49	Houston Black clay, 1 to 3 percent slopes	92,950	14.1
50	Houston Black-Urban land complex, 0 to 3 percent slopes	2,600	0.4
51	Kemp loam, occasionally flooded	1,400	0.2
52	Konsil fine sandy loam, 3 to 5 percent slopes	7,400	1.1
53	Kopperl gravelly sandy loam, 1 to 3 percent slopes	3,500	0.5
54	Krum silty clay, 0 to 1 percent slopes	1,600	0.2
55	Lamar clay loam, 1 to 5 percent slopes	3,200	0.5
56	Lamar clay loam, 3 to 5 percent slopes, eroded	1,300	0.2
57	Lamar-Urban land complex, 1 to 5 percent slopes	500	0.1
58	Lindy clay loam, 1 to 3 percent slopes	2,400	0.4
59	Mabank fine sandy loam, 0 to 2 percent slopes	7,100	1.1
60	Normangee clay loam, 0 to 1 percent slopes	2,800	0.4
61	Normangee clay loam, 1 to 3 percent slopes	16,300	2.5
62	Normangee clay loam, 3 to 5 percent slopes	13,700	2.1
63	Pits	2,000	0.3
64	Pulexas loamy fine sand, 0 to 2 percent slopes	700	0.1
65	Pulexas soils, frequently flooded	1,600	0.2
66	Pursley clay loam, frequently flooded	9,500	1.4
67	Purves clay loam, 1 to 3 percent slopes	1,700	0.3
68	Silstid loamy fine sand, 1 to 3 percent slopes	13,600	2.1
69	Silstid loamy fine sand, 3 to 5 percent slopes	1,600	0.2
70	Stephen silty clay, 1 to 3 percent slopes	12,500	1.9
71	Stephen silty clay, 3 to 5 percent slopes	6,900	1.1
72	Sunev clay loam, 5 to 15 percent slopes	800	0.1

TABLE 5.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS--Continued

Map symbol	Soil name	Acres	Percent
73	Tinn clay, occasionally flooded	6,900	1.1
74	Tinn clay, frequently flooded	27,700	4.2
75	Travis fine sandy loam, 1 to 3 percent slopes	8,800	1.3
76	Ustifluvents, 5 to 20 percent slopes	600	0.1
77	Venus loam, 1 to 3 percent slopes	8,300	1.3
78	Venus loam, 3 to 5 percent slopes	3,900	0.6
79	Wilson clay loam, 0 to 1 percent slopes	6,000	0.9
80	Wilson clay loam, 1 to 3 percent slopes	9,400	1.4
81	Wilson-Heiden complex, 0 to 1 percent slopes	3,400	0.5
	Water	10,370	1.6
	Total	657,920	100.0

TABLE 6.--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	Oats	Wheat	Peanuts	Improved bermudagrass
	Lb	Bu	Bu	Bu	Lb	AUM[1]
Aledo:						
[2]1	---	---	---	---	---	---
[2]2	---	---	---	---	---	---
Altoga:						
3	275	50	40	30	---	6.0
4	225	35	35	25	---	5.0
5	---	---	---	---	---	3.5
Aquilla:						
6	---	---	---	---	1,200	6.0
Austin:						
7	350	75	70	35	---	6.5
8	---	60	45	---	---	6.0
Axtell:						
9	250	45	50	25	---	7.0
10	250	40	45	20	---	7.0
11	---	30	35	---	---	5.0
Bastrop:						
12	250	40	---	---	800	5.0
Bastsil:						
13	350	60	65	30	1,200	6.5
14	350	80	80	35	1,200	7.0
Birome:						
[2]15	---	---	---	---	---	4.0
Blum:						
16	400	85	85	35	---	8.0
Bolar:						
17	300	40	60	30	---	5.0
18	---	30	30	20	---	4.5
[2]19	---	44	44	---	---	5.7
Brackett:						
[2]20	---	---	---	---	---	2.0
Branyon:						
21	500	100	90	35	---	8.0
Burleson:						
22	400	85	65	35	---	7.0
23	450	80	70	30	---	7.0
Chatt:						
24	400	70	70	35	---	8.0
[2]25	---	---	---	---	---	---
Chickasha Variant:						
26	---	---	25	15	---	5.5

See footnotes at end of table.

TABLE 6.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Cotton lint	Grain sorghum	Oats	Wheat	Peanuts	Improved bermuda-grass
	Lb	Bu	Bu	Bu	Lb	AUM[1]
Coving:						
[2]27	---	57	---	---	---	7.6
Crockett:						
28	300	60	50	25	---	7.5
29	300	55	50	25	---	7.5
[2]30	300	50	50	25	---	7.5
Crosstell:						
31	---	---	---	---	---	4.0
Culp:						
32	500	100	70	35	---	8.0
Denton:						
33	350	65	60	35	---	6.0
Eddy:						
34	---	---	30	15	---	2.5
35	---	---	---	---	---	2.0
Eufaula:						
36	---	---	---	---	900	4.0
Ferris:						
37	---	---	---	---	---	4.5
38	---	---	---	---	---	3.5
[2]39	300	58	50	20	---	6.5
Gasil:						
40	300	55	70	30	1,200	7.0
41	200	50	55	20	800	5.0
Gowen:						
42	---	---	---	---	---	8.0
Heiden:						
43	400	80	70	35	---	8.0
44	---	35	30	20	---	5.0
[2]45	---	---	---	---	---	---
Hensley:						
46	---	25	40	20	---	3.5
Hillco:						
47	275	60	60	35	---	6.0
Houston Black:						
48	500	100	90	35	---	8.0
49	500	95	90	35	---	8.0
[2]50	---	---	---	---	---	---
Kemp:						
51	450	90	80	35	---	8.0
Konsil:						
52	250	50	40	25	800	5.5
Kopperl:						
53	---	---	---	---	---	6.0

See footnotes at end of table.

TABLE 6.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Cotton lint	Grain sorghum	Oats	Wheat	Peanuts	Improved bermudagrass
	Lb	Bu	Bu	Bu	Lb	AUM[1]
Krum:						
54	500	100	70	35	---	8.0
Lamar:						
55	250	55	45	25	---	5.0
56	---	45	40	---	---	4.0
[2]57	---	---	---	---	---	---
Lindy:						
58	250	55	45	25	---	5.0
Mabank:						
59	300	55	50	20	---	6.0
Normangee:						
60	300	55	50	20	---	6.0
61	300	50	50	20	---	6.0
62	---	45	50	20	---	5.0
Pits:						
63	---	---	---	---	---	---
Pulexas:						
64	300	35	40	20	1,100	6.5
[2]65	---	---	---	---	---	6.5
Pursley:						
66	---	---	---	---	---	8.0
Purves:						
67	---	35	45	20	---	4.0
Silstid:						
68	---	55	55	30	1,200	5.5
69	---	45	45	25	900	5.0
Stephen:						
70	200	45	45	25	---	4.0
71	---	35	40	20	---	3.5
Sunev:						
72	---	---	---	---	---	5.0
Tinn:						
[3]73	500	100	80	35	---	8.0
74	---	---	---	---	---	8.0
Travis:						
75	300	55	55	30	1,100	7.0
Ustifluvents:						
[2]76	---	---	---	---	---	4.0
Venus:						
77	300	70	60	30	---	7.0
78	250	65	50	25	---	6.5

See footnotes at end of table.

TABLE 6.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Cotton lint	Grain sorghum	Oats	Wheat	Peanuts	Improved bermuda-grass
	Lb	Bu	Bu	Bu	Lb	AUM[1]
Wilson:						
79	350	55	55	30	---	6.0
80	300	45	50	30	---	6.0
[2]81	392	70	60	35	---	6.0

[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 7.--CAPABILITY CLASSES AND SUBCLASSES

[Miscellaneous areas excluded. Absence of an entry means no acreage]

Class	Total acreage	Major management concerns (subclass)		
		Erosion (e)	Wetness (w)	Soil problem (s)
		Acres	Acres	Acres
I	---	---	---	---
II	209,850	163,550	44,700	1,600
III	233,200	187,300	23,400	22,500
IV	72,500	55,500	---	17,000
V	42,000	---	---	---
VI	78,100	53,500	---	24,600
VII	5,200	---	---	5,200
VIII	---	---	---	---
Total	640,850	459,850	68,100	70,900

TABLE 8.--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: Kind of year	Potential production: Dry weight	Common plant name	Composition
			Lb/acre		Pct
Aledo:					
[1]1:					
Aledo part	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
				Hairy grama	5
				Hairv dropseed	5
				Texas needlegrass	5
				Other perennial forbs	5
				Other trees	5
Somervell part	Adobe	Favorable	4,500	Little bluestem	40
		Normal	3,500	Sideoats grama	8
		Unfavorable	2,000	Tall grama	7
				Indiangrass	5
				Silver bluestem	5
				Tall dropseed	3
				Purple threeawn	2
				Slim tridens	2
				Fall witchgrass	2
				Hairy grama	1
				Other perennial forbs	10
				Other trees	6
				Other perennial grasses	5
				Other shrubs	4
[1]2:					
Aledo part	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
				Hairv grama	5
				Hairy dropseed	5
				Texas needlegrass	5
				Other perennial forbs	5
				Other trees	5
Somervell part	Steep Adobe	Favorable	3,500	Little bluestem	30
		Normal	2,500	Sideoats grama	10
		Unfavorable	1,700	Tall grama	10
				Indiangrass	10
				Tall dropseed	5
				Silver bluestem	5
				Slim tridens	5
				Hairy grama	5
				Other trees	15
				Other perennial forbs	5
Altoga:					
3, 4, 5	Clay Loam	Favorable	6,500	Little bluestem	35
		Normal	5,000	Big bluestem	20
		Unfavorable	3,800	Indiangrass	15
				Switchgrass	5
				Florida paspalum	5
				Virginia wildrye	5
				Sideoats grama	5
				Other perennial grasses	5
				Other perennial forbs	5

See footnote at end of table.

TABLE 8.--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
Aquilla:					
6	Deep Sand	Favorable	5,000	Little bluestem	35
		Normal	4,000	Indiangrass	15
		Unfavorable	3,000	Sand lovegrass	5
				Purpletop	5
				Silver bluestem	5
				Fringeleaf paspalum	5
				Greenbrier	5
				Big bluestem	5
				Switchgrass	5
				Other trees	10
				Other shrubs	5
Austin:					
7, 8	Clay Loam	Favorable	6,500	Little bluestem	40
		Normal	5,000	Indiangrass	15
		Unfavorable	3,000	Big bluestem	15
				Sideoats grama	5
				Switchgrass	5
				Silver bluestem	5
				Texas needlegrass	5
				Other perennial forbs	5
				Other half shrubs	5
Axtell.					
9, 10, 11	Claypan Savannah	Favorable	5,000	Little bluestem	25
		Normal	3,500	Sideoats grama	15
		Unfavorable	2,500	Indiangrass	10
				Beaked panicum	5
				Purpletop	5
				Florida paspalum	5
				Tall dropseed	5
				Other trees	20
				Other perennial forbs	5
				Unknowns	5
Bastrop:					
12	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
Bastsil:					
13	Loamy Sand	Favorable	5,500	Little bluestem	50
		Normal	4,200	Indiangrass	10
		Unfavorable	2,500	Switchgrass	5
				Purpletop	5
				Fall witchgrass	5
				Post oak	5
				Blackjack oak	5
				American beautyberry	5
				Other perennial forbs	5
				Other annual forbs	5

See footnote at end of table.

TABLE 8.--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
Bastsil:					
14	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
Birome:					
[1]15:					
Birome part	Sandstone Hills	Favorable	4,000	Little bluestem	25
		Normal	3,000	Purpletop	10
		Unfavorable	2,000	Indiangrass	10
				Post oak	10
				Beaked panicum	5
				Big bluestem	5
				Sideoats grama	5
				Sand lovegrass	5
				Scribner panicum	5
				Catclaw sensitivebrier	5
				Blackjack oak	5
				Sedge	3
				Greenbrier	3
				Tall dropseed	2
				Bumelia	2
Rayex part	Sandstone Hills	Favorable	3,500	Little bluestem	25
		Normal	2,500	Purpletop	10
		Unfavorable	1,500	Indiangrass	10
				Post oak	10
				Beaked panicum	5
				Big bluestem	5
				Sideoats grama	5
				Sand lovegrass	5
				Scribner panicum	5
				Catclaw sensitivebrier	5
				Blackjack oak	5
				Sedge	3
				Greenbrier	3
				Tall dropseed	2
				Bumelia	2
Blum:					
16	Clay Loam	Favorable	7,000	Little bluestem	30
		Normal	5,000	Indiangrass	15
		Unfavorable	3,000	Big bluestem	15
				Switchgrass	10
				Eastern gamagrass	5
				Sideoats grama	5
				Texas needlegrass	5
				Silver bluestem	5
				Other perennial forbs	5
				Other perennial grasses	5

See footnote at end of table.

TABLE 8.--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
Bolar:					
17, 18	Clay Loam	Favorable	6,000	Little bluestem	20
		Normal	5,000	Indiangrass	15
		Unfavorable	3,000	Big bluestem	10
				Sideoats grama	10
				Silver bluestem	5
				Tall dropseed	5
				Texas needlegrass	5
				Canada wildrye	5
				Other perennial forbs	15
				Other perennial grasses	5
				Other trees	5
[1]19:					
Bolar part	Clay Loam	Favorable	6,000	Little bluestem	20
		Normal	5,000	Indiangrass	15
		Unfavorable	3,000	Big bluestem	10
				Sideoats grama	10
				Silver bluestem	5
				Tall dropseed	5
				Texas needlegrass	5
				Canada wildrye	5
				Other perennial forbs	15
				Other perennial grasses	5
				Other trees	5
Sunev part	Clay Loam	Favorable	7,000	Little bluestem	50
		Normal	5,500	Indiangrass	15
		Unfavorable	3,500	Big bluestem	10
				Live oak	3
				Eastern gamagrass	2
				Switchgrass	2
				Sideoats grama	2
				Vine-mesquite	2
				Buffalograss	2
				Other perennial forbs	5
				Other annual forbs	5
				Other trees	2
Brackett:					
[1]20	Steep Adobe	Favorable	3,000	Little bluestem	30
		Normal	2,200	Sideoats grama	10
		Unfavorable	1,500	Tall grama	10
				Indiangrass	10
				Tall dropseed	5
				Silver bluestem	5
				Slim tridens	5
				Hairy grama	5
				Other trees	15
				Other perennial forbs	5
Branyon:					
21	Blackland	Favorable	7,000	Little bluestem	50
		Normal	5,500	Indiangrass	13
		Unfavorable	3,500	Big bluestem	12
				Other perennial grasses	10
				Other perennial forbs	10
				Other trees	5
Burleson:					
22, 23	Blackland	Favorable	7,000	Little bluestem	40
		Normal	5,500	Indiangrass	15
		Unfavorable	4,000	Big bluestem	15
				Sideoats grama	5
				Texas needlegrass	5
				Silver bluestem	5
				Tall dropseed	5
				Other perennial grasses	5
				Other perennial forbs	5

See footnote at end of table.

TABLE 8.--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
Chatt:					
24	Blackland	Favorable	7,000	Little bluestem	40
		Normal	6,000	Big bluestem	15
		Unfavorable	4,000	Indiangrass	10
				Switchgrass	5
				Eastern gamagrass	5
				Texas needlegrass	5
				Meadow dropseed	5
				Other perennial grasses	10
				Other perennial forbs	5
Chickasha Variant:					
26	Sandy Loam	Favorable	5,500	Little bluestem	50
		Normal	4,000	Indiangrass	15
		Unfavorable	3,000	Texas needlegrass	10
				Meadow dropseed	10
				Other perennial grasses	5
				Other annual grasses	5
				Other trees	5
Coving:					
[1]27:					
Coving part	Sandy	Favorable	6,000	Little bluestem	15
		Normal	5,000	Indiangrass	10
		Unfavorable	3,000	Big bluestem	5
				Switchgrass	5
				Sand lovegrass	5
				Purpletop	5
				Tall dropseed	5
				Silver bluestem	5
				Scribner panicum	5
				Other trees	15
				Other perennial grasslikes	10
				Other shrubs	5
				Other perennial grasses	5
				Other perennial forbs	5
Vaughan part	Sandy Loam	Favorable	5,000	Little bluestem	15
		Normal	3,000	Indiangrass	10
		Unfavorable	2,000	Big bluestem	5
				Switchgrass	5
				Sand lovegrass	5
				Purpletop	5
				Tall dropseed	5
				Silver bluestem	5
				Scribner panicum	5
				Other trees	15
				Other perennial grasslikes	10
				Other shrubs	5
				Other perennial grasses	5
				Other perennial forbs	5
Crockett:					
28, 29	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 needlegrass	10
				Silver bluestem	10
				Paspalum	10
				Big bluestem	5
				Other perennial forbs	5
				Other trees	5
				Other perennial grasses	5

See footnote at end of table.

