SOIL SURVEY OF

Carter County, Oklahoma

United States Department of Agriculture
Soil Conservation Service

In cooperation with

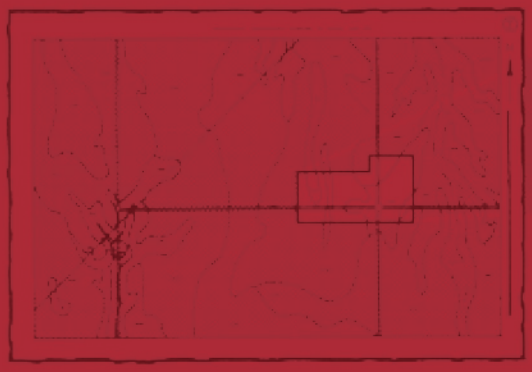
Oklahoma Agricultural Experiment Station

HOW TO USE

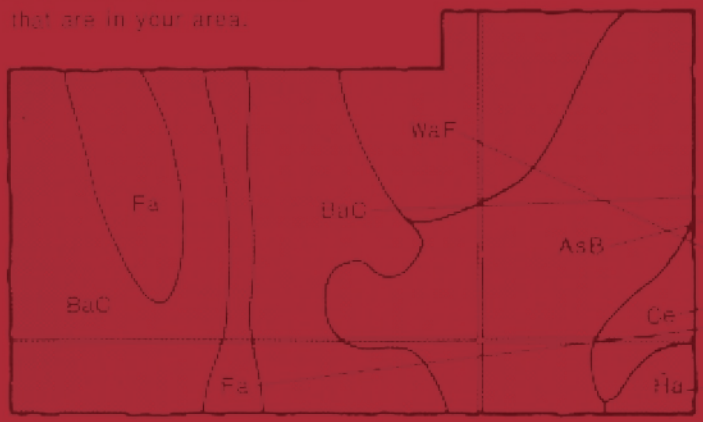
1. Locate your area of interest on the "Index to Map Sheets"

2. Note the number of the map sheet and turn to that sheet.

3. Locate your area of interest on the map sheet.



4. List the map unit symbols that are in your area.



Symbols

AsB
BaC
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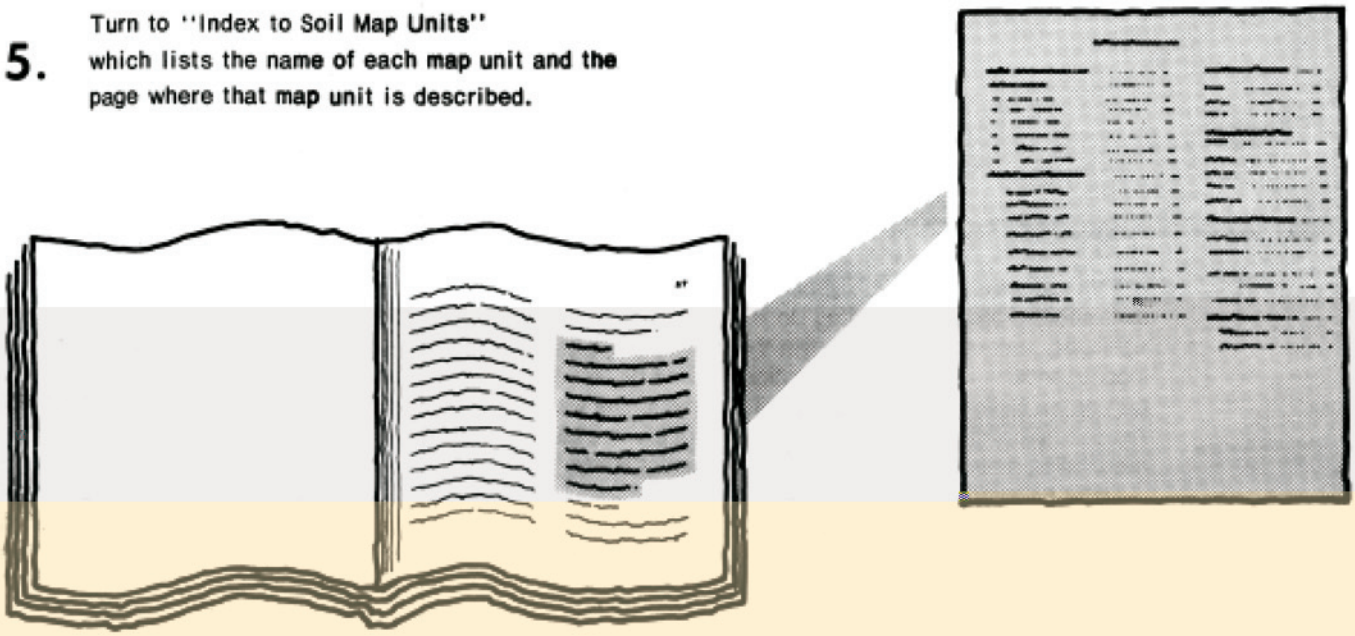
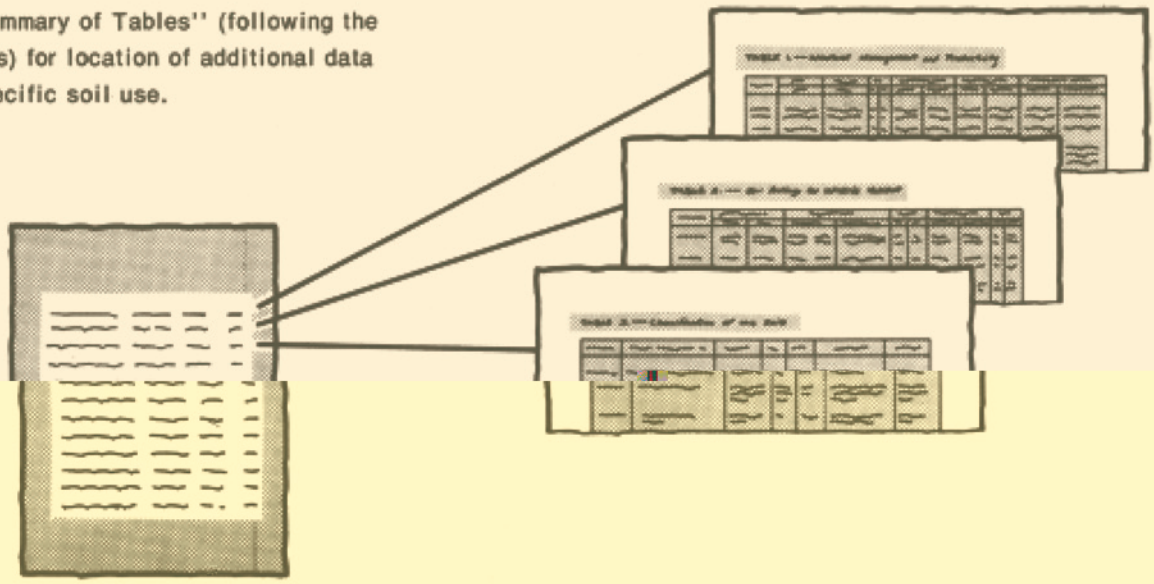
THIS SOIL SURVEY

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



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



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

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

Major fieldwork for this soil survey was completed in the period 1968-75. Soil names and descriptions were approved in 1975. Unless otherwise indicated, statements in the publication refer to conditions in the survey area in 1975. This survey was made cooperatively by the Soil Conservation Service and the Oklahoma Agricultural Experiment Station. It is part of the technical assistance furnished to the Arbuckle Conservation District, Carter County.

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

Contents

Issued June 1979

Index to Map Units

Summary of Tables

Foreword

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

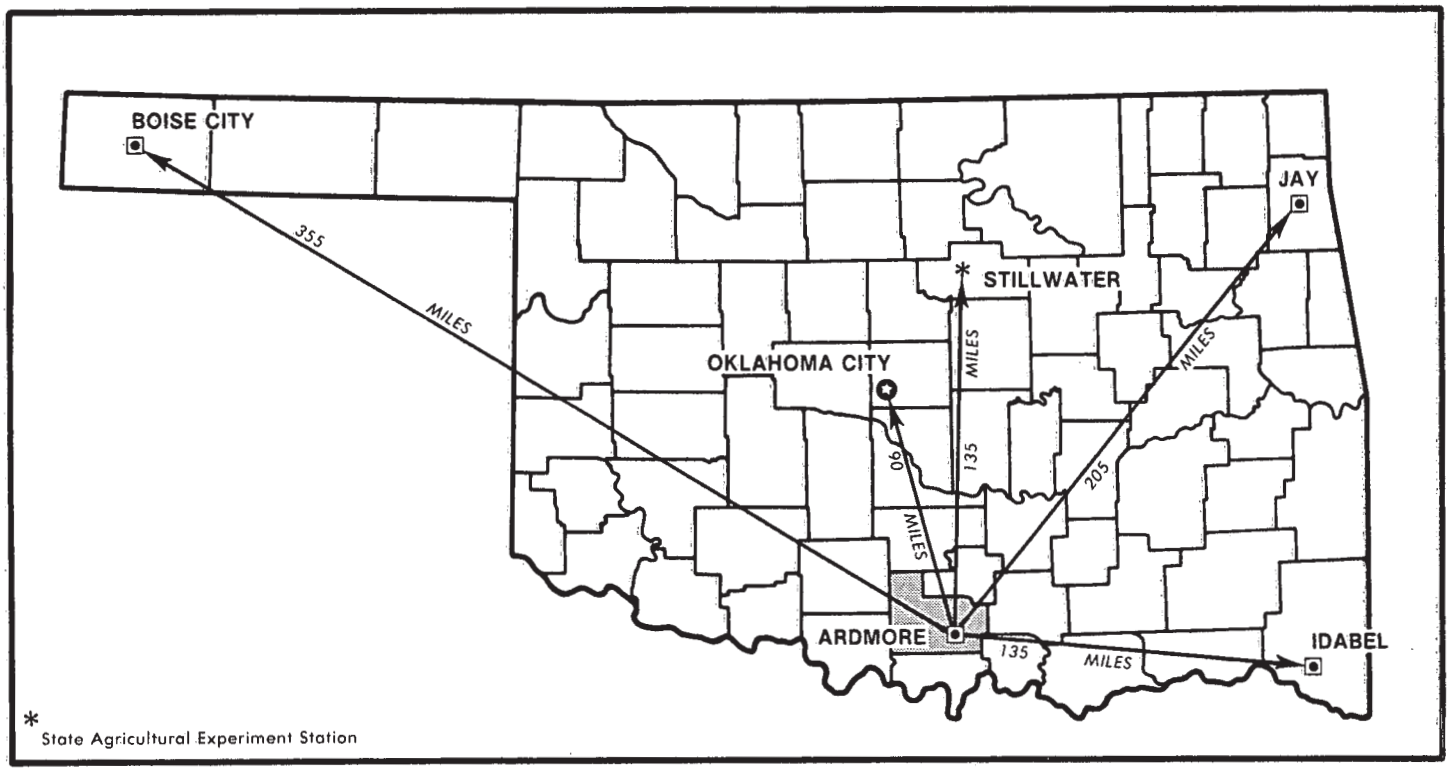
This soil survey has been prepared for many different users. Farmers, ranchers, foresters, and agronomists can use it to determine the potential of the soil and the management practices required for food and fiber production. Planners, community officials, engineers, developers, builders, and homebuyers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

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

These and many other soil properties that affect land use are described in this soil survey. Broad areas of soils are shown on the general soil map; the location of each kind of soil is shown on detailed soil maps. Each kind of soil in the survey area is described, and much information is given about each soil for specific uses. Additional information or assistance in using this publication can be obtained from the local office of the Soil Conservation Service or the Cooperative Extension Service.

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

Roland R. Willis
State Conservationist
Soil Conservation Service



Location of Carter County in Oklahoma.

