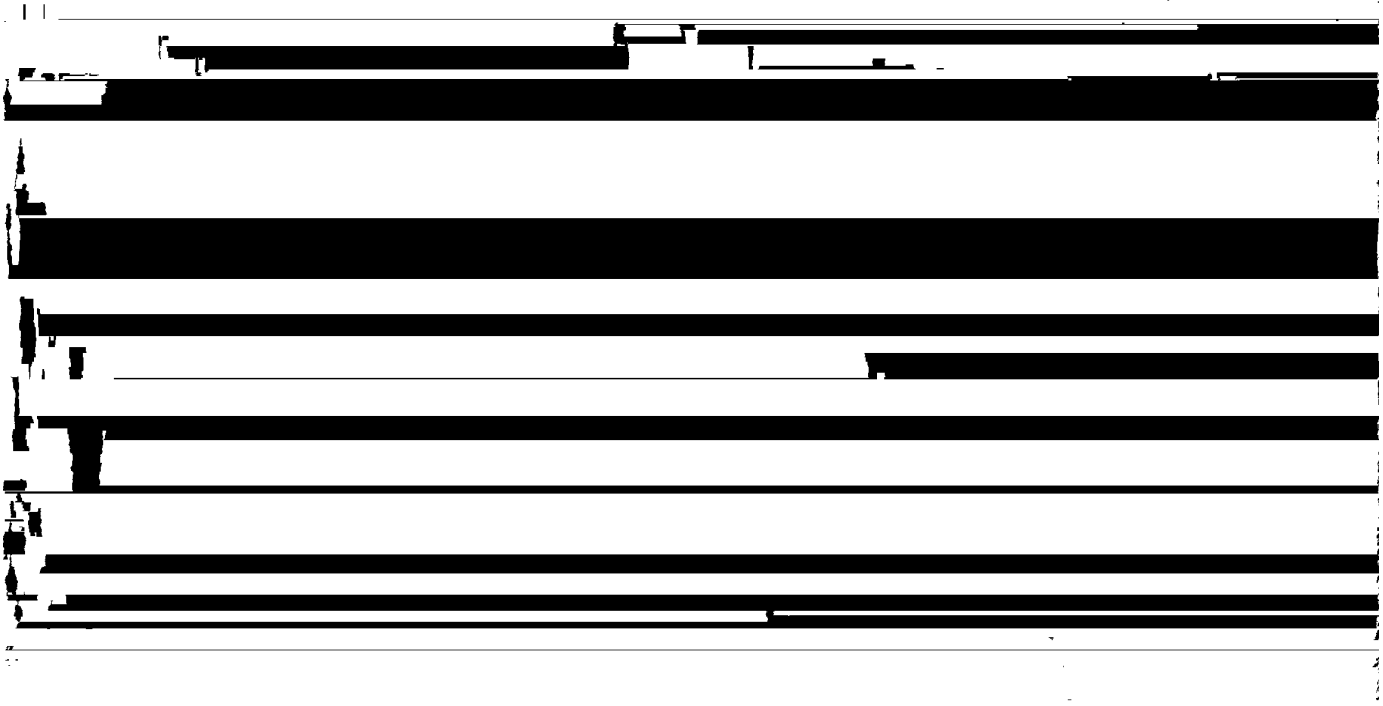
SOIL SURVEY OF



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.

Major fieldwork for this soil survey was completed in the period 1961-71. Soil names and descriptions were approved in 1972. Unless otherwise indicated, statements in the publication refer to conditions in the county in 1971. 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 Central Texas and Little River-San Gabriel Soil and Water Conservation Districts.

Soil maps in this survey may be copied without permission, but any enlargement of these maps could 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.

HOW TO USE THIS SOIL SURVEY

THIS SOIL SURVEY contains information that can be applied in managing farms and ranches; in selecting sites for roads, ponds, buildings, and other structures; and in determining the suitamap and colored to show soils that have the same limitation or suitability. For example, soils that have a slight limitation for a given use can be colored green, those that have a moderate limitation can be

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SOIL SURVEY OF BELL COUNTY, TEXAS

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

BELL COUNTY is in the east-central part of Texas (fig. 1). It has a total area of 690,560 acres, or 1,079 square miles. Belton is the county seat.

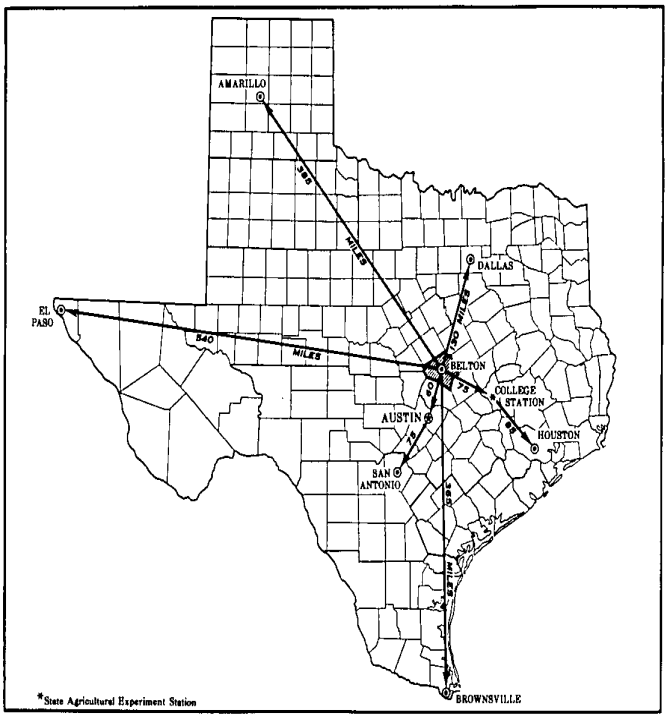


Figure 1.—Location of Bell County in Texas.

The eastern half of the county is in the Texas Blackland Prairie. The soils in this area are mostly deep and are underlain by marl, marly clay, and soft limestone. The western half of the county is in the Grand Prairie. The soils in this area are on a limestone plain, and most are deep to shallow over soft or hard limestone.

Remnants of stream terraces are throughout the

confluence of the Leon and Lampasas Rivers in the central part of the county.

About 56 percent of the county is in crops, and about half of this area is in row crops, mainly grain sorghum and cotton. Smaller areas produce corn, oats, and wheat. The oats are mainly grazed by livestock; only a small acreage is harvested for grain. Grazing land for cattle, sheep, and goats and land in the Fort Hood Military Reservation make up most of the remaining 44 percent of the county.

Fishing, hunting, and recreation contribute to the county's economy, and the factories in the Temple-Belton area are also of considerable economic importance. Sale of dairy and poultry products and of wool and mohair contributes to the local economy.

How This Survey Was Made

Soil scientists made this survey to learn what kinds of soil are in Bell County, where they are located, and how they can be used. The soil scientists went into the county knowing they would find many soils they had already seen and perhaps some they had not. They observed the steepness, length, and shape of slopes, the size and speed of streams, 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 that has not been changed much by leaching or by the action of plant roots.

The soil scientists made comparisons among the profiles they studied, and they compared these profiles with those in counties nearby and in places more distant. They classified and named the soils according to nationwide, uniform procedures. The

essentially alike in those characteristics that affect their behavior in the undisturbed landscape.

Soils of one series can differ in texture of the surface layer and in slope, stoniness, or some other characteristic that affects use of the soils by man. On the basis of such differences, a soil series is divided into phases. The name of a soil phase indicates a feature that affects management. For example, Heiden clay, 1 to 3 percent slopes, is one of

map and are described in the survey, but they are called land types and are given descriptive names. Urban land is a land type in this county.

While a soil survey is in progress, samples of soil are taken as needed for laboratory measurements and for engineering tests. Laboratory data from the same kind of soil in other places are also assembled. Data on yields of crops under defined practices are assembled from farm records and from field or plot

The six soil associations in Bell County are described in this section.

1. Houston Black-Heiden-Branyon association

Nearly level to sloping, deep, clayey soils over clayey material, shale, or marl; on uplands

This association makes up about 38 percent of the county. It is about 32 percent Houston Black soils, 18 percent Heiden soils, and 14 percent Branyon

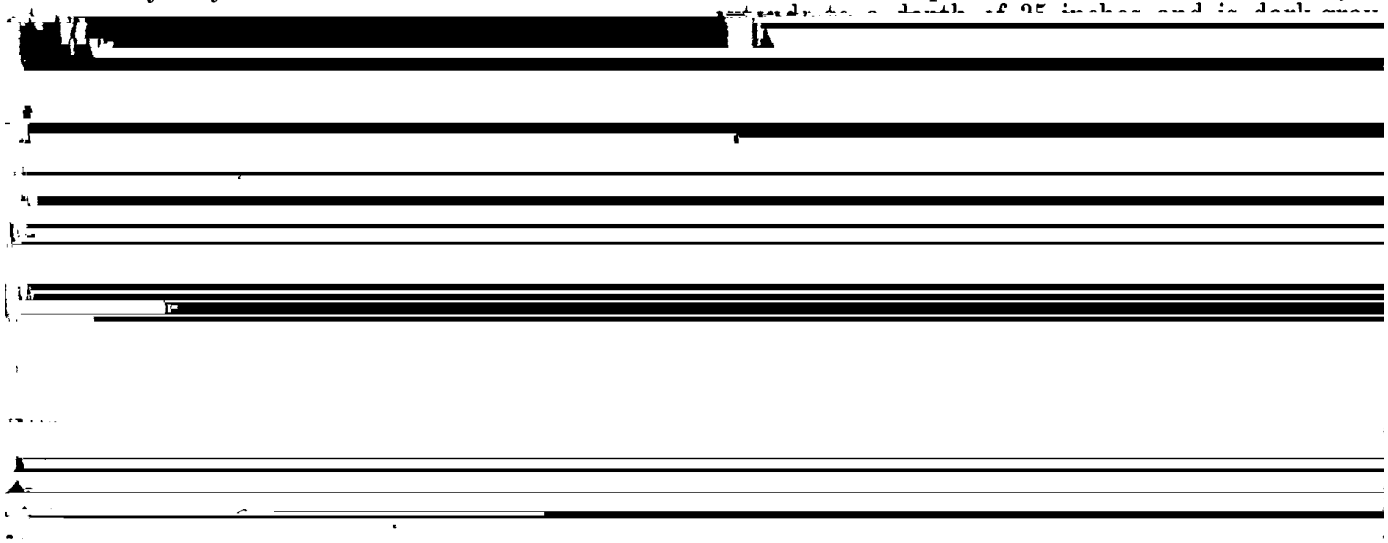
bedrock. Stones and boulders are on the surface and in the soil.

Purves soils are gently sloping to sloping and undulating. They have a dark-brown, calcareous silty clay surface layer about 14 inches thick that rests on hard limestone bedrock.

Brackett soils are on narrow, hard limestone escarpments. Real soils are on the upper part of steeper slopes on hillsides.

percent Purves soils. The remaining 24 percent is less extensive areas of Brackett, Krum, Lewisville, and San Saba soils.

Denton soils are nearly level to gently sloping. They have a dark grayish-brown, calcareous silty clay surface layer about 6 inches thick. The next layer extends to a depth of 40 inches and is dark-brown silty clay that rests on fractured hard lime-



Purves soils are gently sloping to sloping and are above the Denton soils. They have a dark-brown silty clay surface layer about 14 inches thick that

This association makes up about 6 percent of the county. It is 54 percent San Saba soils and 19 percent Crawford soils. The remaining 27 percent is less extensive areas of Lindy and Speck soils.

San Saba soils are nearly level to gently sloping. They have a dark-gray clay surface layer about 4 inches thick. Below this is very dark gray clay that reaches to a depth of 19 inches. The next layer

clay. Below this is gray indurated limestone.

Crawford soils are nearly level to gently sloping. They have a dark-brown clay surface layer about 16

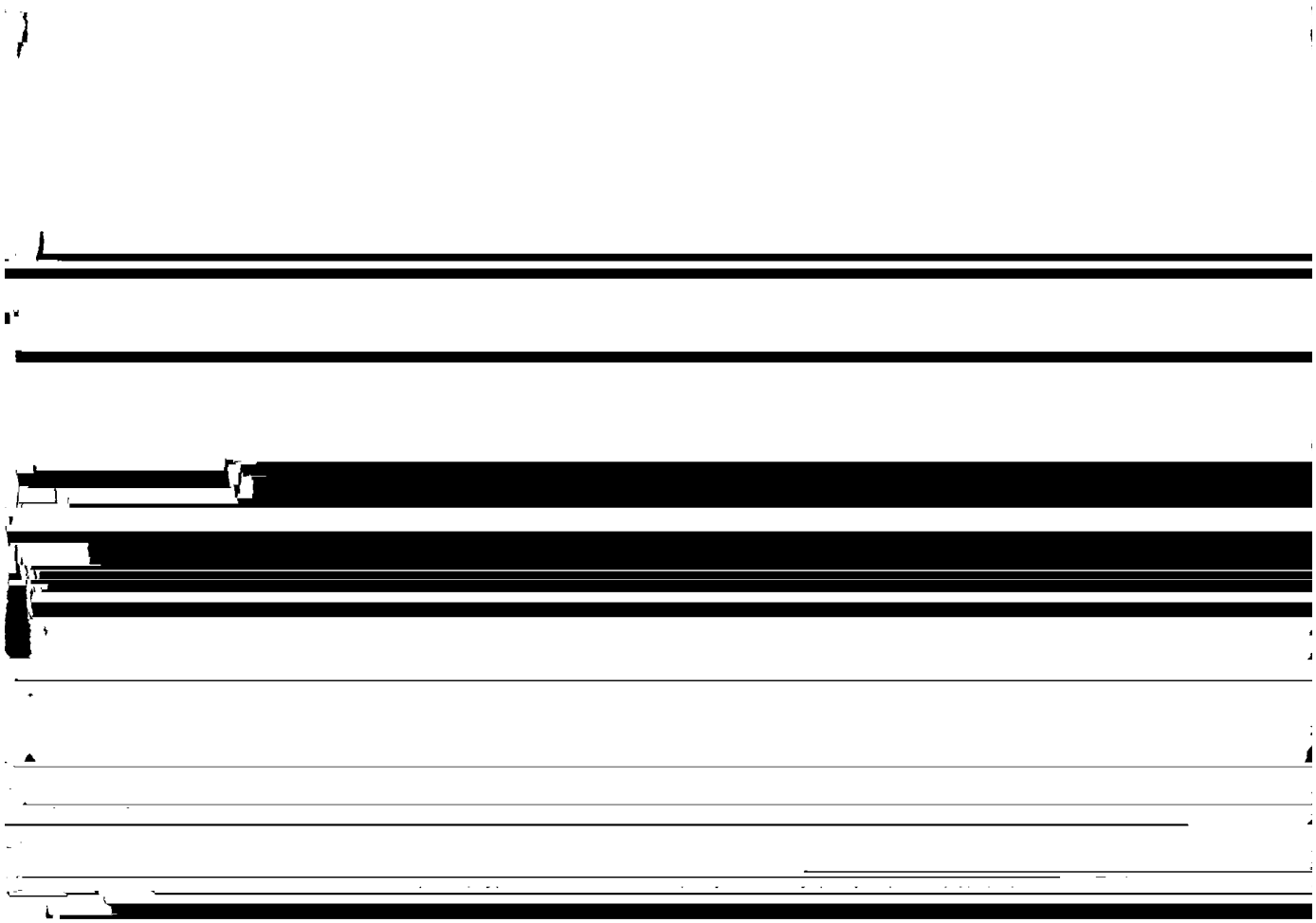


TABLE 1.—*Approximate acreage and proportionate extent of the soils*

Soil	Acres	Percent	Soil	Acres	Percent
Altoga silty clay, 2 to 5 percent slopes	4,950	0.7	Krum-Lewisville association, undulating	6,580	1.0
Altoga silty clay, 5 to 10 percent slopes, eroded	4,570	.7	Lewisville silty clay, 1 to 3 percent slopes	8,330	1.2
Austin silty clay, 1 to 3 percent slopes	13,250	2.0	Lewisville silty clay, 3 to 5 percent slopes	7,800	1.2

It is light-gray marl and has light-gray silty clay in crevices between chalky fragments.

Altoga soils are well drained. Permeability is moderate, and available water capacity is high. Runoff is medium.

These soils are used mostly for crops, but some areas are used for pasture. Small isolated areas are used as native range. These soils are better suited to grazing crops and pasture than to most other uses.

Representative profile of Altoga silty clay, 2 to 5 percent slopes, 2.5 miles north on Interstate Highway 35 from its intersection with the Atchison, Topeka and Santa Fe Railway line in north Temple, then 0.6 mile east, 0.35 mile north, 1.25 miles east, 0.4 mile north, 0.28 mile east, and 0.12 mile north on

[redacted]

field:

Ap—0 to 6 inches, light brownish-gray (10YR 6/2) silty clay, dark grayish brown (10YR 4/2) moist; weak, very fine, subangular blocky and granular structure; slightly hard, friable; few worm casts; calcareous; moderately alkaline; clear, smooth boundary.

B2—6 to 28 inches, very pale brown (10YR 7/3) silty clay, pale brown (10YR 6/3) moist; moderate, fine, subangular blocky and granular structure; slightly hard, friable; calcareous; moderately alkaline; gradual, smooth boundary.

B3ca—28 to 58 inches, light-gray (10YR 7/2) silty clay, same color moist; common fine mottles of very pale brown (10YR 7/4); moderate, fine, subangular blocky and granular structure; slightly hard, friable; common, small, soft masses of calcium carbonate; common chalk fragments; calcareous; moderately alkaline; clear, irregular boundary.

C—58 to 62 inches, light-gray (10YR 7/1) chalky marl; few thin tongues of light-gray silty clay in crevices between chalky fragments.

The solum ranges from 35 to 65 inches in thickness. The A horizon ranges from 2 to 11 inches in thickness and from grayish brown to brown or light brownish gray. The B and C horizons range from brown to very pale brown, dark yellowish brown, grayish brown, or light gray. The zone of visible

small gullies. The gullies are shallow, but some cannot be crossed by farm machinery.

The surface layer is brown silty clay about 11 inches thick. The next layer is dark yellowish-brown silty clay, is about 24 inches thick, and is underlain by chalky marl.

Included with this soil in mapping are small areas of Altoga silty clay, 2 to 5 percent slopes, and small areas of Austin and Lewisville soils.

Most areas of this soil have been cultivated but are now idle or planted to improved grass. Most of these areas are used for pasture. Some small areas are cultivated. Because the hazard of erosion is severe, a good cover of vegetation is needed. This soil is droughty. Capability unit VIe-2; pasture and hay group 7D; Clay Loam range site.

Austin Series

The Austin series consists of gently sloping, moderately deep, clayey soils on uplands. These calcareous soils formed in clayey marl or material weathered from chalky limestone.

In a representative profile the surface layer is dark grayish-brown, calcareous silty clay about 16 inches thick. The next layer is calcareous silty clay that reaches to a depth of 35 inches. It is grayish brown in the upper 9 inches and brown in the lower 10 inches. The underlying material is marly clay and soft chalky marl that extends to a depth of 48 inches.

Austin soils are well drained. Permeability is moderately slow, and available water capacity is high. Runoff is medium to rapid.

These soils are suited to crops, and most areas are cultivated. Some areas are used for pasture and hay.

Representative profile of Austin silty clay, 1 to 3 percent slopes, about 3.6 miles south of Temple on

The solum ranges from 22 to 40 inches in thickness. The A horizon ranges from 12 to 19 inches in thickness. It is very dark grayish brown, dark brown, dark grayish-brown, brown, or grayish brown. The B horizon is 10 to 26 inches thick. This horizon is pale brown, brown, yellowish brown, grayish brown, and light brownish gray. The C horizon is white marly clay or white, chalky, soft limestone. In places it is mottled in shades of gray, brown, or yellow.

Austin silty clay, 1 to 3 percent slopes (AsB).—This

phy is smooth, much of the soil has not been disturbed during construction.

Features of the soils in this complex that affect urban development are shrink-swell potential, which can cause cracking and shifting of structures; corrosivity, which results in deterioration of pipelines and steel in the ground; high pH value, which limits the kinds of ornamental shrubs, trees, and

moist; moderate, medium and coarse, blocky structure; extremely hard, very firm; clay films on peds; few shiny pressure faces; cracks extend from horizon above; few, fine, soft, black masses and few, small, black sploches; medium acid; gradual, wavy boundary.

B3—36 to 54 inches, pale-brown (10YR 6/3) clay, same color moist; moderate, medium and coarse, blocky structure; extremely hard, very firm; clay films on peds; few shiny pressure faces; cracks extend from horizon above; few, fine, soft, black masses; few, fine, soft masses of calcium carbonate; neutral; abrupt, smooth boundary.