TABLE 8.--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
Crockett:					
[1]30:					
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 needlegrass	10
				Silver bluestem	10
				Paspalum	10
				Big bluestem	5
				Other perennial forbs	5
				Other trees	5
				Other perennial grasses	5
Wilson part	Claypan Prairie	Favorable	6,000	Little bluestem	45
		Normal	4,500	Indiangrass	10
		Unfavorable	3,000	Big bluestem	10
				Virginia wildrye	5
				Vine-mesquite	5
				Florida paspalum	5
				Sideoats grama	5
				Texas needlegrass	5
				Silver bluestem	5
				Other perennial forbs	5
Crosstell:					
31	Claypan Savannah	Favorable	4,500	Little bluestem	25
		Normal	2,500	Sideoats grama	15
		Unfavorable	1,500	Purpletop	10
				Silver bluestem	10
				Big bluestem	5
				Indiangrass	5
				Tall dropseed	5
				Other trees	15
				Other perennial forbs	5
				Other perennial grasses	5
Culp:					
32	Clay Loam	Favorable	7,000	Little bluestem	30
		Normal	5,000	Indiangrass	15
		Unfavorable	3,000	Big bluestem	15
				Switchgrass	10
				Eastern gamagrass	5
				Sideoats grama	5
				Texas needlegrass	5
				Silver bluestem	5
				Other perennial forbs	5
				Other perennial grasses	5
Denton:					
33	Clay Loam	Favorable	6,500	Little bluestem	20
		Normal	5,000	Indiangrass	15
		Unfavorable	3,000	Sideoats grama	10
				Big bluestem	10
				Switchgrass	5
				Silver bluestem	5
				Texas needlegrass	5
				Tall dropseed	5
				Other perennial forbs	15
				Other perennial grasses	5
				Other trees	5

See footnote at end of table.

TABLE 8.--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
Eddy:					
34, 35	Chalky Ridge	Favorable	4,500	Little bluestem	30
		Normal	3,500	Indiangrass	15
		Unfavorable	2,000	Big bluestem	10
				Sideoats grama	10
				Texas needlegrass	5
				Silver bluestem	5
				Hairy grama	5
				Other perennial grasses	10
				Other perennial forbs	5
				Other trees	5
Eufaula:					
36	Deep Sand	Favorable	4,000	Little bluestem	25
		Normal	2,800	Big bluestem	10
		Unfavorable	2,000	Sand bluestem	10
				Indiangrass	5
				Switchgrass	5
				Purpletop	5
				Arrowfeather threeawn	5
				Scribner panicum	5
				Sideoats grama	5
				Lespedeza	5
				Other trees	20
Ferris:					
37, 38	Eroded Blackland	Favorable	6,000	Little bluestem	30
		Normal	4,500	Indiangrass	15
		Unfavorable	3,000	Big bluestem	15
				Switchgrass	5
				Florida paspalum	5
				Eastern gamagrass	5
				Virginia wildrye	5
				Sideoats grama	5
				Texas needlegrass	5
				Meadow dropseed	5
				Other perennial forbs	5
[1]39:					
Ferris part	Eroded Blackland	Favorable	7,000	Little bluestem	30
		Normal	5,500	Indiangrass	15
		Unfavorable	3,000	Big bluestem	15
				Switchgrass	5
				Florida paspalum	5
				Eastern gamagrass	5
				Virginia wildrye	5
				Sideoats grama	5
				Texas needlegrass	5
				Meadow dropseed	5
				Other perennial forbs	5
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

See footnote at end of table.

TABLE 8.--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
Gasil:					
40, 41	Sandy Loam	Favorable	6,500	Little bluestem	45
		Normal	5,000	Indiangrass	10
		Unfavorable	3,500	Beaked panicum	10
				Virginia wildrye	5
				Other trees	15
				Other perennial grasses	5
				Other shrubs	5
				Other perennial forbs	5
Gowen:					
42	Loamy Bottomland	Favorable	8,000	Indiangrass	20
		Normal	5,500	Big bluestem	15
		Unfavorable	4,000	Little bluestem	15
				Switchgrass	10
				Tall dropseed	5
				Sideoats grama	5
				Vine-mesquite	5
				Texas needlegrass	5
				Other perennial grasses	5
				Other perennial forbs	5
				Other shrubs	5
				Other trees	5
Heiden:					
43, 44	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
Hensley:					
46	Redland	Favorable	5,000	Little bluestem	30
		Normal	4,000	Indiangrass	20
		Unfavorable	2,500	Sideoats grama	10
				Big bluestem	5
				Silver bluestem	5
				Switchgrass	5
				Blue grama	5
				Other perennial forbs	10
				Other perennial grasses	5
				Other shrubs	5
Hillco:					
47	Clay Loam	Favorable	6,000	Little bluestem	35
		Normal	4,500	Big bluestem	20
		Unfavorable	3,000	Indiangrass	15
				Switchgrass	5
				Sideoats grama	5
				Silver bluestem	5
				Texas needlegrass	5
				Other trees	5
				Other perennial grasses	5
Houston Black:					
48, 49	Blackland	Favorable	7,000	Little bluestem	50
		Normal	6,000	Indiangrass	25
		Unfavorable	3,500	Switchgrass	5
				Sideoats grama	5
				Vine-mesquite	5
				Other shrubs	5
				Other annual forbs	5

See footnote at end of table.

TABLE 8.--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
Kemp:					
51	Loamy Bottomland	Favorable	6,500	Beaked panicum	20
		Normal	5,000	Sedge	10
		Unfavorable	3,000	Virginia wildrye	10
				Purpletop	10
				Longleaf uniola	10
				Broomsedge bluestem	10
				Indiangrass	5
				Eastern gamagrass	5
				Panicum	5
				Paspalum	5
				Other perennial forbs	5
				Other trees	5
Konsil:					
52	Sandy Loam	Favorable	6,500	Little bluestem	45
		Normal	5,000	Indiangrass	10
		Unfavorable	3,500	Big bluestem	10
				Post oak	10
				Purpletop	5
				Sand lovegrass	5
				Blackjack oak	5
				Other perennial forbs	5
				Other perennial grasses	5
Kopperl:					
53	Sandy Loam	Favorable	5,500	Little bluestem	40
		Normal	4,000	Big bluestem	15
		Unfavorable	3,500	Indiangrass	10
				Switchgrass	5
				Purpletop	5
				Sand lovegrass	5
				Tall dropseed	5
				Other trees	10
				Other shrubs	5
Krum:					
54	Clay Loam	Favorable	6,500	Little bluestem	50
		Normal	6,000	Big bluestem	15
		Unfavorable	4,000	Indiangrass	10
				Eastern gamagrass	4
				Switchgrass	4
				Sideoats grama	4
				Virginia wildrye	4
				Vine-mesquite	4
				Unknowns	5
Lamar:					
55, 56	Clay Loam	Favorable	6,000	Little bluestem	35
		Normal	4,500	Big bluestem	20
		Unfavorable	3,000	Indiangrass	15
				Switchgrass	5
				Virginia wildrye	5
				Florida paspalum	5
				Texas needlegrass	5
				Silver bluestem	5
				Other perennial forbs	5

See footnote at end of table.

TABLE 8.--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
Lindy:					
58	Deep Redland	Favorable	6,000	Big bluestem	20
		Normal	5,000	Indiangrass	20
		Unfavorable	4,000	Little bluestem	15
				Sideoats grama	5
				Tall dropseed	5
				Silver bluestem	5
				Plains lovegrass	5
				Texas needlegrass	5
				Canada wildrye	5
				Other perennial grasses	5
				Other perennial forbs	5
				Other shrubs	5
Mabank:					
59	Claypan Prairie	Favorable	6,000	Little bluestem	30
		Normal	5,000	Big bluestem	15
		Unfavorable	3,000	Indiangrass	15
				Switchgrass	10
				Virginia wildrye	5
				Texas needlegrass	5
				Torrey silver bluestem	5
				Meadow dropseed	5
				Other perennial forbs	5
				Other trees	5
Normangee:					
60, 61, 62	Claypan Prairie	Favorable	5,500	Little bluestem	45
		Normal	4,000	Indiangrass	15
		Unfavorable	3,000	Big bluestem	10
				Switchgrass	10
				Florida paspalum	5
				Sideoats grama	5
				Other perennial forbs	5
				Other trees	5
Pulexas:					
64, [1]65	Loamy Bottomland	Favorable	6,500	Indiangrass	20
		Normal	5,000	Switchgrass	15
		Unfavorable	3,500	Big bluestem	10
				Little bluestem	10
				Tall dropseed	5
				Canada wildrye	5
				Texas wintergrass	5
				Vine mesquite	5
				Other trees	10
				Other perennial grasses	10
				Other perennial forbs	5
Pursley:					
66	Loamy Bottomland	Favorable	7,500	Big bluestem	15
		Normal	5,500	Indiangrass	15
		Unfavorable	4,000	Little bluestem	10
				Virginia wildrye	10
				Switchgrass	5
				Eastern gamagrass	5
				Rustyseed paspalum	5
				Knotroot bristlegrass	5
				American elm	5
				Sugar hackberry	5
				Pecan	5
				Sedge	5
				Other shrubs	5
				Other perennial forbs	5

See footnote at end of table.

TABLE 8.--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
Purves: 67	Shallow	Favorable	3,000	Little bluestem	30
		Normal	2,500	Indiangrass	15
		Unfavorable	1,800	Big bluestem	10
				Sideoats grama	10
				Switchgrass	5
				Hairy grama	5
				Texas needlegrass	5
				Silver bluestem	5
				Other perennial grasses	5
				Other perennial forbs	5
				Other trees	5
Silstid: 68, 69	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: 70, 71	Chalky Ridge	Favorable	4,500	Little bluestem	30
		Normal	3,500	Indiangrass	15
		Unfavorable	2,000	Big bluestem	10
				Sideoats grama	10
				Texas needlegrass	5
				Silver bluestem	5
				Hairy grama	5
				Other perennial grasses	10
				Other perennial forbs	5
				Other trees	5
Sunev: 72	Clay Loam	Favorable	7,000	Little bluestem	50
		Normal	5,500	Indiangrass	15
		Unfavorable	3,500	Big bluestem	10
				Live oak	3
				Eastern gamagrass	2
				Switchgrass	2
				Sideoats grama	2
				Vine-mesquite	2
				Buffalograss	2
				Other perennial forbs	5
				Other annual forbs	5
				Other trees	2
Tinn: 73, 74	Clayey Bottomland	Favorable	7,000	Virginia wildrye	15
		Normal	6,000	Sedge	15
		Unfavorable	4,000	Eastern gamagrass	10
				Switchgrass	10
				Indiangrass	10
				Giant cane	5
				Beaked panicum	5
				Panicum	5
				Other trees	20
				Other perennial forbs	5

See footnote at end of table.

TABLE 8.--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
Travis:					
75	Sandy Loam	Favorable	6,000	Little bluestem	50
		Normal	4,000	Indiangrass	10
		Unfavorable	3,000	Post oak	5
				Blackjack oak	5
				Beaked panicum	2
				Switchgrass	2
				Big bluestem	2
				Purpletop	2
				Brownseed paspalum	2
				Other perennial grasses	10
				Other shrubs	5
				Other perennial forbs	5
Ustifluvents:					
[1]76	Sandy	Favorable	3,500	Switchgrass	15
		Normal	2,500	Indiangrass	15
		Unfavorable	1,500	Little bluestem	15
				Beaked panicum	10
				Purpletop	10
				Sand lovegrass	10
				Red lovegrass	5
				Other annual grasses	10
				Other perennial forbs	10
Venus:					
77, 78	Clay Loam	Favorable	6,500	Little bluestem	20
		Normal	5,000	Indiangrass	15
		Unfavorable	3,000	Big bluestem	10
				Sideoats grama	10
				Silver bluestem	5
				Tall dropseed	5
				Texas needlegrass	5
				Canada wildrye	5
				Other perennial forbs	15
				Other perennial grasses	5
				Other trees	5
Wilson:					
79, 80	Claypan Prairie	Favorable	6,000	Little bluestem	45
		Normal	4,500	Indiangrass	10
		Unfavorable	3,000	Big bluestem	10
				Virginia wildrye	5
				Vine-mesquite	5
				Florida paspalum	5
				Sideoats grama	5
				Texas needlegrass	5
				Silver bluestem	5
				Other perennial forbs	5
Wilson:					
[1]81:					
Wilson part	Claypan Prairie	Favorable	6,000	Little bluestem	45
		Normal	4,500	Indiangrass	10
		Unfavorable	3,000	Big bluestem	10
				Virginia wildrye	5
				Vine-mesquite	5
				Florida paspalum	5
				Sideoats grama	5
				Texas needlegrass	5
				Silver bluestem	5
				Other perennial forbs	5

See footnote at end of table.

TABLE 8.--RANGE PRODUCTIVITY AND COMPOSITION--Continued

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

[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 map unit.

TABLE 9.--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." Absence of an entry means soil was not rated]

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
Aledo:					
[1]1:					
Aledo part	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.
Somervell part	Severe: depth to rock, small stones.	Moderate: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Moderate: depth to rock.
[1]2:					
Aledo part	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.
Somervell part	Severe: depth to rock, small stones.	Moderate: depth to rock.	Severe: depth to rock.	Severe: depth to rock, slope.	Moderate: depth to rock, slope.
Altoga:					
3, 4, 5	Moderate: too clayey.	Severe: shrink-swell, low strength.	Moderate: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: low strength, shrink-swell.
Aquilla:					
6	Moderate: wetness.	Slight	Moderate: wetness.	Moderate: wetness.	Slight.
Austin:					
7, 8	Severe: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.
Axtell:					
9, 10, 11	Severe: too clayey.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.
Bastrop:					
12	Slight	Slight	Slight	Moderate: slope.	Moderate: low strength.
Bastsil:					
13, 14	Slight	Slight	Slight	Slight	Moderate: low strength.
Birome:					
[1]15:					
Birome part	Severe: depth to rock, slope.	Severe: shrink-swell.	Severe: depth to rock, shrink-swell.	Severe: depth to rock, shrink-swell.	Severe: shrink-swell.
Rayex part	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.
Blum:					
16	Severe: too clayey.	Moderate: low strength.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.
Bolar:					
17	Moderate: depth to rock.	Moderate: low strength.	Moderate: low strength.	Moderate: low strength.	Severe: low strength.

See footnote at end of table.

TABLE 9.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
Bolar:					
18	Moderate: depth to rock.	Moderate: low strength.	Moderate: low strength.	Moderate: low strength, slope.	Severe: low strength.
[1]19:					
Bolar part	Moderate: depth to rock.	Moderate: low strength.	Moderate: low strength.	Moderate: low strength, slope.	Severe: low strength.
Sunev part	Slight	Slight	Slight	Moderate: slope.	Moderate: low strength.
Brackett:					
[1]20	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Branyon:					
21	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.
Burleson:					
22, 23	Severe: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, corrosive.	Severe: shrink-swell.
Chatt:					
24, [1]25	Moderate: too clayey.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength, corrosive.	Severe: shrink-swell, low strength.
Chickasha Variant:					
26	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.
Coving:					
[1]27:					
Coving part	Severe: wetness.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.
Vaughan part	Severe: wetness, floods.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: wetness, floods.
Crockett:					
28, 29	Severe: too clayey.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, corrosive, low strength.	Severe: shrink-swell, low strength.
[1]30:					
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.
Wilson part	Severe: wetness, too clayey.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.
Crosstell:					
31	Severe: too clayey.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.