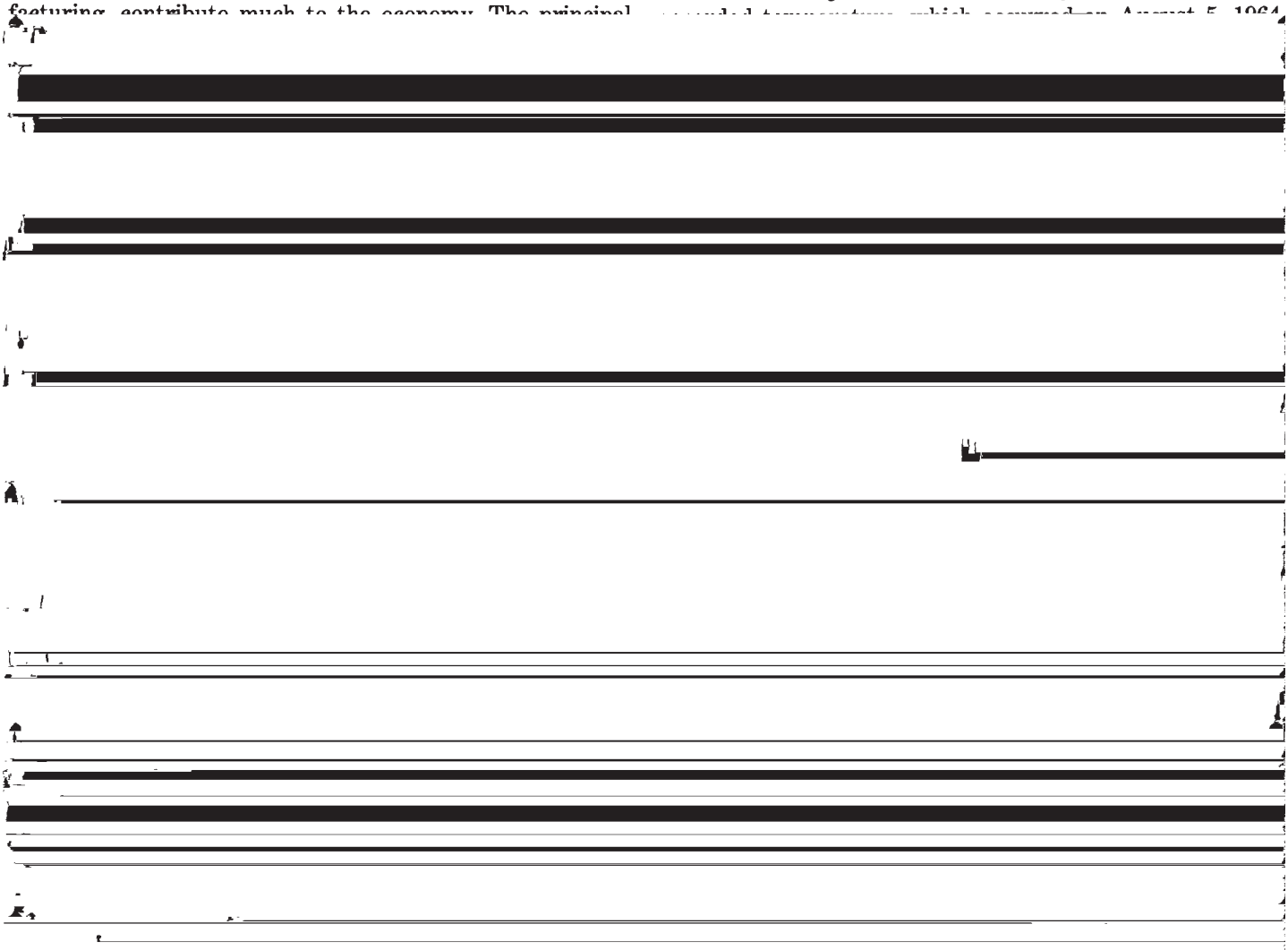
SOIL SURVEY OF CARTER COUNTY, OKLAHOMA

By Gordon E. Moebius and Armine J. Maxwell, Soil Conservation Service

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

CARTER COUNTY is in the south-central part of Oklahoma (see facing page). It has an area of 535,680 acres, or 837 square miles. The county seat is Ardmore, which had a population of about 20,881 in 1970.

The county is largely rural. Raising beef cattle is the chief enterprise. Oil and gas production, as well as manufacturing, contribute much to the economy. The principal



farm crops are alfalfa, winter wheat, peanuts, and grain sorghums. Most of the crops are grown in the northern

In winter the average temperature is 46 degrees F, and the average daily minimum temperature is 34 degrees. The lowest temperature on record, which occurred at Ardmore on January 1, 1962, is 3 degrees. In summer the average temperature is 83 degrees, and the average daily maximum temperature is 94 degrees. The highest recorded temperature, which occurred on August 5, 1964, is 109 degrees.

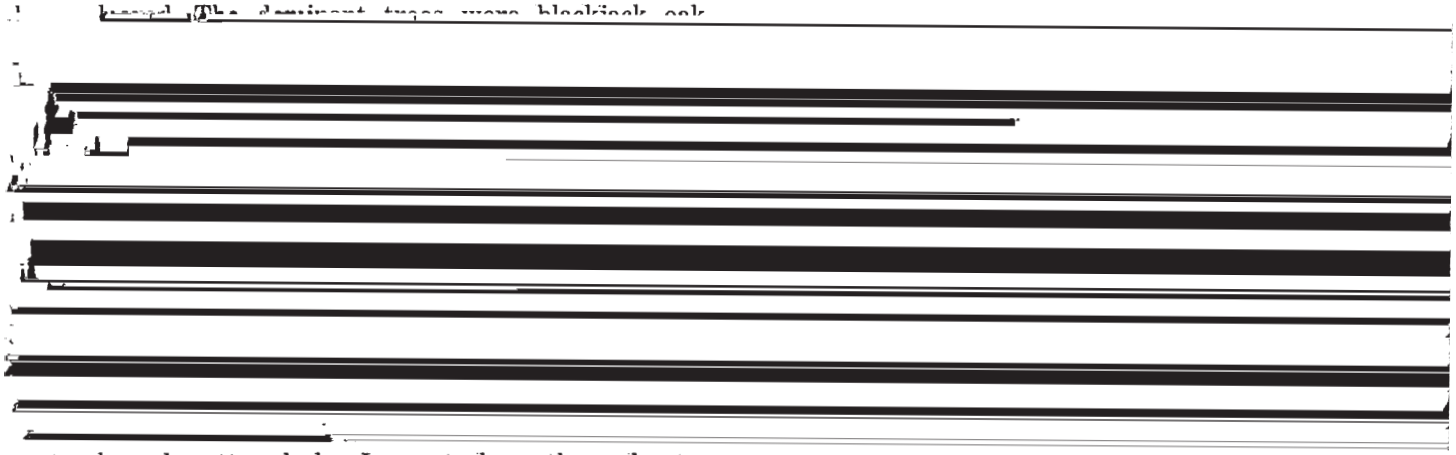
Growing degree days, shown in table 1, are equivalent

Physiography, drainage, and relief

The largest lakes in the county are Lake Murray, Lake

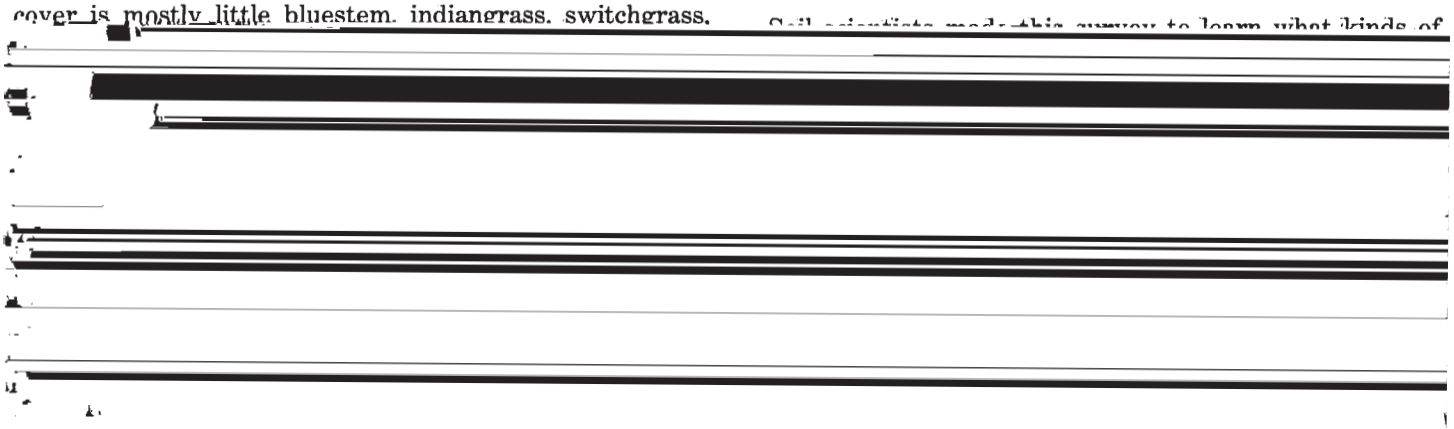
Carter County is dominantly woodland soils and about one-fourth prairie soils. Many areas of wooded soils have

Lake. There are about 60 small watershed lakes. Several more are to be constructed in the near future.



post oak, and scattered elm. In most places the understory is tall native grasses. On the prairie soils the plant cover is mostly little bluestem, indiangrass, switchgrass,

How this survey was made



available to different groups of users, among them farmers, managers of rangeland and woodland, engineers, planners, developers and builders, homebuyers, and those seeking recreation.

General soil map for broad land use planning

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

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

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

Very shallow to deep, loamy or clayey, sloping to steep soils on uplands

The three units in this group make up about 22 percent of Carter County. The soils are used mainly for native range and less extensively for tame pasture.

1. Kiti-Rock outcrop

Shallow and very shallow, sloping to steep, loamy soils over limestone, and rock outcrop; on uplands

This unit makes up about 7 percent of the county. It is about 54 percent Kiti soils, 16 percent Rock outcrop, and 30 percent minor soils.

Kiti soils are shallow and very shallow, sloping to steep, and well drained. They are loamy and have coarse limestone fragments throughout. Rock outcrop is mostly limestone.

Minor in this unit are Heiden, Renfrow, and Grainola soils, and on narrow flood plains, Bergstrom soils. Pits is also in this map unit.

Because the soils are shallow and steep, nearly all the acreage is used as range.

The chief management concern is the invasion of brush and weeds in areas that have been poorly managed.

2. Windthorst-Weatherford-Darnell

Deep to shallow, sloping to moderately steep, loamy soils that have a loamy or clayey subsoil over sandstone and shale; on uplands

This unit makes up about 10 percent of the county. It is about 45 percent Windthorst soils, 24 percent Weatherford soils, 8 percent Darnell soils, and 23 percent minor soils.

Windthorst soils are deep, sloping to moderately steep, and moderately well drained. They are loamy and have a clayey subsoil.

Weatherford soils are deep, sloping to strongly sloping, and well drained. They are loamy throughout.

Darnell soils are shallow, sloping to moderately steep, and well drained to somewhat excessively drained. They are loamy throughout.

Minor in this unit are Woodford and Chigley soils.

Nearly all the acreage is used as range.

The chief management concerns are protecting the range from fire and controlling grazing in order to reduce water erosion.

3. Steedman-Tamford-Heiden

Moderately deep and deep, sloping to moderately steep, loamy and clayey soils that have a clayey subsoil over clayey sediment or shale; on uplands

This unit makes up about 5 percent of the county. It is about 34 percent Steedman soils, 30 percent Tamford soils, 25 percent Heiden soils, and 11 percent minor soils.

Steedman soils are moderately deep, sloping to moderately steep, and moderately well drained. They are loamy and have a clayey subsoil.

Tamford and Heiden soils are deep, sloping to strongly sloping, and well drained. Tamford soils are loamy and have clayey underlying layers. Heiden soils are clayey throughout.

Minor in this unit are Grainola and Woodford soils, and on narrow flood plains, Bunyan and Bergstrom soils.

Nearly all the acreage is used for range and tame pasture.

The chief management concerns are controlling grazing, maintaining fertility, and reducing water erosion.

Deep, loamy or sandy, nearly level to sloping soils on uplands

The four units in this group make up about 65 percent of Carter County. The soils are used chiefly for tame pasture and to a smaller extent for native range and cultivated crops. In most areas they are suited to cultivated crops.

4. Normangee-Wilson-Durant

Deep, nearly level to gently sloping, loamy soils that have a clayey subsoil over clayey sediment or shale; on uplands

This unit makes up about 17 percent of the county. It is about 31 percent Normangee soils, 14 percent Wilson soils, 12 percent Durant soils, and 43 percent minor soils.

Normangee soils are deep, very gently sloping and gently sloping, and moderately well drained. They are

Eufaula soils are deep, mostly gently sloping to sloping, and somewhat excessively drained. They have a thick sandy surface layer and a loamy or sandy subsoil.

Minor in this unit are Weatherford and Windthorst soils, and on narrow flood plains, Kemp, Tullahassee, and

Minor in this unit are the strongly sloping to moderately steep Konawa soils, and on narrow flood plains, Pulaski and Bunyan soils.

Nearly all the acreage is used for cultivated crops and tame pasture. The main crops are peanuts, grain sorghum, and forage sorghum.

The chief concerns of management are maintaining soil structure and fertility and controlling soil blowing and water erosion.

9. Pulaski-Bunyan-Bergstrom

Deep, nearly level and very gently sloping, loamy soils over loamy or sandy sediment; on flood plains

This unit makes up about 11 percent of the county. It is about 34 percent Pulaski soils, 23 percent Bunyan soils, 12 percent Bergstrom soils, and 31 percent minor soils.

Pulaski and Bunyan soils are deep, nearly level to gently sloping, and well drained. Bunyan soils are loamy throughout. Pulaski soils are loamy. Below the surface are a few thin sandy layers.

Bergstrom soils are deep, nearly level, and well drained. They have a loamy surface layer and a loamy subsoil.

Minor in this unit are Elandco, Healdton, Miller, Weswood, Watonga, and Yahola soils.

This unit is used mainly for tame pasture and cultivated crops. The main crops are small grain, alfalfa, and forage sorghum.

The chief management concerns are maintaining soil structure and fertility and providing protection against damaging flooding.