C1—54 to 72 inches, mottled yellowish-red (5YR 4/6), pale-brown (10YR 6/3), and brownish-yellow (10YR 6/6) clay; massive; very hard, firm; neutral; abrupt, smooth boundary.

C2ca—72 to 78 inches, pale-brown (10YR 6/3) clay; 40 to 60 percent, by volume, powdery calcium carbonate.

The solum ranges from 40 to 70 inches in thickness. The A horizon ranges from 7 to 10 inches in thickness. The Ap horizon is dark grayish brown, grayish brown, brown, pale brown, or light brownish gray. The A2 horizon is light gray, light brownish gray, or pale brown. The Bt horizon is yellowish red, light brownish gray, reddish brown, pale brown, and yellowish brown. This horizon has few to many mottles in shades of red, brown, yellow, gray, and olive.

Axtell fine sandy loam, 1 to 3 percent slopes (AxB).—This gently sloping soil is on old terraces that are higher in elevation than other terraces in the county. Areas are irregular in shape and are 5

A1—6 to 16 inches, reddish-brown (5YR 4/4) fine sandy loam, dark reddish brown (5YR 3/4) moist; weak, fine, granular structure; slightly hard, friable; slightly acid; clear, smooth boundary.

B21t—16 to 36 inches, red (2.5YR 5/6) sandy clay loam, red (2.5YR 4/6) moist; moderate, fine, subangular blocky structure; hard, friable; few fine pores; slightly acid; gradual, smooth boundary.

B22t—36 to 72 inches, yellowish-red (5YR 5/6) sandy clay loam, yellowish red (5YR 4/6) moist; weak, fine, subangular blocky structure; hard, friable; few fine pores; neutral.

The solum ranges from 66 to 90 inches in thickness and is slightly acid or neutral. The A horizon ranges from 12 to 20 inches in thickness and is dark brown, brown, reddish brown, or light brownish gray. The Bt horizon ranges from 26 to 56 inches or more in thickness and is reddish brown, yellowish red, and red.

Bastrop fine sandy loam, 0 to 2 percent slopes (BaA).—This nearly level to gently sloping soil is on stream terraces. Areas are long and narrow and are 5 to 184 acres in size. Most areas of this soil receive extra water and soil material from slopes above.

Included with this soil in mapping are narrow areas of Axtell and Payne soils. These included areas make up less than 10 percent of any mapped area.

Most areas of this soil are cultivated. The acreage that is in improved pasture has increased in recent

A13—16 to 45 inches, dark grayish-brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) moist; weak, medium, granular structure parting to subangular blocky; hard, firm, sticky; calcareous; moderately alkaline; gradual, smooth boundary.

B2—45 to 60 inches, brown (10YR 5/3) clay loam, brown (10YR 4/3) moist; weak, medium, subangular blocky structure; hard, firm, sticky; few threads of calcium carbonate; calcareous; moderately alkaline; gradual, smooth boundary.

C—60 to 80 inches, light brownish-gray (10YR 6/2) silty clay, grayish brown (10YR 5/2) moist; weak, medium, subangular blocky structure; porous; hard, friable, sticky. This material extends many feet downward and becomes lighter in color as depth increases.

The solum ranges from 50 to 80 inches in thickness. The A horizon ranges from 29 to 60 inches in thickness. It is grayish brown, dark grayish brown, or very dark grayish brown. This horizon has few to common threads and films of calcium carbonate. Between depths of 10 and 40 inches, the clay content is 25 to 35 percent. The B horizon is dark brown, brown, or very pale brown. The C horizon ranges from clay loam to silty clay. In some places this horizon has thin lenses of coarser material.

Bosque clay loam (Be).—This nearly level soil is on the higher part of bands along the major rivers. Areas are 10 to 224 acres in size, and slopes are 0 to 1 percent. This soil has the profile described as representative of the series.

Included with this soil in mapping are small areas of Frio soils that make up less than 12 percent of any mapped area.

This soil is suited to crops, and most areas are cultivated. It is flooded about once every 4 to 12 years in the Lampasas River bottom upstream from Stillhouse Hollow Lake. Floods along the Little River, except for those that occur at 25- to 50-year intervals as a result of high-intensity, long-duration rains, are controlled by dams that form the Belton and Stillhouse Hollow Lakes. The two potential flood seasons each year are early in spring and in September when hurricanes cause disturbances in the Gulf of Mexico. The hazard of erosion is slight. Capability unit I-1; pasture and hay group 1C; Loamy Bottomland range site.

Bosque clay loam, frequently flooded (Bf).—This deep, nearly level soil is on bottom lands. Areas are parallel to stream channels and are 10 to 200 acres

These shallow soils formed in loamy material underlain by soft limestone. They are in narrow bands, mainly along limestone escarpments, and on ridgetops, where they are underlain by soft chalk.

In a representative profile the surface layer, about 6 inches thick, is light brownish-gray, calcareous loam and a small amount of limestone fragments. The next layer is pale-yellow loam and a small amount of limestone fragments and extends to a depth of 16 inches. The underlying material is interbedded, weakly cemented and strongly cemented limestone and pale-yellow clay loam.

Brackett soils are well drained. Permeability is moderately slow, and available water capacity is very low. Runoff is rapid.

These soils are better suited to range than to most other uses. Most areas are in native grass range, but some of the smoother areas are cultivated.

Representative profile of Brackett loam in an area of Brackett association, rolling, 5.3 miles west on U.S. Highway 190 from its intersection with Interstate Highway 35 in Belton, then 5 miles southwest on Farm Road 2410, then 2.0 miles southeast on a county road and 125 feet north of the road, in an area of range:

A1—0 to 6 inches, light brownish-gray (2.5Y 6/2) loam, grayish brown (2.5Y 5/2) moist; moderate, fine and very fine, subangular blocky and granular structure; hard, firm; many grass roots; many worm casts of lighter-colored material from horizon below; about 3 percent limestone fragments, mostly 5 to 15 millimeters in diameter and mostly on the surface as pavement; about 55 percent calcium carbonate equivalent; calcareous; moderately alkaline; clear, wavy boundary.

B2—6 to 16 inches, pale-yellow (2.5Y 8/4) loam, pale yellow (2.5Y 7/4) moist; moderate, very fine, subangular blocky structure; hard, friable; many roots; about 5 percent, by volume, subrounded, weakly cemented and strongly cemented limestone fragments, mostly 2 to 15 millimeters in diameter; common tongues of darker soil from layer above in old root channels or cracks; a few soft masses of calcium carbonate; about 65 percent calcium carbonate equivalent; calcareous; moderately alkaline; clear, wavy boundary.

C—16 to 50 inches, thinly interbedded, weakly cemented and strongly cemented, platy limestone and pale-yellow calcareous clay loam; clay

of Altoga and Eddy soils. These areas make up 15 percent or less of any mapped area.

Most areas of this soil are cultivated. A few small areas are in improved pasture and a few are in range. The hazard of erosion is moderate. Capability unit IVs-1; pasture and hay group 13A; Adobe range site.

Brackett-Urban land complex, 3 to 12 percent slopes (BnE).—This complex is made up of gently sloping to strongly sloping soils. Areas are irregular in shape and are 5 to 30 acres in size. Brackett soils make up about 65 percent of the complex, Urban land about 30 percent, and rock outcrop and other soils about 5 percent. The soils and Urban land cannot be shown separately at the scale mapped, because they are too intermingled or the areas are too small.

These Brackett soils have a surface layer of light brownish-gray clay loam about 8 inches thick. The next layer is pale-yellow clay loam about 13 inches thick. Below this is chalky nodular limestone and calcareous material. These soils are as much as 35 percent, by volume, limestone gravel, cobblestones, and stones.

Urban land areas are mainly used for single-unit dwellings and attendant streets, driveways, sidewalks, and patios. A few areas are used for small shopping centers, service stations, churches, and paved parking lots. Most structures are on narrow ridges in the less sloping areas. In this complex, the enough, however, for the anticipated use of the soils.

A Brackett soil in this association has the profile described as representative of the series.

Included with these soils in mapping are areas of Altoga, Purves, and Real soils. Also included in mapping are areas of soils that are similar to Brackett soils but have more stone fragments, are underlain by bedrock, or have a darker color in the surface layer. The included areas make up less than 15 percent of any mapped area.

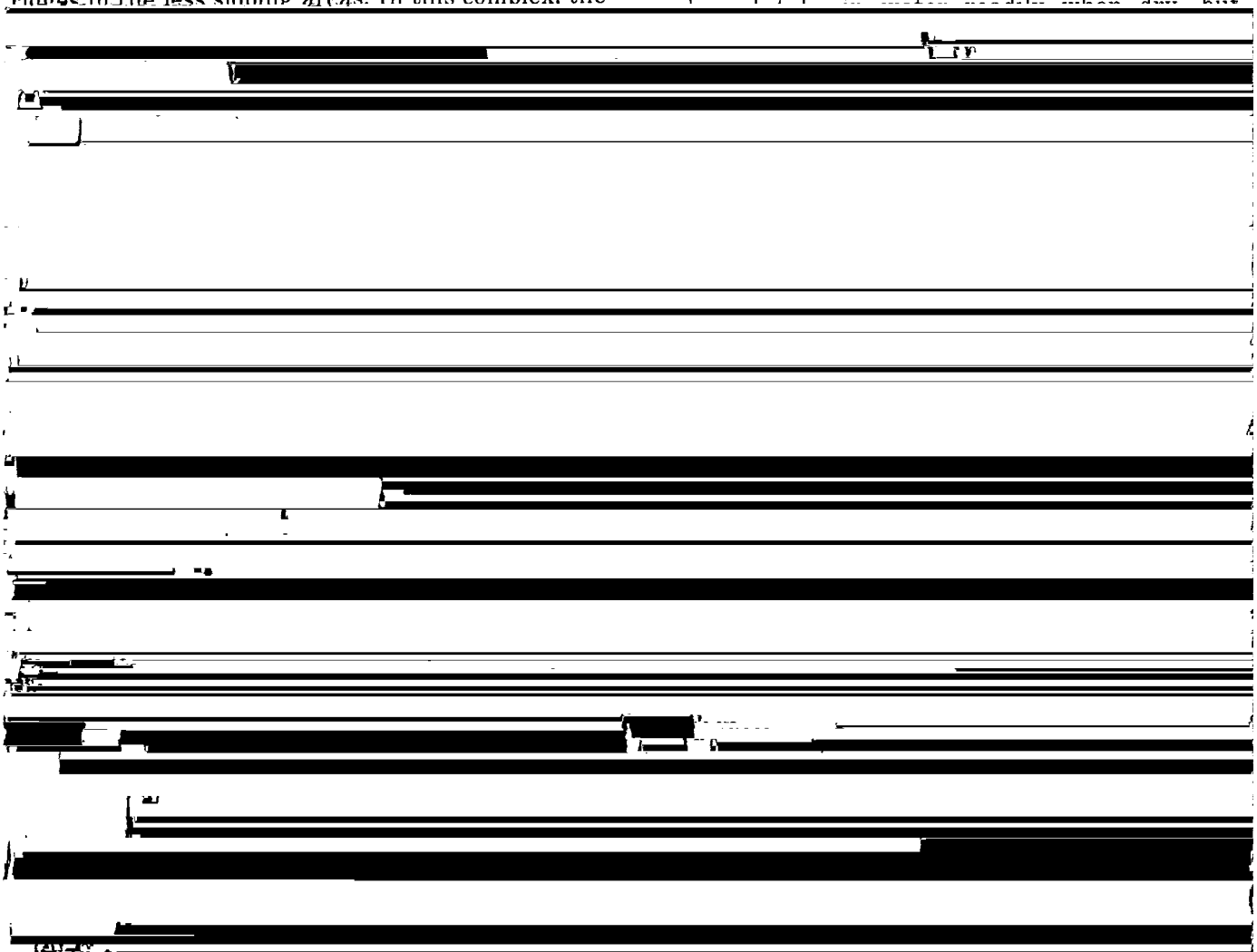
The soils in this association are better suited to range than to most other uses. Grass is sparse, however, because most areas have been continuously overgrazed. The hazard of erosion is severe. Capability unit VIIs-2; Adobe range site.

Branyon Series

The Branyon series consists of nearly level to gently sloping, calcareous, clayey soils on broad ancient terraces. These deep soils formed in clayey alluvial material.

In a representative profile the surface layer is dark-gray, calcareous clay about 45 inches thick. Below this is gray calcareous clay that reaches to a depth of 65 inches. The underlying material is light-gray, calcareous clay and has many very pale brown mottles (fig. 2).

Branyon soils are moderately well drained. They



acres to more than 1,300 acres in size. It has the profile described as representative of the series.

Included with this soil in mapping are small areas of Burleson and Krum soils. The included areas make up less than 5 percent of the mapped area.

This soil is well suited to crops, and nearly all areas are cultivated. The hazard of erosion is slight, and runoff is slow. Capability unit IIw-1; pasture and hay group 7A; Blackland range site.

Branyon clay, 1 to 3 percent slopes (ByB).—This gently sloping soil is mostly around and on the

at the head of drainageways. Most areas are long and narrow and are 10 acres to more than 1,000 acres in size.

thick. The next layer is gray clay that reaches to a depth of 66 inches. Below this is light-gray clay that

pressure faces on peds; few, very dark brown, strongly cemented ferromanganese concretions 1 to 3 millimeters in diameter; slightly acid; diffuse, wavy boundary.

AC—38 to 60 inches, gray (10YR 5/1) clay, dark gray (10YR 4/1) moist; common olive-gray (5Y 4/2) and few very dark gray (10YR 3/1) streaks; distinct intersecting slickensides border parallelepipeds that have the long axis tilted 30 to 60 degrees from the horizontal; extremely hard, very firm; shiny pressure faces on peds; few ferromanganese concretions; few, fine to medium, strongly cemented concretions of calcium

loam. The subsurface layer is reddish-brown very gravelly fine sandy loam about 7 inches thick. The next layer reaches to a depth of 46 inches. It is reddish-brown and light reddish-brown gravelly clay in the upper 21 inches and brownish-yellow clay in the lower 10 inches. The underlying material is yellow, soft, chalky, marly clay that extends to a depth of 50 inches.

Chigley soils are moderately well drained. Permeability is moderately slow, and available water ca-

hazard of erosion is moderate. Capability unit IIIe-1; pasture and hay group 8A; Claypan Savanna range site.

Crawford Series

The Crawford series consists of moderately deep, nearly level to gently sloping, clayey soils on smooth uplands. These noncalcareous soils formed in clayey sediment underlain by limestone.

In a representative profile the surface layer is clay about 36 inches thick. It is dark brown in the upper 16 inches and dark reddish brown and calcareous in the lower 20 inches. Below this is honeycombed limestone bedrock.

Crawford soils are well drained. They crack and take in water readily when dry, but permeability is very slow when they are wet. Available water capacity is medium, and runoff is slow to medium.

These soils are well suited to crops, and most areas are cultivated. A few areas are in improved pasture.

Representative profile of Crawford clay, 0 to 1 percent slopes, 0.2 mile north on Interstate Highway 35 from its Salado Creek crossing in Salado, then 1 mile west on a county road, then 0.25 mile north on the same road and 15 feet east of the road, in a pasture:

Ap—0 to 5 inches, dark-brown (7.5YR 3/2) clay, dark brown (7.5YR 3/2) moist; weak to moderate, very fine, angular blocky structure; hard, firm, sticky; few, fine, quartz pebbles; few, fine, limestone fragments; neutral; abrupt, smooth boundary.

A11—5 to 16 inches, dark-brown (7.5YR 3/2) clay, dark brown (7.5YR 3/2) moist; moderate, medium, angular blocky structure parting to very fine, blocky; extremely hard, very firm, sticky; shiny faces on peds; neutral; gradual, smooth boundary.

A12—16 to 34 inches, dark reddish-brown (5YR 3/2) clay, dark reddish brown (5YR 3/2) moist; moderate to coarse, angular blocky structure parting to fine, blocky; extremely hard, very firm, sticky; few parallelepipeds and slickensides that have the axis tilted more than 10 degrees from the horizontal; shiny pressure faces; neutral; clear, smooth boundary.

A13—34 to 36 inches, dark reddish-brown (5YR 3/2) clay, dark

Runoff is slow, and the hazard of erosion is slight. Capability unit IIIs-1; pasture and hay group 7A; Deep Redland range site.

Crawford clay, 1 to 3 percent slopes (CrB).—This gently sloping soil is at the head of drainageways near the nearly level areas of Crawford clay. Areas are long, are irregular in shape, and are 8 to 350 acres in size.

The surface layer is brown clay 20 inches thick. The next layer is dark reddish-brown clay 11 inches thick. Below this is hard fractured limestone that reaches to a depth of 60 inches.

Included with this soil in mapping are small areas of nearly level Crawford soil and gently sloping Speck soils. Included areas make up less than 8 percent of the mapped acreage.

This soil is used mostly for cultivated crops. A few areas are in improved pasture. The hazard of erosion is moderate, and runoff is medium. Capability unit IIIe-5; pasture and hay group 7A; Deep Redland range site.

Denton Series

The Denton series consists of moderately deep, nearly level to gently sloping and undulating, clayey soils on uplands. These calcareous soils formed in clayey material underlain by limestone and interbedded marl.

In a representative profile the surface layer is calcareous silty clay about 21 inches thick. It is dark grayish brown in the upper 6 inches and dark brown in the lower 15 inches. The next layer is dark-brown calcareous silty clay that reaches to a depth of 40 inches. Below this is fractured hard limestone.

Denton soils are well drained. Permeability is slow, and available water capacity is high. Runoff is medium to rapid.

These soils are suited to crops, and most areas are cultivated. Some areas are in native range.

Representative profile of Denton silty clay, 1 to 3 percent slopes, 0.3 mile south of Prairie Dell on a county road to a county road junction, then 7,200

of soil from horizon above; few fine limestone fragments; calcareous; moderately alkaline; gradual, wavy boundary.

B22ca—35 to 40 inches, dark-brown (7.5YR 4/4) silty clay, same color moist; same structure as horizon above; common, fine to medium, soft masses and concretions of calcium carbonate; calcareous; moderately alkaline; abrupt, irregular boundary.

R—40 to 60 inches, fractured hard limestone that cannot be cut with a spade

The solum ranges from 22 to 40 inches in thickness. The A horizon ranges from 16 to 30 inches in thickness. It is dark brown, dark grayish brown, or very dark grayish brown. The B2 horizon ranges from 10 to 19 inches in thickness and from brown to dark brown. The B horizon has stone lines in some profiles. The C horizon, where present, is clayey material over weakly cemented to indurated limestone and interbedded marl.

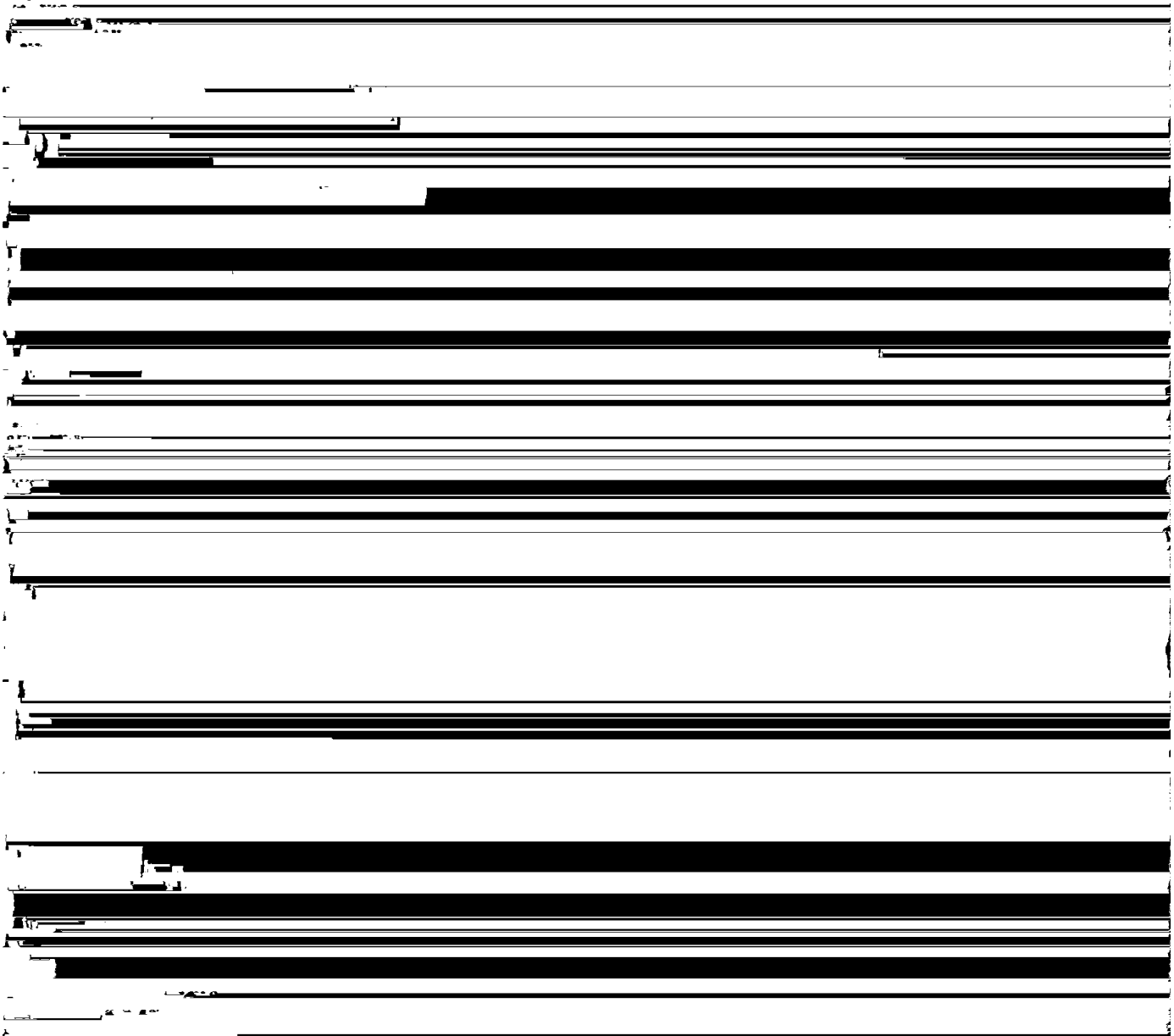
Denton silty clay, 0 to 1 percent slopes (DeA).—This nearly level soil generally is on broad flats or very gently rounded ridges. In some places it is in higher areas. Areas are small, are irregular in shape, and are mainly less than 45 acres in size.