See footnote at end of table.

TABLE 9.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
Culp:					
32	Severe: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.
Denton:					
33	Severe: too clayey.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: low strength, shrink-swell.
Eddy:					
34	Moderate: depth to rock.	Moderate: depth to rock.	Moderate: depth to rock.	Moderate: depth to rock.	Moderate: depth to rock.
35	Moderate: depth to rock.	Moderate: depth to rock.	Moderate: depth to rock.	Moderate: depth to rock, slope.	Moderate: depth to rock.
Eufaula:					
36	Severe: cutbanks cave.	Slight	Slight	Slight	Slight.
Ferris:					
37, 38	Severe: too clayey.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.
[1]39:					
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.
Gasil:					
40, 41	Slight	Moderate: low strength.	Moderate: low strength.	Moderate: low strength.	Severe: low strength.
Gowen:					
42	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.
Heiden:					
43, 44, [1]45	Severe: cutbanks cave, too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.
Hensley:					
46	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.
Hillco:					
47	Severe: depth to rock.	Moderate: depth to rock, low strength.	Severe: depth to rock.	Moderate: depth to rock.	Severe: low strength.
Houston Black:					
48, 49, [1]50	Severe: too clayey.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.
Kemp:					
51	Severe: floods.	Severe: floods.	Severe: floods.	Moderate: floods.	Moderate: shrink-swell, floods.

See footnote at end of table.

TABLE 9.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
Konsil:					
52	Slight	Moderate: low strength.	Moderate: low strength.	Moderate: low strength.	Severe: low strength.
Kopperl:					
53	Moderate: depth to rock, small stones.	Slight	Moderate: depth to rock.	Moderate: depth to rock.	Slight.
Krum:					
54	Severe: cutbanks cave, too clayey.	Severe: low strength, shrink-swell.	Severe: low strength, shrink-swell.	Severe: low strength, shrink-swell.	Severe: low strength, shrink-swell.
Lamar:					
55, 56, [1]57	Slight	Moderate: low strength, shrink-swell.	Moderate: low strength, shrink-swell.	Moderate: low strength, shrink-swell.	Moderate: low strength, shrink-swell.
Lindy:					
58	Severe: depth to rock, too clayey.	Moderate: shrink-swell, low strength.	Severe: depth to rock.	Moderate: shrink-swell, low strength.	Severe: low strength.
Mabank:					
59	Severe: too clayey, wetness.	Severe: shrink-swell, wetness.	Severe: shrink-swell.	Severe: shrink-swell, wetness, low strength.	Severe: shrink-swell, low strength.
Normangee:					
60, 61, 62	Severe: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, corrosive.	Severe: shrink-swell, low strength.
Pits:					
63.					
Pulexas:					
64	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Moderate: floods, low strength.
[1]65	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.
Pursley:					
66	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.
Purves:					
67	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.
Silstid:					
68	Moderate: cutbanks cave.	Slight	Slight	Slight	Slight.
69	Moderate: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight.
Stephen:					
70, 71	Severe: depth to rock.	Moderate: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Moderate: depth to rock.
Sunev:					
72	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: low strength.

See footnote at end of table.

TABLE 9.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
Tinn:					
73	Severe: wetness, too clayey.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell.
74	Severe: wetness, floods, too clayey.	Severe: floods, shrink-swell, wetness.	Severe: floods, shrink-swell, wetness.	Severe: floods, shrink-swell, wetness.	Severe: floods, shrink-swell.
Travis:					
75	Moderate: too clayey.	Moderate: shrink-swell, low strength.	Moderate: shrink-swell, low strength.	Moderate: shrink-swell, low strength.	Moderate: shrink-swell, low strength.
Ustifluvents:					
[1]76	Severe: too sandy.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Venus:					
77	Slight	Slight	Slight	Slight	Moderate: low strength.
78	Slight	Slight	Slight	Moderate: slope.	Moderate: low strength.
Wilson:					
79, 80	Severe: wetness, too clayey.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.
[1]81:					
Wilson part	Severe: wetness, 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.

[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 map unit.

TABLE 10.--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. Absence of an entry means soil was not rated]

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Aledo:					
[1]1:					
Aledo part	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Slight	Poor: thin layer, small stones.
Somervell part	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Slight	Poor: small stones.
[1]2:					
Aledo part	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Moderate: slope.	Poor: thin layer, small stones.
Somervell part	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Moderate: slope.	Poor: small stones.
Altoga:					
3, 4, 5	Moderate: percs slowly.	Moderate: seepage.	Moderate: too clayey.	Slight	Fair: too clayey.
Aquilla:					
6	Moderate: wetness.	Severe: seepage.	Severe: wetness.	Severe: seepage, wetness.	Fair: too sandy.
Austin:					
7, 8	Severe: percs slowly, depth to rock.	Severe: depth to rock.	Severe: depth to rock, too clayey.	Slight	Poor: too clayey.
Axtell:					
9	Severe: percs slowly.	Slight	Severe: too clayey.	Slight	Poor: too clayey.
10, 11	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey.
Bastrop:					
12	Moderate: percs slowly.	Moderate: seepage.	Slight	Slight	Good.
Bastsil:					
13	Moderate: percs slowly.	Moderate: seepage.	Slight	Slight	Fair: too sandy.
14	Moderate: percs slowly.	Moderate: seepage.	Slight	Slight	Good.
Birome:					
[1]15:					
Birome part	Severe: depth to rock, percs slowly.	Severe: depth to rock, slope.	Severe: depth to rock.	Moderate: slope.	Poor: thin layer.
Rayex part	Severe: depth to rock, percs slowly.	Severe: depth to rock, slope.	Severe: depth to rock.	Moderate: slope.	Poor: thin layer.
Blum:					
16	Severe: percs slowly, wetness.	Slight	Severe: too clayey, wetness.	Moderate: wetness.	Fair: too clayey, thin layer.

See footnote at end of table.

TABLE 10.--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
Bolar:					
17, 18	Severe: depth to rock.	Severe: depth to rock.	Moderate: depth to rock.	Slight	Fair: too clayey.
[1]19:					
Bolar part	Severe: depth to rock.	Severe: depth to rock.	Moderate: depth to rock.	Slight	Fair: too clayey.
Sunev part	Slight	Severe: seepage.	Slight	Slight	Fair: excess lime.
Brackett:					
[1]20	Severe: percs slowly, depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: slope.	Poor: thin layer.
Branyon:					
21	Severe: percs slowly.	Slight	Severe: too clayey.	Slight	Poor: too clayey.
Burleson:					
22	Severe: percs slowly.	Slight	Severe: too clayey.	Slight	Poor: too clayey.
23	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey.
Chatt:					
24, [1]25	Severe: percs slowly.	Slight	Moderate: too clayey.	Slight	Poor: too clayey.
Chickasha Variant:					
26	Slight	Moderate: seepage, depth to rock, slope.	Moderate: too clayey.	Slight	Good.
Coving:					
[1]27:					
Coving part	Severe: percs slowly, wetness.	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Fair: too sandy.
Vaughan part	Severe: wetness, percs slowly, floods.	Severe: wetness.	Severe: wetness, floods.	Severe: wetness, floods.	Poor: wetness.
Crockett:					
28	Severe: percs slowly.	Slight	Severe: too clayey.	Slight	Poor: too clayey.
29	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey.
[1]30:					
Crockett part	Severe: percs slowly.	Slight	Severe: too clayey.	Slight	Poor: too clayey.
Wilson part	Severe: percs slowly.	Slight	Severe: too clayey.	Moderate: wetness.	Poor: too clayey.
Crosstell:					
31	Severe: percs slowly.	Severe: slope.	Severe: too clayey.	Moderate: slope.	Poor: too clayey.
Culp:					
32	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Fair: too clayey.

See footnote at end of table.

TABLE 10.--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
Denton:					
33	Severe: percs slowly, depth to rock.	Severe: depth to rock.	Severe: too clayey, depth to rock.	Slight	Poor: too clayey.
Eddy:					
34, 35	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Slight	Poor: thin layer.
Eufaula:					
36	Slight	Severe: seepage.	Severe: seepage.	Severe: seepage.	Poor: too sandy.
Ferris:					
37, 38	Severe: percs slowly.	Severe: slope.	Severe: too clayey.	Moderate: slope.	Poor: too clayey.
[1]39:					
Ferris part	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey.
Heiden part	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey.
Gasil:					
40, 41	Moderate: percs slowly.	Moderate: seepage.	Slight	Slight	Good.
Gowen:					
42	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Fair: too clayey.
Heiden:					
43, 44, [1]45	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey.
Hensley:					
46	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Slight	Poor: thin layer.
Hillco:					
47	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Slight	Fair: thin layer, too clayey.
Houston Black:					
48, [1]50	Severe: percs slowly.	Slight	Severe: too clayey.	Slight	Poor: too clayey.
49	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey.
Kemp:					
51	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Good.
Konsil:					
52	Moderate: percs slowly.	Moderate: seepage.	Slight	Slight	Good.
Kopperl:					
53	Severe: percs slowly.	Moderate: depth to rock, seepage, small stones.	Severe: depth to rock.	Slight	Poor: small stones.
Krum:					
54	Severe: percs slowly.	Slight	Severe: too clayey.	Slight	Poor: too clayey.

See footnote at end of table.

TABLE 10.--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
Lamar:					
55, 56, [1]57	Moderate: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey.
Lindy:					
58	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Slight	Fair: thin layer, too clayey.
Mabank:					
59	Severe: percs slowly, wetness.	Slight	Severe: too clayey.	Severe: wetness.	Poor: too clayey.
Normangee:					
60	Severe: percs slowly.	Slight	Severe: too clayey.	Slight	Poor: too clayey.
61, 62	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey.
Pits:					
63.					
Pulexas:					
64	Severe: floods.	Severe: seepage, floods.	Severe: floods, seepage.	Severe: floods, seepage.	Fair: too sandy, thin layer.
[1]65	Severe: floods.	Severe: seepage, floods.	Severe: floods, seepage.	Severe: floods, seepage.	Good.
Pursley:					
66	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Fair: too clayey.
Purves:					
67	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Slight	Poor: thin layer, too clayey.
Silstid:					
68, 69	Slight	Moderate: seepage, slope.	Slight	Slight	Poor: too sandy.
Stephen:					
70, 71	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Slight	Poor: thin layer, too clayey.
Sunev:					
72	Moderate: slope.	Severe: seepage.	Slight	Moderate: slope.	Fair: excess lime, slope.
Tinn:					
73	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey.
74	Severe: wetness, floods, percs slowly.	Severe: wetness, floods.	Severe: floods, too clayey, wetness.	Severe: floods, wetness.	Poor: too clayey.

See footnote at end of table.

TABLE 10.--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
Travis:					
75	Severe: percs slowly.	Moderate: slope.	Slight	Slight	Fair.
Ustifluvents:					
[1]76	Severe: slope.	Severe: seepage, slope.	Moderate: too sandy.	Severe: slope.	Poor: slope.
Venus:					
77, 78	Slight	Moderate: seepage.	Slight	Slight	Good.
Wilson:					
79	Severe: percs slowly.	Slight	Severe: too clayey.	Moderate: wetness.	Poor: too clayey.
80	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Moderate: wetness.	Poor: too clayey.
[1]81:					
Wilson part	Severe: percs slowly.	Slight	Severe: too clayey.	Moderate: wetness.	Poor: too clayey.
Heiden part	Severe: percs slowly.	Slight	Severe: too clayey.	Slight	Poor: too clayey.

[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 map unit.

TABLE 11.--CONSTRUCTION MATERIALS

["Excess fines" and some of the other terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," "poor," and "unsuited." Absence of an entry means soil was not rated]

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Aledo:				
[1]11:				
Aledo part	Poor: thin layer.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: thin layer, small stones.
Somervell part	Poor: thin layer.	Unsuited: excess fines.	Poor: excess fines.	Poor: small stones.
[1]2:				
Aledo part	Poor: thin layer.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: thin layer, small stones.
Somervell part	Poor: thin layer.	Unsuited: excess fines.	Poor: excess fines.	Poor: small stones.
Altoga:				
3, 4, 5	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: too clayey.
Aquilla:				
6	Good	Poor: excess fines.	Unsuited: excess fines.	Poor: too sandy.
Austin:				
7, 8	Poor: shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey.
Axtell:				
9, 10, 11	Poor: shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: thin layer.
Bastrop:				
12	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
Bastsil:				
13	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too sandy.
14	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
Birome:				
[1]15:				
Birome part	Poor: shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: thin layer.
Rayex part	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: thin layer.
Blum:				
16	Poor: low strength, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
Bolar:				
17, 18	Poor: low strength, thin layer.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: excess lime.

See footnote at end of table.

TABLE 11.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Bolar:				
[1]19:				
Bolar part	Poor: low strength, thin layer.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: excess lime.
Sunev part	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: excess lime.
Brackett:				
[1]20	Poor: thin layer.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: excess lime.
Branyon:				
21	Poor: shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey.
Burleson:				
22, 23	Poor: shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey.
Chatt:				
24, [1]25	Poor: shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey.
Chickasha Variant:				
26	Fair: shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: too clayey.
Coving:				
[1]27:				
Coving part	Good	Poor: excess fines.	Unsuited: excess fines.	Poor: too sandy.
Vaughan part	Poor: low strength, wetness.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: wetness.
Crockett:				
28, 29	Poor: shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: thin layer.
[1]30:				
Crockett part	Poor: shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: thin layer.
Wilson part	Poor: shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey.
Crosstell:				
31	Poor: shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: thin layer.
Culp:				
32	Poor: low strength, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: too clayey.
Denton:				
33	Poor: low strength, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey.

See footnote at end of table.

TABLE 11.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Eddy:				
34, 35	Fair: thin layer.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: thin layer, excess lime.
Eufaula:				
36	Good	Poor: excess fines.	Unsuited: excess fines.	Poor: too sandy.
Ferris:				
37, 38	Poor: shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey.
[1]39:				
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.
Gasil:				
40, 41	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
Gowen:				
42	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: too clayey.
Heiden:				
43, 44, [1]45	Poor: shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey.
Hensley:				
46	Poor: thin layer.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer, too clayey.
Hillco:				
47	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: too clayey.
Houston Black:				
48, 49, [1]50	Poor: shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey.
Kemp:				
51	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
Konsil:				
52	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
Kopperl:				
53	Good	Unsuited: excess fines.	Poor: excess fines.	Poor: small stones.
Krum:				
54	Poor: low strength, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey.
Lamar:				
55, 56, [1]57	Fair: low strength, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: too clayey.

See footnote at end of table.

TABLE 11.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Lindy:				
58	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: too clayey.
Mabank:				
59	Poor: shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey.
Normangee:				
60, 61, 62	Poor: shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey.
Pits:				
63.				
Pulexas:				
64	Fair: low strength.	Poor: excess fines.	Unsuited: excess fines.	Poor: too sandy.
[1]65	Fair: low strength.	Poor: excess fines.	Unsuited: excess fines.	Good.
Pursley:				
66	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: too clayey.
Purves:				
67	Poor: shrink-swell, thin layer.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey, thin layer.
Silstid:				
68, 69	Good	Poor: excess fines.	Unsuited: excess fines.	Poor: too sandy.
Stephen:				
70, 71	Poor: thin layer, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey.
Sunev:				
72	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: excess lime.
Tinn:				
73, 74	Poor: low strength, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey.
Travis:				
75	Fair: low strength, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
Ustifluvents:				
[1]76	Severe: slope.	Poor: excess fines.	Unsuited: excess fines.	Poor: too sandy.
Venus:				
77, 78	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
Wilson:				
79, 80	Poor: shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey.