Soil maps for detailed planning

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

Preceding the name of each map unit is the symbol that identifies the soil on the detailed soil maps. Each soil description includes general facts about the soil and a brief description of the soil profile. In each description, Soils that have a profile that is almost alike make up a *soil series*. Except for allowable differences in texture of the surface layer or of the underlying substratum, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement in the profile. A soil series commonly is named for a town or geographic feature near the place where a soil of that series was first observed and mapped.

Soils of one series can differ in texture of the surface layer or in the underlying substratum and in slope, erosion, stoniness, salinity, wetness, or other characteristics that affect their use. On the basis of such differences, a soil series is divided into phases. The name of a *soil phase* commonly indicates a feature that affects use or management. For example, Chickasha loam, 2 to 5 percent slopes, eroded, is one of several phases within the Chickasha series.

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

A *soil complex* consists of areas of two or more soils that are so intricately mixed or so small in size that they cannot be shown separately on the soil map. Each area includes some of each of the two or more dominant soils, and the pattern and proportion are somewhat similar in all areas. Kiti-Grainola complex, 5 to 20 percent slopes, is an example.

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

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

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

Soil descriptions

1—Bergstrom silt loam. This is a deep, nearly level, well drained soil that is moderately permeable. It occurs as narrow to wide areas along streams and is occasionally flooded.

In a representative profile the upper 6 inches of the surface layer is grayish brown, moderately alkaline silt loam. The lower 18 inches is dark grayish brown, moderately alkaline silt loam. The next 31 inches is brown, moderately alkaline silty clay loam. The underlying layer is reddish brown, moderately alkaline silty clay loam.

The soil is high in natural fertility, organic matter content, and available water capacity. It is alkaline throughout.

About 15 percent of this map unit is included areas of soils that are noncalcareous in the surface layer and more sandy in the upper 40 inches but are otherwise similar to the Bergstrom soil. About 5 percent is areas where the soil is lighter colored within 10 to 20 inches of the surface.

The potential is high for most crops commonly grown in the county. The main crops are small grain, alfalfa, grain sorghum, and tame pasture.

The chief concerns in management are flooding, soil structure, and fertility. Flooding is a hazard in most years. The cropping system should provide adequate amounts of residue. Excessive tillage should be avoided.

The potential is low for urban use of this soil because of the flood hazard in most years. Major flood control measures are needed. Capability subclass IIw; Loamy Bottomland range site.

2—Bergstrom silty clay loam. This is a deep, nearly level, well drained soil on flood plains. It formed in smooth, narrow to wide areas along streams, under a cover of scattered trees and tall native grasses. It is occasionally flooded.

Typically, the upper 14 inches of the surface layer is dark gray heavy silty clay loam. The lower 20 inches is grayish brown, moderately alkaline silty clay loam. The next 26 inches is brown, moderately alkaline silty clay loam.

This soil is high in natural fertility and organic matter content. It is moderately alkaline throughout. It has good tilth if well managed. Permeability is moderate, and the available water capacity is high.

About 15 percent of this map unit is included areas of Bergstrom silt loam and 5 percent areas of Elandco soils. About 5 percent is areas where the soil is redder in the lower part but is otherwise similar to the Bergstrom soil.

The potential is high for row crops, small grain, pasture, and hay.

Tilth can be maintained by returning ample crop residue to the soil. Timely tillage at the proper soil moisture content helps maintain structure. The main concern in management is protecting the soil from erosion during periods of occasional flooding. A plant cover helps reduce soil losses.

The potential is low for most urban uses. The flood hazard, moderate shrink-swell potential, and low strength are difficult to overcome. Major flood prevention measures and special engineering design are needed. Capability subclass IIw; Loamy Bottomland range site.

3—Bunyan loam. This is a deep, nearly level, well drained soil that is moderately permeable. It occurs as narrow to wide areas on smooth flood plains and is occasionally flooded for brief periods. Slopes are 0 to 1 percent.

In a representative profile the surface layer is dark yellowish brown, slightly acid loam 10 inches thick. The next 14 inches is yellowish brown, mildly alkaline fine sandy loam. The next 26 inches is grayish brown, moderately alkaline loam. The underlying material is yellowish brown, mildly alkaline loam.

Depth to bedrock is more than 72 inches. Available water capacity is high in the upper 40 inches.

About 15 percent of this map unit is included areas where the soil is reddish brown and dark reddish gray in the upper part but is otherwise similar to the Bunyan soil. About 5 percent is areas of Pulaski soils and about 5 percent areas of a soil that is similar to Bunyan but has a perched water table between depths of 3 and 5 feet. Also included are areas of a soil that is similar to this soil but is calcareous below a depth of 10 inches.

The potential is high for crops. Tame pasture, forage sorghum, and small grain are the chief crops. Grain sorghum, peanuts, and alfalfa hay are also grown.

The main concerns in management are flooding and soil structure. Returning crop residue contributes to good soil structure and intake of water. Minimum tillage is needed. A plant cover is needed during flooding late in fall and in spring to prevent excessive soil loss. The best protection is well managed tame pasture or woodland.

The potential is very low for urban use. Flooding is the main limitation. Major flood control is needed. Capability subclass IIw; Loamy Bottomland range site.

4—Burleson clay, 0 to 1 percent slopes. This deep, moderately well drained, nearly level soil occurs as broad smooth areas on uplands.

Typically, the upper 40 inches is dark gray and very dark gray, moderately alkaline clay. The next 13 inches is gray, moderately alkaline silty clay. The underlying layer is grayish brown, moderately alkaline silty clay.

This soil has moderate fertility and organic matter content. It is typically moderately alkaline throughout. Permeability is very slow, and the available water capacity is high. The soil has fair tilth but can be tilled within only a limited range of moisture content. The root zone is deep but difficult to penetrate.

About 10 to 20 percent of this map unit is included areas of Wilson and Heiden soils and areas where the surface layer is calcareous. Areas are generally less than 5 acres.

This soil is suited to hay and pasture. The potential is only medium for small grain and row crops. Tilth can be maintained or improved by returning crop residue. The erosion hazard is slight.

The potential is medium for most urban use because of the low strength and high shrink swell potential, which can be overcome only by special engineering design. The subsoil percolates slowly. The moisture level in the surface layer is at or near the field capacity from December through March in most years. Runoff is slow. Simple surface drains are used to remove excess water. Capability subclass IIw; Blackclay Prairie range site.

5—Chickasha loam, 1 to 3 percent slopes. This is a deep, very gently sloping, well drained soil that is moderately permeable. It occurs as narrow to wide areas on smooth upland ridge crests.

In a representative profile the surface layer is grayish brown, medium acid loam 12 inches thick. The upper 32 inches of the subsoil is reddish yellow, medium acid sandy clay loam. The lower 14 inches is reddish yellow, medium acid sandy clay loam and a few sandstone fragments. The underlying material is grayish sandstone mottled with reddish yellow. It is rippable (fig. 1).

This soil is medium in natural fertility and organic matter content. It is typically medium acid or slightly acid throughout. It has good tilth and can be worked throughout a wide range of moisture content. The available water capacity is high.

About 20 percent of this map unit is included areas of Zaneis soils, and 5 percent is areas of Renfrow soils. In a few areas the Chickasha soil has a fine sandy loam surface layer.

The potential is high for most crops in the county. The main crops are tame pasture plants, small grain, grain

This soil is medium in natural fertility and organic matter content. It is typically medium acid or slightly acid throughout. It can be easily worked throughout a wide range of moisture content. The available water capacity is high.

About 15 percent of this map unit is included areas of Zaneis soils. About 15 percent is areas of a soil that has a thicker surface layer and subsoil and reddish and grayish mottles in the lower part of the subsoil but is otherwise similar to this Chickasha soil. In a few areas the Chickasha soil has a fine sandy loam surface layer.

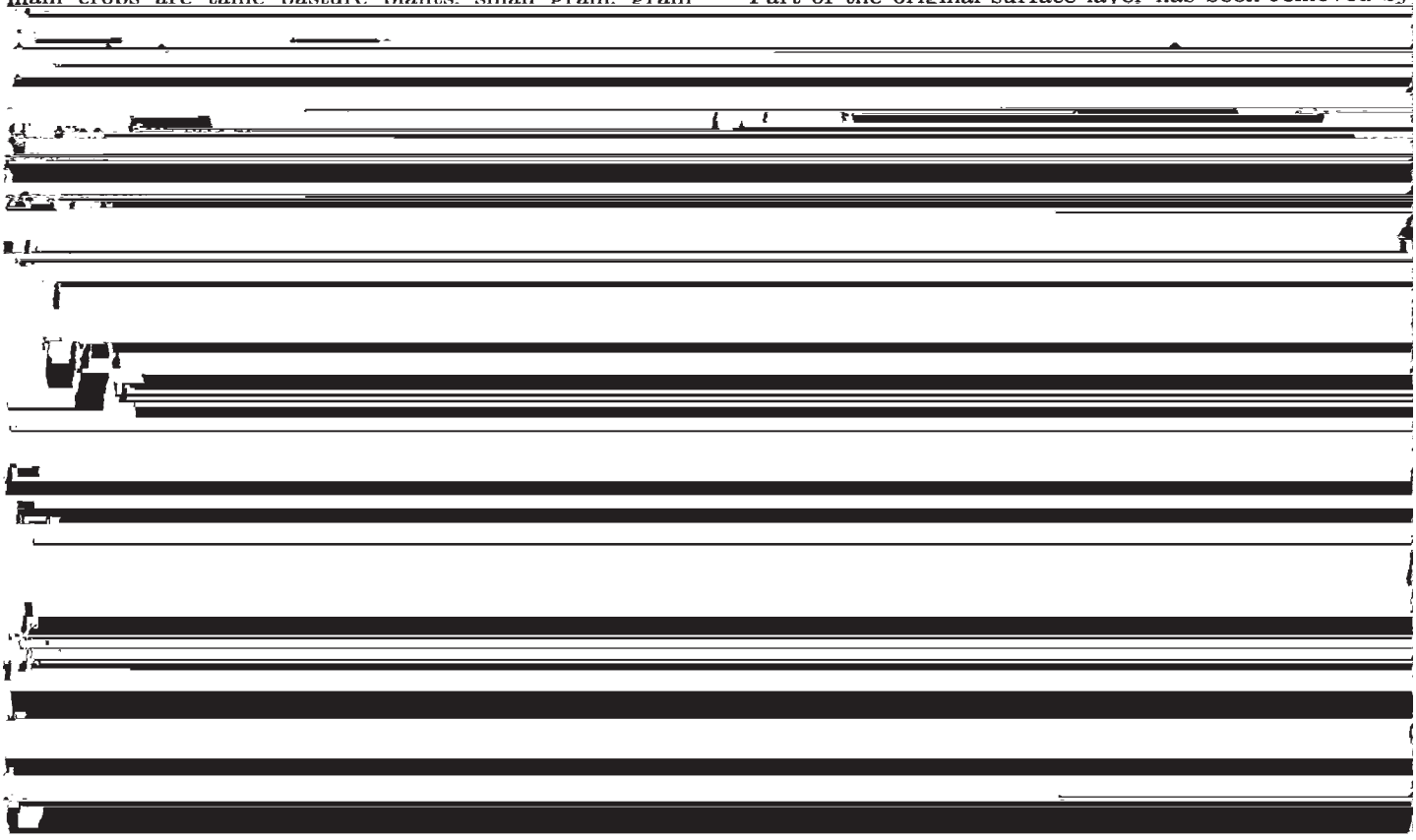
The potential is medium for tame pasture, native grass, and field crops, including peanuts, small grain, and grain or forage sorghum.

The main concerns in management are controlling erosion and maintaining fertility and soil structure. Terraces, contour farming, and crop residue are needed to control water erosion. Minimum tillage is essential. Rowcropping should be avoided unless small grain is a predominant part of the rotation. Tame pasture or native grass provides the best protection against erosion. Fertilization increases plant growth and provides additional crop residue.

The potential is high for most urban uses. Low strength and depth to rock are limitations for some uses. Capability subclass IIIe; Loamy Prairie range site.