The surface layer is dark grayish-brown silty clay 8 inches thick. The next layer is dark-brown silty clay that extends to a depth of 38 inches. The

Belton and Killeen they are mostly single-unit dwellings and attendant streets, driveways, sidewalks, patios, and cemeteries. Because the topography is smooth, much of the soil has not been disturbed during construction. Shallow ditches along roads and streets account for most of the soil movement.

Features of the soils in this complex that affect urban development are shrink-swell potential, which can cause cracking and shifting of structures; corrosivity, which causes deterioration of pipelines and steel in the ground; and silty clay texture, which becomes sticky and plastic when wet. Nearly all new dwellings are built on a floating reinforced concrete slab so that the effects of the shrink-swell behavior of these soils are reduced. Not placed in interpretive groups.

Denton association, undulating (DPB).—This association is mostly on the Fort Hood Military Reservation. Soil areas are mainly in saddles between hills and on foot slopes. Slopes are 1 to 8 percent. Mapped areas are irregular in shape and are 200 acres to more than 1,000 acres in size. A mapped area generally is about 50 percent Denton soils and about 50



the soil is very dark grayish brown, the A horizon is less than 4 inches thick. The A&C horizon ranges from 2 to 5 inches in thickness and is 60 to 95 percent, by volume, chalk fragments. This horizon is light brownish gray, very dark grayish brown, dark grayish brown, grayish brown, and pale brown. In the C horizon the chalky limestone ranges in hardness from about 1 to slightly less than 3 on the Mohs scale.

Eddy-Stephen complex, 0 to 3 percent slopes (EsB).—This complex is made up of nearly level to gently sloping soils on the tops of ridges and the sides of slopes. Most areas are oval in shape and are 7 to 50 acres in size. This complex is about 50 percent Eddy soils, 47 percent Stephen soils, and 3 percent other soils. The included soils cannot be shown separately at the scale mapped, because they are too intermingled or the areas are too small.

An Eddy soil in this complex has the profile described as representative of the series.

This Stephen soil has a surface layer of dark grayish-brown silty clay about 10 inches thick. The next layer is dark grayish-brown silty clay about 4 inches thick. It is about 35 percent soft chalk fragments. Below this is light-gray, soft platy chalk.

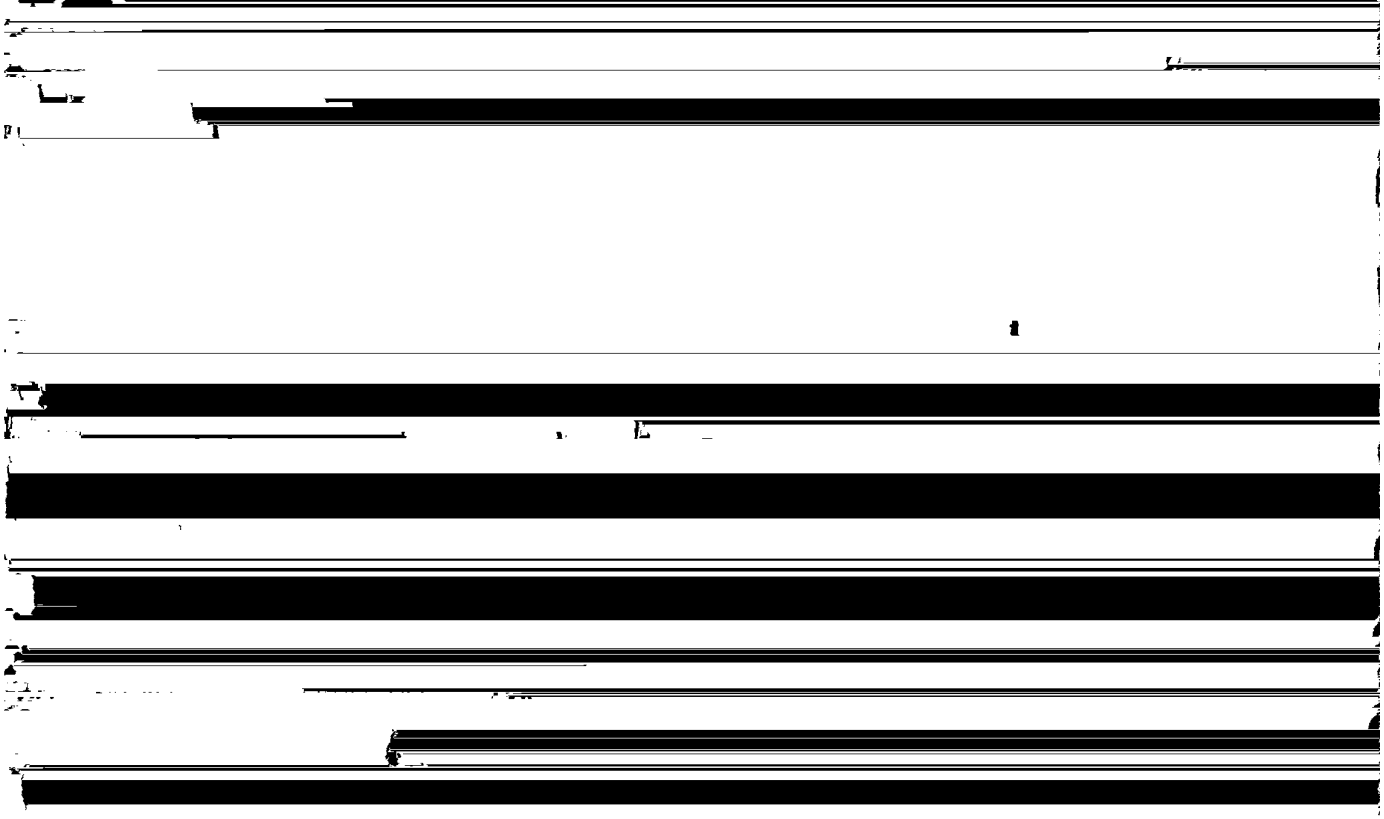
Included with these soils in mapping are small areas of Austin soils that make up less than 8 percent of any mapped area.

The soils in this complex are better suited to improved pasture than to most other uses. They are not suited to crops. Most areas are used as pasture. The hazard of erosion is moderate, and runoff is medium. Capability unit IVs-1; pasture and hay group 14A; Chalky Ridge range site.

Eddy-Stephen complex, 3 to 8 percent slopes (EsD).—This complex is made up of gently sloping to sloping soils on the sides of slopes and the tops of

Figure 3.—**Profile of an Eddy gravelly loam that shows platy chalk fragments.**

Eddy soils are well drained. Permeability is moderately slow, and available water capacity is very low. Runoff is medium to rapid.



Ferris Series

The Ferris series consists of sloping to strongly sloping, calcareous, clayey soils on uplands. These deep soils formed in shaly clay and marl.

In a representative profile the surface layer is olive calcareous clay about 8 inches thick. The next layer is about 28 inches of pale-olive calcareous clay that has brownish-yellow mottles. The underlying material is mottled, pale-olive and yellow marly and

ridges and in other less sloping areas. It has a surface layer of dark grayish-brown clay 18 inches thick. The next layer is olive-gray clay that reaches to a depth of 48 inches. Below this is mottled, olive and yellow shaly clay that extends to a depth of 70 inches.

The soils in this complex are not suited to crops. They are better suited to improved pasture than to most other uses. Most areas are abandoned fields that have a thin plant cover. The hazard of erosion

Figure 4.—Area of Ferris-Heiden complex, 5 to 12 percent slopes, eroded. Mesquite trees are invading this gullied area.

and are 10 acres to several hundred acres in size. The largest areas of this soil are protected from flooding by Belton and Stillhouse Hollow Dams. Areas above these dams are flooded once every 4 to 10 years.

Included with this soil in mapping are small areas of Bosque soils, Frio soils, frequently flooded, and Trinity soils. The included areas make up less than 10 percent of any mapped area.

This soil is well suited to crops, and most areas are cultivated. Flooding does not limit the use of this soil for crops, because most flooding occurs early in spring before crops are planted. This soil receives extra water as runoff and has potential for irrigated crops. A few areas are in improved pasture. The hazard of erosion is slight. Capability unit I-1; pasture and hay group 1C; Loamy Bottomland range site.

Frio silty clay, frequently flooded (Fs).—This soil is on flood plains in lower areas that are long and narrow and are 10 to 100 acres in size. It is flooded as often as once or twice a year. Mapped areas include sloughs and slopes leading down to the

Included with this soil in mapping are small areas of Frio silty clay, of Frio soils that have slopes of 1 to 3 percent, and of Trinity clay, frequently flooded. Included areas make up less than 10 percent of any mapped area.

This soil is mainly in improved pasture and pecan trees. It is not suited to cultivation. The hazard of erosion is slight. Capability unit Vw-1; pasture and hay group 1C; Loamy Bottomland range site.

Heiden Series

The Heiden series consists of gently sloping to sloping, calcareous, clayey soils on uplands. These deep soils formed in clayey material.

In a representative profile the surface layer is dark grayish-brown clay about 36 inches thick. The next layer is olive-gray clay about 22 inches thick. The underlying material is mottled, olive and yellow shaly clay that extends to a depth of 70 inches.

Heiden soils are well drained. Permeability is very slow, and available water capacity is high. Runoff is rapid. When these soils are dry, cracks form in the

These soils are suited to crops, and most areas are cultivated. Some areas are in improved pasture. is in oblong areas that lead to natural drainageways. Areas average about 40 acres in size.

areas of Ferris and Heiden soils that have slopes of less than 3 percent. Included areas are 2 to 8 acres in size and make up less than 10 percent of any mapped area.

The soils in this complex are suited to pasture. Most areas have been cultivated in the past but are being planted to improved pasture and to hay. Runoff is rapid, and the hazard of erosion is severe. A few gullies are in this mapping unit, and most of the deeper ones cannot be crossed by farm machinery. Capability unit IVe-1; pasture and hay group 7B; Blackland range site.

Houston Black Series

The Houston Black series consists of nearly level to gently sloping, calcareous, clayey soils on uplands. These deep soils formed in clay and marl.

In a representative profile the surface layer is clay about 46 inches thick. It is very dark gray in the upper 24 inches and dark gray in the lower 22 inches. The next layer is gray clay that reaches to a depth of 68 inches. The underlying material is coarsely mottled, light-gray and yellow clay that extends to a depth of 110 inches (fig. 5).

Houston Black soils are moderately well drained. Runoff is slow to rapid. Permeability is very slow, and available water capacity is high. When these soils are dry, cracks form on the surface and extend to a depth of more than 40 inches. Water rapidly enters the cracks when they are open, but after the soil is wet, the cracks close and water moves very slowly through the soil.

Most areas of these soils are cultivated, but some areas are used for pasture and hay.

Representative profile of Houston Black clay, 1 to 3 percent slopes, 12.3 miles east of the Municipal Building in downtown Temple on Texas Highway 53 to junction with Farm Road 485, then 250 feet north of the edge of Farm Road 485 and 225 feet east of the edge of Texas Highway 53, in a native meadow:

A11—0 to 8 inches, very dark gray (10YR 3/1) clay, black (10YR 2/1) moist; moderate, fine, subangular blocky structure parting to very fine, angular blocky; very hard, very firm, very sticky and plastic; many grass roots; few worm casts; few snail shell fragments; shiny faces on peds; calcareous; moderately alkaline; gradual, wavy boundary.

A12—8 to 24 inches, very dark gray (10YR 3/1) clay, black (10YR 2/1) moist; moderate, fine and very fine, angular blocky structure; extremely hard, very firm, very sticky and plastic; many grass roots; few worm casts; few snail shell fragments; shiny faces on peds; few, fine, weakly cemented concretions of ferromanganese; calcareous; moderately alkaline; gradual, wavy boundary.

A13—24 to 46 inches, dark-gray (10YR 4/1) clay, very dark gray (10YR 3/1) moist; intersecting slickensides border parallelepipeds that have the long axis tilted 40 to 60 degrees from the horizontal parting to moderate, coarse, blocky structure; extremely hard, very firm, very sticky and plastic; common grass roots; few, fine, black masses of ferromanganese; few, fine, strongly cemented concretions of calcium carbonate; calcareous; moderately alkaline; gradual, wavy boundary.

AC—46 to 68 inches, gray (10YR 6/1) clay, gray (10YR 5/1) moist; few, fine, distinct, olive-brown (2.5Y 4/4) mottles; weak, very coarse, blocky structure; extremely hard, very firm, very sticky and plastic; few fine roots; common strongly cemented concretions and few soft masses of calcium carbonate; calcareous; moderately alkaline; diffuse, wavy boundary.

C—68 to 110 inches, mottled, light-gray (10YR 7/1) and yellow (2.5Y 7/6) clay; common, coarse, distinct, olive and brown mottles; massive; very hard; firm, very sticky and plastic; few strongly cemented concretions and few soft masses of calcium carbonate; calcareous; moderately alkaline.

Figure 5.—**A coarse-grooved slickenside in a profile of a Houston Black clay.**

The A and AC horizons combined range from about 60 to more than 100 inches in thickness. In undisturbed areas the gilgai microrelief consists of knolls that are 3 to 15 inches higher than depressions. The distance between the center of the knolls and the center of the depressions ranges from about 6 to 12 feet. At a depth of 20 to 24 inches are intersecting slickensides. The A horizon ranges from 6 inches in thickness on the microknolls to as much as 66 inches in thickness in the microdepressions. It is gray, dark gray, very dark gray, or black. The AC horizon is gray, grayish brown, dark grayish brown, or dark gray and has few to common mottles of olive brown, olive, and yellow. The C horizon is yellow, light brownish gray, or light gray.

Houston Black clay, 0 to 1 percent slopes (HoA).—This nearly level soil is on ridgetops and on upland divides. Areas are irregular in shape and are 5 to 100 acres in size. On the surface is a mulch of fine, discrete, very hard aggregates.

The surface layer is very dark gray clay about 25 inches thick. Below this is dark-gray clay that reaches to a depth of 48 inches. The next layer is gray clay that extends to a depth 70 inches. The underlying material is coarsely mottled, light-gray and yellow clay that extends to a depth of 100 inches.

Included with this soil in mapping are small areas of gently sloping Heiden and Houston Black soils. The included areas make up less than 8 percent of any mapped area.

This soil is well suited to crops, and most areas are cultivated. A few areas are in improved pasture. The hazard of erosion is slight. Capability unit IIw-1; pasture and hay group 7A; Blackland range site.

Houston Black clay, 1 to 3 percent slopes (HoB).—This gently sloping soil is in areas irregular in shape and 5 acres to more than 1,000 acres in size. It has the profile described as representative of the

percent, and other soils 3 percent. The soils and Urban land cannot be shown separately at the scale mapped, because they are too intermingled or the areas are too small.

These Houston Black soils have a surface layer of very dark gray clay about 25 inches thick. Below this is dark-gray clay that reaches to a depth of 48 inches. The underlying material is gray clay that extends to a depth of 70 inches.

Urban land areas are mostly occupied by single-unit dwellings and such works and structures as streets, sidewalks, buildings, driveways, paved parking lots, and patios. Schools and school grounds and small one-story factories are in some areas.

The shrink-swell potential of the soils in this complex is very high. The soils have cracks as much as 2 inches wide when they are dry. The cracks can cause a concrete sidewalk, concrete floor, or brick wall to crack; therefore, such precaution as reinforcing foundation material with steel rods is needed to prevent damage to structures. In addition, these soils are sticky and plastic when they are wet, their infiltration rate is very slow, and they have a high pH value, which limits the kinds of ornamental

ate, fine, subangular blocky structure; hard, firm but crumbly, sticky and plastic; common roots; calcareous; moderately alkaline; gradual, wavy boundary.

A13—16 to 36 inches, very dark grayish brown (10YR 3/2) silty clay, very dark grayish brown moist; strong, medium, subangular blocky structure; hard, very firm, sticky and plastic; few, fine, angular blocky peds; shiny pressure faces on a few peds; cracks filled with dark soil material from above; calcareous; moderately alkaline; gradual, wavy boundary.

B21—36 to 58 inches, dark-brown (10YR 3/3) silty clay, dark brown (10YR 3/3) moist; moderate, medium to coarse, subangular blocky structure; very hard, very firm, sticky and plastic; shiny pressure faces on peds; vertical streaks of darker soil from above; few weakly and strongly cemented concretions of calcium carbonate in lower part; calcareous; moderately alkaline; gradual, irregular boundary.

B22—58 to 66 inches, brown (10YR 4/3) silty clay; brown (10YR 4/3) moist; strong, medium, subangular blocky structure; hard, firm, sticky; 2 percent, by volume, visible soft masses and concretions of calcium carbonate; calcareous; moderately alkaline; diffuse, irregular boundary.

C1ca—66 to 82 inches, very pale brown (10YR 7/3) silty clay, pale brown (10YR 6/3) moist; massive; common, scattered, soft masses and few concretions of calcium carbonate.

The solum ranges from about 40 inches to more than 60 inches in thickness. The A horizon ranges from 22 inches to about 44 inches in thickness. This horizon ranges from dark gray, dark grayish brown, or very dark grayish brown to dark brown. The B2 horizon is 18 to 44 inches thick and is dark brown or brown. The C horizon ranges from brown, light olive brown, or very pale brown to reddish yellow. This horizon is about 2 to 20 percent, by volume, concretions and powdery masses of visible calcium carbonate.

and a few areas are in range. The hazard of erosion is moderate. Capability unit IIe-2; pasture and hay group 7C; Clay Loam range site.

Krum-Urban land complex, 0 to 3 percent slopes (KuB).—This complex is made up of nearly level to gently sloping soils. The soils are mainly in Belton, but some areas are in Fort Hood and Killeen. About two-thirds of the acreage has slopes of 0 to 1 percent. Mapped areas are 5 to 50 acres in size. Krum silty clay makes up about 68 percent of this mapping unit, Urban land about 26 percent, and Lewisville and other soils about 6 percent. The soils and Urban land cannot be shown separately at the scale mapped, because they are too intermingled or the areas are too small.

This Krum soil has a surface layer of very dark grayish-brown silty clay about 6 inches thick. Below this is dark-gray silty clay that reaches to a depth of 30 inches. The next layer is brown silty clay that reaches to a depth of 54 inches. Below this is light olive-brown silty clay that extends to a depth of 70 inches.

Urban land areas are occupied by such works and structures as single-unit dwellings, army barracks, streets, driveways, sidewalks, patios, schools and school grounds, and paved parking lots. Because the topography is smooth, little soil has been disturbed during construction.

Features of the soils in this complex that affect urban development are shrink-swell potential,

extends to a depth of 54 inches. Below this is olive-brown silty clay that reaches to a depth of 70 inches.

The Lewisville soils have a surface layer of dark-brown silty clay about 18 inches thick. Below this is brown silty clay that extends to a depth of 34 inches. The next layer is strong-brown silty clay that extends to a depth of 44 inches. Below this is reddish-brown, brown, strong brown, yellowish brown, and grayish brown. The C horizon ranges from pale brown, light yellowish brown, or very pale brown to reddish yellow. This horizon has few to common threads and films of calcium carbonate.