See footnote at end of table.

TABLE 11.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
[1]81:				
Wilson 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.

[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 map unit.

TABLE 12.--WATER MANAGEMENT

["Seepage" and some of the other terms that describe restrictive soil features are defined in the Glossary. Absence of an entry means soil was not evaluated]

Soil name and map symbol	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Terraces and diversions	Grassed waterways
Aledo:					
[1]1:					
Aledo part	Severe: depth to rock.	Severe: thin layer.	Depth to rock	Depth to rock, rooting depth.	Droughty, rooting depth.
Somervell part	Severe: seepage.	Moderate: thin layer.	Not needed	Complex slope	Droughty.
[1]2:					
Aledo part	Severe: depth to rock.	Severe: thin layer.	Depth to rock	Depth to rock, rooting depth.	Droughty, rooting depth.
Somervell part	Severe: seepage.	Moderate: thin layer.	Not needed	Complex slope	Droughty.
Altoga:					
3, 4, 5	Moderate: seepage.	Moderate: unstable fill.	Not needed	Favorable	Favorable.
Aquilla:					
6	Severe: seepage.	Moderate: piping, unstable fill.	Complex slope	Piping, erodes easily.	Droughty, erodes easily, complex slope.
Austin:					
7, 8	Severe: depth to rock.	Moderate: compressible.	Not needed	Favorable	Favorable.
Axtell:					
9, 10, 11	Slight	Moderate: unstable fill.	Complex slope, percs slowly.	Percs slowly, erodes easily.	Percs slowly, erodes easily.
Bastrop:					
12	Moderate: seepage.	Moderate: piping.	Not needed	Favorable	Favorable.
Bastsil:					
13	Moderate: seepage.	Moderate: piping.	Not needed	Not needed	Favorable.
14	Moderate: seepage.	Moderate: piping.	Not needed	Favorable	Favorable.
Birome:					
[1]15:					
Birome part	Severe: depth to rock.	Moderate: unstable fill, piping.	Not needed	Erodes easily, complex slope.	Favorable.
Rayex part	Severe: depth to rock.	Severe: thin layer.	Not needed	Depth to rock, rooting depth.	Rooting depth, droughty.
Blum:					
16	Slight	Moderate: unstable fill, compressible.	Percs slowly	Percs slowly	Percs slowly.
Bolar:					
17	Severe: seepage.	Moderate: thin layer.	Depth to rock	Favorable	Favorable.
18	Severe: seepage.	Moderate: thin layer.	Depth to rock	Slope	Favorable.
[1]19:					
Bolar part	Severe: seepage.	Moderate: thin layer.	Depth to rock	Favorable	Favorable.

See footnote at end of table.

TABLE 12.--WATER MANAGEMENT--Continued

Soil name and map symbol	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Terraces and diversions	Grassed waterways
Bolar:					
Sunev part	Severe: seepage.	Moderate: compressible, piping.	Not needed	Favorable	Favorable.
Brackett:					
[1]20	Severe: seepage.	Severe: thin layer.	Depth to rock	Depth to rock, rooting depth.	Droughty, rooting depth.
Branyon:					
21	Slight	Moderate: compressible, piping.	Percs slowly, cutbanks cave.	Percs slowly	Percs slowly.
Burleson:					
22, 23	Slight	Moderate: unstable fill, hard to pack.	Percs slowly	Percs slowly	Percs slowly.
Chatt:					
24, [1]25	Moderate: seepage.	Moderate: low strength, unstable fill.	Not needed	Percs slowly	Percs slowly.
Chickasha Variant:					
26	Moderate: seepage.	Moderate: piping.	Not needed	Complex slope, erodes easily.	Erodes easily.
Coving:					
[1]27:					
Coving part	Moderate: seepage.	Moderate: piping.	Cutbanks cave	Not needed	Droughty.
Vaughan part	Slight	Slight	Floods	Not needed	Wetness.
Crockett:					
28, 29	Slight	Moderate: unstable fill, compressible.	Not needed	Percs slowly, erodes easily.	Percs slowly, erodes easily.
[1]30:					
Crockett part	Slight	Moderate: unstable fill, compressible.	Not needed	Percs slowly, erodes easily.	Percs slowly, erodes easily.
Wilson part	Slight	Moderate: unstable fill.	Percs slowly	Percs slowly	Percs slowly.
Crosstell:					
31	Slight	Moderate: unstable fill.	Not needed	Percs slowly, slow intake.	Percs slowly.
Culp:					
32	Slight	Moderate: unstable fill.	Not needed	Percs slowly	Favorable.
Denton:					
33	Severe: depth to rock.	Moderate: compressible, shrink-swell.	Not needed	Favorable	Favorable.
Eddy:					
34, 35	Severe: depth to rock.	Severe: thin layer.	Not needed	Depth to rock, rooting depth.	Droughty, rooting depth.
Eufaula:					
36	Severe: seepage.	Moderate: unstable fill, piping.	Not needed	Seepage, fast intake, droughty.	Erodes easily, droughty, fast intake.

See footnote at end of table.

TABLE 12.--WATER MANAGEMENT--Continued

Soil name and map symbol	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Terraces and diversions	Grassed waterways
Ferris:					
37, 38	Slight	Moderate: unstable fill.	Not needed	Percs slowly, erodes easily.	Percs slowly, erodes easily.
[1]39:					
Ferris part	Slight	Moderate: unstable fill.	Not needed	Percs slowly, erodes easily.	Percs slowly, erodes easily.
Heiden part	Slight	Moderate: unstable fill, shrink-swell.	Not needed	Percs slowly	Percs slowly.
Gasil:					
40, 41	Moderate: seepage.	Slight	Not needed	Erodes easily	Erodes easily.
Gowen:					
42	Moderate: seepage.	Moderate: compressible.	Not needed	Wetness	Favorable.
Heiden:					
43	Slight	Moderate: unstable fill, shrink-swell.	Not needed	Percs slowly	Percs slowly.
44, [1]45	Slight	Moderate: unstable fill, shrink-swell.	Not needed	Slope	Percs slowly, slope.
Hensley:					
46	Severe: depth to rock.	Severe: thin layer.	Not needed	Depth to rock	Percs slowly, rooting depth.
Hillco:					
47	Severe: depth to rock.	Moderate: low strength.	Not needed	Depth to rock	Favorable.
Houston Black:					
48, 49, [1]50	Slight	Moderate: compressible, unstable fill.	Percs slowly	Percs slowly	Percs slowly.
Kemp:					
51	Moderate: seepage.	Moderate: compressible.	Not needed	Favorable	Favorable.
Konsil:					
52	Moderate: seepage.	Moderate: piping.	Not needed	Favorable	Favorable.
Kopperl:					
53	Moderate: depth to rock.	Moderate: piping.	Not needed	Small stones	Small stones.
Krum:					
54	Moderate: seepage.	Moderate: low strength.	Not needed	Percs slowly, erodes easily.	Percs slowly, erodes easily.
Lamar:					
55, 56, [1]57	Moderate: seepage.	Moderate: piping, unstable fill.	Not needed	Favorable	Favorable.
Lindy:					
58	Severe: depth to rock.	Moderate: piping, thin layer.	Not needed	Rooting depth	Rooting depth.
Mabank:					
59	Slight	Moderate: unstable fill.	Percs slowly	Percs slowly	Percs slowly.

See footnote at end of table.

TABLE 12.--WATER MANAGEMENT--Continued

Soil name and map symbol	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Terraces and diversions	Grassed waterways
Normangee: 60, 61, 62	Slight	Moderate: unstable fill.	Not needed	Slow intake, erodes easily, percs slowly.	Percs slowly, erodes easily.
Pits: 63.					
Pulexas: 64, [1]65	Severe: seepage.	Moderate: unstable fill, seepage, piping.	Not needed	Not needed	Not needed.
Pursley: 66	Moderate: seepage.	Moderate: compressible.	Not needed	Floods	Favorable.
Purves: 67	Severe: depth to rock.	Severe: thin layer.	Depth to rock	Depth to rock	Rooting depth, droughty.
Silstid: 68, 69	Moderate: seepage.	Moderate: piping.	Not needed	Too sandy	Erodes easily.
Stephen: 70, 71	Severe: depth to rock.	Severe: thin layer.	Not needed	Depth to rock, rooting depth.	Droughty, rooting depth.
Sunev: 72	Severe: seepage.	Moderate: compressible, piping.	Not needed	Favorable	Favorable.
Tinn: 73	Slight	Moderate: compressible, unstable fill.	Percs slowly	Wetness	Wetness, percs slowly.
74	Slight	Moderate: compressible, unstable fill.	Percs slowly, floods.	Floods, wetness, percs slowly.	Floods, wetness, percs slowly.
Travis: 75	Moderate: seepage.	Slight	Percs slowly	Percs slowly	Percs slowly.
Ustifluvents: [1]76	Severe: seepage, slope.	Severe: piping.	Not needed	Not needed	Not needed.
Venus: 77, 78	Severe: seepage.	Moderate: piping.	Not needed	Favorable	Favorable.
Wilson: 79, 80	Slight	Moderate: unstable fill.	Percs slowly	Percs slowly	Percs slowly.
[1]81: Wilson part	Slight	Moderate: unstable fill.	Percs slowly	Percs slowly	Percs slowly.
Heiden part	Slight	Moderate: unstable fill, shrink-swell.	Not needed	Percs slowly	Percs slowly.

[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 map unit.

TABLE 13.--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]1:				
Aledo part	Moderate: too clayey.	Moderate: too clayey.	Severe: depth to rock, small stones.	Moderate: too clayey.
Somervell part	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Moderate: small stones.
[1]2:				
Aledo part	Moderate: too clayey.	Moderate: slope.	Severe: depth to rock, small stones.	Moderate: too clayey.
Somervell part	Moderate: small stones.	Moderate: small stones.	Severe: slope, small stones.	Moderate: small stones.
Altoga:				
3, 4	Moderate: too clayey.	Moderate: too clayey.	Moderate: too clayey.	Moderate: too clayey.
5	Moderate: too clayey.	Moderate: too clayey.	Severe: slope.	Moderate: too clayey.
Aquilla:				
6	Moderate: too sandy.	Moderate: too sandy.	Severe: too sandy.	Moderate: too sandy.
Austin:				
7, 8	Severe: too clayey.	Severe: too clayey.	Severe: too clayey.	Severe: too clayey.
Axtell:				
9, 10, 11	Severe: percs slowly.	Slight	Severe: percs slowly.	Slight.
Bastrop:				
12	Slight	Slight	Moderate: slope.	Slight.
Bastsil:				
13	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.
14	Slight	Slight	Slight	Slight.
Birome:				
[1]15:				
Birome part	Moderate: percs slowly.	Moderate: slope.	Severe: slope.	Slight.
Rayex part	Moderate: slope.	Moderate: slope.	Severe: slope, depth to rock.	Slight.
Blum:				
16	Moderate: percs slowly.	Slight	Moderate: percs slowly.	Slight.
Bolar:				
17, 18	Moderate: too clayey.	Moderate: too clayey.	Moderate: too clayey.	Moderate: too clayey.
[1]19:				
Bolar part	Moderate: too clayey.	Moderate: too clayey.	Moderate: too clayey.	Moderate: too clayey.

See footnote at end of table.

TABLE 13.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
Bolar:				
Sunev part	Moderate: too clayey.	Moderate: too clayey.	Moderate: too clayey, slope.	Moderate: too clayey.
Brackett:				
[1]20	Severe: slope.	Severe: slope.	Severe: depth to rock.	Moderate: slope.
Branyon:				
21	Severe: percs slowly, too clayey.	Severe: too clayey.	Severe: percs slowly, too clayey.	Severe: too clayey.
Burleson:				
22, 23	Severe: percs slowly, too clayey.	Severe: too clayey.	Severe: percs slowly, too clayey.	Severe: too clayey.
Chatt:				
24, [1]25	Severe: too clayey.	Severe: too clayey.	Severe: too clayey.	Severe: too clayey.
Chickasha Variant:				
26	Slight	Slight	Moderate: slope.	Slight.
Coving:				
[1]27:				
Coving part	Severe: wetness, floods, too sandy.	Moderate: wetness, floods, too sandy.	Moderate: wetness, floods, too sandy.	Moderate: wetness, floods, too sandy.
Vaughan part	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, floods.
Crockett:				
28, 29	Severe: percs slowly.	Slight	Severe: percs slowly.	Slight.
[1]30:				
Crockett part	Severe: percs slowly.	Slight	Severe: percs slowly.	Slight.
Wilson part	Severe: percs slowly, wetness.	Moderate: wetness.	Severe: percs slowly, wetness.	Moderate: wetness.
Crosstell:				
31	Severe: percs slowly.	Moderate: slope.	Severe: percs slowly, slope.	Slight.
Culp:				
32	Moderate: percs slowly, too clayey.	Moderate: too clayey.	Moderate: percs slowly.	Moderate: too clayey.
Denton:				
33	Severe: too clayey.	Severe: too clayey.	Severe: too clayey.	Severe: too clayey.
Eddy:				
34, 35	Moderate: percs slowly, small stones.	Moderate: small stones.	Severe: depth to rock.	Moderate: small stones, too clayey.

See footnote at end of table.

TABLE 13.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
Eufaula:				
36	Moderate: too sandy.	Moderate: too sandy.	Severe: too sandy.	Severe: too sandy.
Ferris:				
37, 38	Severe: too clayey, percs slowly.	Severe: too clayey.	Severe: too clayey, percs slowly, slope.	Severe: too clayey.
[1]39:				
Ferris part	Severe: too clayey, percs slowly.	Severe: too clayey.	Severe: too clayey, percs slowly.	Severe: too clayey.
Heiden part	Severe: too clayey, percs slowly.	Severe: too clayey.	Severe: too clayey, percs slowly.	Severe: too clayey.
Gasil:				
40, 41	Slight	Slight	Moderate: slope.	Slight.
Gowen:				
42	Severe: floods.	Moderate: floods.	Severe: floods.	Moderate: too clayey, floods.
Heiden:				
43, 44, [1]45	Severe: too clayey, percs slowly.	Severe: too clayey.	Severe: too clayey, percs slowly.	Severe: too clayey.
Hensley:				
46	Moderate: percs slowly.	Slight	Severe: depth to rock.	Slight.
Hillco:				
47	Moderate: too clayey.	Moderate: too clayey.	Moderate: too clayey, depth to rock.	Moderate: too clayey.
Houston Black:				
48, 49, [1]50	Severe: percs slowly, too clayey.	Severe: too clayey.	Severe: percs slowly, too clayey.	Severe: too clayey.
Kemp:				
51	Severe: floods.	Moderate: floods.	Moderate: too clayey, floods.	Moderate: too clayey.
Konsil:				
52	Slight	Slight	Moderate: slope.	Slight.
Kopperl:				
53	Moderate: small stones, percs slowly.	Moderate: small stones.	Severe: small stones.	Moderate: small stones.
Krum:				
54	Severe: too clayey.	Severe: too clayey.	Severe: too clayey.	Severe: too clayey.
Lamar:				
55, 56, [1]57	Moderate: too clayey.	Moderate: too clayey.	Moderate: too clayey.	Moderate: too clayey.

See footnote at end of table.