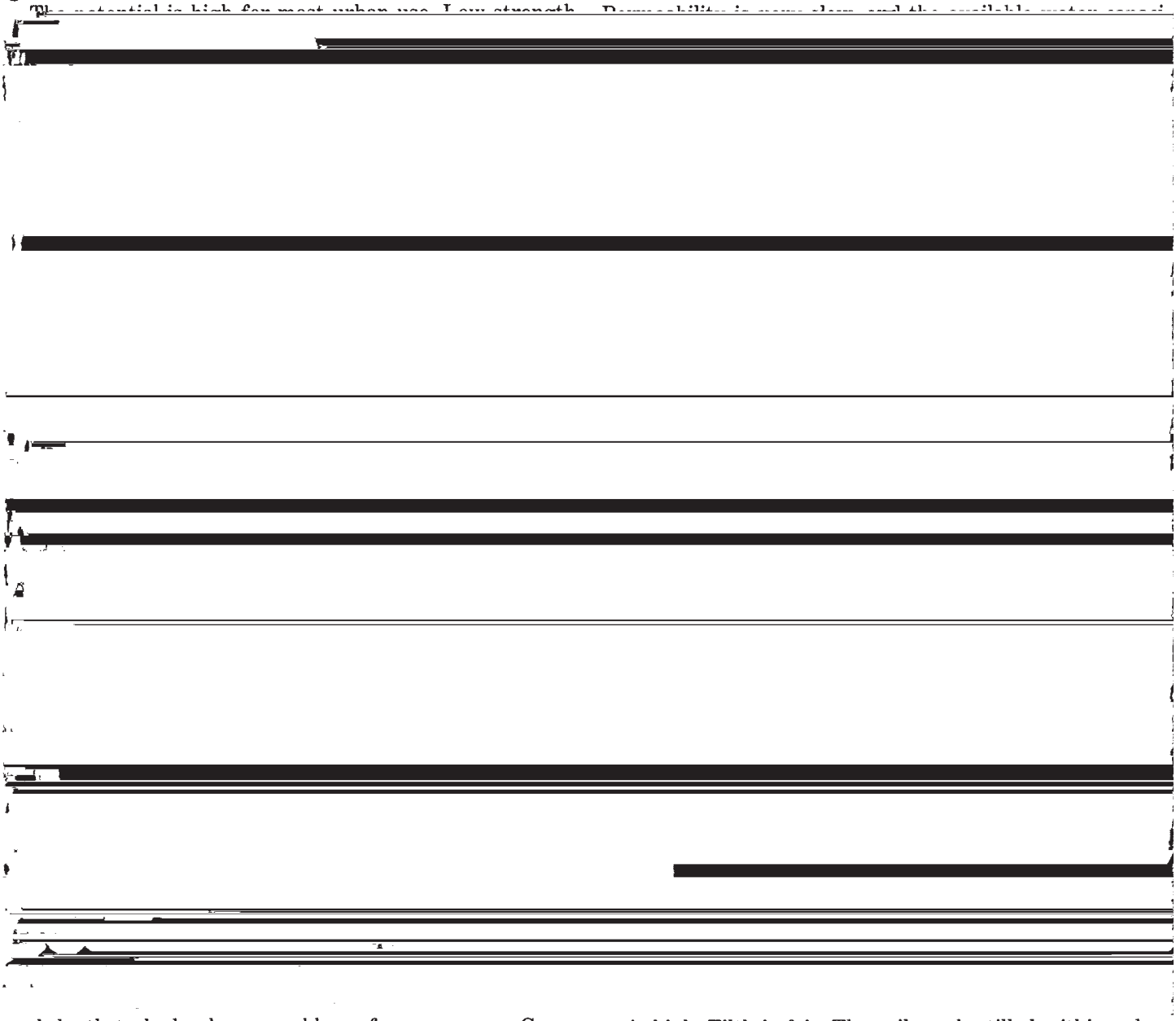
7—Chickasha loam, 2 to 5 percent slopes, eroded. This is a deep, very gently sloping to gently sloping, well drained soil that is moderately permeable. It occurs as narrow to wide areas of smooth upland side slopes.

Part of the original surface layer has been removed by



tour farming provide additional protection. Tame pasture grasses and fertilization reduce the hazard of soil erosion.

This soil is high in natural fertility and organic matter content. It is typically moderately alkaline throughout.



and depth to bedrock are problems for some uses. Capability subclass IIIe; Loamy Prairie range site.

8—**Chigley-Darnell Variant complex, 10 to 30 percent slopes.** This unit consists of small areas of the Chigley soil and the Darnell Variant. These soils are so intermingled that they cannot be shown separately on the soil map. They occur as bands 150 to 350 feet wide on side slopes and foot slopes.

Chigley gravelly loam makes up 30 to 50 percent of the

ty is high. Tilth is fair. The soil can be tilled within only a limited range of moisture content.

About 20 to 25 percent of this map unit is included areas of Heiden, Tamford, and Renfrow soils, all of which are similar to the Clarita soil.

The potential is medium for row crops, small grain, pasture, and hay. Erosion is a hazard in cultivated areas. Minimum tillage, cover crops, high residue crops, grasses and legumes in the cropping system, and terraces reduce

About 15 percent of this map unit is included areas of intermingled Normangee and Wilson soils.

The potential is medium for row crops, small grain, hay, and pasture. Tilth can be maintained or improved by returning ample crop residue to the soil. The erosion hazard is moderate if cultivated crops are grown. Erosion and runoff can be reduced by using terraces, contour farming, and minimum tillage; growing cover crops; and including grasses and legumes in the cropping system.

The potential is medium for most urban use. The clayey subsoil has low strength, high shrink-swell potential, and very slow percolation. Special engineering design is needed. Capability subclass IIe; Loamy Prairie range site.

Depth to bedrock is more than 72 inches. Available water capacity is high.

About 10 percent of this map unit is included areas of Bergstrom soils. About 10 percent is a soil that has grayish or brownish mottles in the subsoil but is otherwise similar to this Elandco soil.

The potential is high for crops. Small grain, alfalfa, grain sorghum, forage sorghum, and tame pasture are the chief crops.

The main concerns in management are protecting the soil from erosion during periods of flooding and maintaining soil structure and fertility. The flood hazard is greatest in spring or fall. A plant cover is needed to

Typically, the surface layer is light brownish gray, slightly acid silt loam about 6 inches thick. The upper 20 inches of the subsoil is dark gray, mildly alkaline and moderately alkaline silty clay. The lower 19 inches is brown, moderately alkaline silty clay. The underlying material is brown, moderately alkaline, massive silty clay.

This soil is low in natural fertility and organic matter content. It has a perched water table near the surface for short periods in winter and spring. Tilth is fair to poor. The clayey subsoil is not easily penetrated by plant roots. Permeability is very slow, and the available water capacity is high.

About 15 percent of this map unit is included areas of soils that have a reddish subsoil and a less clayey subsoil but are otherwise similar to the Healdton soil. About 5 percent is areas of Watonga soils.

The potential is low for small grain because of the high salt concentration near the surface, the slow surface drainage, and the very slow permeability. Tilth can be improved by returning crop residue.

Small grain, forage sorghum, and bermudagrass are commonly grown. Plants that grow during the cool season and are moderately to highly tolerant of sodium salts are successful. Simple surface drainage can remove water in

17—Heiden clay, 5 to 12 percent slopes. This is a sloping or strongly sloping, well drained, very slowly permeable soil on uplands. It occurs as broad areas on gently rolling hills or smooth hillsides.

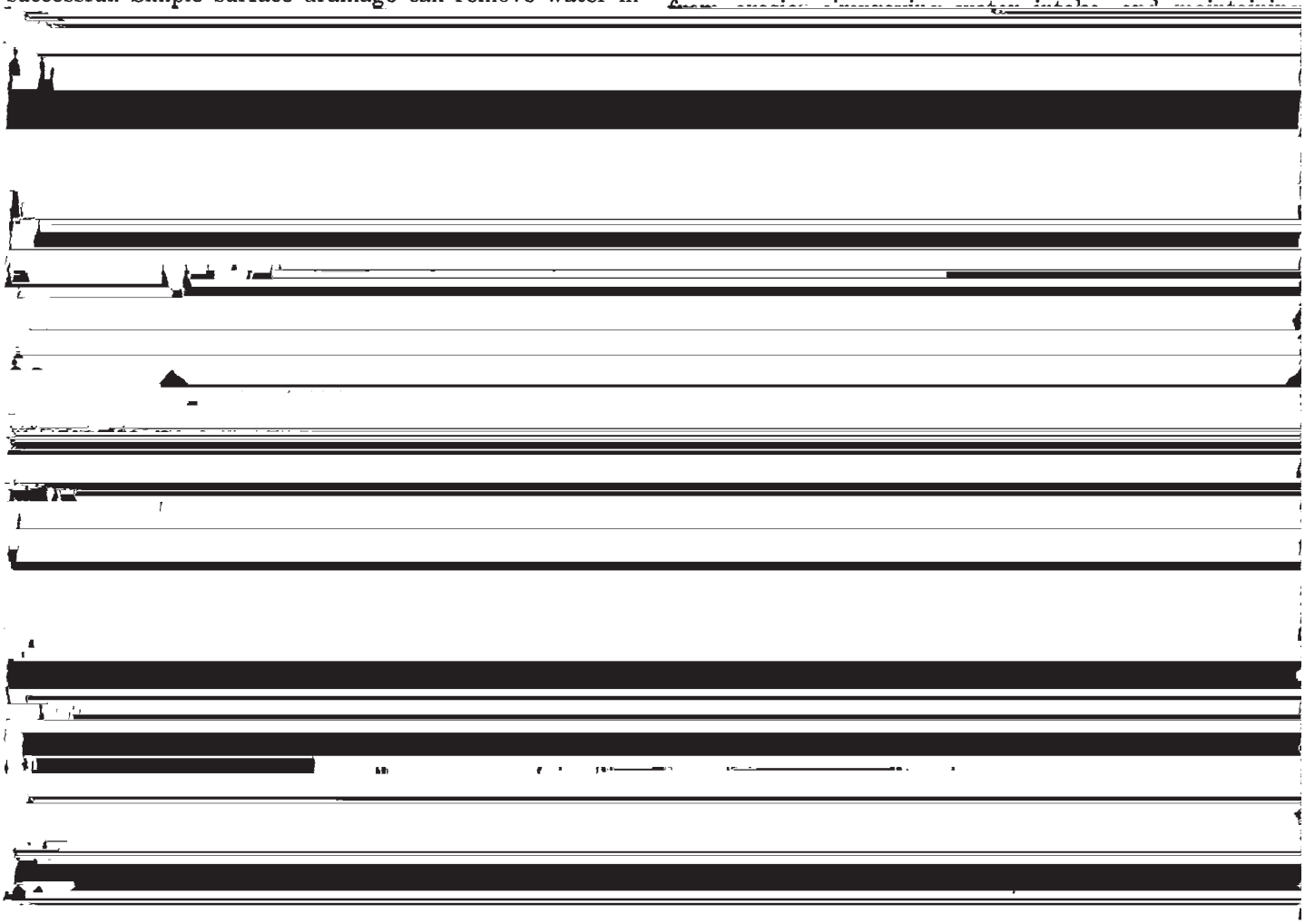
In a representative profile the surface layer is dark grayish brown, mildly alkaline clay 7 inches thick. The next 43 inches is grayish brown and light olive brown, moderately alkaline clay. The underlying material is light yellowish brown, moderately alkaline shaly clay.

This soil is moderately high in natural fertility and organic matter content. It has very slow permeability and a high content of available water.

About 20 percent of this map unit is included areas of soils that have pale olive or yellowish brown layers at depths of 4 to 12 inches but are otherwise similar to the Heiden soil. About 5 percent is areas of a soil that is similar to Heiden soil but has a clay loam surface layer. Another 5 percent is areas of a soil that is similar to this soil but has a surface layer and subsoil less than 40 inches thick.

This soil is used mostly for native pasture. In a few areas tame pasture has been established. The potential is medium for native grasses.

The main concern in management is protecting the soil



strata of brown and very pale brown. Below this is 20 inches of very pale brown, slightly acid loamy fine sand that is mottled with light brownish gray and has thin strata of pale brown and light brownish gray fine sandy loam. The underlying material to a depth of 65 inches is grayish brown, neutral loam that is mottled with light brown and gray and has thin strata of light brown.

Depth to bedrock is more than 72 inches. Available water capacity is moderate to a depth of 40 inches when the water table is below that depth.

About 15 percent of this map unit is included areas of a soil that has a dark grayish brown, grayish brown, or light gray surface layer but is otherwise similar to Tullahassee soil. About 10 percent is areas of Pulaski soils, and 5 percent areas of Bunyan soils.

The potential is high for grazing on both soils in this unit is not suitable for farming. The intermingled Rock outcrop, the shallowness over rock, and the strong slopes are limitations. The potential is medium for native grasses. The quality of native grasses can be maintained through proper grazing and by controlling weeds and protecting the pasture from fire. Grainola soils are subject to severe erosion unless protected by a good grass cover.

The potential is generally low for urban development. The shallow soil, the rocky surface, and the moderately steep slopes are problems that are difficult to overcome for most urban uses. Capability subclass VIIs; Kiti soil in Edgerock range site, Grainola soil in Shallow Prairie range site.

20—Kiti-Rock outcrop complex, 5 to 30 percent slopes. This unit consists of large, sloping to steep areas of Kiti soil and intermingled areas of limestone Rock out-

This soil is moderate in natural fertility, organic matter content, and water holding capacity. It can be worked throughout a wide range of moisture content. The root zone is deep and is easily penetrated by plant roots.

About 10 percent of this map unit is included areas of Dale soils, and 5 percent areas of soils that have a more clayey lower subsoil but are otherwise similar to this soil.

The potential is high for small grain, grain sorghum, forage sorghum, peanuts, tame pasture, and hay. Crops generally respond well to applications of fertilizer.

Management is needed to maintain fertility and soil structure and to protect this soil from blowing. The cropping system should provide adequate amounts of residue. Cover crops should follow clean tilled crops. Depth of tillage should be varied and kept to a minimum.