Lewisville silty clay, 1 to 3 percent slopes (LeB).—This gently sloping soil is in curved bands along major streams. Areas are as much as 100 acres in

acres in size. This complex is about 66 percent Lewisville soils, 25 percent Urban land, and 9 percent other soils. The soils and Urban land cannot be shown separately at the scale mapped, because they are too intermingled or the areas are too small.

This Lewisville soil has a surface layer of dark grayish-brown silty clay about 16 inches thick. The next layer is brown silty clay that reaches to a depth of 38 inches. The underlying material is very pale brown silty clay that extends to a depth of 60 inches.

The Urban land areas are occupied by such works

B23t—22 to 33 inches, reddish-brown (5YR 5/4 moist) clay; moderate, medium, angular and subangular blocky structure; extremely hard, very firm, sticky and plastic; few films and threads of calcium carbonate; few small chert fragments; calcareous; moderately alkaline; gradual, smooth boundary.

B3ca—33 to 43 inches, yellowish-red (5YR 5/6 moist) silty clay; moderate, medium, subangular blocky structure; hard, friable, sticky; few to many small concretions of calcium carbonate; calcareous; moderately alkaline; clear, smooth boundary.

C—43 to 56 inches, reddish-yellow (5YR 6/6 moist) silty clay loam; massive but porous; slightly hard, friable; about 50 percent lime-coated chert and limestone fragments that are estimated to be more than 50

junction with Interstate Highway 35 in southeast Belton, then 0.8 mile south on a county road, then

These soils are suited to pasture. Most areas were once used as pasture, but many areas are now

In a representative profile the surface layer is brown loam about 7 inches thick. The next layer is clay that extends to a depth of 50 inches. It is dark reddish brown in the upper 8 inches and reddish brown in the lower 35 inches. Below this is reddish-yellow silty clay that has many soft masses and

deep, gently sloping, loamy soil is in irregularly shaped areas that are mainly 10 to 30 acres in size.

The surface layer is dark-brown loam about 8 inches thick. The next layer is dark reddish-brown clay that reaches to a depth of 48 inches. Below this is reddish-yellow silty clay that extends to a depth

Payne soils are well drained. Permeability is very slow, and available water capacity is high. Runoff is slow to medium.

Included with this soil in mapping are small areas of nearly level Payne loam and small areas of Wilson soils.

pockets of sand, sand and gravel, and sandy clay. It is mildly alkaline or moderately alkaline.

Pedernales fine sandy loam, 1 to 3 percent slopes (PdB).—This gently sloping soil is on parts of ridgetops on ancient high terraces. Areas are irregular in

Included with this soil in mapping are small areas of Brackett and Denton soils that make up less than 12 percent of any mapped area.

This soil is suited to crops, and most areas have been cultivated. Some areas are in native range,

Real Series

The Real series consists of very shallow to shallow, calcareous, loamy soils in hilly areas. These gravelly soils formed in material weathered from limestone.

In a representative profile the surface layer is about 15 inches thick. It is very dark grayish-brown gravelly loam in the upper 11 inches and dark grayish-brown very gravelly loam in the lower 4 inches. It rests abruptly on nodular limestone.

Real soils are well drained. Permeability is moderate, and available water capacity is very low. Runoff is rapid.

These soils are used as native grass range.

Representative profile of Real gravelly loam in an area of Real association, hilly, 1 mile north of Salado on Interstate Highway 35, then 5 miles west on Farm Road 2786 to Union Grove crossroads, then 1.7 miles west on a county road to the junction of a county road going north to Cedar Knob church, then 500 feet south along fence line and 10 feet west, in area of native range:

A11—0 to 11 inches, very dark grayish-brown (10YR 3/2) gravelly loam, very dark brown (10YR 2/2) moist; moderate, very fine, granular structure parting to weak, medium, subangular blocky; hard, friable; many fine roots; an estimated 35 percent, by volume, weakly cemented limestone fragments as much as 2 inches in diameter; few cobblestones and stones; calcareous; moderately alkaline; clear, smooth boundary.

A12—11 to 15 inches, dark grayish-brown (10YR 4/2) very gravelly loam, very dark grayish brown (10YR 3/2) moist; weak, medium, subangular blocky structure parting to moderate, fine, granular; hard, friable; many fine roots; an estimated 75 percent, by vol-

ard of erosion is severe. Capability unit VIIs-1; Steep Rocky range site.

Riesel Series

The Riesel series consists of deep, gently sloping, loamy soils on ancient high terraces that are not associated with the present major streams. These noncalcareous soils formed in old, gravelly and clayey alluvial sediment.

In a representative profile the surface layer is 16 inches thick. It is dark grayish-brown gravelly fine sandy loam in the upper 5 inches and brown very gravelly fine sandy loam in the lower 11 inches. The next layer extends to a depth of 56 inches. It is red gravelly clay in the upper part and red clay in the lower part. The underlying material is reddish-yellow very gravelly loamy sand and has soft masses of calcium carbonate in the upper part.

Riesel soils are well drained. Permeability is slow, and available water capacity is low. Internal drainage is slow, and runoff is medium.

These soils are used mostly as pasture.

Representative profile of Riesel gravelly fine sandy loam in an area of Riesel gravelly soils, 1 to 3 percent slopes, about 4 miles south of Academy on Texas Highway 95, then 1.8 miles west on a county road to a junction, then 0.5 mile south on another county road, then 10 feet east of a fence, in a wooded pasture:

A11—0 to 5 inches, dark grayish-brown (10YR 4/2) gravelly fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak, fine, granular structure; hard, friable; many fine roots; 15 percent, by volume, siliceous

most profiles, this horizon has few to common mottles of yellowish red and strong brown. The IIC horizon is sandy and is 55 to 90 percent coarse gravel and a few cobbles.

Riesel gravelly soils, 1 to 3 percent slopes (RgB).—These gently sloping, loamy soils are on ancient high stream terraces. Areas are irregular in shape and 10 to 70 acres in size.

The surface layer is variable in texture. Texture ranges from fine sandy loam to very gravelly sandy loam. The soil patterns are not uniform, and all textures are not in all mapped areas.

Included with these soils in mapping are small areas of Pedernales soils that make up less than 12 percent of any mapped area.

These soils are suited to improved pasture, but most areas are in wooded pasture. Trees have been removed in some small areas. The hazard of erosion is slight. Capability unit VIe-1; pasture and hay group 8A; Gravelly range site.

San Saba Series

The San Saba series consists of nearly level to gently sloping, calcareous, clayey soils in low areas on limestone uplands. These moderately deep soils formed in clayey material underlain by limestone.

In a representative profile the surface layer is clay about 19 inches thick. It is dark gray in the

inches. Some profiles are 5 to 8 percent, by volume, limestone fragments that are ½ inch to 2 inches in diameter. The A horizon ranges from 12 to 32 inches in thickness and is very dark gray or dark gray. Slickensides are common in the lower part of this horizon and extend into the AC horizon. The AC horizon ranges from 12 to 20 inches in thickness and from gray or dark gray to grayish brown or dark grayish brown.

San Saba clay, 0 to 1 percent slopes (SaA).—This nearly level soil is in smooth, shallow valleys. Areas are long, narrow, and irregular in shape and are 10 to 100 acres in size. This soil has the profile described as representative of the series. In some areas the soil has seepy spots after heavy rains.

Included with this soil in mapping are small areas of nearly level Denton and Trinity soils and small areas of gently sloping Purves and San Saba soils. Included areas make up less than 6 percent of any mapped area.

This soil is well suited to crops, and most areas are cultivated. A few areas are in improved pasture. The hazard of erosion is slight. Capability unit IIIs-1; pasture and hay group 7A; Blackland range site.

San Saba clay, 1 to 3 percent slopes (SaB).—This soil is in contour bands on the gentle slopes of smooth valleys and at the heads of drainageways. Areas are irregular in shape and are 50 to 200 acres in size.

The surface layer is dark-gray clay about 4 inches

been disturbed during construction. Most structures have been built on 6 to 12 inches of fill dirt to keep foundations high and to reduce the hazard of wetness.

Features of the soils in this complex that affect urban development are shrink-swell potential, corrosivity, very slow permeability, and clay texture. Not placed in interpretive groups.

Speck Series

The Speck series consists of gently sloping and undulating, noncalcareous, clayey soils on uplands. These shallow soils formed in noncalcareous, loamy and clayey material underlain by limestone.

In a representative profile the surface layer is very dark grayish brown gravelly clay loam about 8 inches thick. The next layer is clay that reaches to a depth of 19 inches. It is reddish brown in the upper part and dark reddish brown in the lower part. Below this is indurated limestone bedrock.

Speck soils are well drained. Permeability is slow, and available water capacity is low. Runoff is medium.

These soils are suited to range, and most areas are used as native grass range. A small area is cultivated. A large area on the Fort Hood Military Reservation is used both for army maneuvers and as range for livestock.

Representative profile of Speck gravelly clay loam in an area of Speck [illegible]

it is thicker, and about 9 percent a soil that is similar to Speck soils except that it is thinner. The soils could have been mapped separately, but their similar use and management made separation impractical. Areas of this association are much larger and their composition is more variable than those of most other mapping units in the county. Mapping has been controlled well enough, however, for the anticipated use of the soils.

A Speck soil in this mapping unit has the profile described as representative of the series.

The soils in this association are better suited to range than to most other uses. Most areas are used as range. A few small fields have been cleared of stones and cultivated. Areas on the Fort Hood Military Reservation are used as range for livestock as well as for army maneuvers. The hazard of erosion is slight. Capability unit VIs-1; Redland range site.

Speck soils, 1 to 3 percent slopes (SsB).—This undifferentiated group is made up of gently sloping soils in irregularly shaped areas 10 to 80 acres in size. Speck soils make up about 76 percent of the mapping unit. Soils that are similar to Speck soils except that they are thicker make up about 18 percent, and soils that are similar to Speck soils except that they are thinner make up about 6 percent. Speck soils are in all mapped areas, but the soils that are similar to Speck soils are not.

The Speck soils have a surface layer of very dark brown clay loam 7 inches thick. The next layer is

limestone. Included areas make up less than 12 percent of any mapped area.

This soil is used mostly for cultivation. Some areas are in native range, and some areas are abandoned fields that are now used for grazing. A few small areas are in improved pasture. The hazard of erosion is moderate. Capability unit IIIe-6; pasture and hay group 13A; Chalky Ridge range site.

Stephen silty clay, 3 to 5 percent slopes (StC).—This gently sloping soil is on ridgetops and in areas that slope into natural drainageways. Areas are irregular in shape and are 7 to 50 acres in size.

The surface layer is dark grayish-brown silty clay about 8 inches thick. The next layer, reaching to a depth of 12 inches, is dark grayish-brown silty clay and is 80 to 90 percent small, soft, chalk fragments. Below this is gray, soft, platy chalk.

Included with this soil in mapping are areas of Brackett and Eddy soils. Included areas are less than 5 acres in size and make up less than 15 percent of any mapped area.

Most areas of this soil are abandoned fields. Shallow gullies are in many areas. The hazard of erosion is severe. Capability unit IVe-3; pasture and hay group 13A; Chalky Ridge range site.

Stephen-Urban land complex, 1 to 6 percent slopes (SuC).—This complex is made up of gently sloping to sloping soils. Most areas are in Temple. Mapped areas are irregular in shape and are 10 to 50 acres in size. Stephen soils make up 52 percent of this mapping unit, Urban land 30 percent, and Eddy and other soils 18 percent. The soils cannot be shown separately at the scale mapped, because they are too intermingled or the areas are too small.

The Stephen soils have a surface layer of dark grayish-brown silty clay about 10 inches thick. The next layer, which reaches to a depth of 12 inches, is dark grayish-brown silty clay and is 80 to 90 percent small, soft, chalk fragments. The underlying material is soft platy chalk that is harder in some places

Figure 6.—Profile of a Stephen silty clay that shows platy chalk.

very fine, subangular blocky structure; hard, firm, sticky and plastic; many roots; calcareous; moderately alkaline; abrupt, smooth boundary.

A1—5 to 10 inches, dark grayish-brown (10YR 4/2) silty clay, very dark grayish brown (10YR 3/2) moist; moder-

ded chalk, marl, and marly material weathered mainly from limestone.

as range and wildlife habitat. The hazard of erosion is slight. Capability unit VIIs-3; Low Stony Hill range site.

available water capacity is high. Runoff is very slow.

Large areas of these soils that were once frequently flooded are now protected by the Belton and Stillhouse Hollow Dams. Soils in the higher areas on bottom lands are cultivated. Lower, more frequently flooded areas are used for pasture and hay.

Representative profile of Trinity clay, frequently flooded, 1.9 miles north on Farm Road 437 from its intersection with Texas Highway 36 in Rogers, then 120 feet west of the road, in a pasture:

Ap—0 to 6 inches, very dark gray (5Y 3/1) clay, dark gray (5Y

most areas are in improved pasture. The hazard of erosion is slight. Capability unit Vw-1; pasture and hay group 1A; Clayey Bottomland range site.

Urban Land

Urban land (Ub) is in parts of Belton, Killeen, and Temple. Areas are 10 to 100 acres in size. About 75 to 95 percent of Urban land is covered with such works and structures as office buildings, hotels, railroad yards, multiple-unit dwellings, churches, schools, streets, wide sidewalks, and paved parking lots. About 10 to 15 percent of the Urban land

brown (10YR 4/3) moist; moderate, medium, subangular and angular blocky structure; hard, firm but crumbly; few soft masses and hard concretions of calcium carbonate; few ferromanganese concretions; calcareous; moderately alkaline; clear, smooth boundary.

C—46 to 72 inches, pink (7.5YR 7/4) clay loam, light brown (7.5YR 6/4) moist; massive; hard, firm but very crumbly; calcareous; moderately alkaline.

The solum ranges from 40 to 70 inches in thickness. The A horizon ranges from 10 to 19 inches in thickness and is very dark grayish brown, dark grayish brown, or grayish brown. It is subangular blocky to granular in structure. The B2 horizon is 20 to 50 inches thick and is clay loam or loam. It ranges from grayish brown, brown, pale brown, or yellowish brown to dark brown and has common to many threads and films of calcium carbonate. The C horizon is pale brown, light brown, or pink. It contains many threads and films of calcium carbonate, some sand and fine gravel, and a few fine concretions of calcium carbonate.

Venus clay loam, 0 to 1 percent slopes (VeA).—This nearly level soil is on low terraces of flood plains that are high on the landscape and do not flood. Areas are long and oval and are 10 to 200 acres in size.

The surface layer is dark grayish-brown clay loam 6 inches thick. The next layer is clay loam that extends to a depth of 45 inches. It is very dark grayish brown in the upper 13 inches, brown in the next 14 inches, and pale brown in the lower 12 inches. Below this is very pale brown clay loam that extends to a depth of 70 inches.

Included with this soil in mapping are a few small areas of soils that are similar to this Venus soil, except that the surface layer is slightly thicker or the lower layers are redder. Included areas make up less than 10 percent of any mapped area.

This soil is well suited to crops, and most areas are cultivated. A few small areas are in improved pasture. The hazard of erosion is slight. Capability unit I-1; pasture and hay group 7C; Clay Loam range site.

Venus clay loam, 1 to 3 percent slopes (VeB).—This gently sloping soil is on terraces in long, narrow bands parallel to drainageways. Areas are 15 to 250 acres in size.

The surface layer is dark grayish-brown clay loam 6 inches thick. The next layer is very dark grayish-brown clay loam that reaches to a depth of 13 inches. The next 14 inches is brown clay loam. Below this is a layer of light-brown clay loam 30 inches thick.

Included with this soil in mapping are small areas of Lewisville soils that make up less than 10 percent of any mapped area.

This soil is suited to crops. Most areas are cultivated, but some areas are in pasture. The hazard of erosion is slight. Capability unit IIe-2; pasture and hay group 7C; Clay Loam range site.

Venus clay loam, 3 to 5 percent slopes (VeC).—This gently sloping soil is in long, narrow, convex areas that conform to the contour of the landscape. Areas are 15 to 200 acres in size. Some areas are [illegible] soil, except that the surface layer is less than 10 inches thick. Included areas make up as much as 20 percent of some mapped areas.

This soil has been cultivated, but it is now used mostly as pasture. The hazard of erosion is moderate. Capability unit IIIe-3; pasture and hay group 7C; Clay Loam range site.

Wilson Series

The Wilson series consists of nearly level to gently sloping, loamy soils on uplands. These deep soils formed in clayey alluvium.

In a representative profile the surface layer is dark grayish-brown clay loam about 7 inches thick. The next layer is dark-gray clay to a depth of 42 inches and gray clay between the depths of 42 and 54 inches. The underlying material is light olive-gray clay that extends to a depth of 72 inches.

Wilson soils are somewhat poorly drained. Internal drainage is very slow, and runoff is very slow to medium. Permeability is very slow, and available water capacity is high. When these soils are dry, cracks more than 1 centimeter wide form on the surface and extend to a depth of more than 30 inches. Water readily enters these cracks, but after the soil is wet, the cracks close and water intake is very slow.

These soils are used mostly for crops, but some areas are used for pasture and hay.

Representative profile of Wilson clay loam, 0 to 1 percent slopes, 0.4 mile north on a county road from its intersection with Farm Road 436 in Little River, then 40 feet east from the edge of the pavement, in a field:

Ap—0 to 5 inches, dark grayish-brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) moist; weak, very fine, granular structure when moist, but massive when dry; very hard, firm; slightly acid; abrupt, smooth boundary.

A1—5 to 7 inches, dark grayish-brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) moist; weak, fine, granular structure; hard, friable; slightly acid; abrupt, wavy boundary.

B21tg—7 to 15 inches, dark-gray (10YR 4/1) clay, very dark gray (10YR 3/1) moist; moderate, medium, blocky structure; extremely hard, very firm; continuous thin clay films on peds; vertical cracks filled with material from the above layer; slightly acid; gradual, wavy boundary.

B22tg—15 to 42 inches, dark-gray (10YR 4/1) clay, very dark gray (10YR 3/1) moist; moderate, coarse, blocky structure; extremely hard, very firm; few fine pores; vertical cracks filled with material from the above layer; continuous thin clay films on peds; slightly acid, diffuse, wavy boundary.

B3tg—42 to 54 inches, gray (10YR 5/1) clay, dark gray (10YR 4/1) moist; moderate, coarse, blocky structure; extremely hard, very firm; common, fine, soft masses of calcium carbonate; mildly alkaline; diffuse, wavy boundary.

C—54 to 72 inches, light olive-gray (5Y 6/2) clay, olive gray (5Y 5/2) moist; massive; mildly alkaline.

The solum ranges from 40 to 75 inches in thickness. The A

or sand and gravel is at a depth of more than 8 feet on stream terraces.

Use of the Soils for Crops

In this section the system of capability classifica-

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

water readily enters. After the soil is wet, the cracks close, and water enters very slowly. Available water capacity is high, and the hazard of erosion is moderate. These soils are difficult to keep in good

Figure 7.—Parallel terraces and contour farming used to control loss of soil and water on Houston Black clay, 1 to 3 percent slopes.

These soils are well suited to small grain, corn, and sweetclover.

A cropping system that helps to maintain tilth is needed. The layer immediately below the plow layer may become compacted by tillage if row crops are grown continuously. A rotation of clean-tilled row crops following small grain, sweetclover, or other close-growing crops and shredding crop residue and leaving it on the surface help to maintain tilth and to conserve moisture.

CAPABILITY UNIT IIIe-1

This unit consists of deep, gently sloping soils. These soils have a surface layer of fine sandy loam and gravelly fine sandy loam. They have lower layers of dense, moderately slowly permeable to very slowly permeable clay that hinder the movement of water and air and restrict the growth of plant roots. These soils are difficult to keep in good tilth because a hard crust forms on the surface after rain. Available water capacity is medium, and the

Figure 8.—Management of crop residue on Burleson clay, 0 to 1 percent slopes, helps to maintain tilth.

that hinder the movement of water and air and restrict the growth of plant roots. When these soils are dry, cracks form on the surface and extend to a depth of more than 30 inches, and water rapidly enters. After the soil is wet, the cracks close and water enters very slowly. Available water capacity is high, and the hazard of erosion is severe.

Most areas of these soils are cultivated, but some areas are used as pasture. Grain sorghum is the main crop, but cotton, corn, small grain, and sweetclover are also grown.

A cropping system that helps to maintain tilth, control erosion, and conserve moisture is needed. Close-growing crops and crops that produce a large amount of residue are very suitable. Keeping crop residue on or near the surface helps to protect the soil from damaging rains. Terracing and farming on the contour help to control erosion in cultivated fields. Fertilizer is needed for good plant growth.