TABLE 13.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
Lindy:				
58	Moderate: percs slowly.	Moderate: too clayey.	Moderate: depth to rock.	Moderate: too clayey.
Mabank:				
59	Severe: wetness.	Moderate: wetness.	Severe: percs slowly, wetness.	Moderate: wetness.
Normangee:				
60, 61, 62	Severe: percs slowly.	Moderate: too clayey.	Severe: percs slowly.	Moderate: too clayey.
Pits:				
63.				
Pulexas:				
64	Severe: floods.	Moderate: floods.	Moderate: floods.	Moderate: too sandy.
[1]65	Severe: floods.	Severe: floods.	Severe: floods.	Moderate: floods.
Pursley:				
66	Severe: floods.	Moderate: floods.	Severe: floods.	Moderate: too clayey, floods.
Purves:				
67	Severe: too clayey.	Severe: too clayey.	Severe: depth to rock, too clayey.	Severe: too clayey.
Silstid:				
68, 69	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.
Stephen:				
70, 71	Severe: too clayey.	Severe: too clayey.	Severe: depth to rock, too clayey.	Severe: too clayey.
Sunev:				
72	Moderate: too clayey.	Moderate: too clayey.	Severe: slope.	Moderate: too clayey.
Tinn:				
73	Severe: wetness, percs slowly.	Severe: too clayey.	Severe: wetness, too clayey.	Severe: too clayey.
74	Severe: wetness, floods, percs slowly.	Severe: floods, too clayey.	Severe: wetness, floods, percs slowly.	Severe: floods, too clayey.
Travis:				
75	Moderate: percs slowly.	Slight	Moderate: percs slowly, slope.	Slight.
Ustifluvents:				
[1]76	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: slope, too sandy.	Moderate: slope, too sandy.

See footnote at end of table.

TABLE 13.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
Venus:				
77, 78	Slight	Slight	Moderate: slope.	Slight.
Wilson:				
79, 80	Severe: percs slowly, wetness.	Moderate: wetness.	Severe: percs slowly, wetness.	Moderate: wetness.
[1]81:				
Wilson part	Severe: percs slowly, wetness.	Moderate: wetness.	Severe: percs slowly, wetness.	Moderate: wetness.
Heiden part	Severe: too clayey, percs slowly.	Severe: too clayey.	Severe: too clayey, percs slowly.	Severe: too clayey.

[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 map unit.

TABLE 14.--WILDLIFE HABITAT POTENTIALS

[See text for definitions of "good," "fair," "poor," and "very poor." Absence of an entry indicates the soil was not rated]

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Wetland wildlife	Rangeland wildlife
Aledo:										
[1]1:										
Aledo part	Poor	Poor	Poor	---	Fair	Very poor.	Very poor.	Poor	Very poor.	Poor.
Somervell part	Poor	Poor	Fair	---	Fair	Very poor.	Very poor.	Poor	Very poor.	Fair.
[1]2:										
Aledo part	Poor	Poor	Poor	---	Fair	Very poor.	Very poor.	Poor	Very poor.	Poor.
Somervell part	Very poor.	Very poor.	Fair	---	Fair	Very poor.	Very poor.	Poor	Very poor.	Fair.
Altoga:										
3, 4, 5	Fair	Fair	Fair	---	Fair	Poor	Very poor.	Fair	Very poor.	Fair.
Aquilla:										
6	Fair	Fair	Fair	---	Fair	Very poor.	Very poor.	Fair	Very poor.	Fair.
Austin:										
7, 8	Fair	Good	Fair	---	Fair	Poor	Very poor.	Fair	Very poor.	Fair.
Axtell:										
9, 10, 11	Fair	Fair	Good	Good	Good	Poor	Very poor.	Fair	Very poor.	Good.
Bastrop:										
12	Fair	Fair	Good	---	Good	Poor	Very poor.	Fair	Very poor.	Good.
Bastsil:										
13	Fair	Fair	Good	---	Good	Poor	Very poor.	Fair	Very poor.	Good.
14	Good	Fair	Good	---	Good	Poor	Very poor.	Good	Very poor.	Good.
Birome:										
[1]15:										
Birome part	Poor	Fair	Good	Good	Fair	Very poor.	Very poor.	Fair	Very poor.	Fair.
Rayex part	Poor	Poor	Fair	Poor	Fair	Very poor.	Very poor.	Poor	Very poor.	Fair.
Blum:										
16	Good	Good	Good	---	Fair	Poor	Poor	Good	Poor	Fair.
Bolar:										
17	Good	Good	Fair	---	Fair	Poor	Very poor.	Good	Very poor.	Fair.
18	Fair	Good	Fair	---	Fair	Poor	Very poor.	Fair	Very poor.	Fair.
[1]19:										
Bolar part	Fair	Good	Fair	---	Fair	Poor	Very poor.	Fair	Very poor.	Fair.

See footnote at end of table.

TABLE 14.--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	Hardwood trees	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Wetland wildlife	Rangeland wildlife
Bolar:										
Sunev part	Fair	Good	Good	---	Good	Poor	Very poor.	Good	Very poor.	Good.
Brackett:										
[1]20	Very poor.	Very poor.	Fair	---	Fair	Very poor.	Very poor.	Very poor.	Very poor.	Fair.
Branyon:										
21	Good	Good	Poor	---	Fair	Poor	Poor	Fair	Poor	Fair.
Burleson:										
22, 23	Good	Good	Poor	---	Poor	Very poor.	Very poor.	Fair	Very poor.	Poor.
Chatt:										
24, [1]25	Fair	Good	Fair	---	Fair	Poor	Very poor.	Fair	Very poor.	Fair.
Chickasha Variant:										
26	Fair	Good	Good	---	Fair	Poor	Very poor.	Good	Very poor.	Fair.
Coving:										
[1]27:										
Coving part	Fair	Good	Good	---	Good	Fair	Poor	Good	Poor	Good.
Vaughan part	Fair	Good	Good	---	Good	Fair	Good	Good	Fair	Good.
Crockett:										
28, 29	Fair	Good	Good	Good	Good	Poor	Poor	Good	Poor	Good.
[1]30:										
Crockett part	Fair	Good	Good	Good	Good	Poor	Poor	Good	Poor	Good.
Wilson part	Fair	Fair	Good	---	Fair	Fair	Fair	Fair	Fair	Fair.
Crosstell:										
31	Poor	Fair	Good	Good	Good	Poor	Very poor.	Fair	Very poor.	Fair.
Culp:										
32	Good	Good	Fair	Good	Fair	Poor	Poor	Good	Poor	Fair.
Denton:										
33	Good	Good	Fair	---	Fair	Poor	Very poor.	Good	Very poor.	Fair.
Eddy:										
34, 35	Poor	Poor	Poor	---	Fair	Very poor.	Very poor.	Poor	Very poor.	Poor.
Eufaula:										
36	Fair	Fair	Fair	---	Good	Very poor.	Very poor.	Fair	Very poor.	Fair.
Ferris:										
37, 38	Poor	Fair	Fair	---	Fair	Very poor.	Very poor.	Fair	Very poor.	Fair.
[1]39:										
Ferris part	Fair	Good	Fair	---	Fair	Very poor.	Very poor.	Fair	Very poor.	Fair.
Heiden part	Fair	Good	Fair	---	Fair	Poor	Very poor.	Fair	Very poor.	Fair.

See footnote at end of table.

TABLE 14.--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	Hardwood trees	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Wetland wildlife	Rangeland wildlife
Gasil: 40, 41	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Very poor.	Good.
Gowen: 42	Very poor.	Poor	Fair	---	Good	Poor	Very poor.	Poor	Very poor.	Fair.
Heiden: 43	Good	Good	Fair	---	Fair	Poor	Very poor.	Good	Very poor.	Fair.
44, [1]45	Fair	Good	Fair	---	Fair	Poor	Very poor.	Fair	Very poor.	Fair.
Hensley: 46	Poor	Poor	Fair	---	Fair	Very poor	Very poor.	Poor	Very poor.	Fair.
Hillco: 47	Fair	Good	Fair	---	Fair	Poor	Very poor.	Fair	Very poor.	Fair.
Houston Black: 48, 49, [1]50	Good	Good	Poor	---	Fair	Poor	Poor	Fair	Poor	Fair.
Kemp: 51	Good	Good	Good	---	Good	Poor	Very poor.	Good	Very poor.	Good.
Konsil: 52	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Very poor.	Good.
Kopperl: 53	Poor	Fair	Good	---	Fair	Poor	Very poor.	Fair	Very poor.	Fair.
Krum: 54	Good	Good	Fair	---	Fair	Poor	Very poor.	Good	Very poor.	Fair.
Lamar: 55, 56, [1]57	Fair	Good	Fair	---	Fair	Poor	Very poor.	Fair	Very poor.	Fair.
Lindy: 58	Fair	Good	Good	---	Good	Very poor.	Very poor.	Good	Very poor.	Good.
Mabank: 59	Fair	Good	Good	Good	Fair	Fair	Fair	Good	Fair	Fair.
Normangee: 60, 61, 62	Fair	Good	Fair	---	Good	Poor	Poor	Fair	Poor	Fair.
Pits: 63.										
Pulexas: 64	Fair	Fair	Good	---	Good	Poor	Very poor.	Fair	Very poor.	Good.
[1]65	Poor	Fair	Fair	---	Good	Poor	Very poor.	Fair	Very poor.	Fair.

See footnote at end of table.

TABLE 14.--WILDLIFE HABITAT POTENTIALS--Continued

Soil name and map symbol	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Shrubs	Wetland plants	Shallow water areas	Potential as habitat for--: Openland wildlife	Wetland wildlife	Rangeland wildlife
Pursley:										
66	Very poor.	Poor	Fair	---	Good	Poor	Very poor.	Poor	Very poor.	Fair.
Purves:										
67	Fair	Good	Poor	---	Fair	Poor	Very poor.	Fair	Very poor.	Poor.
Silstid:										
68, 69	Poor	Poor	Fair	Poor	Good	Poor	Very poor.	Poor	Very poor.	Fair.
Stephen:										
70	Fair	Good	Fair	---	Fair	Poor	Very poor.	Fair	Very poor.	Fair.
71	Fair	Good	Fair	---	Fair	Poor	Very poor.	Fair	Very poor.	Fair.
Sunev:										
72	Poor	Fair	Good	---	Good	Poor	Very poor.	Fair	Very poor.	Good.
Tinn:										
73	Fair	Fair	Fair	Good	Fair	Poor	Fair	Fair	Poor	Fair.
74	Poor	Fair	Fair	Good	Fair	Poor	Fair	Fair	Poor	Fair.
Travis:										
75	Good	Good	Good	---	Good	Poor	Very poor.	Good	Very poor.	Good.
Ustifluvents:										
[1]76	Poor	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Good	Very poor.	Fair.
Venus:										
77	Good	Good	Good	---	Fair	Poor	Very poor.	Good	Very poor.	Fair.
78	Fair	Good	Good	---	Fair	Poor	Very poor.	Good	Very poor.	Fair.
Wilson:										
79, 80	Fair	Fair	Good	---	Fair	Fair	Fair	Fair	Fair	Fair.
[1]81:										
Wilson part	Fair	Fair	Good	---	Fair	Fair	Fair	Fair	Fair	Fair.
Heiden part	Good	Good	Fair	---	Fair	Poor	Very poor.	Good	Very poor.	Fair.

[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 map unit.

TABLE 15.--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: Unified	Classification: AASHTO	Fragments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
Aledo:											
[1]1:											
Aledo part	0-4	Gravelly clay loam.	CL, GC, GM, SC	A-4, A-6	0-20	65-95	60-90	55-90	40-70	30-40	10-20
	4-18	Very gravelly clay 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
	18-19	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Somervell part	0-14	Very gravelly clay loam.	GC, GP-GC, CL, SC	A-6, A-2-6	0-35	15-80	10-75	8-75	6-60	25-40	11-25
	14-36	Very gravelly clay loam, very gravelly loam.	GC, GP-GC	A-6, A-2-6	0-35	15-50	10-50	8-50	6-40	25-40	11-25
	36-60	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
[1]2:											
Aledo part	0-4	Gravelly clay loam.	CL, GC, GM, SC	A-4, A-6	0-20	65-95	60-90	55-90	40-70	30-40	10-20
	4-18	Very gravelly clay 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
	18-19	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Somervell part	0-14	Very gravelly clay loam.	GC, GP-GC, CL, SC	A-6, A-2-6	0-35	15-80	10-75	8-75	6-60	25-40	11-25
	14-36	Very gravelly clay loam, very gravelly loam.	GC, GP-GC	A-6, A-2-6	0-35	15-50	10-50	8-50	6-40	25-40	11-25
	36-60	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Altoga:											
3, 4	0-37	Silty clay	CL, CH	A-6, A-7-6	0	95-100	95-100	85-100	80-99	35-51	20-31
	37-60	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
5	0-4	Clay loam	CL, CH	A-6, A-7-6	0	95-100	95-100	85-100	80-99	35-51	20-31
	4-45	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
Aquilla:											
6	0-26	Fine sand	SM, SP-SM	A-2-4	0	98-100	95-100	90-100	10-20	<21	NP-3
	26-62	Loamy fine sand, fine sandy loam, sandy loam.	SM, SP-SM	A-2-4	0	98-100	95-100	90-100	10-25	<21	NP-3
	62-80	Sandy clay loam, fine sandy loam.	SM, SC, SM-SC	A-2-4, A-2-6	0	85-100	80-100	75-100	15-30	18-30	3-14

See footnote at end of table.

TABLE 15.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Austin:											
7, 8	0-15	Silty clay	CH, CL	A-7-6	0-5	95-100	90-100	80-100	75-95	45-65	25-40
	15-33	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
	33-60	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Axtell:											
9, 10, 11	0-7	Fine sandy loam	SM, ML, SM-SC, CL-ML	A-2-4, A-4	0	90-100	80-100	75-95	30-60	<31	NP-7
	7-52	Clay, clay loam, sandy clay.	CL, CH	A-7-6	0-2	90-100	75-100	75-100	51-75	45-60	25-40
	52-66	Sandy clay loam, clay loam, clay.	CL, CH, SC	A-6, A-7-6	0-2	85-100	75-100	75-90	36-88	35-45	15-35
Bastrop:											
12	0-8	Fine sandy loam	ML, SM, CL-ML, SM-SC	A-4	0	95-100	80-100	80-100	36-70	18-25	2-7
	8-80	Sandy clay loam, clay loam, loam.	CL, SC	A-6	0	95-100	80-100	80-100	40-70	26-40	11-22
Bastsil:											
13	0-16	Loamy fine sand	SM, SM-SC	A-2-4, A-4	0	95-100	80-100	75-95	20-50	<20	NP-4
	16-80	Loam, clay loam, sandy clay loam.	CL, SC	A-6	0	95-100	80-100	75-100	40-70	26-40	11-24
14	0-13	Fine sandy loam	ML, SM, CL-ML, SM-SC	A-4	0	95-100	80-100	75-95	36-70	<25	NP-7
	13-64	Loam, clay loam, sandy clay loam.	CL, SC	A-6	0	95-100	80-100	75-100	40-70	26-40	11-24
Birome:											
[1]15:											
Birome part	0-8	Fine sandy loam	SM, SM-SC, ML, CL-ML	A-4, A-2-4	0-5	90-100	90-100	70-100	25-70	18-30	2-7
	8-33	Clay, sandy clay	CL, CH	A-6, A-7	0-2	80-100	80-100	70-100	51-75	35-55	15-35
	33-37	Clay, sandy clay, clay loam.	CL, SC	A-6, A-7	2-30	70-100	60-100	50-70	40-60	30-45	15-25
	37-80	Stratified unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rayex part	0-8	Fine sandy loam	GM, SM, GM-GC, SM-SC	A-1, A-2	0-5	55-75	40-75	40-65	20-35	<25	NP-4
	8-16	Clay loam, sandy clay, clay.	CL, SC	A-6, A-7	0-10	80-100	80-100	80-100	48-80	30-45	15-25
	16-30	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Blum:											
16	0-19	Loam	SC, CL	A-4, A-6	0	98-100	95-100	95-100	45-65	25-40	8-18
	19-36	Clay, clay loam	CL	A-6, A-7	0	98-100	95-100	90-100	65-85	35-49	15-27
	36-74	Clay	CH, CL	A-7	0	98-100	95-100	95-100	65-85	45-65	22-40
	74-80	Clay, clay loam	CL, CH	A-7	0	95-100	90-98	90-95	70-90	41-55	20-30

See footnote at end of table.