The potential is high for most urban use. Seepage is severe if the soil is used for sewage lagoons or trench sanitary landfill. Capability class I; Sandy Savannah range site.

22—Konawa fine sandy loam, 1 to 3 percent slopes. This is a deep, very gently sloping, well drained soil that is moderately permeable. It occurs as broad smooth areas of high upland terraces.

In a representative profile the surface layer is brown, neutral (limed) fine sandy loam 10 inches thick. The upper 50 inches of the subsoil is reddish brown, medium acid sandy clay loam. The lower 12 inches is yellowish red, medium acid sandy clay loam.

This soil is moderate in natural fertility, water holding capacity, and organic matter content. It has a deep root zone and can be tilled throughout a wide range of moisture content. The response to fertilization is usually excellent.

About 5 percent of this map unit is included areas of Weatherford soils, about 5 percent areas of a soil that is similar to Konawa but has a more clayey subsoil, and about 5 percent areas of Konawa loamy fine sand.

The potential is high for small grain, forage sorghum, peanuts, and tame pasture.

Management is needed to maintain fertility and soil structure and to reduce soil losses through erosion. Adequate amounts of residue should be returned to the soil. Erosion can be reduced by contour farming and terraces. A cover crop or crop residue is essential in winter and spring to keep the soil from eroding. Excessive tillage should be avoided.

The potential is high for most urban use. Seepage is severe if this soil is used for sewage lagoons or trench sanitary landfill. Capability subclass IIe; Sandy Savannah range site.

23—Konawa fine sandy loam, 8 to 20 percent slopes. This is a deep, strongly sloping to moderately steep soil formed in loamy sediment on high terraces. It is on uplands. It occurs as a long narrow band between broad terraces of different elevations. Slopes are short, generally less than 300 feet. In some places they are smooth. In others they are dissected by small drainageways.

Konawa fine sandy loam makes up about 65 percent of each mapped area. Typically, it is brown, neutral fine sandy loam in the upper 6 inches. The subsurface layer is 7 inches of pale brown, neutral fine sandy loam. The upper 13 inches of the subsoil is reddish brown, neutral sandy clay loam. The next 24 inches is yellowish red, slightly acid sandy clay loam. The lower 22 inches is yellowish red, neutral fine sandy loam.

This soil is moderate in natural fertility, organic matter content, and available water capacity.

About 5 percent of this map unit is included areas of soils that have a 10- to 14-inch surface layer of dark grayish brown fine sandy loam over a reddish brown sandy clay loam subsoil. About 10 percent is areas of a soil that is similar to Konawa but has a fine sandy loam or silty clay loam subsoil. About 5 percent is areas of Konawa loamy fine sand. About 15 percent is areas where 12 to 24 inches of the original soil material has been removed by erosion.

This soil is generally not suited to farming. The potential is low for grasses. The native vegetation is scattered trees and an understory of tall grasses. Tame pasture has been established in some areas. The erosion hazard is severe unless the soil is protected by a permanent plant cover. Bermudagrass or native vegetation that is well managed provides the best protection from excessive erosion.

The potential is medium for most urban use. The slope and rapid percolation are limitations. Capability subclass VIe; Sandy Savannah range site.

24—Konsil loamy fine sand, 0 to 3 percent slopes. This is a deep, well drained, nearly level to very gently sloping soil on broad smooth uplands.

Typically, the plowed surface layer is pale brown, slightly acid loamy fine sand 8 inches thick. The subsurface layer is 6 inches of pale brown, medium acid loamy fine sand. The upper 26 inches of the subsoil is reddish yellow, medium acid sandy clay loam. The lower 25 inches is reddish yellow, medium acid fine sandy loam. The underlying material is reddish yellow, slightly acid loamy fine sand.

The organic matter content and natural fertility are low. Permeability and the available water capacity are moderate. The root zone is deep and is easily penetrated by roots. The shrink-swell potential is low. The soil can be worked throughout a wide range of moisture content.

About 5 percent of this map unit is included areas of Weatherford soils. About 5 percent is areas of a soil that is similar to the Konsil soils but has only yellowish brown or brownish yellow colors in the subsoil. About 10 percent is areas where the surface layer has been thinned by erosion.

The potential is medium for row crops, small grain, hay, and pasture. The main concerns in management are the moderate hazard of water erosion and soil blowing, the tilth, the fertility, and soil moisture.

Ample crop residue worked lightly into the surface, minimum tillage, and contour tillage reduce soil losses

through blowing and water erosion and help to conserve soil moisture and maintain tilth. Cover crops or grasses and legumes in the crop rotation also reduce the risk of erosion. Crops, pasture, and hay respond favorably to applications of fertilizer.

The potential is high for most urban use. The soil is sandy, however, and has low strength. Seepage is severe if it is used for sewage lagoons or trench sanitary landfill. Capability subclass IIIe; Deep Sand Savannah range site.

25—Konsil loamy fine sand, 3 to 8 percent slopes. This is a deep, well drained, gently sloping and sloping soil on broad smooth hillsides.

Typically, the surface layer is dark grayish brown, slightly acid loamy fine sand about 6 inches thick. The subsurface layer is 8 inches of pale brown, slightly acid loamy fine sand. The subsoil is 51 inches of reddish yellow, medium acid and slightly acid sandy clay loam. The underlying material is reddish yellow, slightly acid, massive fine sandy loam.

This soil is low in natural fertility and organic matter content. Permeability, shrink-swell potential, and the available water capacity are moderate. The soil can be tilled throughout a wide range of moisture content.

About 15 percent of this map unit is included areas of a soil similar to Konsil soil but the thickness of the surface layer and subsurface layer ranges from 20 to 45 inches. About 10 percent is areas of the similar Weatherford soils.

The potential is low for row crops. It is moderate for small grain or pasture. The erosion hazard is severe unless the soil is protected. Tame pasture grass or native grass is the best way to protect the soil from excessive erosion. If small grain or other sown crops are grown, high levels of crop residue should be left as a mulch and worked lightly into the surface layer. In some areas runoff should be diverted into terraces. Fertilization increases crop residue and forage of tame pasture grasses.

The potential is only moderate for most urban use because of the low strength, sandy surface layer, the slopes, and the seepage problem. Capability subclass IVe; Deep Sand Savannah range site.

26—Konsil and Weatherford soils, gullied. This unit consists of well drained, moderately permeable, very gently sloping to sloping soils. It occurs on uplands that have been gullied by water erosion.

Gullies 6 to 60 feet wide and 3 to 20 feet deep make up an average of 25 percent of the acreage. The percentage, however, ranges from as low as 15 in some areas to as high as 45 in others. About 40 percent of the unit is Konsil soil, 20 percent Weatherford soil, 10 percent Windthorst soil, and 5 percent Stephenville soil.

In a representative profile of the Konsil soil the surface layer is pale brown, slightly acid loamy fine sand 5 inches thick. The upper 45 inches of the subsoil is yellowish red, medium acid sandy clay loam. The lower 25 inches is reddish yellow, medium acid fine sandy loam with a few pink mottles.

Depth to bedrock is more than 60 inches. Available water capacity is moderate.

In a representative profile of the Weatherford soil the surface layer is pale brown, slightly acid fine sandy loam 5 inches thick. The subsoil is 43 inches of reddish yellow, medium acid sandy clay loam that is mottled in the lower part.

Depth to bedrock ranges from 40 to 60 inches. Available water capacity is moderate in the upper 40 inches.

The potential is medium for pasture and native range. Cultivated crops are generally not suited.

The main concern in management is protecting these soils from accelerated erosion and improving fertility and soil structure. In most areas runoff from higher areas should be diverted and the banks of gullies shaped before grasses can be established. Fertilizing tame pasture grass and legumes and controlling grazing improve soil structure and reduce the risk of erosion.

The potential is low for most urban use. The soils have low strength. Most areas are sandy. Gullies should be shaped, smoothed, and vegetated. Capability subclass VIe; Eroded Sandy Savannah range site.

27—Lawton Variant clay loam, 3 to 5 percent slopes. This deep, well drained, gently sloping soil is on smooth convex upland hillsides. Individual areas are generally 5 to 50 acres.

Typically, the surface layer is very dark grayish brown, neutral clay loam about 11 inches thick. The subsoil is more than 49 inches of a reddish brown, neutral to moderately alkaline clay.

This soil is high in natural fertility and organic matter content. Permeability is moderately slow, and the available water capacity is high. The shrink-swell potential of the subsoil is high.

About 15 to 22 percent of this map unit is included areas of soils that have a thinner surface layer, areas of a soil that has a brownish yellow lower subsoil but is otherwise similar to the Lawton soil, and a few intermingled areas of Clarita soils.

The potential is medium for row crops and small grain. It is also medium for pasture and hay.

The main concerns in management are controlling water erosion and maintaining soil structure and fertility. Terraces, contour farming, high residue crops, and cover crops reduce excessive erosion in cultivated areas. Returning crop residue helps to maintain soil structure and fertility. Tame pasture or native grass is the best way to control erosion.

The potential is medium for most urban use. The gentle slopes and the high shrink-swell characteristics of the subsoil should be considered in developing a facility. Capability subclass IIIe; Loamy Prairie range site.

28—Miller silty clay. This is a nearly level, moderately well drained, very slowly permeable soil on flood plains. It is occasionally flooded.

In a representative profile the surface layer is reddish brown, calcareous silty clay 24 inches thick. The next layer is 10 inches of brown, calcareous silty clay. The next 19 inches is reddish brown, calcareous silty clay. The underlying material is light reddish brown, calcareous clay loam.

This soil is high in natural fertility and organic matter content. Permeability is very slow, and the available water capacity is high. The soil has good tilth but can be tilled within only a narrow range of moisture content.

About 5 percent of this map unit is included areas of Elandco clay loam and about 5 percent areas of Weswood soils.

The potential is medium for most crops grown in the county. The main crops are small grain, grain sorghum, forage sorghum, alfalfa, and tame pasture.

The main concerns in management are the overflow hazard, the soil structure, and the slow runoff. Returning crop residue helps to improve soil structure. Surface drains generally are sufficient for improving runoff. Tillage should be timely and kept to a minimum.

The urban potential of this soil is low. Flooding is an occasional hazard, shrink-swell potential is high, and percolation is slow. Constructing flood control structures and designing facilities to overcome the high shrink-swell potential are needed. Capability subclass IIIw; Heavy Bottomland range site.

29—Miller soils. These are nearly level to very gently sloping, moderately well drained soils that are very slowly permeable. They occur on flood plains that are subject to frequent flooding. Slopes are 0 to 2 percent.

In a representative profile the surface layer is recent deposits 35 inches thick of reddish brown, calcareous silty

30—Normangee loam, 2 to 5 percent slopes. This is a gently sloping, moderately well drained soil that is very slowly permeable. It occurs as broad areas on smooth upland side slopes and ridge crests.

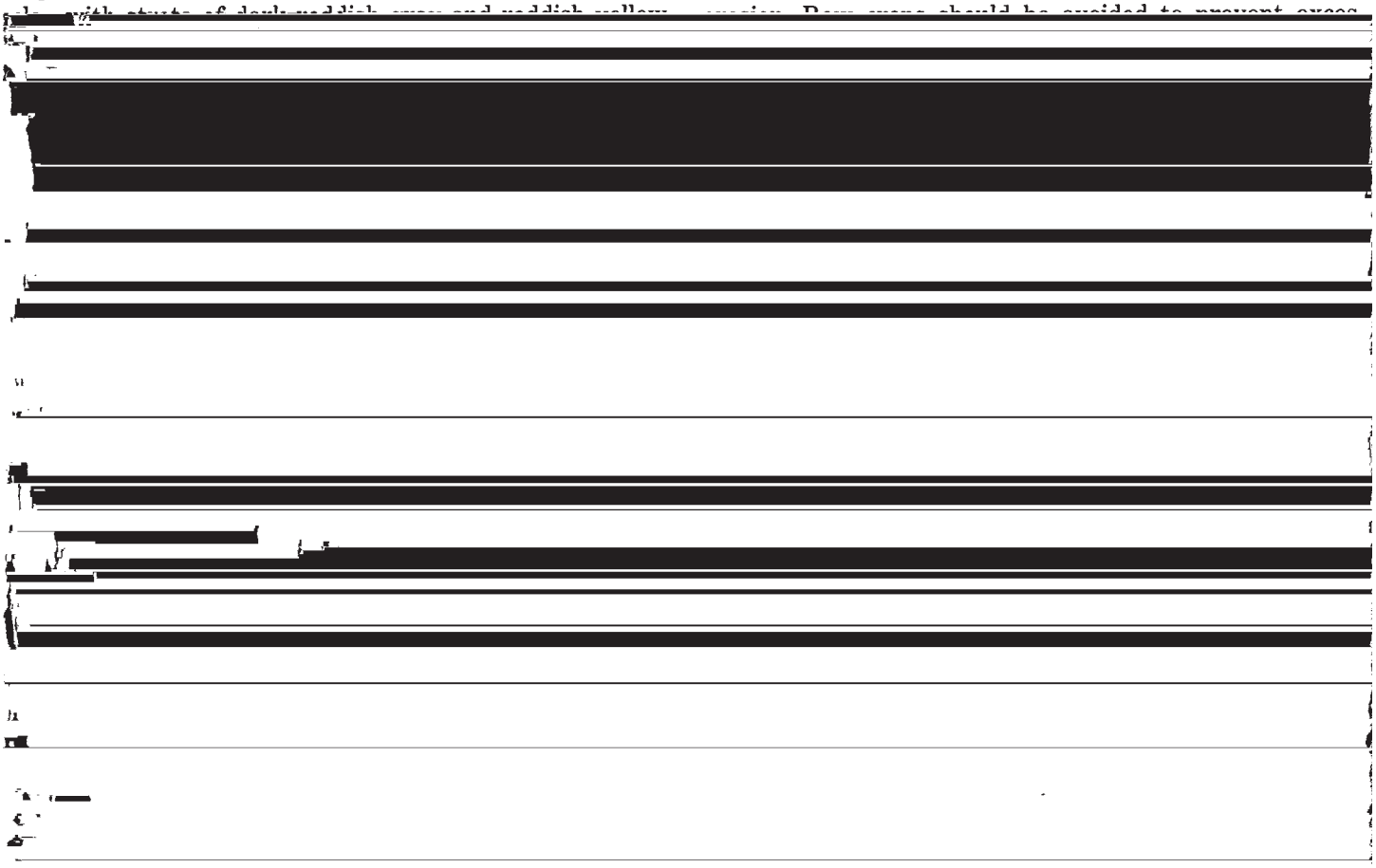
In a representative profile the surface layer is dark grayish brown, slightly acid loam 8 inches thick. The upper 13 inches of the subsoil is brown, slightly acid clay with brownish mottles. The lower 24 inches is light yellowish brown, mildly alkaline clay with brownish mottles. The underlying layer is olive yellow, moderately alkaline clay with grayish mottles.