CAPABILITY UNIT IIIe-3

This unit consists of moderately deep to deep, gently sloping to sloping soils. These soils have a surface layer of clay loam to silty clay. They have lower layers that are moderately permeable to slowly permeable. Available water capacity is high.

These soils are better suited to cool-season crops than to most other crops. Grain sorghum and small grain are the main crops.

A cropping system that helps to conserve moisture, control erosion, and maintain tilth is needed. Terraces, contour tillage, and grassed waterways are needed in areas where row crops are planted.

CAPABILITY UNIT IIIe-4

This unit consists of deep, gently sloping clay loams and loams on uplands. These soils have dense lower layers that hinder the movement of water and air and restrict the growth of plant roots. They are difficult to keep in good tilth, because a hard crust forms on the surface after rain. When these soils are dry, cracks form on the surface and extend to a depth of 20 to 30 inches, and water rapidly enters. After the soil is wet, the cracks close and water enters very slowly. Available water capacity is high, and the hazard of erosion is moderate.

Most areas of these soils are cultivated. Grain sorghum and small grain are the main crops.

A cropping system that helps to maintain tilth and control erosion is needed. Grain sorghum or other crops that produce a large amount of residue are very suitable. Keeping the residue on or near the soil surface helps to prevent surface crusting. Farming on the contour and terracing help to con-

trol erosion. Fertilizer is needed for good plant growth.

CAPABILITY UNIT IIIe-5

This unit consists of moderately deep, gently sloping, clayey soils. These soils have lower layers of very slowly permeable clay that hinder the movement of water and air and restrict the growth of plant roots. When these soils are dry, cracks form on the surface and water readily enters, but after they are wet, the cracks close and water enters very slowly. Available water capacity is medium, and the hazard of erosion is moderate. These soils are difficult because a crust forms on the surface after rain. It has very slowly permeable lower layers that hinder the movement of water and air and restrict the growth of plant roots. Available water capacity is high, and the hazard of erosion is slight.

Cotton, grain sorghum, and small grain are the main crops. Some corn is also grown.

A cropping system that helps to maintain tilth is needed. Planting crops that produce a large amount of residue and keeping the residue on or near the soil surface help to maintain tilth.

CAPABILITY UNIT IIIw-1

These soils are droughty and are better suited to cool-season drilled crops, such as small grain, than to most other crops. They are well suited to sweetclover, but they are not suited to row crops.

A cropping system that provides a permanent cover of vegetation or produces a large amount of residue is needed. Keeping the residue on or near the surface helps to conserve moisture and control erosion. Contour tillage and terraces are needed

surrounding higher areas. Permeability is moderately slow to very slow. Available water capacity is high, and the hazard of erosion is slight.

These soils are used mainly for pasture and hay or for some kind of permanent vegetation. They are not suitable for cultivated crops.

CAPABILITY UNIT VIe-1

Bigsol gravelly soils, 1 to 3 percent slopes, are the

They have lower layers that are moderately permeable or moderately slowly permeable. Available water capacity is low to very low. The hazard of erosion is severe.

These soils are used only as native range. They are not suitable for cultivation, because soil areas are too steep and stony. Native grasses and browse afford a moderate amount of forage. Grazing should be controlled to maintain grass at a sufficient height to keep plants vigorous.

CAPABILITY UNIT VIIs-2

Only Brackett association, rolling, is in this unit. These shallow soils have a loam surface layer and moderately slowly permeable lower layers. Available water capacity is very low, and the hazard of erosion is severe.

[redacted]

to control runoff and erosion is needed. Grazing should be controlled to maintain grass at a sufficient height to keep plants vigorous.

CAPABILITY UNIT VIIs-3

Only Tarrant association, undulating, is in this

ground cover restricts the growth of undesirable plants. Plants in improved pasture can be adversely affected if weeds are not controlled early.

Many of the soils in the county, because they have steeper slopes, less depth, and a higher hazard of erosion, are better suited to pasture or hay than to cultivated crops. Many areas in the county that are suitable for cultivation are used for hay or pasture, and areas that were once cultivated are being converted to improved pasture and hay. An improved pasture or meadow is one in which grasses are introduced into the plant community to obtain high production of forage.

The most important grasses in the area for pasture and hay are Coastal bermudagrass and common bermudagrasses. These grasses grow better on such deep soils as Austin, Branyon, Burleson, Houston Black, and Trinity than on [redacted]

Other grasses generally planted for hay and pasture are johnsongrass, King Ranch bluestem, Kleberg bluestem, and Kleingrass. Several native grasses, such as indiangrass and switchgrass, respond to intensive management and are suitable for pasture and hay.

as improved bermudagrass, johnsongrass, and Kleingrass-75 is high.

PASTURE AND HAY GROUP 1C

This group consists of nearly level clayey to loamy soils on bottom lands. Some areas of these soils are subject to flooding if they are not protected. Permeability is moderate or moderately slow, and available water capacity is high.

[redacted]

uplands. Permeability is moderate, and available water capacity is high.

Management is difficult on this soil because it is eroded and has steeper slopes than most soils in other groups. Some areas are so severely eroded that area shaping is required before grass can be planted. Nitrogen and phosphorus are needed to maintain satisfactory forage production.

This soil is suited to cool-season grazing because

satisfactory forage production. The amount of fertilizer needed varies according to the depth of the soil. The potential of these soils to produce such grasses as improved bermudagrass, King Ranch bluestem, and Kleberg bluestem is medium or low.

PASTURE AND HAY GROUP 14A

This group consists of nearly level to gently sloping clayey to gravelly and loamy soils on uplands. These shallow to very shallow soils are moderately

A complete fertilizer containing nitrogen, phosphorus, and potassium is needed to maintain satisfactory forage production. The amount of fertilizer needed varies with the depth of the soil. The potential of these soils to produce such grasses as improved bermudagrass, King Ranch bluestem, and Kleberg bluestem is medium to low.

Predicted Yields

estimates made by farmers, soil scientists, and oth[illegible] the Little River San Gabriel Soil and Water Conser-

have some grazing value, but others have little or no value for grazing.

Four range condition classes are used to indicate the degree of departure from the native, or climax, vegetation brought about by grazing or other uses. Range condition class indicates the present condition of the native vegetation on a range site in relation to the native vegetation that could grow there.

A range is in *excellent* condition if 76 to 100 percent of the vegetation is the same as that in the climax stand. It is in *good* condition if the percentage is 51 to 75, in *fair* condition if the percentage is 26 to 50, and in *poor* condition if the percentage is 25 or less.

The potential forage production depends on the range site. The current forage production depends on the range condition and the moisture available to plants during their growing season.

The main objective of good range management is to keep the range in excellent or good condition. If this is done, water is conserved, yields are improved or maintained, and the soils are protected. The major concern in range management is recognition of important changes in the kind of cover on a range site. These changes take place gradually and can be misinterpreted or overlooked. Plant growth encouraged by heavy rainfall may lead to the conclusion that the range is in good condition, when actually the cover is weedy and the long term trend is toward lower production. On the other hand, some range that has been closely grazed for short periods, under the supervision of a careful manager, may [illegible]

tion. These include redbud, black dalea, kidneywood, and ash. Juniper, Texas persimmon, Mexicanbuckeye, agrito, Texas sophora, western soapberry, and sumac originally grew in areas of rocky outcrops on the steep slopes.

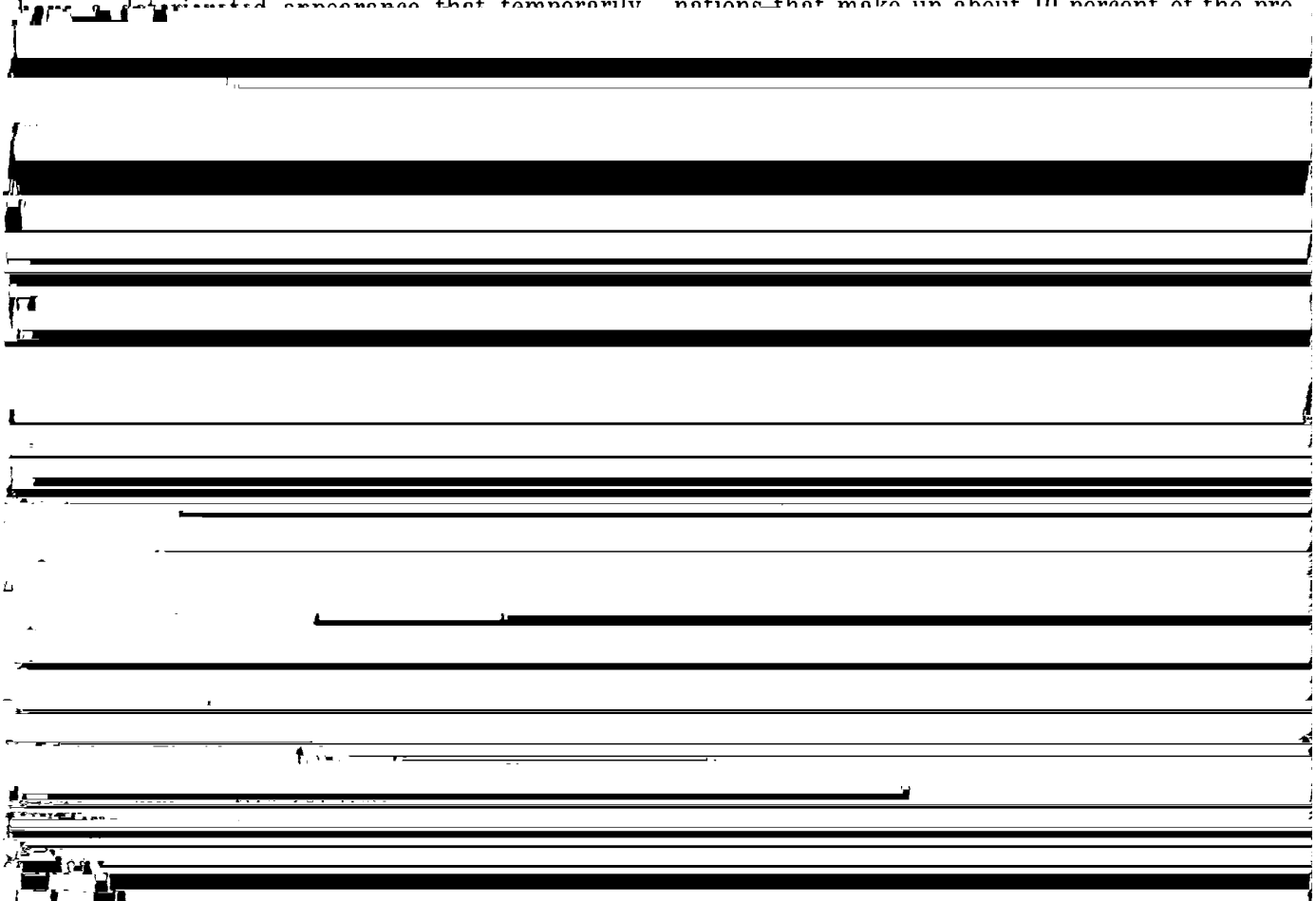
Where this site is in deteriorated condition, the main plant is juniper. Other invaders are sumac, Mexicanbuckeye, Texas persimmon, queen's-delight, evax, cedar sedge, Texas grama, hairy tridens, three-awns, and poverty dropseed.

Where this site is in excellent condition, potential annual acre production of air-dry herbage ranges from 3,500 pounds in wet years to 1,800 pounds in dry years.

BLACKLAND RANGE SITE

This range site is made up of nearly level to sloping soils that are moderately deep to deep. Sloping areas commonly have microridges and valleys extending up and down the slopes. Nearly level areas have a microrelief of knolls and depressions. Runoff is slow to rapid, and available water capacity is medium or high. The hazard of erosion is slight to severe.

The climax plants are mainly grasses. Motts of large live oak are scattered throughout the site, and hackberry and elm are along the draws. Woody plants contribute little to the total annual production. Little bluestem makes up about 50 percent, by weight, of the annual production, and indiangrass and big bluestem in localized areas make up 30 percent. A small amount of eastern gamagrass grows on this site. Other grasses in various combi[illegible]



bluestem make up 10 percent; and Texas winter- trees are scattered throughout the site. Woody

water capacity is medium. The hazard of erosion is slight.

If this site is in climax condition, it is a savanna. Little bluestem makes up almost 50 percent, by weight, of the total annual production, purpletop

weed, Texas grama, and hairy tridens increase or invade.

Where this site is in excellent condition, potential annual acre production of air-dry herbage ranges from 6,000 pounds in wet years to 3,000 pounds in

bluestem, wildindigo, goldenrod, bitter sneezeweed, croton, and bullnettle also increase or invade.

Where this site is in excellent condition, potential annual acre yield of air-dry herbage ranges from 3,500 pounds in wet years to 2,000 pounds in dry years. In areas where the tree canopy is 20 percent, as much as 700 pounds of the annual production is woody plants, and some or all of this production will likely be unpalatable to or out of reach of grazing animals.

LOAMY BOTTOMLAND RANGE SITE

This range site is made up of deep, nearly level soils on flood plains. This site receives extra water from occasional to frequent stream flooding and runoff from adjacent higher sites. Runoff is slow to medium, and available water capacity is high. The hazard of erosion is slight.

If this site is in climax condition, it is a savanna. Pecan, elm, hackberry, live oak, ash, western soapberry, cottonwood, and Texas sophora grow on this site. Woody plants contribute as much as 20 percent to the total annual production. Tall grasses such as switchgrass and indiangrass make up more than 35 percent, by weight, of the annual production; big bluestem and little bluestem make up about 25 percent; and cool-season plants such as Virginia wildrye, Texas wintergrass, and sedges make up about 10 percent. Other climax grasses that make up about 10 percent of the production are eastern gamagrass, Lindheimer muhly, vine-mesquite, meadow dropseed, side-oats grama, silver bluestem, percent to the total annual production. Little bluestem makes up 40 percent, by weight, of the annual production; indiangrass and big bluestem make up 15 percent; and side-oats grama, tall dropseed, silver bluestem, and vine-mesquite make up 15 percent. Texas wintergrass and Canada wildrye make up 10 percent to the annual production, and green sprangletop, buffalograss, fall witchgrass, and hairy grama make up 5 percent. Forbs such as bundleflower, knotweed leafflower, dalea, prairie-clover, scurf-pea, gayfeather, and halfshrub sundrops make up 5 percent of the production.

Where this site is in deteriorated condition, ash, juniper, sumac, mesquite, Texas persimmon, pricklypear, broomweed, croton, hairy tridens, Texas grama, and three-awns increase and invade.

Where this site is in excellent condition, potential annual acre production of air-dry herbage ranges from 3,000 pounds in wet years to 1,000 pounds in dry years. In areas that have a tree canopy of 20 percent, as much as 600 pounds of the annual production is woody plants, and some or all of this production will likely be unpalatable to or out of reach of grazing animals.

REDLAND RANGE SITE

This range site is made of shallow, gently sloping and undulating soils on uplands. Runoff is medium to rapid, and available water capacity is low. The hazard of erosion is slight.

If this site is in climax condition, it is a savanna. Live oak, shin oak, and motts of post oak are scat-

grass make up 15 percent; and purpletop, tall dropseed, side-oats grama, silver bluestem, Texas win-

If this site is in climax condition, it is a savanna. Live oak, Texas oak, and Bigelow oak are the domi-

panicums make up 15 percent. Woody plants such as post oak, blackjack oak, elm, hackberry, elbowbush, skunkbush, bumelia, greenbriar, grape, wildplum, and Carolina snailseed make up about 15 percent of the annual production. Such forbs as Engelmann-daisy, gayfeather, lespedeza, tickclover, sensitive-brier, bundleflower, yellow neptunia, snoutbean,

escarpment blackcherry, kidneywood, bumelia, elbowbush, and black dalea also grow on this site. Sumac, Texas persimmon, Mexican buckeye, Texas sophora, agrito, and juniper grow in small amounts on the rocky, craggy outcrop. Woody plants contribute about 15 percent, by weight, to the total annual production. Little bluestem makes up about 35 per-

TABLE 3.—*Suitability of the soils for elements of wildlife habitat and for kinds of wildlife*

Soil series and map symbols	Elements of wildlife habitat						Kinds of wildlife		
	Grain and seed crops	Grasses and legumes	Wild herbaceous upland plants	Hardwood trees, shrubs, and vines	Wetland food and cover plants	Ponds	Open-land	Range-land	Wetland
[redacted]	Fair	Fair	Fair	Fair	Very poor	Poor	Fair	Fair	Very poor

TABLE 3.—*Suitability of the soils for elements of wildlife habitat and for kinds of wildlife*—Continued

Soil series and map symbols	Elements of wildlife habitat	Kinds of wildlife
[illegible]	[illegible]	[illegible]

water of suitable quality and depth to support fish production.

The three major kinds of wildlife rated in table 3 are briefly defined as follows.

Open-land wildlife are birds and mammals that normally live in meadows, pastures, and open areas where grasses, herbs, and shrubby plants grow. Quail, dove, meadowlark, field sparrow, cottontail rabbit, and fox are examples of open-land wildlife.

Rangeland wildlife are birds and mammals that normally live in natural rangelands. White-tailed deer, fox, bobcat, raccoon, wild turkey, dove, and woodpecker are examples of rangeland wildlife.

Wetland wildlife are birds and mammals that normally live in wet areas. Duck, geese, rail, shore birds, beaver, heron, and muskrat are examples of wetland wildlife.

Recreation

Knowledge of soils is necessary for planning, developing, and maintaining areas used for recreation. In table 4 the soils of Bell County are rated according to the limitations that affect their suitability for camp areas, playgrounds, picnic areas, and paths and trails.

The soils are rated as having slight, moderate, or severe limitations for the specified uses. For all of these ratings, it is assumed that a good cover of vegetation can be established and maintained. A limitation of *slight* means that soil properties are generally favorable and limitations are so minor that they easily can be overcome. A *moderate* limitation can be overcome or modified by planning, by design, or by special maintenance. A *severe* limitation means that costly soil reclamation, special design, intense maintenance, or a combination of these activities is required.

Figure 9.—A nest of quail eggs in a native grass meadow on Denton silty clay, 1 to 3 percent slopes.

umes include annual lespedeza, shrub lespedeza, and other clovers.