TABLE 15.--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	
Bolar:											
17, 18	0-15	Clay loam	CL, SC	A-6, A-7, A-4	0-5	75-100	75-100	70-98	40-80	25-42	9-25
	15-35	Clay loam, loam, silty clay loam.	CL, SC	A-6, A-7	0-10	75-95	75-95	70-90	40-75	25-42	11-25
	35-62	Weathered bedrock.	---	---	---	---	---	---	---	---	---
[1]19:											
Bolar part	0-15	Clay loam	CL, SC	A-6, A-7, A-4	0-5	75-100	75-100	70-98	40-80	25-42	9-25
	15-35	Clay loam, loam, silty clay loam.	CL, SC	A-6, A-7	0-10	75-95	75-95	70-90	40-75	25-42	11-25
	35-62	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Sunev part	0-16	Clay loam	CL, SC	A-4, A-6	0	90-100	80-100	80-100	45-60	25-40	8-18
	16-50	Loam, clay loam, silty clay loam.	CL	A-4, A-6	0	90-100	80-100	80-100	51-65	28-40	8-18
	50-80	Loam, clay loam, silty clay loam.	CL	A-4, A-6	0	90-100	75-100	75-100	51-61	25-40	8-18
Brackett:											
[1]20	0-19	Gravelly clay loam.	CL, SC	A-6, A-4	0-20	70-100	60-100	55-95	40-85	28-40	10-20
	19-37	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Branyon:											
21	0-58	Clay	CH	A-7-6	0	95-100	75-100	75-100	75-100	60-80	35-55
	58-70	Clay, silty clay, clay loam.	CH, CL, GC, SC	A-2, A-4, A-6, A-7	0-10	40-100	35-100	30-100	25-100	25-80	8-60
Burleson:											
22, 23	0-44	Clay	CH, MH	A-7-6, A-7-5	0-2	83-100	80-100	80-100	80-95	51-80	27-55
	44-66	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
Chatt:											
24, [1]25	0-27	Clay	CH	A-7	0	95-100	95-100	95-100	85-100	54-74	28-47
	27-80	Clay loam, clay, silty clay.	CL, CH	A-6, A-7	0	80-100	70-100	60-98	55-95	35-55	18-35
Chickasha Variant:											
26	0-9	Fine sandy loam	ML, CL-ML, SM, SM-SC	A-4	0	100	98-100	94-100	36-70	<26	NP-6
	9-27	Sandy clay loam	CL, SC	A-4, A-6	0	100	100	90-100	40-75	28-39	9-18
	27-44	Clay loam	CL, SC	A-4, A-6	0	98-100	98-100	90-100	40-70	26-37	8-16
	44-76	Weathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 15.--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	
Coving:											
[1]27:											
Coving part------	0-28	Loamy fine sand	SM, SP-SM	A-3, A-2-4	0	95-100	95-100	90-100	8-28	<25	NP-4
	28-46	Loam, clay loam	SC, CL, SM-SC, CL-ML	A-6,	0	95-100	95-100	90-100	36-75	20-35	5-20
	46-66	Sandy clay loam, clay loam.	CL-ML, SC, CL	A-4, A-6	0	95-100	95-100	90-100	36-75	20-35	8-20
	66-76	Sandy clay loam, clay loam.	CL-ML, SC, CL	A-4, A-6	0	95-100	95-100	90-100	36-75	20-35	8-20
Vaughan part-----	0-17	Fine sandy loam	ML, SM, CL-ML, SM-SC	A-4	0	95-100	80-100	75-95	36-70	<25	NP-7
	17-70	Clay loam, sandy clay loam.	CL, SC	A-6, A-7	0	95-100	80-100	75-100	40-70	36-49	16-30
Crockett:											
28, 29------------	0-7	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
	7-60	Clay, clay loam, sandy clay.	CH, CL	A-7, A-6	0	85-100	80-100	75-100	65-91	36-60	22-40
	60-70	Clay loam, sandy clay loam, loam.	CL	A-6, A-7	0-5	90-100	85-100	75-100	51-90	30-45	11-30
[1]30:											
Crockett part----	0-7	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
	7-60	Clay, clay loam, sandy clay.	CH, CL	A-7, A-6	0	85-100	80-100	75-100	65-91	36-60	22-40
	60-70	Clay loam, sandy clay loam, loam.	CL	A-6, A-7	0-5	90-100	85-100	75-100	51-90	30-45	11-30
Wilson part------	0-7	Clay loam-------	CL, CL-ML	A-4, A-6	0	95-100	85-100	80-100	60-96	25-35	7-20
	7-42	Silty clay, clay, clay loam.	CL, CH	A-7-6, A-6	0	90-100	80-100	80-100	65-90	41-55	25-35
	42-70	Silty clay, clay	CL, CH	A-7-6, A-6	0	95-100	95-100	90-100	70-90	41-55	25-35
Crosstell:											
31----------------	0-5	Fine sandy loam	SM, ML, SM-SC, CL-ML	A-2-4, A-4	0	85-100	85-100	75-95	28-60	<31	NP-7
	5-46	Clay------------	CH, CL	A-7-6	0	80-100	80-100	75-98	51-75	42-60	25-40
	46-54	Shaly clay.	CH, CL, SC	A-7-6, A-6	0	80-100	80-98	70-95	36-88	35-55	15-35
	54-70	Weathered bedrock.									
Culp:											
32----------------	0-7	Clay loam-------	CL	A-6	0	95-100	85-95	80-95	60-80	28-40	12-24
	7-18	Sandy clay loam, clay loam, clay.	CL, CH	A-7	0	95-100	85-98	80-95	75-98	41-55	20-35
	18-57	Sandy clay loam, clay loam, clay.	CL, CH	A-7	0	90-100	80-95	75-95	60-95	41-55	20-35
	57-73	Sandy clay loam, clay loam, clay.	CL, CH	A-7, A-6	0	90-100	80-95	70-95	51-85	30-51	15-35

See footnote at end of table.

TABLE 15.--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	
Denton:											
33	0-18	Clay	CH, MH	A-7	0-10	80-100	80-100	80-100	75-95	51-70	26-45
	18-39	Silty clay, clay, silty clay loam.	CH, CL, MH	A-7	0-20	80-100	80-100	80-100	70-95	41-60	21-40
	39-50	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Eddy:											
34, 35	0-6	Very gravelly clay loam.	GC	A-2, A-6	0-20	40-50	35-50	30-45	20-40	30-40	11-20
	6-9	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	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Eufaula:											
36	0-6	Fine sand	SM, SP-SM	A-2, A-3	0	100	98-100	82-100	5-35	---	NP
	6-80	Loamy fine sand	SM, SP-SM	A-2, A-3	0	100	98-100	82-100	5-35	---	NP
Ferris:											
37, 38	0-60	Clay	CH	A-7-6	0	95-100	95-100	75-100	75-98	51-70	35-50
139:											
Ferris part	0-60	Clay	CH	A-7-6	0	95-100	95-100	75-100	75-98	51-70	35-50
Heiden part	0-18	Clay	CH	A-7-6	0	95-100	90-100	80-100	75-99	54-80	35-55
	18-56	Clay, silty clay	CH	A-7-6	0	90-100	90-100	75-100	70-99	52-80	35-55
Gasil:											
40, 41	0-13	Fine sandy loam	CL, ML, SC, SM	A-4	0	95-100	92-100	85-95	36-55	20-28	3-10
	13-78	Sandy clay loam, loam, fine sandy loam.	CL, SC, CL-ML, SM-SC	A-6, A-4	0	95-100	92-100	85-100	36-55	28-40	11-22
Gowen:											
42	0-34	Clay loam	CL	A-6, A-7-6	0	100	95-100	85-100	60-80	30-40	11-25
	34-70	Clay loam, loam	CL	A-4, A-6, A-7-6	0	100	95-100	85-100	55-80	25-40	10-25
Heiden:											
43, 44, 145	0-26	Clay	CH	A-7-6	0	95-100	90-100	80-100	75-99	54-80	35-55
	26-56	Clay, silty clay	CH	A-7-6	0	90-100	90-100	75-100	70-99	52-80	35-55
Hensley:											
46	0-5	Loam	CL, CL-ML	A-6, A-4	0-2	80-100	75-100	70-100	60-85	20-40	5-20
	5-18	Clay, clay loam	CL, CH	A-6, A-7	0-10	80-100	75-100	70-100	60-95	35-55	18-35
	18-30	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Hillco:											
47	0-25	Clay loam	CL, CH	A-6, A-7	0	80-95	75-95	60-85	51-80	30-56	13-35
	25-34	Gravelly clay loam, gravelly silty clay loam, gravelly loam.	CL, CH, SC, GC	A-6, A-7	0-15	60-80	50-70	40-60	36-60	30-51	13-32
	34-38	Gravelly clay loam, gravelly silty clay loam, gravelly loam.	CL, SC, GC	A-2-6, A-2-7, A-6, A-7	30-60	40-70	30-60	20-50	13-40	30-50	13-32
	38-50	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 15.--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	
Houston Black:											
48, 49, [1]50	0-19	Clay	CH	A-7-6	0	95-100	95-100	95-100	85-100	58-90	34-65
	19-70	Clay, silty clay	CH	A-7-6	0	95-100	95-100	95-100	85-100	58-90	34-65
Kemp:											
51	0-19	Loam	SM-SC, CL-ML, CL, SC	A-4, A-6	0	100	100	90-100	40-80	20-35	7-20
	19-66	Sandy clay loam, clay loam, sandy clay.	CL, ML	A-6, A-7	0	100	100	85-95	51-80	25-50	11-30
Konsil:											
52	0-13	Fine sandy loam	CL, ML, SC, SM	A-4	0	90-100	90-100	85-95	36-55	20-28	3-10
	13-64	Sandy clay loam, loam, fine sandy loam.	CL, SC	A-6	0	90-100	90-99	85-95	40-60	28-40	11-20
Kopperl:											
53	0-14	Gravelly sandy loam.	SM, SM-SC, GM, GM-GC	A-1, A-2	0	45-95	35-70	30-50	15-30	<25	NP-7
	14-26	Gravelly loam, gravelly clay loam.	SC, GC	A-2	0	45-95	35-70	30-50	15-30	25-40	10-25
	26-40	Gravelly clay loam, very gravelly clay loam, gravelly clay.	SC, GC	A-2	0	45-90	35-70	15-30	15-30	55-80	30-50
	40-54	Clay, gravelly clay.	CH	A-7	0-5	85-99	75-95	70-90	65-90	70-85	42-55
	54-60	Indurated, unweathered bedrock.	---	---	---	---	---	---	---	---	---
Krum:											
54	0-5	Clay loam	CH	A-7-6	0	95-100	85-100	85-100	85-95	51-65	25-45
	5-40	Silty clay, clay	CH	A-7-6	0	95-100	85-100	80-100	65-95	51-74	28-50
	40-70	Silty clay loam, silty clay, clay.	CH, CL	A-7-6	0	85-100	75-100	70-95	65-95	48-60	28-38
Lamar:											
55, [1]57	0-13	Clay loam	CL, CL-ML	A-6, A-4	0	95-100	95-100	85-100	60-80	20-40	5-18
	13-80	Clay loam, loam, silty clay loam.	CL, CL-ML	A-6, A-4	0	95-100	95-100	85-100	60-80	20-40	5-18
56	0-5	Loam	CL, CL-ML	A-6, A-4	0	95-100	95-100	85-100	60-80	20-40	5-18
	5-80	Clay loam, loam, silty clay loam.	CL, CL-ML	A-6, A-4	0	95-100	95-100	85-100	60-80	20-40	5-18
Lindy:											
58	0-7	Clay loam	CL, CL-ML	A-4, A-6	0-15	75-100	70-100	70-100	60-85	20-40	5-20
	7-36	Clay loam, clay	CL, CH	A-6, A-7	0-5	80-100	75-100	75-100	65-90	35-60	15-35
	36-44	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Mabank:											
59	0-5	Fine sandy loam	CL, ML, SM, SC	A-4	0	95-100	95-100	80-98	40-70	<30	NP-10
	5-65	Clay, clay loam	CH, CL	A-7, A-6	0	95-100	95-100	95-100	60-85	35-65	20-40

See footnote at end of table.

TABLE 15.--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	
Normangee:											
60, 61, 62	0-5	Clay loam	CL	A-6, A-7	0	98-100	96-100	90-100	55-85	30-48	11-25
	5-60	Clay	CL, CH	A-7	0	98-100	98-100	90-100	70-90	44-70	22-45
	60-80	Stratified shaly clay.	CL, CH	A-7	0	95-100	90-100	90-100	70-90	41-60	20-35
Pit:											
63.											
Pulexas:											
64	0-14	Loamy fine sand	SM	A-2	0	100	95-100	90-100	15-35	---	NP
	14-80	Fine sandy loam, loam.	SM, SC, ML, CL	A-4	0	100	95-100	90-100	36-85	<30	NP-10
[1]65	0-34	Fine sandy loam	SM, SC, ML, CL	A-4	0	100	95-100	90-100	36-85	<30	NP-10
	34-76	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
Pursley:											
66	0-62	Clay loam	CL	A-4, A-6, A-7-6	0	100	95-100	85-100	55-85	25-43	10-25
Purves:											
67	0-16	Clay loam	CH	A-7-6	0-5	90-100	80-100	80-95	70-95	51-65	30-40
	16-19	Gravelly clay, very gravelly clay, gravelly clay loam.	CH, SC	A-7-6	0-35	60-100	60-100	55-95	45-90	51-65	30-40
	19-30	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Silstid:											
68, 69	0-27	Loamy fine sand	SM, SP-SM	A-2-4	0	95-100	90-100	90-100	10-25	<25	NP-3
	27-59	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	4-23
Stephen:											
70, 71	0-12	Silty clay	CL, CH	A-7-6	0-5	95-100	90-100	85-100	80-90	45-66	22-42
	12-18	Variable	---	---	---	---	---	---	---	---	---
	18-40	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Sunev:											
72	0-16	Clay loam	CL, SC	A-4, A-6	0	90-100	80-100	80-100	45-60	25-40	8-18
	16-50	Loam, clay loam, silty clay loam.	CL	A-4, A-6	0	90-100	80-100	80-100	51-65	28-40	8-18
	50-80	Loam, clay loam, silty clay loam.	CL	A-4, A-6	0	90-100	75-100	75-100	51-61	25-40	8-18
Tinn:											
73, 74	0-16	Clay	CH, CL	A-7	0	100	98-100	85-100	80-95	41-60	20-40
	16-80	Clay, silty clay	CH	A-7	0	100	98-100	85-100	80-95	51-60	30-40
Travis:											
75	0-7	Fine sandy loam	SM, SP-SM, SM-SC	A-2-4	0-2	90-100	83-100	80-90	10-35	<21	NP-4
	7-70	Sandy clay, clay, gravelly clay.	SC, CL, CH	A-6, A-7-6	0-2	90-100	69-100	60-90	36-53	38-54	18-26
Ustifluvents:											
[1]76.											

See footnote at end of table.

TABLE 15.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Venus:											
77, 78	0-14	Loam	CL, CL-ML	A-4, A-6	0	100	95-100	85-100	50-80	20-40	5-20
	14-57	Loam, clay loam, sandy clay loam.	CL, CL-ML	A-4, A-6	0	95-100	90-100	85-100	50-80	20-40	5-21
	57-68	Fine sandy loam, loam, sandy clay loam.	SC, SM-SC, CL, CL-ML	A-4, A-6	0	80-100	70-100	65-100	40-80	20-40	5-20
Wilson:											
79, 80	0-7	Clay loam	CL	A-4, A-6	0	95-100	85-100	80-100	60-96	25-36	10-20
	7-57	Silty clay, clay, clay loam.	CL, CH	A-7-6, A-6	0	90-100	80-100	80-100	65-90	41-55	21-35
	57-70	Silty clay, clay	CL, CH	A-7-6, A-6	0	95-100	95-100	90-100	70-90	41-55	25-35
[1]81:											
Wilson part	0-7	Clay loam	CL	A-4, A-6	0	95-100	85-100	80-100	60-96	25-36	10-20
	7-57	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
	57-70	Silty clay, clay	CL, CH	A-7-6, A-6	0	95-100	90-100	85-100	70-90	40-57	24-35
Heiden part	0-19	Clay	CH	A-7-6	0	95-100	90-100	80-100	75-99	54-80	35-55
	19-56	Clay, silty clay	CH	A-7-6	0	90-100	90-100	75-100	70-99	52-80	35-55

[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 map unit.