This soil is moderate in natural fertility and organic matter content. The available water capacity is high. The surface layer has fair tilth when moist but is hard or very hard when dry. The thin surface layer and clayey subsoil restrict normal root development of most plants.

About 10 percent of this map unit is included areas of Durant soils. About 5 percent is areas of a soil that is only 30 to 40 inches deep over sandstone but is otherwise similar to the Normangee soil.

The potential is low for grain sorghum and small grain. It is medium for native pasture or tame pasture.

The main concern in management is protecting the soil from erosion and maintaining or improving soil structure and fertility. The cropping system should provide adequate amounts of crop residue to improve soil structure and water intake. Fertilization helps to produce the maximum residue needed for controlling excessive water



About 10 percent of this map unit is included areas of Durant and Renfrow soils. About 20 percent is shallow gullies and other areas where the subsoil has been exposed by erosion.

This soil is used mainly for tame pasture, native grasses, small grain, grain sorghum, and forage sorghum. The potential is low for crops.

The main concern in management is protecting the soil from accelerated erosion and maintaining or improving fertility and soil structure. Small grain in the cropping system and adequate amounts of fertilizer in order to produce maximum residue help to control water erosion. Returning ample residue improves soil structure and water intake. Row crops should be avoided to prevent excessive loss of soil. Terraces, waterways, and contour farming are additional practices that protect the soil. Tame pasture grasses and legumes and additions of fertilizer are the best ways to reduce the risk of soil erosion.

The potential is low for most urban use. Slow percolation, thin layers of topsoil, and high shrink-swell potential in the subsoil are the most serious limitations for community development. Capability subclass IVe; Claypan Prairie range site.

32—Normangee clay loam, 2 to 5 percent slopes, severely eroded. This is a deep, very gently sloping to gently sloping, moderately well drained soil that is very slowly permeable. It is on uplands.

Part of the original surface layer has been removed by erosion from about 35 percent of the unit. In about 25 percent, the surface layer and upper part of the subsoil have been mixed by tillage. Gullies caused by water erosion are common. In about 25 percent of the unit the gullies are 8 feet to 35 feet wide and 1 foot to 2 feet deep. In about 15 percent, they are 3 feet to 6 feet deep.

In a representative profile the surface layer is 6 inches of brown, medium acid clay loam. The upper 6 inches of the subsoil is brown, slightly acid clay. The lower 42 inches is brownish yellow and reddish yellow, moderately alkaline clay.

This soil is low in natural fertility and organic matter content. The available water capacity is high. The dense clayey subsoil severely limits root development of most plants. The thin surface layer is crusty and hard or very hard when dry.

About 10 percent of this map unit is included areas of Durant and Renfrow soils. About 5 percent is areas of Chickasha soils.

This soil is generally no longer suited to cultivated crops. It is used mostly for tame pasture or native grasses. The potential is low for grasses.

The main concern in management is protecting the soil from accelerated erosion and improving fertility and soil structure. Fertilizing tame pasture and legumes for maximum residue helps to reduce the risk of further erosion. Runoff from higher areas should be diverted and banks of gullies shaped before establishing a permanent cover.

The potential is low to moderate for most urban use. The main limitations are gullied areas, slow percolation, high shrink-swell potential in the subsoil, and in much of the area, little or no topsoil. Most community facilities can be designed to overcome these limitations. Capability subclass VIe; Eroded Prairie range site.

33—Oil-Waste land. Oil-waste land consists of areas of accumulated liquid wastes, principally oil and saltwater. It is in most parts of the county that have oil and gas production. Areas range from about 5 acres up to 80 acres. Slopes are mostly 0 to 8 percent. Surface runoff is rapid, and erosion is a severe hazard.

Oil-waste land is unsuitable for farming. Some of it could be reclaimed, but the cost would be high. Diverting surface drainage from higher areas would be necessary. Rainwater could be impounded on the surface to help leach out soluble salts. A mulch of hay or straw would reduce evaporation and thus prevent the accumulation of salts on the surface.

Little vegetation grows on these areas. Salt-tolerant pasture plants could be grown if seeded in the middle of the rainy season, when the salt accumulation on the surface is reduced.

The urban potential is very low. Overcoming the high susceptibility to erosion and the corrosive effect of the salts is difficult. Smoothing, grading, and protection from overhead water are needed in most areas. Topsoil from nonaffected areas can then be spread on the surface and vegetation established. Capability subclass VIIIs; not assigned a range site.

34—Pits. Pits are mostly in areas of Kiti, Woodford, and Chigley soils, where fragments of limestone, chert, and sandstone have been excavated. A small acreage also occurs in the sandy and loamy areas of Yahola and Konawa soils, which provide base material for building roads, foundations, and similar structures.

The areas of Pits range from about 5 acres to 70 acres and are a few feet to 40 feet deep. They are of limited use for farming. Some support sparse to moderate amounts of vegetation and can be lightly grazed or used as wildlife habitat. Some contain water.

Pits are generally not suited to urban development. They are subject to flooding. Steep sides are common. Not assigned to a capability subclass or range site.

35—Pulaski fine sandy loam. This is a nearly level, well drained soil that is moderately rapidly permeable. It occurs as smooth narrow areas on flood plains that are occasionally flooded.

In a representative profile the surface layer is 8 inches of light grayish brown, medium acid fine sandy loam. The next 16 inches is reddish brown, medium acid fine sandy loam. The underlying layer is reddish yellow, medium acid fine sandy loam.

This soil is moderate in natural fertility and organic matter content. It has fair tilth and can be worked throughout a wide range of moisture content. The available water capacity is moderate. The water table is below 6 feet.

About 10 percent of this map unit is included areas of Bunyan soils, about 5 percent areas of Tullahassee soils, and 3 percent areas of Kamp soils.

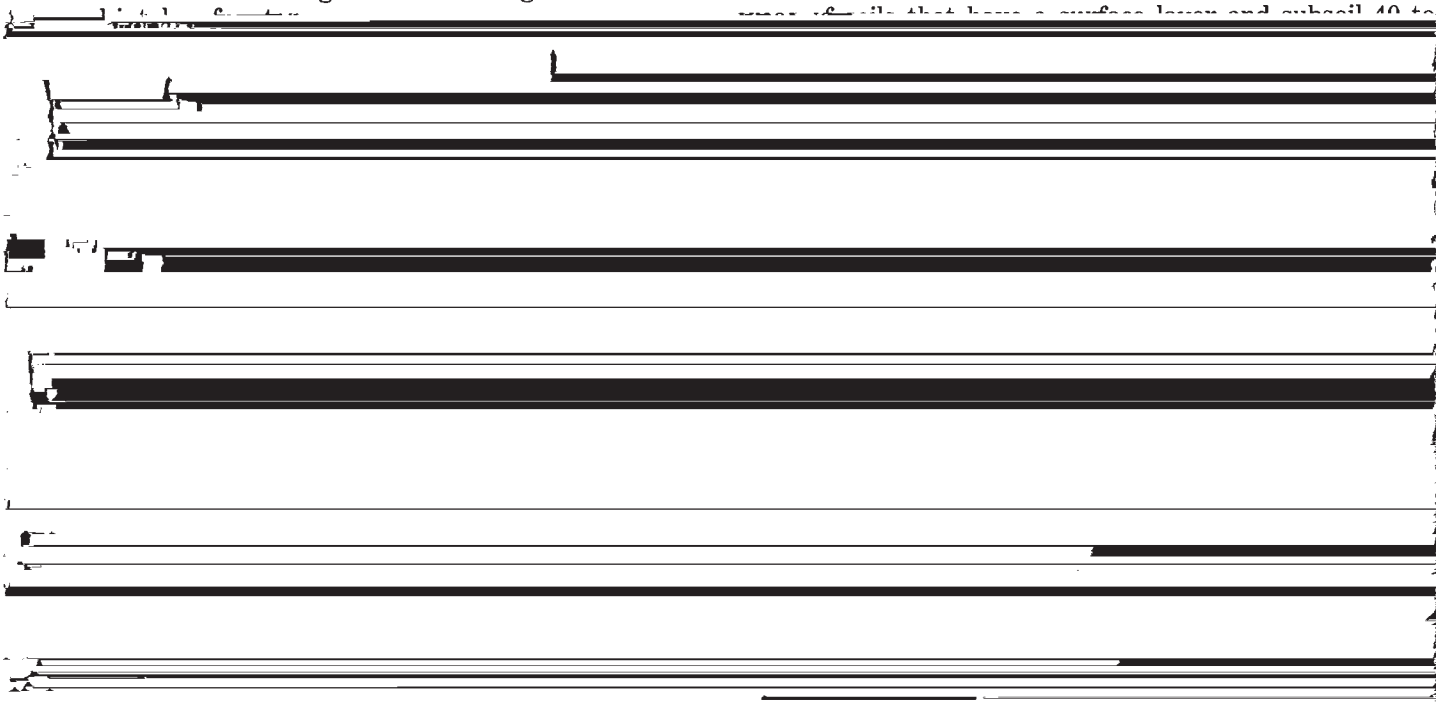
The potential is high for crops. The soil is used mainly for tame pasture, peanuts, small grain, forage sorghum, and native grasses. It is suited to most crops commonly grown in the county.

The main concerns in management are flooding and maintaining soil structure. A heavy residue of crops or grasses is needed to protect the soil from excessive loss during periods of flooding. Well managed tame pasture or woodland provides the best protection. Returning crop residue and minimum tillage contribute to good soil struc-

Typically, the surface layer is reddish brown, slightly acid silt loam about 8 inches thick. The upper 4 inches of the subsoil is reddish brown, slightly acid clay loam. The lower part is reddish brown and red, mildly alkaline and moderately alkaline clay to a depth of 65 inches or more.

This soil is high in natural fertility and organic matter content. Permeability is very slow, and the available water capacity is high. Tilth is moderate.

About 25 percent of this map unit is included areas of soils that have more yellowish colors in the subsoil and



The urban potential of this soil is very low and is largely limited by occasional flooding. Major flood control measures are needed. Capability subclass IIw; Loamy Bottomland range site.

36—Pulaski and Bunyan soils. This unit consists of well drained, moderately rapidly permeable soils. These are nearly level to very gently sloping soils on flood plains that are subject to frequent flooding.

About 40 percent of this map unit is areas of Pulaski soil, 30 percent Bunyan soil, about 15 percent areas of Tullahassee and Kemp soils, about 10 percent areas of Elandco soil, and about 5 percent active stream channels or abandoned channels.

In a representative profile of the the Pulaski soil the surface layer is light brown, medium acid fine sandy loam 20 inches thick. The next 10 inches is light reddish brown, slightly acid fine sandy loam. The underlying material is reddish brown, slightly acid loam.

The available water capacity is moderate. Natural fer-

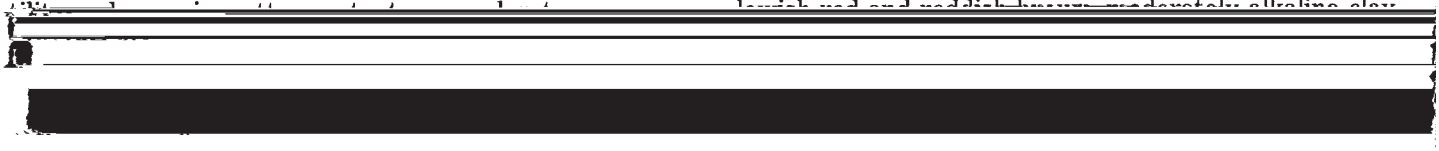
60 inches thick but are otherwise similar to this Renfrow soil.