Wild herbaceous upland plants are native or intro-

Camp areas are used intensively for tents and small camp trailers and the accompanying activities of outdoor living. Little preparation of the site is

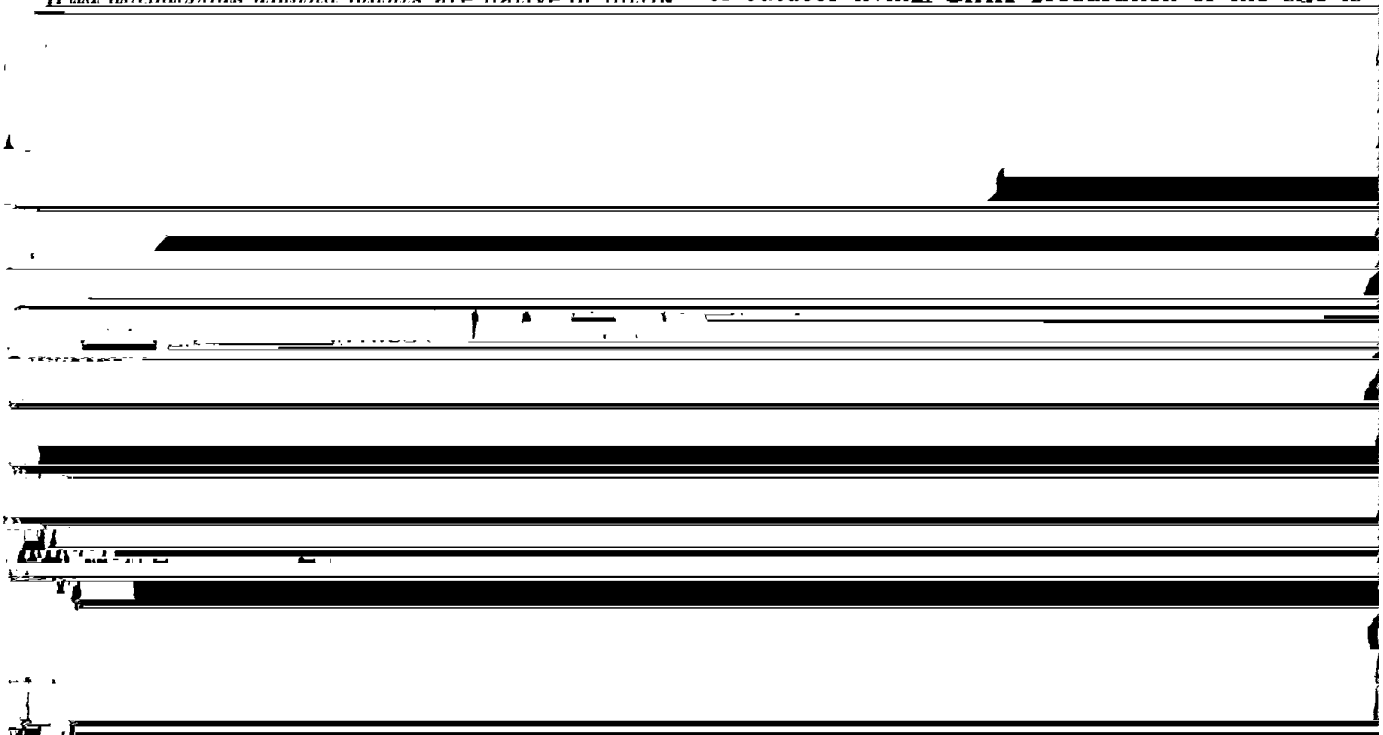


TABLE 4.—*Degree of limitation and soil features affecting recreational development*

[An asterisk in the first column indicates that at least one mapping unit in this series is made up of two or more kinds of soil. The soils in such mapping units may have different properties and limitations, and for this reason it is necessary to follow carefully the instructions for referring to other series that appear in the first column of this table]

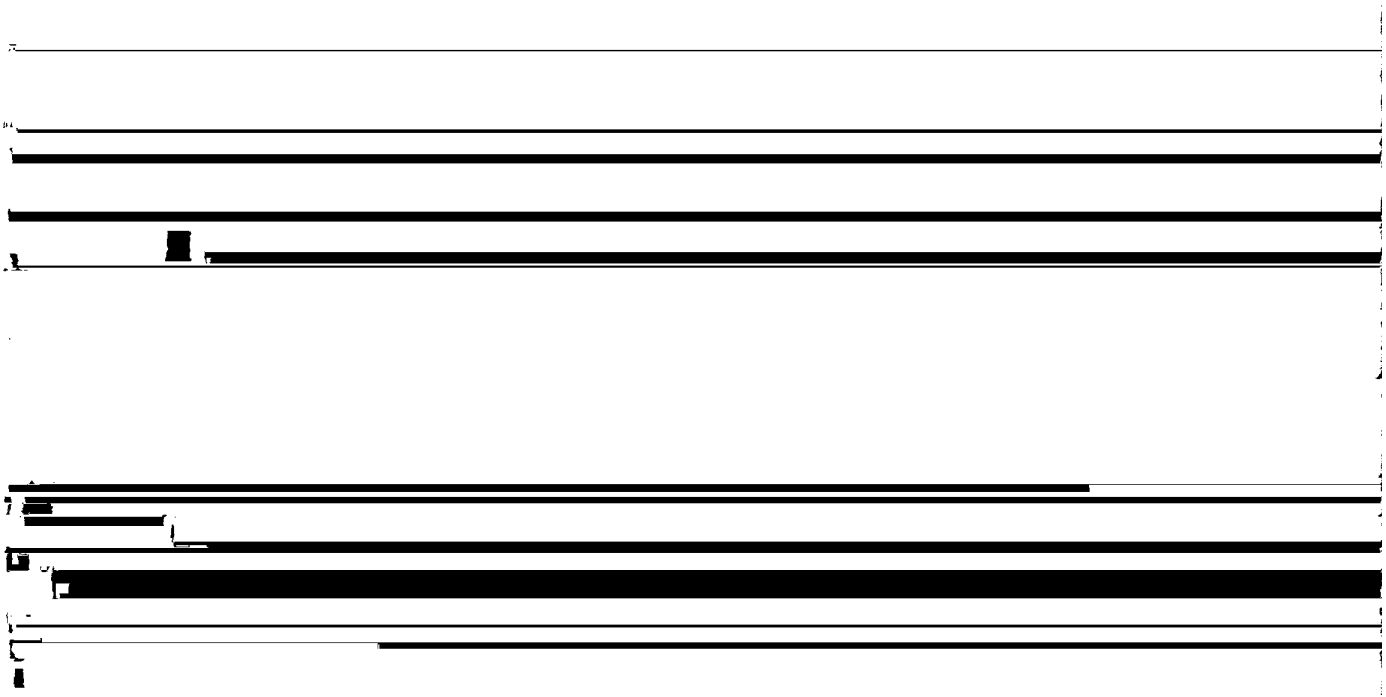
Soil series and map symbols	Camp areas	Playgrounds	Picnic areas	Paths and trails
Altoga: AlC, AlE2	Severe: silty clay surface layer.	Severe: silty clay surface layer; slope.	Severe: silty clay surface layer.	Severe: silty clay surface layer.
*Austin: AsB, AsC, AuC For Urban land part of AuC, see Urban land.	Severe: silty clay surface layer.	Severe: silty clay surface layer.	Severe: silty clay surface layer.	Severe: silty clay surface layer.
Axtell: AxB	Severe: very slow permeability.	Severe: very slow permeability.	Slight	Slight.
Bastrop: BaA	Slight	Slight	Slight	Slight.
Bosque: Be	Moderate: clay loam surface layer.	Moderate: clay loam surface layer.	Moderate: clay loam surface layer.	Slight.
Bf	Severe: frequently flooded.	Severe: frequently flooded.	Moderate: flooding hazard.	Slight.
*Brackett: BkB, BnE For Urban land part of BnE, see Urban land.	Moderate: clay loam surface layer.	Moderate: clay loam surface layer.	Moderate: clay loam surface layer.	Moderate: clay loam surface layer.
BRE	Moderate: slope	Severe: slope	Moderate: slope	Slight.
Branyon: ByA, ByB	Severe: clay surface layer; very slow permeability.	Severe: clay surface layer; very slow permeability.	Severe: clay surface layer.	Severe: clay surface layer.
Burleson: BzA, BzB	Severe: clay surface layer; very slow permeability.	Severe: clay surface layer; very slow permeability.	Severe: clay surface layer.	Severe: clay surface layer.
Chigley: ChB	Moderate: moderately slow permeability.	Moderate: moderately slow permeability.	Slight	Slight.
Crawford: CrA, CrB	Severe: clay surface layer; very slow permeability.	Severe: clay surface layer; very slow permeability.	Severe: clay surface layer.	Severe: clay surface layer.
*Denton: DeA, DeB, DnB For Urban land part of DnB, see Urban land.	Severe: clay surface layer.	Severe: clay surface layer.	Severe: clay surface layer.	Severe: clay surface layer.
DPB	Severe: clay surface layer.	Severe: clay surface layer.	Severe: clay surface layer.	Severe: clay surface layer.
*Eddy: EsB, EsD For Stephen part of EsB and EsD, see Stephen series.	Moderate: 35 to 50 percent coarse fragments.	Severe: bedrock at a depth of 5 to 12 inches; 35 to 50 percent coarse fragments.	Moderate: 35 to 50 percent coarse fragments.	Moderate: 35 to 50 percent coarse fragments.
*Ferris: FeE2 For Heiden part of FeE2, see Heiden series.	Severe: clay surface layer; very slow permeability.	Severe: clay surface layer; very slow permeability.	Severe: clay surface layer.	Severe: clay surface layer.
Frio: Fr, Fs	Severe: silty clay surface layer; flooding hazard.	Severe: silty clay surface layer; flooding hazard.	Severe: silty clay surface layer.	Severe: silty clay surface layer.
*Heiden: HeB, HeC, HfD, HgD2. For Ferris part of HgD2, see Ferris series.	Severe: clay surface layer; very slow permeability.	Severe: clay surface layer; very slow permeability.	Severe: clay surface layer.	Severe: clay surface layer.
*Houston Black: HoA, HoB, HoC, HuC. For Urban land part of HuC, see Urban land.	Severe: clay surface layer; very slow permeability.	Severe: clay surface layer; very slow permeability.	Severe: clay surface layer.	Severe: clay surface layer.

TABLE 4.—*Degree of limitation and soil features affecting recreational development*—Continued

Soil series and map symbols	Camp areas	Playgrounds	Picnic areas	Paths and trails
*Krum: KrA, KrB, KuB, KVB. For Urban land part of KuB, see Urban land. For Lewisville part of KVB, see Lewisville series.	Severe: silty clay surface layer.	Severe: silty clay surface layer.	Severe: silty clay surface layer.	Severe: silty clay surface layer.
*Lewisville: LeB, LeC, LgC, LuC. For Altoga part of LgC, see Altoga series. For Urban land part of LuC, see Urban land.	Severe: silty clay surface layer.	Severe: silty clay surface layer.	Severe: silty clay surface layer.	Severe: silty clay surface layer.
Lindy variant: LyB	Moderate: clay loam surface layer; slow permeability.	Moderate: clay loam surface layer; slow permeability.	Moderate: clay loam surface layer.	Moderate: clay loam surface layer.
Menard: MeD2	Slight	Severe: slope	Slight	Slight.
Patrick: PaD	Severe: silty clay surface layer.	Severe: silty clay surface layer; slope.	Severe: silty clay surface layer.	Severe: silty clay surface layer.
Payne: PcA, PcB	Severe: very slow permeability.	Severe: very slow permeability.	Slight	Slight.
Pedernales: PdB	Moderate: moderately slow permeability.	Moderate: moderately slow permeability.	Slight	Slight.
*Purves: PrB, PuD. For Urban land part of PuD, see Urban land.	Severe: silty clay surface layer.	Severe: silty clay surface layer.	Severe: silty clay surface layer.	Severe: silty clay surface layer.
PVD	Severe: stony	Severe: silty clay sur-	Severe: silty clay	Severe: silty clay

Figure 10.—Picnic area on Tarrant-Purves association, rolling, along Belton Lake.

slopes or stoniness that greatly increase cost of [redacted] and reaction. Depth to the water table, depth to bedrock, and slope are also important. These proper-



country movement of vehicles and construction equipment

distribution, liquid limit, and plasticity index. In

TABLE 5.—*Estimates of soil properties*

[An asterisk in the first column indicates that at least one mapping unit in this series is made up of two or more kinds of soil. The soils in such other series that appear in the first column of this table. The symbol > means more than;

Soil series and map symbols	Hydrologic group	Depth to bedrock	Depth from surface	USDA texture	Classification		Percentage passing sieve—	
					Unified	AASHO	Coarse fraction greater than 3 inches	No. 4 (4.7 mm)
		In	*In*					
Altoga: AlC, AlE2	C	>72	0–6	Silty clay	CL or CH	A-6 or A-7		100
			6–58	Silty clay	CL	A-6 or A-7		100
			58–62	Chalky marl.				
*Austin: AsB, AsC, AuC	C	22–40	0–16	Silty clay	CH or CL	A-7-6	0–5	95–100

significant in engineering

mapping units may have different properties and limitations, and for this reason it is necessary to follow carefully the instructions for referring to the symbol < means less than. Absence of data indicates that no estimate was made]

Percentage passing sieve—Continued			Liquid limit	Plasticity index	Permeability	Available water capacity	Reaction	Shrink-swell potential	Corrosivity of uncoated steel
No. 10 (2.0 mm)	No. 40 (0.42 mm)	No. 200 (0.074 mm)							
			Pct		*In per hr*	*In per in of soil*	*pH*		
95-100	85-95	80-95	40-51	20-31	0.6-2.0	0.15-0.19	7.9-8.4	High	Moderate

TABLE 5.—*Estimates of soil properties*

Soil series and map symbols	Hydrologic group	Depth to bedrock	Depth from surface	USDA texture	Classification		Percentage passing sieve—	
					Unified	AASHO	Coarse fraction greater than 3 inches	No. 4 (4.7 mm)
		In	*In*					
*Heiden: HeB, HeC, HfD, HgD2—For Ferris part of HgD2, see Ferris series.	D	>72	0–70	Clay and shaly clay	CH	A-7-6		95–100
*Houston Black: HoA, HoB, HoC, HuC.—For Urban land part of HuC, see Urban land.	D	>72	0–110	Clay	CH	A-7		95–100
*Krum: KrA, KrB, KuB, KVB—For Urban land part of KuB, see Urban land. For Lewisville part of KVB, see Lewisville series.	C	>72	0–36	Silty clay	CH	A-7-6		95–100
			36–82	Silty clay	CH	A-7-6		85–100
*Lewisville: LeB, LeC, LgC, LuC—For Altoga part of LgC, see Altoga series. For Urban land part of LuC, see Urban land.	B	>72	0–18	Silty clay	CH, CL	A-7		100
			18–70	Silty clay	CH, CL	A-7		100
Lindy variant: LyB	C	25–60	0–6	Clay loam	CL	A-6	0–5	75–100
			6–43	Clay and silty clay	CH or CL	A-7	0–5	80–100
			43–56	Silty clay loam and chert and limestone fragments.				
Menard: MeD2	B	>72	0–10	Fine sandy loam	SM, ML, CL-ML	A-4, A-2		95–100
			10–50	Sandy clay loam	CL, SC	A-6		95–100
Patrick: PaD	B	>72	0–18	Silty clay	CL, CH	A-7		85–100
			18–70	Very gravelly sand	GM, GC, GW-GM	A-2-4	0–10	25–50
Payne: PcA, PcB	C	>72	0–7	Loam	CL	A-4		95–100
			7–80	Clay and silty clay	CL or CH	A-7	0–5	95–100
Pedernales: PdB	C	>72	0–14	Fine sandy loam	SM, ML, CL-ML	A-4		95–100
			14–52	Sandy clay	CL, CH	A-6 or A-7		90–100
			52–90	Sand and gravel.				
*Purves: PrB, PuD, PVD—For Urban land part of PuD, see Urban land.	D	8–20	0–14	Silty clay	CH	A-7-6	0–20	90–100
			14–24	Hard limestone.				
Real: REF	D	8–20	0–15	Gravelly and very gravelly loam.	GC, GM, SC, or SM	A-2-6	0–15	40–75
			15–40	Weakly cemented limestone.				
Riesel: RgB	C	>72	0–16	Gravelly and very gravelly fine sandy loam.	GM, SM	A-2-4	0–5	25–85
			16–56	Gravelly clay and clay	GC, SC, CL, CH	A-7, A-2	0–5	25–90
			56–62	Very gravelly loamy sand.	GP-GM	A-1	5–10	10–40
*San Saba: SaA, SaB, SnB—For Urban land part of SnB, see Urban land.	D	24–40	0–35	Clay	CH	A-7-6		100
			35–38	Indurated limestone.				

significant in engineering—Continued

Percentage passing sieve—Continued			Liquid limit	Plasticity index	Permeability	Available water capacity	Reaction	Shrink-swell potential	Corrosivity of uncoated steel
No. 10 (2.0 mm)	No. 40 (0.42 mm)	No. 200 (0.074 mm)							
			Pct		*In per hr*	*In per in of soil*	*pH*		
95–100	80–95	75–95	55–80	40–50	<0.06	0.15–0.20	7.9–8.4	Very high	High.
95–100	95–100	85–100	55–110	35–90	<0.06	0.15–0.20	7.9–8.4	Very high	Very high.
95–100	95–100	85–95	50–65	30–45	0.2–0.6	0.15–0.20	7.9–8.4	High	High.
75–100	70–95	65–90	50–60	30–40	0.2–0.6	0.15–0.20	7.9–8.4	High	High.
98–100	70–90	70–85	40–65	25–40	0.6–2.0	0.16–0.20	7.9–8.4	High	High.
95–100	65–90	65–85	35–55	20–35	0.6–2.0	0.16–0.20	7.9–8.4	High	High.
70–100	70–100	60–85	20–40	10–20	0.6–2.0	0.12–0.20	5.1–8.4	Low	High.
75–100	75–100	65–90	38–55	20–30	0.06–0.2	0.10–0.20	5.1–8.4	Moderate	High.
95–100	75–90	30–60	15–20	2–7	2.0–6.0	0.11–0.17	6.1–7.3	Low	High.
95–100	80–100	36–60	30–40	12–22	0.6–2.0	0.15–0.19	6.1–7.8	Low	High.
75–95	60–90	51–79	45–60	23–35	0.6–2.0	0.13–0.15	7.9–8.4	Moderate	High.
25–45	10–25	8–20	15–25	1–8	>20	0.02–0.03	7.9–8.4	Very low	High.
95–100	85–100	60–80	15–30	3–10	0.2–0.6	0.15–0.20	6.1–7.3	Low	High.
95–100	90–100	70–90	35–55	20–30	<0.06	0.14–0.18	6.1–8.4	Moderate	High.
90–100	75–100	36–55	15–25	2–7	0.6–2.0	0.12–0.17	6.6–7.3	Low	High.
90–100	85–100	55–75	35–55	20–35	0.2–0.6	0.15–0.20	6.1–7.8	High	High.
80–95	80–95	70–90	50–65	30–40	0.2–0.6	0.12–0.18	7.9–8.4	High	High.
30–65	25–50	20–35	25–35	10–20	0.6–2.0	0.05–0.10	7.9–8.4	Moderate	High.
15–75	12–65	5–25	<20	NP	2.0–6.0	0.04–0.10	6.1–7.3	Low	High.
20–80	18–80	15–75	41–55	20–30	0.06–0.2	0.05–0.12	6.6–7.3	Moderate	High.
10–30	10–15	6–10	NP	NP	6.0–20	0.03–0.05	7.4–7.8	Very low	High.
98–100	95–100	90–100	55–70	35–45	<0.06	0.15–0.20	7.4–8.4	Very high	High.

TABLE 5.—*Estimates of soil properties*

Soil series and map symbols	Hydrologic group	Depth to bedrock	Depth from surface	USDA texture	Classification		Percentage passing sieve—	
					Unified	AASHO	Coarse fraction greater than 3 inches	No. 4 (4.7 mm)
		In	*In*					
Speck: SPD, SsB	D	14–20	0–8	Gravelly clay loam	CL	A-6 or A-7	0–5	90–100
			8–19	Clay	CL or CH	A-7-6		75–95
			19–21	Indurated limestone.				
*Stephen: StB, StC, SuC	C	8–20	0–5	Silty clay	CH or CL	A-7	0–5	95–100
			5–14	Silty clay	CL or CH	A-7	0–5	100
For Urban land part of SuC, see Urban land.			14–36	Soft and hard chalk.				
*Tarrant: TAD, TPF	D	6–20	0–16	Silty clay	CH	A-7-5	25–65	80–100
			16–20	Hard limestone.				
For Purves part of TPF, see Purves series.								
Trinity: Tr, Ty	D	>72	0–72	Clay	CH	A-7-6		100
Urban land: Ub. Properties too variable to estimate.								
Venus: VeA, VeB, VeC	B	>72	0–12	Clay loam	CL, CL-ML	A-6		100
			12–46	Clay loam	CL, CL-ML	A-6		95–100
			46–72	Clay loam	CL, CL-ML, SC-SM, SC	A-6		80–100
Wilson: WcA, WcB, WcC	D	>72	0–7	Clay loam	CL	A-6		95–100
			7–42	Clay	CH, CL	A-7-6		90–100
			42–72	Clay	CL, CH	A-7-6		95–100

[1] NP = Nonplastic.

material. These soils have a very slow rate of water transmission and a very high runoff potential.

Depth to bedrock is the distance from the surface of the soil to the upper surface of the rock layer.

In the column headed "Depth from surface," the depth is given in inches for the major distinctive layers of the soil profile.

Soil texture is described in table 5 in the standard [illegible] the U.S. Department of Agriculture.

helping to determine suitability of the soil as a material for construction purposes.

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 a semisolid to a plastic state. If the moisture content is further increased, the material changes from a plastic to a liquid state. The plastic limit is

significant in engineering—Continued

Percentage passing sieve—Continued			Liquid limit	Plasticity index	Permeability	Available water capacity	Reaction	Shrink-swell potential	Corrosivity of uncoated steel
No. 10 (2.0 mm)	No. 40 (0.42 mm)	No. 200 (0.074 mm)							
			Pct		*In per hr*	*In per in of soil*	*pH*		
80–100	80–95	75–90	30–45	15–25	0.2–0.6	0.15–0.20	6.1–6.5	Low	High.
75–95	75–95	60–95	45–55	25–35	0.06–0.2	0.15–0.20	6.6–7.3	Moderate	High.
90–100	85–100	80–90	45–60	20–32	0.2–0.6	0.10–0.15	7.9–8.4	Moderate	High.
90–95	85–95	80–90	45–60	20–32	0.2–0.6	0.10–0.15	7.9–8.4	Moderate	High.
80–100	70–90	70–95	55–70	30–40	0.2–0.6	0.15–0.17	6.6–8.4	High	High.
98–100	85–100	80–95	51–60	30–40	<0.06	0.15–0.20	7.9–8.4	Very high	Very high.
95–100	85–100	50–75	20–40	5–18	0.6–2.0	0.15–0.20	7.9–8.4	Low	High.
95–100	85–100	50–75	20–40	5–18	0.6–2.0	0.15–0.20	7.9–8.4	Low	High.
70–100	65–100	40–75	20–40	5–18	0.6–2.0	0.15–0.18	7.9–8.4	Low	High.
95–100	95–100	60–85	25–35	7–20	0.2–0.6	0.15–0.20	6.1–6.5	Low	High.
80–100	80–100	65–90	41–55	25–35	<0.06	0.14–0.20	6.1–7.8	High	High.
95–100	90–100	70–90	41–55	25–35	<0.06	0.12–0.15	7.4–7.8	High	High.

such transient soil features as plowpans and surface crusts. These ratings should not be confused with the coefficient of permeability, or k-value, used by engineers.