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS

[Dashes indicate data were not available. The symbol < means less than; > means greater than. The erosion tolerance factor (T) is for the entire profile. Absence of an entry means data were not estimated]

Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Risk of corrosion		Erosion factors	
						Uncoated steel	Concrete	K	T
	In	In/hr	In/in	pH					
Aledo:									
[1]1:									
Aledo part	0-4	0.6-2.0	0.07-0.18	7.9-8.4	Moderate	Moderate	Low	0.32	1
	4-18	0.6-2.0	0.05-0.12	7.9-8.4	Low	Moderate	Low	0.32	
	18-19	---	---	---	---	---	---	---	
Somervell part	0-14	0.6-2.0	0.03-0.13	7.9-8.4	Low	High	Low	0.10	2
	14-36	0.6-2.0	0.03-0.13	7.9-8.4	Low	High	Low	0.10	
	36-60	---	---	---	---	---	---	---	
[1]2:									
Aledo part	0-4	0.6-2.0	0.07-0.18	7.9-8.4	Moderate	Moderate	Low	0.32	1
	4-18	0.6-2.0	0.05-0.12	7.9-8.4	Low	Moderate	Low	0.32	
	18-19	---	---	---	---	---	---	---	
Somervell part	0-14	0.6-2.0	0.03-0.13	7.9-8.4	Low	High	Low	0.10	2
	14-36	0.6-2.0	0.03-0.13	7.9-8.4	Low	High	Low	0.10	
	36-60	---	---	---	---	---	---	---	
Altoga:									
3, 4, 5	0-37	0.6-2.0	0.15-0.18	7.9-8.4	High	High	Low	0.32	5
	37-60	0.6-2.0	0.15-0.18	7.9-8.4	Moderate	Moderate	Low	0.32	
Aquilla:									
6	0-26	>20	0.05-0.10	5.6-7.8	Very low	Low	Low	0.17	5
	26-62	>20	0.07-0.12	5.6-7.8	Very low	Low	Low	0.17	
	62-80	2.0-6.0	0.11-0.16	5.6-7.8	Low	Low	Low	0.24	
Austin:									
7, 8	0-15	0.2-0.6	0.15-0.20	7.9-8.4	High	High	Low	0.32	2
	15-33	0.2-0.6	0.15-0.20	7.9-8.4	Moderate	High	Low	0.32	
	33-60	---	---	---	---	---	---	---	
Axtell:									
9, 10, 11	0-7	0.6-2.0	0.11-0.15	5.1-6.5	Low	Moderate	Moderate	0.43	5
	7-52	<0.06	0.13-0.18	4.5-7.3	High	High	Moderate	0.37	
	52-66	0.2-0.6	0.13-0.18	5.6-7.8	High	High	Low	0.37	
Bastrop:									
12	0-8	2.0-6.0	0.11-0.17	5.6-7.3	Low	Low	Low	0.24	5
	8-80	0.6-2.0	0.15-0.19	6.1-8.4	Low	Moderate	Low	0.32	
Bastsil:									
13	0-16	2.0-6.0	0.07-0.11	5.1-6.5	Very low	Low	Low	0.20	5
	16-80	0.6-2.0	0.15-0.19	5.6-7.8	Moderate	Moderate	Low	0.32	
14	0-13	2.0-6.0	0.11-0.17	5.1-6.5	Low	Low	Low	0.24	5
	13-64	0.6-2.0	0.15-0.19	5.6-7.8	Moderate	Moderate	Low	0.32	
Birome:									
[1]15:									
Birome part	0-8	0.6-2.0	0.11-0.15	5.6-7.3	Low	Low	Moderate	0.37	2
	8-33	0.2-0.6	0.15-0.20	5.1-6.0	High	High	Moderate	0.28	
	33-37	0.6-2.0	0.12-0.18	5.1-6.0	Moderate	High	Moderate	0.28	
	37-80	---	---	---	---	---	---	---	
Rayex part	0-8	0.6-2.0	0.08-0.15	5.6-7.3	Low	Low	Low	0.32	1
	8-16	0.2-0.6	0.12-0.20	4.5-6.0	Moderate	High	Moderate	0.32	
	16-30	---	---	---	---	---	---	---	

See footnote at end of table.

TABLE 16.--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		Erosion factors	
						Uncoated steel	Concrete	K	T
	In	In/hr	In/in	pH					
Blum:									
16----------------	0-19	0.6-2.0	0.11-0.16	6.1-7.8	Low--------	Moderate	Low--------	0.32	5
	19-36	0.2-0.6	0.12-0.18	6.1-7.3	Moderate	High------	Low--------	0.32	
	36-74	0.06-0.2	0.12-0.18	7.4-8.4	High------	High------	Low--------	0.32	
	74-80	0.06-0.2	0.12-0.18	7.4-8.4	High------	High------	Low--------	0.32	
Bolar:									
17, 18------------	0-15	0.6-2.0	0.11-0.20	7.9-8.4	Moderate	High------	Low--------	0.32	2
	15-35	0.6-2.0	0.11-0.20	7.9-8.4	Moderate	High------	Low--------	0.32	
	35-62	---	---	---	----------	----------	----------	---	
[1]19:									
Bolar part--------	0-15	0.6-2.0	0.11-0.20	7.9-8.4	Moderate	High------	Low--------	0.32	2
	15-35	0.6-2.0	0.11-0.20	7.9-8.4	Moderate	High------	Low--------	0.32	
	35-62	---	---	---	----------	----------	----------	---	
Sunev part--------	0-16	0.6-2.0	0.11-0.16	7.9-8.4	Low--------	Moderate	Low--------	0.28	5
	16-50	0.6-2.0	0.11-0.16	7.9-8.4	Low--------	Moderate	Low--------	0.28	
	50-80	0.6-2.0	0.11-0.16	7.9-8.4	Low--------	Moderate	Low--------	0.28	
Brackett:									
[1]20----------------	0-19	0.2-0.6	0.10-0.20	7.9-8.4	Low--------	High------	Low--------	0.32	2
	19-37	---	---	---	----------	----------	----------	---	
Branyon:									
21----------------	0-58	<0.06	0.15-0.18	7.9-8.4	Very high	High------	Low--------	0.32	5
	58-70	<2.0	0.11-0.18	7.9-8.4	Very high	High------	Low--------	0.32	
Burleson:									
22, 23------------	0-44	<0.06	0.12-0.18	5.6-8.4	High------	High------	Low--------	0.32	4
	44-66	<0.06	0.12-0.18	7.4-8.4	High------	High------	Low--------	0.32	
Chatt:									
24, [1]25-----------	0-27	0.2-0.6	0.15-0.20	7.9-8.4	High------	High------	Low--------	0.32	5
	27-80	0.2-0.6	0.15-0.20	7.9-8.4	High------	High------	Low--------	0.32	
Chickasha Variant:									
26----------------	0-9	2.0-6.0	0.13-0.17	5.6-7.3	Low--------	Low--------	Moderate	0.28	4
	9-27	0.6-2.0	0.14-0.18	5.6-7.3	Low--------	Moderate	Moderate	0.28	
	27-44	0.6-2.0	0.12-0.16	5.6-8.4	Low--------	Moderate	Moderate	0.28	
	44-76	---	0.13-0.17	---	----------	----------	----------	---	
Coving:									
[1]27:									
Coving part-------	0-28	6.0-20	0.05-0.10	6.1-7.8	Very low	Low--------	Low--------	0.20	5
	28-46	0.6-2.0	0.12-0.18	5.6-7.8	Low--------	High------	Moderate	0.32	
	46-66	0.6-2.0	0.12-0.18	6.1-7.8	Low--------	High------	Moderate	0.32	
	66-76	0.6-2.0	0.12-0.18	6.6-8.4	Low--------	High------	Moderate	0.32	
Vaughan part------	0-17	2.0-6.0	0.11-0.17	5.6-7.8	Low--------	High------	Low--------	0.32	5
	17-70	0.06-0.2	0.15-0.18	5.6-8.4	Moderate	High------	Low--------	0.32	
Crockett:									
28, 29------------	0-7	0.6-2.0	0.11-0.20	5.6-7.3	Low--------	Moderate	Low--------	0.43	5
	7-60	<0.06	0.14-0.18	5.6-7.8	High------	High------	Low--------	0.32	
	60-70	0.06-0.2	0.15-0.20	7.4-8.4	Moderate	High------	Low--------	0.32	
[1]30:									
Crockett part-----	0-7	0.6-2.0	0.11-0.20	5.6-7.3	Low--------	Moderate	Low--------	0.43	5
	7-60	<0.06	0.14-0.18	5.6-7.8	High------	High------	Low--------	0.32	
	60-70	0.06-0.2	0.15-0.20	7.4-8.4	Moderate	High------	Low--------	0.32	
Wilson part-------	0-7	0.2-0.6	0.15-0.20	5.6-7.8	Low--------	High------	Low--------	0.43	5
	7-42	<0.06	0.14-0.20	5.6-7.8	High------	High------	Low--------	0.37	
	42-70	<0.06	0.12-0.15	6.6-8.4	High------	High------	Low--------	0.37	

See footnote at end of table.

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Risk of corrosion		Erosion factors	
						Uncoated steel	Concrete	K	T
	In	In/hr	In/in	pH					
Crosstell:									
31	0-5	0.6-2.0	0.10-0.14	5.6-7.8	Low	Low	Low	0.43	3
	5-46	<0.06	0.14-0.18	5.1-8.4	High	High	Moderate	0.37	
	46-54	<0.06	0.14-0.18	6.6-8.4	High	High	Moderate	0.37	
	54-70	---	---	---	---	---	---	---	
Culp:									
32	0-7	0.6-2.0	0.15-0.20	6.6-7.8	Moderate	High	Moderate	0.32	5
	7-18	0.2-0.6	0.12-0.18	6.6-7.8	Moderate	High	Moderate	0.37	
	18-57	0.06-0.2	0.12-0.18	7.4-8.4	High	High	Moderate	0.37	
	57-73	0.06-0.2	0.12-0.18	7.4-8.4	High	High	Moderate	0.43	
Denton:									
33	0-18	0.06-0.2	0.15-0.20	7.9-8.4	High	High	Low	0.32	2
	18-39	0.06-0.2	0.15-0.20	7.9-8.4	High	High	Low	0.32	
	39-50	---	---	---	---	---	---	---	
Eddy:									
34, 35	0-6	0.2-0.6	0.10-0.13	7.9-8.4	Low	High	Low	0.24	1
	6-9	0.2-0.6	0.03-0.07	7.9-8.4	Low	High	Low	0.24	
	9-60	---	---	---	---	---	---	---	
Eufaula:									
36	0-80	6.0-20.0	0.05-0.11	5.1-7.3	Low	Low	Moderate	0.17	5
Ferris:									
37, 38	0-60	<0.06	0.15-0.18	7.9-8.4	Very high	High	Low	0.32	4
[1]39:									
Ferris part	0-60	<0.06	0.15-0.18	7.9-8.4	Very high	High	Low	0.32	4
Heiden part	0-18	<0.06	0.15-0.20	7.9-8.4	Very high	High	Low	0.32	5
	18-56	<0.06	0.12-0.20	7.9-8.4	Very high	High	Low	0.32	
Gasil:									
40, 41	0-13	2.0-6.0	0.11-0.15	6.1-7.8	Low	Low	Low	0.24	5
	13-78	0.6-2.0	0.12-0.19	5.1-6.5	Moderate	Low	Moderate	0.32	
Gowen:									
42	0-34	0.6-2.0	0.15-0.20	6.6-8.4	Moderate	Moderate	Low	0.32	5
	34-70	0.6-2.0	0.15-0.20	6.6-8.4	Moderate	Moderate	Low	0.32	
Heiden:									
43, 44, [1]45	0-26	<0.06	0.15-0.20	7.9-8.4	Very high	High	Low	0.32	5
	26-56	<0.06	0.12-0.20	7.9-8.4	Very high	High	Low	0.32	
Hensley:									
46	0-5	0.2-0.6	0.12-0.20	6.1-7.8	Low	High	Low	0.37	1
	5-18	0.06-0.2	0.10-0.20	6.6-8.4	Moderate	High	Low	0.32	
Hillco:									
47	0-25	0.6-2.0	0.16-0.20	7.9-8.4	Moderate	High	Low	0.32	2
	25-34	0.6-2.0	0.16-0.20	7.9-8.4	Moderate	High	Low	0.17	
	34-38	0.6-2.0	0.16-0.20	7.9-8.4	Moderate	High	Low	0.17	
	38-50	---	---	---	---	---	---	---	
Houston Black:									
48, 49, [1]50	0-19	<0.06	0.15-0.20	7.4-8.4	Very high	High	Low	0.32	4
	19-70	<0.06	0.15-0.20	7.4-8.4	Very high	High	Low	0.32	
Kemp:									
51	0-19	0.6-2.0	0.13-0.20	5.1-6.5	Low	Moderate	Moderate	0.28	5
	19-66	0.6-2.0	0.12-0.18	5.1-7.3	Moderate	Moderate	Moderate	0.28	
Konsil:									
52	0-13	2.0-6.0	0.11-0.15	6.1-7.8	Low	Low	Low	0.24	5
	13-64	0.6-2.0	0.12-0.19	5.1-6.5	Moderate	Low	Moderate	0.32	

See footnote at end of table.

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Permeability	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					
Kopperl:									
53	0-14	2.0-6.0	0.08-0.12	6.1-7.8	Low	Low	Low	0.24	4
	14-26	0.6-2.0	0.08-0.14	5.1-7.3	Low	Low	Low	0.10	
	26-40	0.2-0.6	0.10-0.17	5.1-7.3	Moderate	High	Low	0.17	
	40-54	0.2-0.6	0.12-0.18	6.1-7.8	High	High	Low	0.17	
	54-60	---	---	---	---	---	---	---	
Krum:									
54	0-5	0.2-0.6	0.15-0.20	7.4-8.4	High	High	Low	0.32	5
	5-40	0.2-0.6	0.14-0.20	7.9-8.4	High	High	Low	0.32	
	40-70	0.2-0.6	0.14-0.20	7.9-8.4	High	High	Low	0.32	
Lamar:									
55, 56, [1]57	0-13	0.6-2.0	0.12-0.15	7.8-8.4	Moderate	Moderate	Low	0.32	4
	13-80	0.6-2.0	0.12-0.15	7.8-8.4	Moderate	Moderate	Low	0.32	
Lindy:									
58	0-7	0.6-2.0	0.12-0.20	6.1-7.8	Low	High	Low	0.37	2
	7-36	0.06-0.2	0.10-0.20	6.1-7.8	Moderate	High	Low	0.32	
	36-44	---	---	---	---	---	---	---	
Mabank:									
59	0-5	0.6-2.0	0.10-0.15	5.6-7.3	Low	Moderate	Low	0.43	5
	5-65	<0.06	0.12-0.16	5.6-8.4	High	High	Low	0.32	
Normangee:									
60, 61, 62	0-5	0.06-0.2	0.15-0.20	5.6-7.3	Moderate	High	Low	0.43	3
	5-60	<0.06	0.12-0.18	5.6-8.4	High	High	Low	0.37	
	60-80	<0.06	0.12-0.18	6.1-8.4	High	High	Low	---	
Pit:									
63.									
Pulexas:									
64	0-14	6.0-20.0	0.07-0.11	5.6-7.3	Low	Low	Moderate	0.20	5
	14-80	2.0-6.0	0.12-0.16	5.6-7.3	Low	Low	Moderate	0.24	
[1]65	0-34	2.0-6.0	0.12-0.16	5.6-7.3	Low	Low	Moderate	0.24	5
	34-76	2.0-6.0	0.07-0.16	5.6-8.4	Low	Low	Low	0.20	
Pursley:									
66	0-62	0.6-2.0	0.15-0.20	7.4-8.4	Moderate	Moderate	Low	0.28	5
Purves:									
67	0-16	0.2-0.6	0.12-0.18	7.9-8.4	High	High	Low	0.32	1
	16-19	0.2-0.6	0.08-0.18	7.9-8.4	High	High	Low	0.32	
	19-30	---	---	---	---	---	---	---	
Silstid:									
68, 69	0-27	6.0-20	0.05-0.10	5.6-6.5	Low	Low	Moderate	0.20	5
	27-59	0.6-2.0	0.12-0.17	5.6-6.5	Low	Moderate	Moderate	0.24	
Stephen:									
70, 71	0-12	0.2-0.6	0.10-0.15	7.9-8.4	Moderate	High	Low	0.32	1
	12-18	---	---	---	---	---	---	---	
	18-40	---	---	---	---	---	---	---	
Sunev:									
72	0-16	0.6-2.0	0.11-0.16	7.9-8.4	Low	Moderate	Low	0.28	5
	16-50	0.6-2.0	0.11-0.16	7.9-8.4	Low	Moderate	Low	0.28	
	50-80	0.6-2.0	0.11-0.16	7.9-8.4	Low	Moderate	Low	0.28	
Tinn:									
73, 74	0-16	0.06-0.2	0.15-0.20	7.4-8.4	High	High	Low	0.32	5
	16-80	<0.06	0.15-0.20	7.4-8.4	High	High	Low	0.32	

See footnote at end of table.