The potential is medium for row crops, small grain, hay, and pasture. Tilth can be maintained by returning crop residue to the soil. Erosion is a moderate hazard if cultivated crops are grown. Terraces, minimum tillage, high residue crops, and cover crops reduce runoff and help in erosion control.

The potential is medium to high for most urban use. Engineering design is needed to overcome the slow percolation rate and the high shrink-swell potential. Capability subclass IIIe; Claypan Prairie range site.

38—Renfrow silt loam, 3 to 5 percent slopes. This is a deep, well drained, gently sloping soil on uplands. Slopes are smooth and convex.

Typically, the surface layer is dark grayish brown, neutral silt loam about 11 inches thick. The upper few inches of the subsoil is reddish brown, neutral clay loam. The lower part to a depth of 60 inches or more is yel-



narrow to wide, smooth to gently undulating areas on the crests and sides of upland ridges.

About 50 percent of this map unit is Scullin soil, 25 percent Kiti soil, 12 percent the Lawton Variant, 10 percent Heiden soils, and about 3 percent limestone outcrop.

In a representative profile of the Scullin soil the surface layer is grayish brown, slightly acid clay loam 11 inches thick. The upper 7 inches of the subsoil is reddish brown, slightly acid clay loam. The next 10 inches is reddish brown, slightly acid clay. The lower 6 inches is reddish brown, moderately alkaline flaggy clay. Below this is hard fractured limestone.

Depth to limestone is 20 to 40 inches. Available water capacity is medium.

In a representative profile of the Kiti soil the surface layer is grayish brown, mildly alkaline channery silty clay loam 7 inches thick. The subsurface layer is grayish brown, mildly alkaline flaggy silty clay loam 10 inches thick. The underlying material is highly fractured hard limestone.

Depth to bedrock ranges from 4 to 20 inches. The available water capacity is low.

The potential is medium for grasses. This unit, however, is used mainly for grazing. A few areas have been established in tame pasture.

The main concerns in managing tame pasture are the shallowness of the soil over rock and the scattered rock outcrop. The quality of native grass can be maintained or improved by proper grazing, protecting the pasture from fire, and controlling weeds and scattered brush. Fertilizing tame pasture increases production and improves the quality of grass. A few areas are too rocky for establishing tame pasture. This unit is generally not suitable for cultivation.

The potential is low to medium for most urban use because the Kiti soil is shallow over rock and the Scullin soil is only moderately deep. Additional limitations in the Scullin soil are the moderate to high shrink-swell potential and the slow percolation rate. Capability subclass have a thicker surface layer but are otherwise similar to this soil. There are also small areas of Rock outcrop.

The potential is low for grasses. This soil, however, is used mostly for native range or tame pasture. The quality of grasses can be maintained or improved by using suitable grazing practices, providing protection from fire, and controlling brush and weeds.

The potential is low to medium for most urban use. The moderate depth, high shrink-swell potential, slow percolation, and strong slopes are features that are difficult to overcome for some urban facilities. Capability subclass VIe; Loamy Prairie range site.

41—Stephenville-Darnell complex, 2 to 8 percent slopes. This unit consists of the well drained, moderately permeable Stephenville soil and the well drained, moderately rapidly permeable Darnell soil. These very gently sloping to sloping soils are on upland ridge crests.

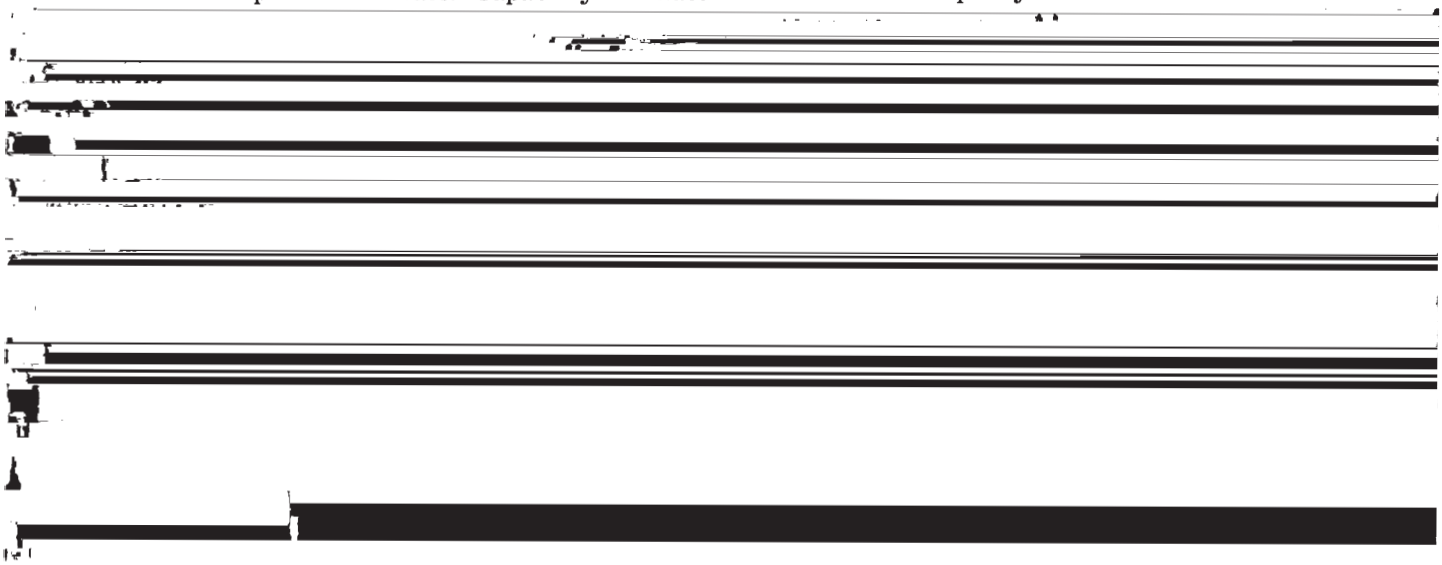
The unit is in a mixed pattern of 55 percent Stephenville soil, 20 percent Darnell soil, 10 percent Windthorst soil, and 5 percent Weatherford soil.

In a representative profile of the Stephenville soil the surface layer is brown, slightly acid fine sandy loam 6 inches thick. The subsurface layer is pale brown, slightly acid fine sandy loam 6 inches thick. The upper 8 inches of the subsoil is reddish brown, medium acid sandy clay loam. The lower 5 inches is reddish brown, medium acid gravelly sandy clay loam. The underlying material is soft rippable sandstone.

Depth to sandstone is 20 to 40 inches. The available water capacity between depths of 20 and 40 inches is low to medium.

In a representative profile of the Darnell soil the surface layer is brown, slightly acid fine sandy loam 6 inches thick. The subsoil to a depth of 13 inches is reddish brown, slightly acid loam. The underlying material is a rippable sandstone similar in color and reaction to the subsoil (fig. 5).

Depth to sandstone ranges from 10 to 20 inches. The available water capacity is low.



outcrop limit the use of certain types of machinery in managing tame pasture.

The potential is low or medium for most urban use because the soils are shallow and only moderately deep over bedrock. Capability subclass VIe; Stephenville soil in Sandy Savannah range site, Darnell soil in Shallow Savannah range site.

42—Tamford-Grainola complex, 5 to 12 percent slopes. This unit consists of well drained, very slowly and slowly permeable soils. These sloping to strongly sloping soils occur on the crests and sides of ridges on uplands.

The unit is about 40 percent Tamford soil, which is mostly on foot slopes and side slopes; 30 percent Grainola soil, which is on ridge crests and the upper part of side slopes; 20 percent soils that are similar to the Tamford soil but have a darker colored surface layer; and 5 percent soils that are similar to the Grainola soil but have a thicker dark brown surface layer.

In a representative profile of the Tamford soil the surface layer is reddish gray, slightly acid clay loam 6 inches thick.

The subsoil to a depth of 54 inches is reddish brown, moderately alkaline clay. It is calcareous in the lower part. The underlying material is red, moderately alkaline, massive clay.

The soil is 40 to 60 inches deep. The available water capacity is high. Natural fertility and organic matter content are moderate.

In a representative profile of the Grainola soil the surface layer is reddish brown, moderately alkaline clay loam 3 inches thick. The subsoil to a depth of 32 inches is reddish brown and weak red, moderately alkaline clay. The underlying material is massive, calcareous clay (fig. 6).

This soil is 20 to 40 inches deep. The available water capacity is moderate. Natural fertility is moderate, and organic matter content is low. The upper part of the soil is mildly or moderately alkaline. The shrink-swell poten-

43—Watonga silty clay. This deep, moderately well drained, nearly level soil occurs as broad smooth areas on flood plains near large streams. It is occasionally flooded.

Typically, the surface layer is dark gray silty clay about 24 inches thick. The next 31 inches is dark grayish brown silty clay. Below this layer is brown silty clay.

This soil is high in natural fertility and organic matter content. It is neutral to moderately alkaline in the upper part. Permeability is very slow, and the available water capacity is high. The soil has fair tilth but can be tilled within only a narrow range of moisture content.

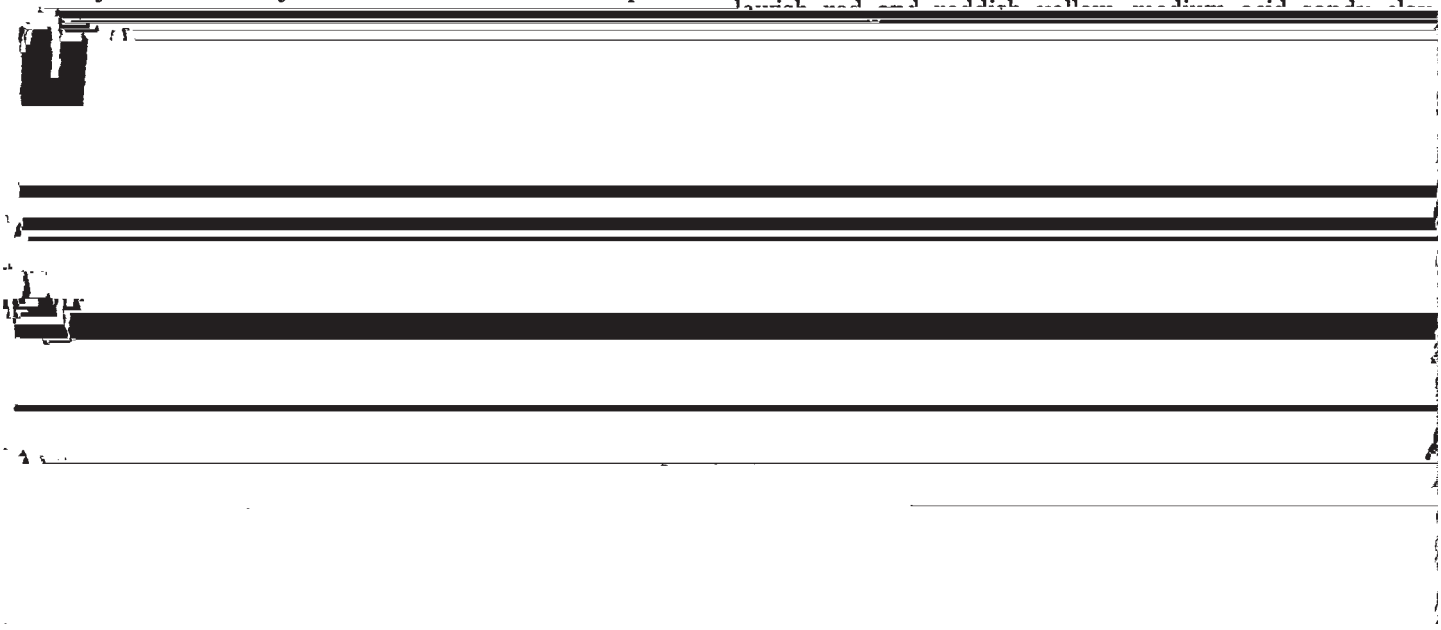
About 15 percent of this map unit is included areas of intermingled soils that have more reddish colors at depths of 20 to 40 inches and areas of soils that are similar to this soil but have thin strata of loam or clay loam in the upper 40 inches. About 10 percent is included areas of Bergstrom clay loam.

The potential is medium for row crops, small grain, pasture, and hay. The potential is limited because of tillage and problems caused by flooding and surface drainage. Tilth can be maintained by returning crop residue to the soil. Surface drainage improves runoff during periods of high rainfall.

The potential is very low for urban use. The soil is severely limited by the occasional flood hazard. Other problems are the high shrink-swell potential and the slow percolation rate. Capability subclass IIIw; Heavy Bottomland range site.

44—Weatherford fine sandy loam, 1 to 3 percent slopes. This deep, well drained, very gently sloping soil occurs as narrow to wide areas on ridgetops. Slopes are smooth and convex.