Available water capacity is the ability of a soil to hold water for use by most plants. It commonly is defined as the numerical difference between the amount of water in the soil at field capacity and the amount of water at the time most crop plants wilt. The rate is expressed as inches of water per inch of soil depth.

Reaction is the degree of acidity or alkalinity of a soil, expressed as pH. The pH value and terms used

damage to building foundations, roads, and other structures. A *high* shrink-swell potential indicates a hazard to the maintenance of structures built in, on, or of material having this rating.

Corrosivity, as used in table 5, pertains to potential soil-induced chemical action that dissolves or weakens uncoated steel or concrete. Rate of corrosion of uncoated steel is related to soil properties such as drainage, texture, total acidity, and electrical conductivity of the soil material. Corrosivity for concrete is influenced mainly by the content of sodium or magnesium sulfate as well as by soil texture and acidity. Installations of uncoated steel

TABLE 6.—*Engineering*

[A ... in the first column indicates that at least one mapping unit in this series is made up of two or more kinds of soil. The soils in such

Soil series and map symbols	Degree and kind of limitation for—				
	Septic tank absorption fields	Sewage lagoons	Shallow excavations	Dwellings without basements	Sanitary landfill[1]
Altoga: AIC, AIE2	Moderate: moderate permeability.	Moderate: seepage.	Moderate: silty clay.	Severe: high shrink-swell potential.	Severe: silty clay.

interpretations

mapping units may have different properties and limitations, and for this reason it is necessary to follow carefully the instructions for referring the first column of this table]

Degree and kind of limitation for—Continued			Suitability as a source of—		Soil features affecting—	
Local roads and streets	Pond reservoir areas	Pond embankments	Road fill	Topsoil	Terraces and diversions	Grassed waterways
Severe: low strength.	Moderate: seepage.	Moderate: medium compressibility.	Poor: high shrink-swell potential.	Poor: silty clay.	Slope	Slope.
Severe: high shrink-swell potential.	Severe: bedrock at a depth of 22 to 40 inches.	Moderate: fair slope stability.	Poor: high shrink-swell potential.	Poor: silty clay.	All features favorable.	All features favorable.
Severe: high shrink-swell potential.	Slight	Moderate: fair slope stability.	Poor: high shrink-swell potential.	Fair: thickness of material.	High erosion potential.	All features favorable.
Moderate: low strength.	Moderate: seepage.	Moderate: poor resistance to piping and erosion.	Fair: low strength.	Fair: thickness of material.	All features favorable.	All features favorable.
Severe: hazard of flooding.	Moderate: seepage.	Moderate: fair slope stability; medium compressibility.	Fair: low strength.	Fair: clay loam.	Hazard of flooding.	Hazard of flooding.
Moderate: low strength; rippable bedrock at a depth of 10 to 20 inches.	Severe: bedrock at a depth of 10 to 20 inches.	Severe: only 10 to 20 inches of borrow material.	Fair: low strength.	Poor: coarse fragments.	Shallow depth	Shallow depth.
Severe: very high shrink-swell potential.	Slight	Moderate: fair slope stability.	Poor: very high shrink-swell potential.	Poor: clay	All features favorable.	All features favorable.
Severe: very high shrink-swell potential.	Slight	Moderate: fair slope stability.	Poor: very high shrink-swell potential.	Poor: clay	All features favorable.	All features favorable.
Severe: low strength.	Moderate: seepage.	Moderate: fair slope stability.	Poor: low strength.	Poor: coarse fragments.	High erosion potential.	All features favorable.
Severe: bedrock at a depth of 20 to 40 inches; very high shrink-swell potential.	Severe: bedrock at a depth of 20 to 40 inches.	Moderate: 20 to 40 inches of borrow material.	Poor: very high shrink-swell potential.	Poor: clay	All features favorable.	All features favorable.
Severe: bedrock at a depth of 22 to 40 inches; high shrink-swell potential.	Severe: bedrock at a depth of 22 to 40 inches.	Moderate: fair slope stability; 22 to 40 inches of borrow material.	Poor: high shrink-swell potential.	Poor: clay	All features favorable.	All features favorable.
Moderate: bedrock at a depth of 5 to 12 inches.	Severe: bedrock at a depth of 5 to 12 inches.	Severe: only 5 to 12 inches of borrow material.	Poor: bedrock at a depth of 5 to 12 inches.	Poor: thickness of material; coarse fragments.	Shallow depth	Shallow depth.
Severe: low strength; very high shrink-swell potential.	Slight	Moderate: fair slope stability.	Poor: very high shrink-swell potential.	Poor: clay	Steep and eroded slopes.	Steep and eroded slopes.

TABLE 6.—*Engineering*

Soil series and map symbols	Degree and kind of limitation for—				
	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

interpretations—Continued

Degree and kind of limitation for—Continued			Suitability as a source of—		Soil features affecting—	
Local roads and streets	Pond reservoir areas	Pond embankments	Road fill	Topsoil	Terraces and diversions	Grassed waterways
Severe: low strength.	Moderate: seepage.	Moderate: medium compressibility.	Poor: low strength.	Poor: silty clay.	Hazard of flooding.	All features favorable.
Severe: low strength; very high shrink-swell potential.	Slight	Moderate: fair slope stability.	Poor: very high shrink-swell potential; low strength.	Poor: clay	Slope	Slope.
Severe: low strength; very high shrink-swell potential.	Slight	Moderate: fair slope stability.	Poor: very high shrink-swell potential; low strength.	Poor: clay	Clay	Clay.
Severe: low strength; very high shrink-swell potential.	Slight	Moderate: fair slope stability.	Poor: very high shrink-swell potential; low strength.	Poor: clay	Slope	Slope.
Severe: low strength; high shrink-swell potential.	Moderate: seepage.	Moderate: fair slope stability.	Poor: high shrink-swell potential; low strength.	Poor: clay	All features favorable.	All features favorable.
Severe: low strength; high shrink-swell potential.	Moderate: seepage.	Moderate: fair slope stability.	Poor: high shrink-swell potential; low strength.	Poor: clay	Slope	Slope.
Severe: low strength; high shrink-swell potential.	Moderate: seepage.	Moderate: fair slope stability.	Poor: high shrink-swell potential; low strength.	Poor: silty clay.	Slope	Slope.
Severe: low strength.	Moderate: bedrock at a depth of 25 to 60 inches.	Moderate: fair slope stability.	Poor: low strength.	Fair: clay loam.	All features favorable.	All features favorable.
Moderate: low strength.	Moderate: seepage.	Moderate: poor resistance to piping and erosion.	Fair: low strength.	Fair: thickness of material.	Slope	Slope.
Severe: low strength.	Severe: seepage.	Moderate: 18 to 30 inches of borrow material.	Fair: low strength.	Poor: silty clay.	Slope	Slope.

TABLE 6.—*Engineering*

Soil series and map symbols	Degree and kind of limitation for—				
	Septic tank absorption fields	Sewage lagoons	Shallow excavations	Dwellings without basements	Sanitary landfill[1]

interpretations—Continued

Degree and kind of limitation for—Continued			Suitability as a source of—		Soil features affecting—	
Local roads and streets	Pond reservoir areas	Pond embankments	Road fill	Topsoil	Terraces and diversions	Grassed waterways
Severe: bedrock at a depth of 8 to 20 inches.	Severe: bedrock at a depth of 8 to 20 inches.	Severe: only 8 to 20 inches of borrow material.	Poor: bedrock at a depth of 8 to 20 inches.	Poor: coarse fragments.	Slope; shallow depth.	Slope; shallow depth.
Severe: low	Severe:	Moderate: 40				

[redacted]

runoff so that it soaks into the soil or flows slowly to a prepared outlet. Features that affect suitability of a soil for terraces are uniformity and steepness of slope; depth to bedrock or other unfavorable material; presence of stones; permeability; and resistance to water erosion, soil slipping, and soil blowing. A soil suitable for these structures provides outlets for runoff and is not difficult to vegetate.

Grassed waterways are either natural or shaped channels seeded with grass to carry runoff water without causing erosion. The suitability of a soil for grassed waterways is determined by the hazard of erosion; the amount of shaping that can be done, which in turn depends on slope, stoniness, and depth to bedrock; and the difficulty in establishing vegetation.

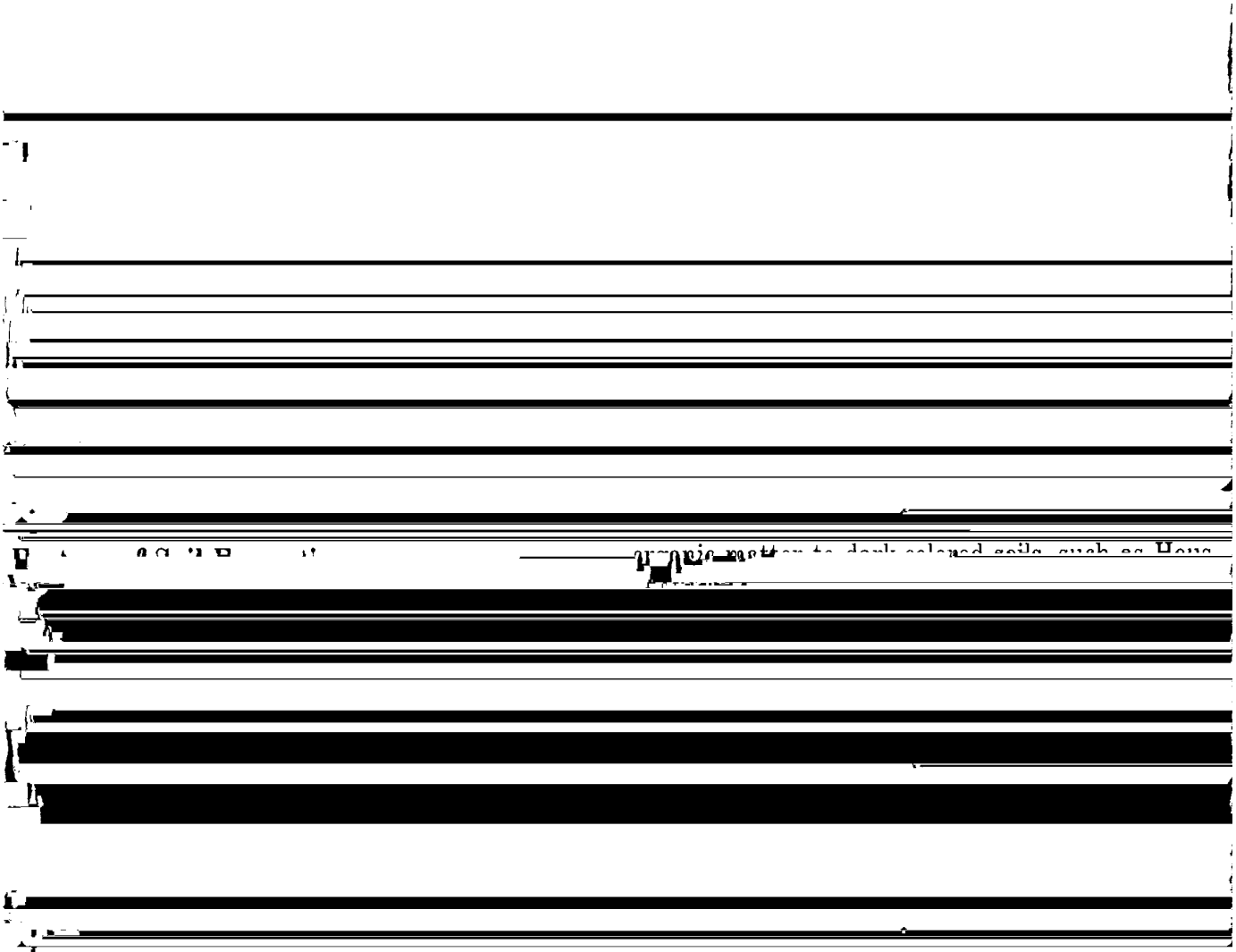
Formation and Classification of the Soils

In this section the five major factors of soil formation are discussed in terms of their effect on the soils of Bell County, the processes of soil horizon differentiation are described, the comprehensive system of soil classification is discussed, and the soils in the county are placed in some of the categories of that system.

causes the soils to be alternately wet and dry. When such clay soils as Branyon, Crawford, Heiden, and Houston Black dry, they crack. The cracks fill with water when it rains, and the water washes topsoil to the bottom of the crack. In many places these cracks are more than 40 inches deep. After these clay soils become wet, they swell and the cracks close completely. Alternate shrinking and swelling of these soils and the downward movement of the topsoil cause the soil to churn and prevent formation of distinct horizons. Other soils, such as Axtell and Pedernales soils, have clayey lower layers. Water moving through the soil carries clay particles downward into the soil from the surface layer. As the movement of water slows, these clay particles are deposited. As clay accumulates, the water moves more slowly, and the deposition of clay accelerates. Thus, the process tends to speed up, and eventually the lower layers become clayey.

Living organisms

Plants, animals, insects, worms, bacteria, fungi, and man contribute to the formation of soil. Gain of organic matter and of nitrogen in the soil, gain or loss of plant nutrients, and a change in structure and porosity are among the effects of living organisms on soil. In that part of the county on the prairie, grasses have had more influence than other plants on the formation of the soils. The grasses provided litter that protected the surface and added



of the Comanchean Series, and the eastern half by material of the Gulf Series. The Comanchean Series consists of the Fredericksburg, Trinity, and Washita Groups, and the Gulf Series consists of the Austin, Eagle Ford, and Taylor Groups.

Brackett, Purves, Real, Speck, and Tarrant soils are in areas where limestone is near the surface. Crawford, Denton, Lindy, and San Saba soils are in areas that are deeper over limestone. Austin, Eddy, and Stephen soils are examples of soils that formed in weathered material from the Gulf Series.

Soils such as Bosque, Frio, and Trinity are on the flood plains of rivers and drainageways and formed in alluvium.

Relief

Bell County is a moderately dissected plain that slopes southeastward toward the coast at a rate of [illegible]

The A horizon is the surface layer. It can be either the horizon of maximum organic matter, called the A1, or the horizon of maximum leaching of dissolved or suspended materials, called the A2. The organic-matter content of the soils in Bell County ranges from high to low. Branyon soils have a thick, dark A1 horizon that has a high organic-matter content. Axtell soils have a very thin A1 horizon over an A2 horizon that is thicker and has low organic-matter content.

The B horizon lies immediately beneath the A horizon. It is either the horizon where the maximum amount of dissolved or suspended materials, such as iron or clay, has accumulated or an altered horizon that has distinct structure but little evidence of clay translocation and accumulation. The B horizon that has a significant accumulation of clay is given the designation Bt. The Bt horizon is firmer than the horizons immediately above or below it

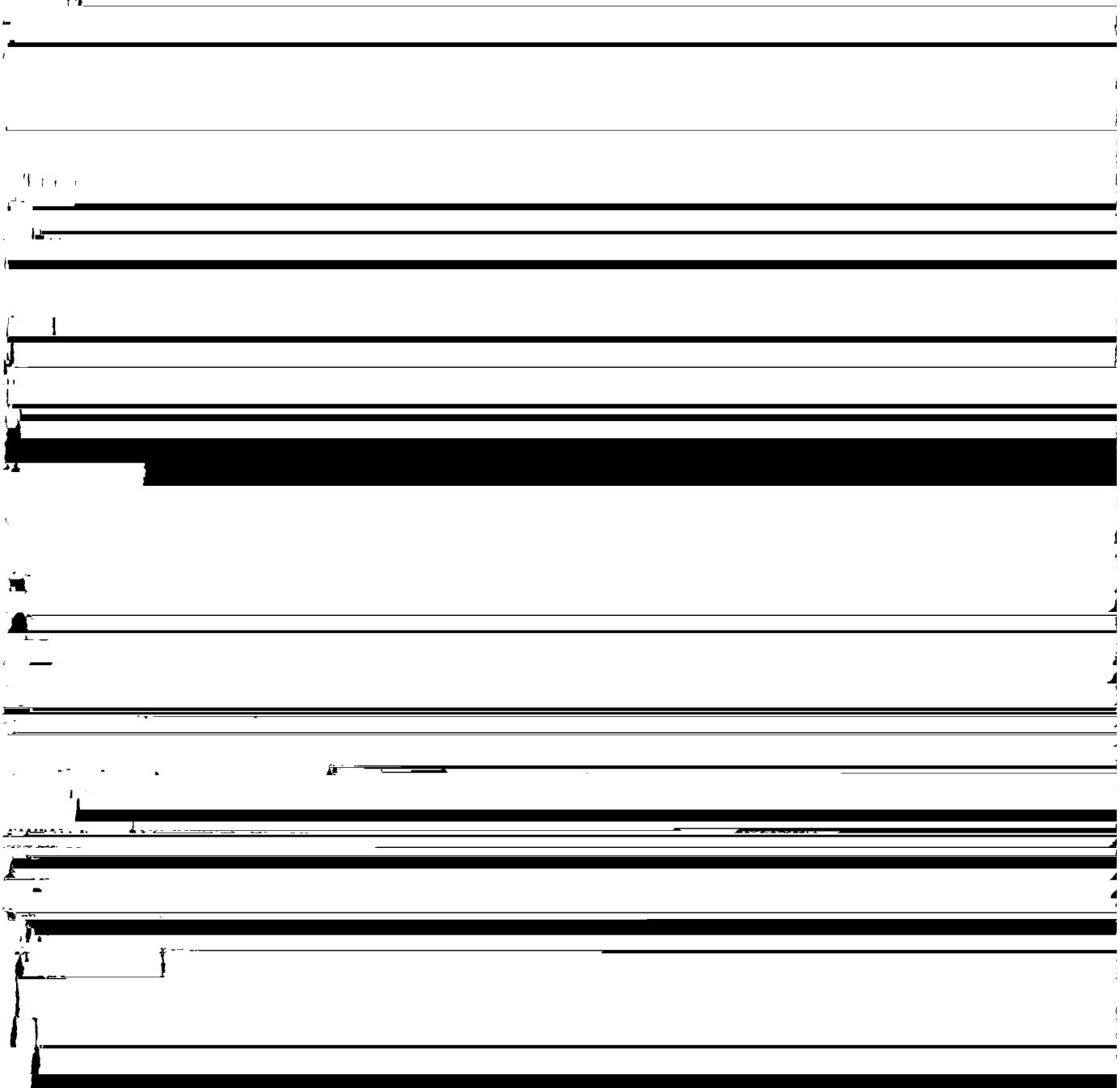


TABLE 7.—*Classification of soil series*

Series	Family	Subgroup	Order
Altoga	Fine-silty, carbonatic, thermic	Typic Ustochrepts	Inceptisols.
Austin	Fine-silty, carbonatic, thermic	Typic Haplustolls (Calciustolls).	Mollisols.
Axtell	Fine, montmorillonitic, thermic	Udertic Paleustalfs	Alfisols.
Bastrop	Fine-loamy, mixed, thermic	Udic Paleustalfs	Alfisols.
Bosque	Fine-loamy, mixed, thermic	Cumulic Haplustolls	Mollisols.
Brackett	Loamy, carbonatic, thermic, shallow	Typic Ustochrepts	Inceptisols.
Branyon	Fine, montmorillonitic, thermic	Udic Pellusterts	Vertisols.
Burleson	Fine, montmorillonitic, thermic	Udic Pellusterts	Vertisols.
Chigley	Fine, mixed, thermic	Udic Paleustalfs	Alfisols.
Crawford	Fine, montmorillonitic, thermic	Udic Chromusterts	Vertisols.
Denton	Fine, montmorillonitic, thermic	Vertic Calciustolls	Mollisols.
Eddy	Loamy-skeletal, carbonatic, thermic, shallow	Typic Ustorthents	Entisols.
Ferris	Fine, montmorillonitic, thermic	Udorthentic Chromusterts	Vertisols.
Frio	Fine, mixed, thermic	Cumulic Haplustolls	Mollisols.
Heiden	Fine, montmorillonitic, thermic	Udic Chromusterts	Vertisols.
Houston Black	Fine, montmorillonitic, thermic	Udic Pellusterts	Vertisols.
Krum	Fine, mixed, thermic	Vertic Haplustolls	Mollisols.
Lewisville	Fine-silty, mixed, thermic	Typic Calciustolls	Mollisols.
Lindy variant	Fine, mixed, thermic	Udic Haplustalfs	Alfisols.
Menard	Fine-loamy, mixed, thermic	Typic Haplustalfs	Alfisols.
Patrick	Clayey over sandy or sandy-skeletal, carbonatic, thermic	Typic Calciustolls	Mollisols.
Payne	Fine, montmorillonitic, thermic	Udic Paleustalfs	Alfisols.
Pedernales	Fine, mixed, thermic	Udic Paleustalfs	Alfisols.
Purves	Clayey, montmorillonitic, thermic	Lithic Calciustolls	Mollisols.
Real	Loamy-skeletal, carbonatic, thermic, shallow	Typic Calciustolls	Mollisols.
Riesel	Clayey-skeletal, montmorillonitic, thermic	Udic Paleustalfs	Alfisols.
San Saba	Fine, montmorillonitic, thermic	Udic Pellusterts	Vertisols.
Speck	Clayey, mixed, thermic	Lithic Argiustolls	Mollisols.
Stephen	Clayey, mixed, thermic, shallow	Typic Haplustolls (Calciustolls).	Mollisols.
Tarrant	Clayey-skeletal, montmorillonitic, thermic	Lithic Calciustolls	Mollisols.
Trinity	Fine, montmorillonitic (calcareous), thermic	Vertic Haplaquolls	Mollisols.
Venus	Fine-loamy, mixed, thermic	Typic Calciustolls	Mollisols.
Wilson	Fine, montmorillonitic, thermic	Vertic Ochraqualfs	Alfisols.

observable and measurable. The properties are chosen, however, so that the soils of similar genesis, or mode of origin, are grouped. In table 7, the soil series of Bell County are placed in some categories of the classification system. Classes of the system are briefly defined in the following paragraphs.