TABLE 16.--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					
Travis:									
75----------------	0-7	2.0-6.0	0.08-0.11	5.6-7.0	Low--------	Low--------	Low--------	0.24	5
	7-70	0.2-0.6	0.14-0.16	5.1-6.0	Moderate	High------	Moderate	0.32	
Ustifluvents:									
[1]76.									
Venus:									
77, 78------------	0-14	0.6-2.0	0.15-0.20	7.9-8.4	Low--------	High------	Low--------	0.28	5
	14-57	0.6-2.0	0.15-0.20	7.9-8.4	Low--------	High------	Low--------	0.28	
	57-68	0.6-2.0	0.13-0.18	7.9-8.4	Low--------	High------	Low--------	0.28	
Wilson:									
79, 80------------	0-7	0.2-0.6	0.15-0.20	5.6-7.8	Low--------	High------	Low--------	0.43	5
	7-57	<0.06	0.14-0.20	5.6-7.8	High------	High------	Low--------	0.37	
	57-70	<0.06	0.12-0.15	6.6-8.4	High------	High------	Low--------	0.37	
[1]81:									
Wilson part------	0-7	0.2-0.6	0.15-0.20	5.6-7.8	Low--------	High------	Low--------	0.43	5
	7-57	<0.06	0.14-0.20	5.6-7.8	High------	High------	Low--------	0.37	
	57-70	<0.06	0.12-0.15	6.6-8.4	High------	High------	Low--------	0.37	
Heiden part------	0-19	<0.06	0.15-0.20	7.9-8.4	Very high	High------	Low--------	0.32	5
	19-56	<0.06	0.12-0.20	7.9-8.4	Very high	High------	Low--------	0.32	

[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 map unit.

TABLE 17.--SOIL AND WATER FEATURES

[Absence of an entry indicates the feature is not a concern. See text for descriptions of symbols and such terms as "apparent" and "perched." The symbol > means greater than]

Soil name and map symbol	Hydro-logic group	Flooding			High water table			Bedrock	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness
					Ft			In	
Aledo:									
[1]1:									
Aledo part	C	None	---	---	>6.0	---	---	8-20	Hard
Somervell part	B	None	---	---	>6.0	---	---	20-40	Hard
[1]2:									
Aledo part	C	None	---	---	>6.0	---	---	8-20	Hard
Somervell part	B	None	---	---	>6.0	---	---	20-40	Hard
Altoga: 3, 4, 5	C	None	---	---	>6.0	---	---	>60	---
Aquilla: 6	A	None	---	---	4.0-5.0	Perched	Dec-Mar	>60	---
Austin: 7, 8	C	None	---	---	>6.0	---	---	20-40	Rippable
Axtell: 9, 10, 11	D	None	---	---	>6.0	---	---	>60	---
Bastrop: 12	B	None	---	---	>6.0	---	---	>60	---
Bastsil: 13, 14	B	None	---	---	>6.0	---	---	>60	---
Birome:									
[1]15:									
Birome part	C	None	---	---	>6.0	---	---	20-40	Rippable
Rayex part	D	None	---	---	>6.0	---	---	8-20	Rippable
Blum: 16	C	None	---	---	3.0-6.0	Apparent	Dec-Mar	>60	---
Bolar: 17, 18	C	None	---	---	>6.0	---	---	20-40	Rippable
[1]19:									
Bolar part	C	None	---	---	>6.0	---	---	20-40	Rippable
Sunev part	B	None	---	---	>6.0	---	---	>60	---
Brackett: [1]20	C	None	---	---	>6.0	---	---	10-20	Rippable
Branyon: 21	D	None	---	---	>6.0	---	---	>60	---
Burleson: 22, 23	D	None	---	---	>6.0	---	---	>60	---
Chatt: 24, [1]25	C	None	---	---	>6.0	---	---	>60	---
Chickasha Variant: 26	B	None	---	---	>6.0	---	---	40-60	Rippable

See footnote at end of table.

TABLE 17.--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	
Coving:									
[1]27:									
Coving part	C	Rare to common.	Very brief	Sep-May	2.5-4.0	Perched	Nov-May	>60	---
Vaughan part	D	Common	Very brief	Sep-May	0-2.5	Perched	Sep-May	>60	---
Crockett: 28, 29	D	None	---	---	>6.0	---	---	>60	---
[1]30:									
Crockett part	D	None	---	---	>6.0	---	---	>60	---
Wilson part	D	None	---	---	0-1.0	Perched	Nov-Mar	>60	---
Crosstell: 31	D	None	---	---	>6.0	---	---	>60	---
Culp: 32	C	None	---	---	>6.0	---	---	>60	---
Denton: 33	D	None	---	---	>6.0	---	---	22-40	Hard
Eddy: 34, 35	C	None	---	---	>6.0	---	---	3-15	Rippable
Eufaula: 36	A	None	---	---	>6.0	---	---	>60	---
Ferris: 37, 38	D	None	---	---	>6.0	---	---	>60	---
[1]39:									
Ferris part	D	None	---	---	>6.0	---	---	>60	---
Heiden part	D	None	---	---	>6.0	---	---	>60	---
Gasil: 40, 41	B	None	---	---	>6.0	---	---	>60	---
Gowen: 42	B	Rare to common.	Brief	Oct-May	>6.0	---	---	>60	---
Heiden: 43, 44, [1]45	D	None	---	---	>6.0	---	---	>60	---
Hensley: 46	D	None	---	---	>6.0	---	---	10-20	Hard
Hillco: 47	B	None	---	---	>6.0	---	---	20-40	Hard
Houston Black: 48, 49, [1]50	D	None	---	---	>6.0	---	---	>60	---
Kemp: 51	C	Rare to common.	Very brief to brief.	Nov-May	2.0-3.0	Apparent	Nov-May	>60	---
Konsil: 52	B	None	---	---	>6.0	---	---	>60	Rippable
Kopperl: 53	B	None	---	---	>6.0	---	---	40-60	Hard

See footnote at end of table.

TABLE 17.--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	
Krum: 54	D	None	---	---	>6.0	---	---	>60	---
Lamar: 55, 56, [1]57	B	None	---	---	>6.0	---	---	>60	---
Lindy: 58	C	None	---	---	>6.0	---	---	24-40	Hard
Mabank: 59	D	None	---	---	0.6-1.0	Perched	Dec-Mar	>60	---
Normangee: 60, 61, 62	D	None	---	---	>6.0	---	---	>60	---
Pit: 63.									
Pulexas: 64, [1]65	B	Common	Very brief	Sep-Mar	>6.0	---	---	>60	---
Pursley: 66	B	Rare to common.	Brief	Sep-May	>6.0	---	---	>60	---
Purves: 67	D	None	---	---	>6.0	---	---	8-20	Hard
Silstid: 68, 69	A	None	---	---	>6.0	---	---	>60	---
Stephen: 70, 71	C	None	---	---	>6.0	---	---	7-20	Rippable
Sunev: 72	B	None	---	---	>6.0	---	---	>60	---
Tinn: 73, 74	D	None to frequent.	Brief	Feb-May	0-3.0	Apparent	Nov-Feb	>60	---
Travis: 75	C	None	---	---	>6.0	---	---	>60	---
Ustifluvents: [1]76	A	Rare	---	---	>6.0	---	---	>60	---
Venus: 77, 78	B	None to common.	Very brief	Oct-May	>6.0	---	---	>60	---
Wilson: 79, 80	D	None	---	---	0-1.0	Perched	Nov-Mar	>60	---
[1]81: Wilson part	D	None	---	---	0-1.0	Perched	Nov-Mar	>60	---
Heiden part	D	None	---	---	>6.0	---	---	>60	---

[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 map unit.

TABLE 18.--ENGINEERING TEST DATA

[Tests were performed by the Texas Highway Department]

Soil name and report number	Depth	Shrinkage: Limit	Shrinkage: Linear	Shrinkage: Ratio	Mechanical analysis[1]: Percentage passing sieve--: 3/4 in	3/8 in	No. 4	No. 10	No. 40	No. 60	No 200	Percentage smaller than--: 0.05 mm	0.005 mm	0.002 mm	Liquid Limit	Plasticity index	Classification[2]: AASHTO[3]	Unified[4]
	In																	
Aquilla fine sand:																		
73-57-R	14-26	14	0.9	1.84	100	100	99	98	93	77	15	8	2	1	19	2	A-2-4	SM
73-58-R	62-90	16	5.4	1.82	100	98	95	81	77	61	26	21	14	14	26	14	A-2-6	SC
Chatt clay:																		
73-61-R	8-17	11	22.2	2.03	100	100	100	99	99	98	93	85	50	39	66	42	A-7-6(20)	CH
73-62-R	27-49	17	9.1	1.85	100	99	97	95	95	94	92	87	63	42	36	18	A-6(11)	CL
Ferris clay:																		
73-63-R	5-25	11	23.3	2.02	100	100	100	100	99	99	98	95	76	64	70	49	A-7-6(20)	CH
Gasil fine sandy loam:																		
73-53-R	13-23	16	10.3	1.82	100	100	99	98	97	97	45	40	35	34	37	22	A-6(5)	SC
73-54-R	30-55	18	10.7	1.77	100	100	100	100	100	100	35	33	30	29	41	25	A-2-7(3)	SC
Hillco silty clay:																		
73-48-R	25-35	16	7.6	1.85	100	81	72	62	53	51	44	39	23	13	31	13	A-6(3)	SC
Kopperl gravelly sandy loam:																		
73-49-R	0-8	15	2.6	1.87	100	93	80	61	39	33	23	19	4	3	20	5	A-1-b(0)	SM-SC
73-50-R	26-40	14	23.5	1.93	100	91	76	48	23	21	19	19	17	16	77	50	A-2-7(1)	SC
73-51-R	40-66	12	25.7	2.00	100	97	94	90	86	83	80	77	70	59	84	55	A-7-6(20)	CH
Silstid loamy fine sand:																		
73-55-R	8-15	18	1.4	1.71	100	99	96	93	92	90	17	12	6	5	20	2	A-2-4	SM
73-56-R	27-44	18	9.7	1.77	100	99	99	98	97	96	40	37	33	31	38	23	A-6(4)	SC
Venus loam:																		
73-66-R	14-29	14	11.4	1.92	100	99	96	91	87	85	59	53	31	23	36	21	A-6(9)	CL
73-67-R	29-46	14	8.5	1.95	100	100	97	93	88	84	53	48	27	22	30	16	A-6(6)	CL

[1]Mechanical analyses according to the AASHTO Designation T88. 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 analysed by the hydrometer method and the various grain-sized fractions are calculated on the basis of all the material, including that coarser than 2 millimeter in diameter. In the SCS soil survey soil survey procedure, the fine material is analysed by the pipette method and the material coarser than 2 millimeters in diameter is excluded from calculations of grain-sized 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. Designation M 145-49.

[4]Based on the Unified Soil Classification System.

TABLE 19.--CLASSIFICATION OF THE SOILS

[An asterisk in the first column indicates a taxadjunct to the series. See text 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
Aquilla	Sandy, siliceous, thermic Psammentic Paleustalfs
Austin	Fine-silty, carbonatic, thermic Entic Haplustolls
Axtell	Fine, montmorillonitic, thermic Udertic Paleustalfs
Bastrop	Fine-loamy, mixed, thermic Udic Paleustalfs
Bastsil	Fine-loamy, siliceous, thermic Udic Paleustalfs
Birome	Fine, mixed, thermic Ultic Paleustalfs
Blum	Fine, mixed, thermic Aquic Argiustolls
Bolar	Fine-loamy, carbonatic, thermic Typic Calciustolls
Brackett	Loamy, carbonatic, thermic, shallow Typic Ustochrepts
Branyon	Fine, montmorillonitic, thermic Udic Pellusterts
Burleson	Fine, montmorillonitic, thermic Udic Pellusterts
Chatt	Fine, mixed, thermic Typic Calciustolls
Chickasha Variant	Fine-loamy, mixed, thermic Typic Argiustolls
Coving	Loamy, siliceous, thermic Aquic Arenic Paleustalfs
Crockett	Fine, montmorillonitic, thermic Udertic Paleustalfs
Crosstell	Fine, montmorillonitic, thermic Udertic Paleustalfs
Culp	Fine, mixed, thermic Vertic Argiustolls
*Denton	Fine, montmorillonitic, thermic Vertic Calciustolls
Eddy	Loamy-skeletal, carbonatic, thermic, shallow Typic Ustorthents
Eufaula	Sandy, siliceous, thermic Psammentic Paleustalfs
Ferris	Fine, montmorillonitic, thermic Udorthentic Chromusterts
Gasil	Fine-loamy, siliceous, thermic Ultic Paleustalfs
Gowen	Fine-loamy, mixed, thermic Cumulic Haplustolls
Heiden	Fine, montmorillonitic, thermic Udic Chromusterts
Hensley	Clayey, mixed, thermic Lithic Rhodustalfs
Hillco	Fine-silty, carbonatic, thermic Entic Haplustolls
Houston Black	Fine, montmorillonitic, thermic Udic Pellusterts
Kemp	Fine-loamy, mixed, nonacid, thermic Aquic Udifluvents
Konsil	Fine-loamy, siliceous, thermic Ultic Paleustalfs
Kopperl	Loamy-skeletal, siliceous, thermic Udic Haplustalfs
*Krum	Fine, montmorillonitic, thermic Vertic Haplustolls
Lamar	Fine-silty, mixed, thermic Typic Ustochrepts
Lindy	Fine, mixed, thermic Udic Haplustalfs
Mabank	Fine, montmorillonitic, thermic Vertic Albaqualfs
Normangee	Fine, montmorillonitic, thermic Vertic Haplustalfs
Pulexas	Coarse-loamy, mixed, nonacid, thermic Typic Ustifluvents
Pursley	Fine-loamy, mixed, thermic Fluventic Haplustolls
Purves	Clayey, montmorillonitic, thermic Lithic Calciustolls
Rayex	Clayey, mixed, thermic, shallow Ultic Haplustalfs
Silstid	Loamy, siliceous, thermic Arenic Paleustalfs
Somervell	Loamy-skeletal, carbonatic, thermic Typic Calciustolls
Stephen	Clayey, mixed, thermic, shallow Entic Haplustolls
Sunev	Fine-loamy, carbonatic, thermic Typic Calciustolls
Tinn	Fine, montmorillonitic (calcareous), thermic Vertic Haplaquolls
Travis	Fine, mixed, thermic Ultic Paleustalfs
Ustifluvents	Ustifluvents
Vaughan	Fine-loamy, siliceous, thermic Typic Albaqualfs
Venus	Fine-loamy, mixed, thermic Typic Calciustolls
Wilson	Fine, montmorillonitic, thermic Vertic Ochraqualfs

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