ORDER: Ten soil orders are recognized. The properties used to differentiate among soil orders are those that tend to give broad climatic groupings of soils. The three exceptions to this are the Entisols, Inceptisols, and Histosols, which occur in many

that have pans that interfere with growth of roots, movement of water, or both; and those that have thick, dark-colored surface horizons. The features used are the self-mulching properties of clay, soil temperature, major differences in chemical composition (mainly calcium, magnesium, sodium, and potassium), dark-red and dark-brown colors associated with basic rocks, and the like. The names of great groups have three or four syllables and are made by adding a prefix to the name of the suborder.

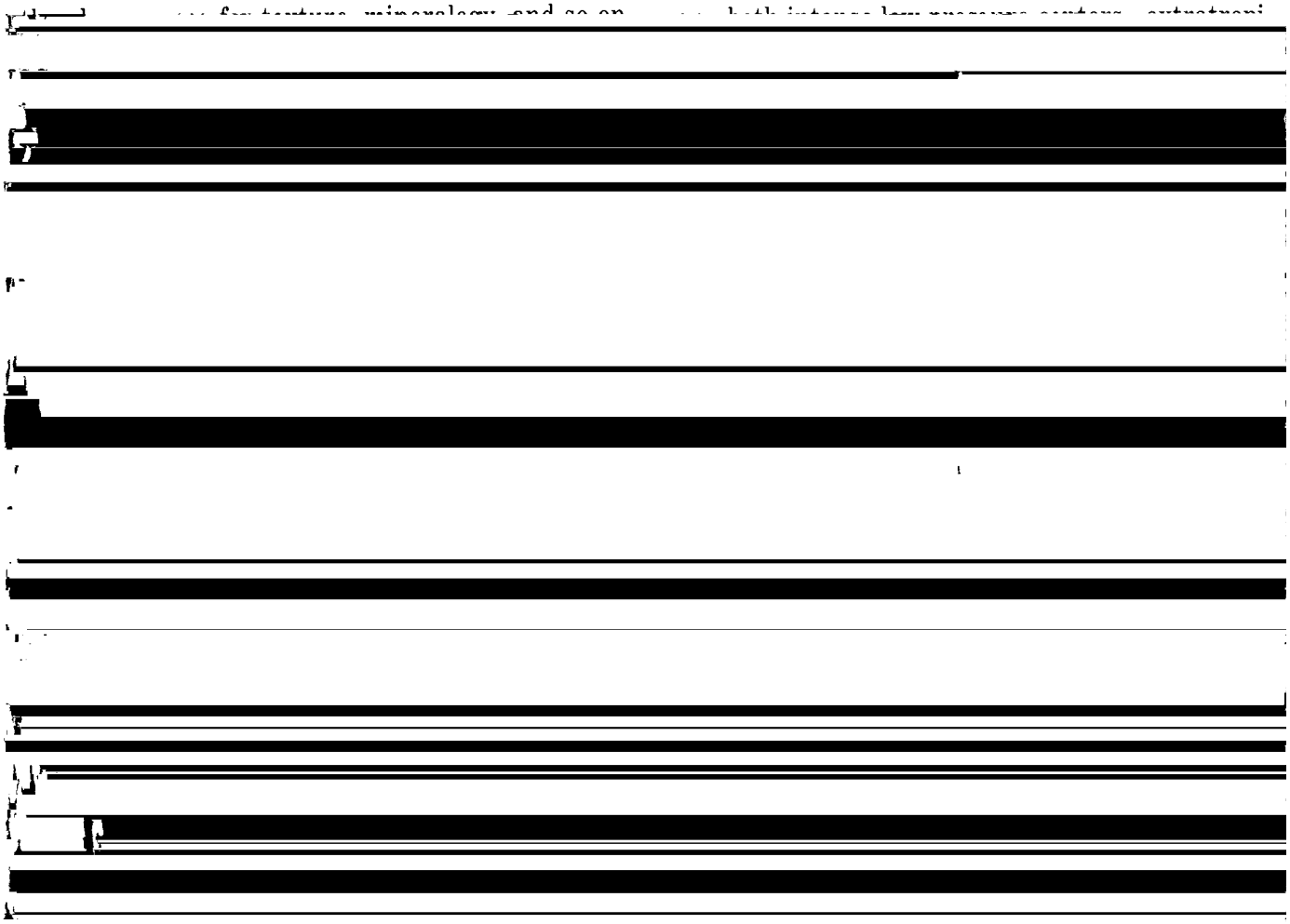
SUBGROUP: Each great group is divided into

TABLE 8.—*Temperature*

[Data recorded at Temple, elevation

Month	Temperature[1]				Precipitation				
						Probability, in percent, of receiving—			
	Average daily maximum	Average monthly maximum	Average daily minimum	Average monthly minimum	Average total	0 or trace	0.50 inch or more	1 inch or more	2 inches or more
	°F	°F	°F	°F	In	Pct	Pct	Pct	Pct
January	58.3	78.4	36.2	18.8	2.35	(3)	90	74	48
February	62.1	80.7	39.4	23.5	2.62	(3)	95	83	55
March	70.4	85.7	45.7	29.6	2.01	(3)	92	76	48
April	78.5	90.8	55.2	39.6	3.67	(3)	96	89	70
May	84.9	93.8	63.5	50.9	4.65	(3)	98	94	79
June	92.2	98.3	70.3	62.1	3.17	1	90	74	55
July	96.1	102.3	73.0	68.0	1.96	(3)	86	70	40
August	97.5	104.3	72.7	66.4	1.97	5	80	62	38
September	91.6	100.3	67.2	54.6	3.15	(3)	88	75	55
October	82.2	92.7	57.2	42.2	2.73	3	82	82	45
November	69.3	85.3	45.8	30.3	2.93	(3)	85	70	40
December	61.5	78.9	39.9	23.8	2.66	1	90	80	50
Year	78.7		55.4		33.87				

[1] Average length of record, 35 years.
[2] Average length of record, 12 years.
[3] Less than 1 percent.



and precipitation

700 feet; period of record 1933–67]

Precipitation—Continued									
Probability, in percent, of receiving—Continued				Average number of days when rainfall is—[1]			Snow and sleet		
3 inches or more	4 inches or more	5 inches or more	6 inches or more	0.10 inch or more	0.50 inch or more	1 inch or more	Average total[1]	Maximum[1]	Greatest depth[2]
Pct	*Pct*	*Pct*	*Pct*				*In*	*In*	*In*
30	18	10	4	4	1	1	0.8	8.0	5
34	18	9	4	5	2	1	.6	9.0	5
30	18	10	2	3	1	([4])	.1	3.5	0
50	34	23	15	6	2	2	0	0	0
59	45	31	21	5	2	2	0	0	0
40	28	20	15	4	2	1	0	0	0
20	10	5	4	2	1	1	0	0	0
20	10	5	4	3	1	1	0	0	0
38	28	20	15	5	2	1	0	0	0
30	20	18	10	4	2	1	0	0	0
25	15	10	5	5	2	1	.2	6.0	([5])
30	20	10	5	5	1	1	([5])	([5])	0
				51	19	13	1.7	9.0	5

[4] Less than one-half day.
[5] Trace.

days per month in April and 7 days in May, the peak month for thunderstorms.

In summer, daytime temperatures are high and the day-to-day weather seldom changes. Thundershowers occur less frequently in summer than in spring, but they help to break the uniformity of the hot weather. Early morning and evening temperatures are normally pleasant, and midday temperatures are hot. The highest temperature on record is 112°, which occurred August 11, 1947.

In fall, temperatures continue to be high into September. The daily maximum is 90° or above about 57 percent of the time. The amount of precipitation increases in September. After mid-October, more cold fronts move through the area and the weather becomes more varied. Thundershowers become less frequent, temperatures more moderate, and windspeeds relatively low.

The average length of the freeze-free period in Bell County is 260 days. The average date of the last occurrence of 32° in spring is March 9, and the first

ity). 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 capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil.

Calcareous soil. A soil containing enough calcium carbonate (often with magnesium carbonate) to effervesce (fizz) visibly when treated with cold, dilute hydrochloric acid.

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 clay on the surface of a soil aggregate. Synonyms: clay coat, clay skin.

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

Coarse fragments. Mineral or rock particles more than 2 millimeters in diameter.

Cobblestone. A rounded or partly rounded fragment of rock 3 to 10 inches in diameter.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrations of compounds, or of soil grains cemented together. The composition of some concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are examples of material commonly

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 and brittle; little affected by moistening.

Contour farming. Plowing, cultivating, planting, and harvesting in rows that are at right angles to the natural direction of the slope or that are parallel to terrace grade.

Diversion, or diversion terrace. A ridge of earth, generally a terrace, that is built to divert runoff from its natural course and, thus, to protect areas downslope from the effects of such runoff.

Erosion. The wearing away of the land surface by wind (sandblast), running water, and other geological agents.

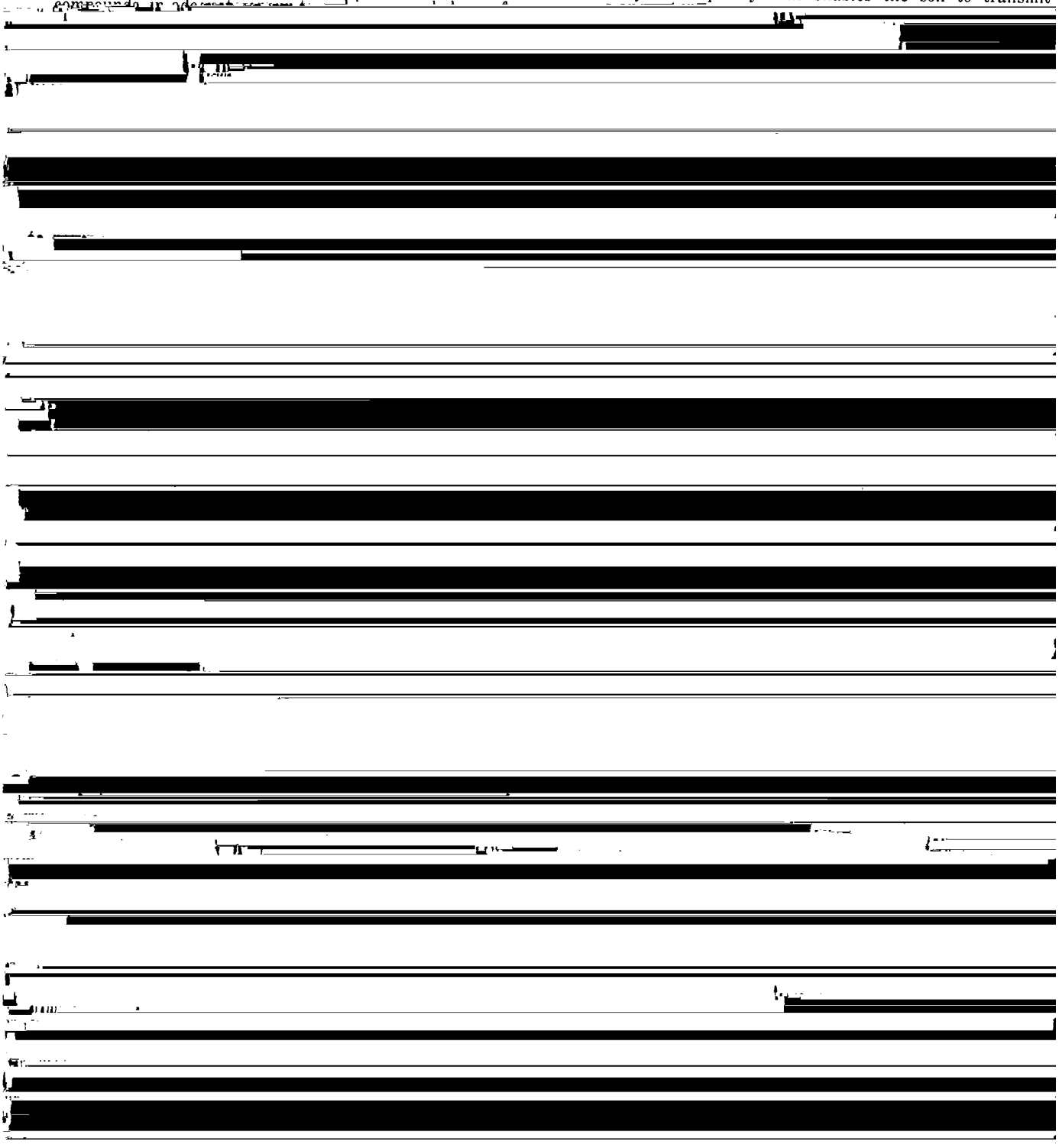
Fertility, soil. The quality of a soil that enables it to provide

Mottling, soil. Irregularly marked with spots of different colors that vary in number and size. Mottling in soils usually indicates poor aeration and lack of 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 these: *fine*, less than 5 millimeters (about 0.2 inch) in diameter along the greatest dimension; *medium*, ranging from 5 millimeters to 15 millimeters (about 0.2 to 0.6 inch) in diameter along the greatest dimension; and *coarse*, more than 15 millimeters (about 0.6 inch) in diameter along the greatest dimension.

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

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

Permeability. The quality that enables the soil to transmit



are as follows: I (2.0 to 0.2 millimeter); II (0.2 to 0.02 millimeter); III (0.02 to 0.002 millimeter); IV (less than 0.002 millimeter).

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

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

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

Substratum. Technically, the part of the soil below the solum.

Surface soil. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, about 5 to 8 inches in thickness. The plowed layer.

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 may soak into the soil or flow slowly to a prepared outlet without harm. Terraces in fields are generally built so they can be farmed. Terraces intended mainly for drainage have a deep channel that is maintained in permanent sod.

Terrace (geological). An old alluvial plain, ordinarily flat or undulating, bordering a river, lake, or the sea. Stream terraces are frequently called second bottoms, as contrasted to flood plains, and are seldom subject to overflow. Marine terraces were deposited by the sea and are generally wide.

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 loam*, *silt*, *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."

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

Topsoil. A presumed fertile soil or soil material, or one that responds to fertilization, ordinarily rich in organic matter, used to topdress roadbanks, lawns, and gardens.

Water table. The highest part of the soil or underlying rock material that is wholly saturated with water. In some places an upper, or perched, water table may be separated from a lower one by a dry zone.

GUIDE TO MAPPING UNITS

For a full description of a mapping unit, read both the description of the mapping unit and that of the soil series to which the mapping unit belongs. In referring to a capability unit, a pasture and hay group, or a range site read the introduction to the section it is in for general information about its management. Dashes in a column mean that the mapping unit was not placed in that particular grouping. Other information is given in tables as follows:

Acreage and extent, table 1, page 5.
Predicted yields, table 2, page 42.
Suitability of the soils for wildlife, table 3, page 49.
Recreational development, table 4, page 52.
Engineering uses of soils, tables 5 and 6, pages 56 through 67.

Map symbol	Mapping unit	Page	Capability unit		Pasture and hay group		Range site	
			Symbol	Page	Symbol	Page	Name	Page
AlC	Altoga silty clay, 2 to 5 percent slopes	6	IIIe-3	37	7C	41	Clay Loam	45
AlE2	Altoga silty clay, 5 to 10 percent slopes, eroded	6	VIe-2	39	7D	41	Clay Loam	45
AsB	Austin silty clay, 1 to 3 percent slopes	7	IIIe-3	37	7C	41	Clay Loam	45
AsC	Austin silty clay, 3 to 5 percent slopes	7	IVe-2	38	7C	41	Clay Loam	45
AuC	Austin-Urban land complex, 1 to 5 percent slopes	7	--------	--	---	--	----------	--
AxB	Axtell fine sandy loam, 1 to 3 percent slopes	8	IIIe-1	36	8A	41	Claypan Savanna	45
BaA	Bastrop fine sandy loam, 0 to 2 percent slopes	8	IIe-3	35	8C	41	Sandy Loam	47
Be	Bosque clay loam	9	I-1	35	1C	41	Loamy Bottomland	47
Bf	Bosque clay loam, frequently flooded	9	Vw-1	39	1C	41	Loamy Bottomland	47
BkB	Brackett clay loam, 1 to 3 percent slopes	9	IVs-1	39	13A	41	Adobe	44
BnE	Brackett-Urban land complex, 3 to 12 percent slopes	10	--------	--	---	--	----------	--
BRE	Brackett association, rolling	10	VIIs-2	40	---	--	Adobe	44
ByA	Branyon clay, 0 to 1 percent slopes	11	IIw-1	36	7A	41	Blackland	44
ByB	Branyon clay, 1 to 3 percent slopes	11	IIe-1	35	7A	41	Blackland	44
BzA	Burleson clay, 0 to 1 percent slopes	12	IIw-1	36	7A	41	Blackland	44
BzB	Burleson clay, 1 to 3 percent slopes	12	IIe-1	35	7A	41	Blackland	44
ChB	Chigley gravelly fine sandy loam, 1 to 3 percent slopes	12	IIIe-1	36	8A	41	Claypan Savanna	45
CrA	Crawford clay, 0 to 1 percent slopes	13	IIIs-1	38	7A	41	Deep Redland	46
CrB	Crawford clay, 1 to 3 percent slopes	13	IIIe-5	38	7A	41	Deep Redland	46

Map symbol	Mapping unit	Page	Capability unit		Pasture and hay group		Range site	
			Symbol	Page	Symbol	Page	Name	Page
HgD2	Heiden-Ferris complex, 3 to 8 percent slopes, eroded	18	IVe-1	38	7B	41	Blackland	44
HoA	Houston Black clay, 0 to 1 percent slopes	20	IIw-1	36	7A	41	Blackland	44
HoB	Houston Black clay, 1 to 3 percent							

Map symbol	Mapping unit	Page	Capability unit		Pasture and hay group		Range site	
			Symbol	Page	Symbol	Page	Name	Page
SuC	Stephen-Urban land complex, 1 to 6 percent slopes	30	--------	--	---	--	----------	--
TAD	Tarrant association, undulating	31	VIIs-3	40	---	--	Low Stony Hill	47
TPF	Tarrant-Purves association, rolling	31	VIIs-1	39	---	--	Low Stony Hill	47
Tr	Trinity clay	32	IIw-1	36	1A	40	Clayey Bottomland	45
Ty	Trinity clay, frequently flooded	32	Vw-1	39	1A	40	Clayey Bottomland	45
Ub	Urban land	32	--------	--	---	--	----------	--
VeA	Venus clay loam, 0 to 1 percent slopes	33	I-1	35	7C	41	Clay Loam	45
VeB	Venus clay loam, 1 to 3 percent slopes	33	IIe-2	35	7C	41	Clay Loam	45
VeC	Venus clay loam, 3 to 5 percent slopes	33	IIIe-3	37	7C	41	Clay Loam	45
WcA	Wilson clay loam, 0 to 1 percent slopes	34	IIIw-1	38	7H	41	Claypan Prairie	45
WcB	Wilson clay loam, 1 to 3 percent slopes	34	IIIe-4	37	7H	41	Claypan Prairie	45
WcC	Wilson clay loam, 3 to 5 percent slopes	34	IVe-4	39	7H	41	Claypan Prairie	45

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