Typically, the surface layer is grayish brown, slightly acid fine sandy loam about 6 inches thick. The subsurface layer is pale brown, slightly acid fine sandy loam about 2 inches thick. The subsoil to a depth of 50 inches is yel-



The potential is high for most urban use. The 40- to 60-inch depth over bedrock is a limitation for some urban use. Capability subclass IIe; Sandy Savannah range site.

45—Weatherford fine sandy loam, 3 to 5 percent slopes. This is a gently sloping, well drained soil that is moderately permeable. It occurs as broad smooth areas of upland ridge crests and side slopes.

In a representative profile the surface layer is grayish brown, neutral fine sandy loam 5 inches thick. The subsurface layer is 6 inches of light yellowish brown, slightly acid fine sandy loam. The upper 26 inches of the subsoil is yellowish red, neutral sandy clay loam. The lower 7 inches is reddish yellow, slightly acid fine sandy loam. The underlying layer is reddish yellow, slightly acid soft sandstone.

Depth to bedrock is 40 to 60 inches. Permeability is moderate. The available water capacity is medium. The soil is medium acid to neutral in the upper part. It has good tilth, is easily worked, and has a deep root zone.

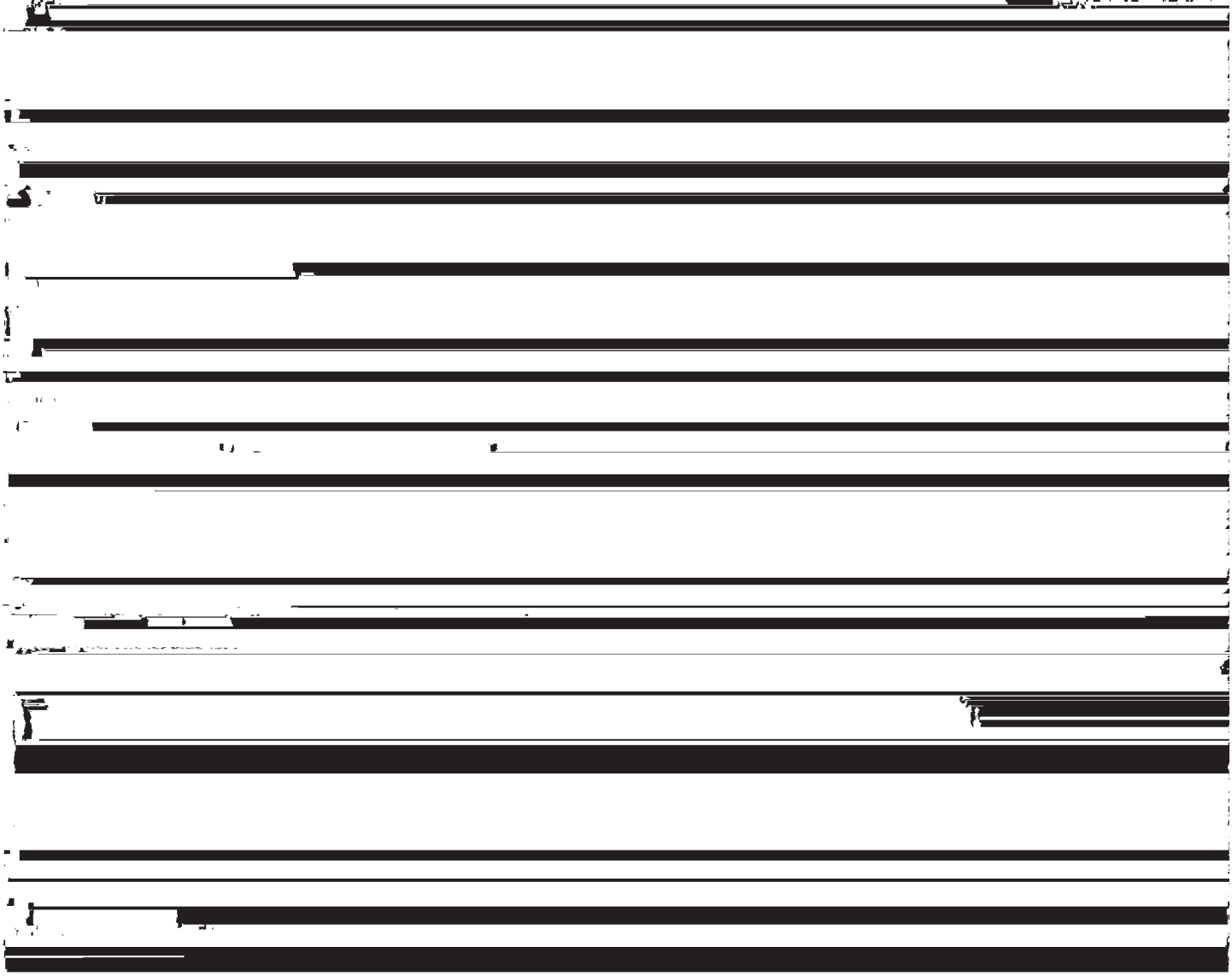
About 10 percent of the acreage is included areas of

The potential is low for row crops. It is medium for small grain or hay and pasture.

Erosion is a hazard if crops are grown. Intensive use of crop residue, cover crops or grasses or legumes in the crop rotation, terraces, and contour tillage reduce erosion losses. Tame pasture grasses can prevent excessive erosion. Applying adequate amounts of fertilizers increases crop residue and improves the soil cover when tame pasture grasses are grown.

The potential is high for most urban use. The 40- to 60-inch depth to bedrock requires additional design for sanitary facilities. Capability subclass IIIe; Sandy Savannah range site.

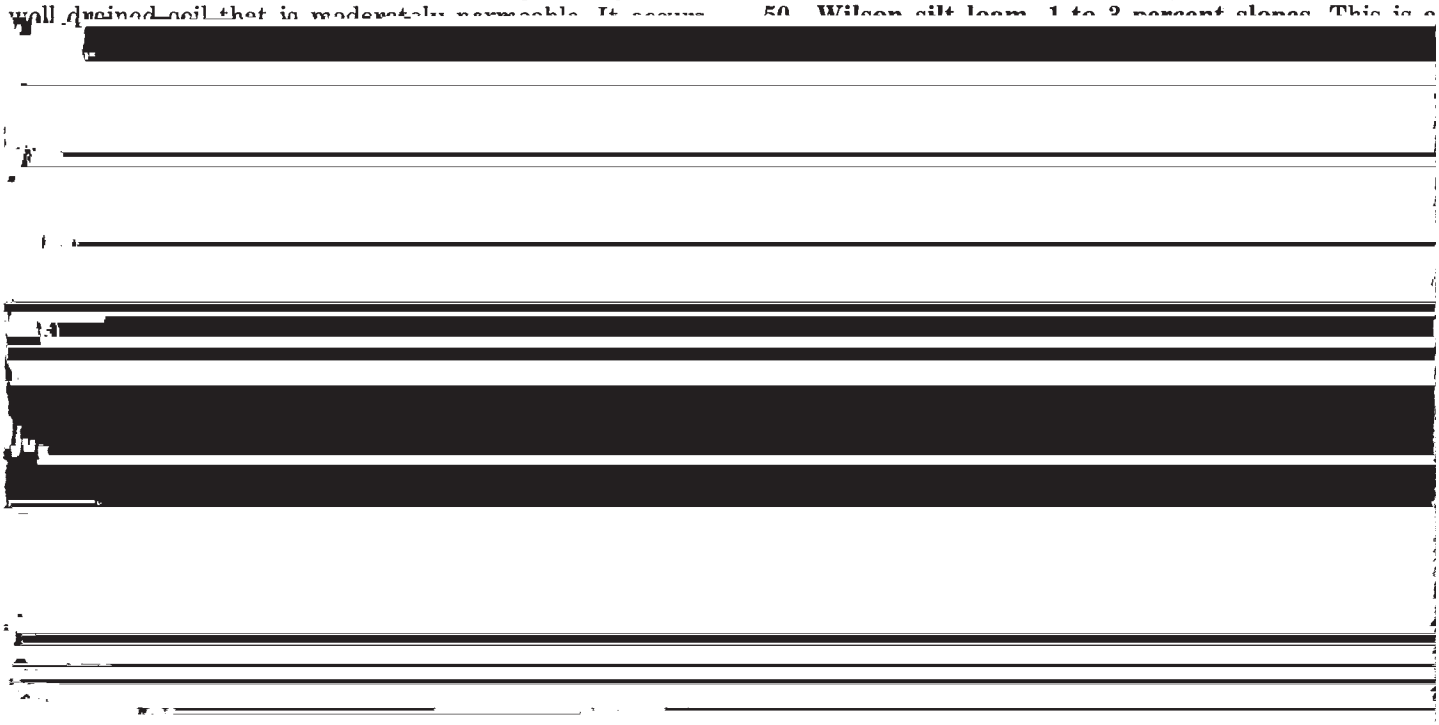
47—Weatherford-Duffau complex, 3 to 8 percent slopes. This unit is 45 percent Weatherford soil and 30 percent Duffau soil. These are well drained, moderately permeable, gently sloping and sloping soils on the side slopes of uplands. They occur in a mixed pattern. The Weatherford soil is mostly on the upper parts of side



should be avoided. Terraces, waterways, and contour farming are additional practices that protect the soil from eroding. Managing native grasses or tame pasture grasses with additions of fertilizer is the best way to reduce soil erosion.

The potential is medium or high for most urban use. The limiting factors for some uses are the slopes of 3 to 8 percent and the rippable sandstone bedrock at 40 to 60 inches in the Weatherford soil. Capability subclass IVe; Sandy Savannah range site.

48—**Weswood silt loam.** This is a deep, nearly level, well drained soil that is moderately permeable. It occurs



on flood plains as narrow to wide areas along streams. It is occasionally flooded.

In a representative profile the surface layer is light brown, moderately alkaline silt loam 6 inches thick. Below this to a depth of 80 inches or more is light brown, stratified, moderately alkaline silt loam.

The soil is 30 to 60 inches thick. It is high in natural fertility and has moderate organic matter content. The available water capacity of the upper 40 inches is high.

About 5 percent of this map unit is included areas of soils that have a dark brown surface layer but are otherwise similar to the Weswood soil. About 5 percent is areas of soils that are similar but have a more sandy surface layer and underlying layers.

The potential is high for most commonly grown crops. The main crops are small grain, alfalfa, forage sorghum, and tame pasture.

Management is needed to maintain fertility and soil structure. Flooding is a hazard in most years. Cropping systems should provide adequate amounts of residue. Excessive tillage should be avoided.

The potential is very low for urban development sive and hard when dry. Tilth is improved when high levels of crop residue are returned to the soil. Minimum tillage and timely tillage help maintain tilth and reduce compaction. In some areas terraces are needed to help remove excess surface water during periods of high rainfall.

The potential is medium for most urban use. The high shrink-swell factor, surface drainage, and surface wetness in spring and fall can limit some urban uses unless facilities are designed to overcome those limitations. Capability subclass IIs; Claypan Prairie range site.

50—**Wilson silt loam, 1 to 3 percent slopes.** This is a

very gently sloping, somewhat poorly drained, very slowly permeable soil. It occurs as broad areas on the smooth sides and crests of upland ridges.

In a representative profile the surface layer is dark grayish brown, medium acid silt loam 8 inches thick. The upper 20 inches of the subsoil is dark gray, slightly acid clay. The next 14 inches is grayish brown, neutral clay. The lower 18 inches is brown, moderately alkaline clay with grayish brown mottles (fig. 7).

This soil is moderate in natural fertility and organic matter content. Permeability is very slow. Available water capacity is high. Shallowness over the dense clay subsoil limits the normal root development of most crops. The surface layer is massive and very hard when dry.

About 10 percent of this map unit is included areas of Normangee soils and 5 percent areas of Durant soils.

This soil is used for grain sorghum or forage sorghum, small grain, tame pasture, and native range. The potential is medium for field crops and grasses.

Management is needed to maintain fertility and soil structure and to control the loss of soil through erosion. The cropping system should provide adequate amounts of

This soil is generally low in natural fertility and organic matter content. The available water capacity is medium or high.

About 5 percent of this map unit is included areas of soils that are brown or yellowish brown in the upper part of the subsoil but are otherwise similar to the Windthorst soil. About 5 percent is areas of soils that are similar to the Windthorst soil but are sandy clay loam in the upper part of the subsoil.

This soil is used for tame pasture, small grain, forage sorghum, grain sorghum, and native grasses. The potential is high for field crops and grasses.

Management is needed to maintain fertility and soil structure and to control the loss of soil through water erosion. A cropping system that provides adequate amounts of residue is needed. The risk of erosion can be reduced by using contour farming and terraces and by managing crop residue. A plant cover or crop residue is needed in fall and spring to keep the soil from eroding. Fertilization increases plant growth and provides additional crop residue. Terraces, contour farming, and cover crops are especially needed where row crops are grown. Excessive tillage should be avoided.

The potential is medium or high for most urban use. The main limitations are the moderate or high shrink-swell potential in the subsoil, the slow percolation rate, and the low strength. Most facilities can be designed to overcome these limitations. Capability subclass IIe; Sandy Savannah range site.

52—Windthorst fine sandy loam, 3 to 5 percent slopes. This is a deep, gently sloping, moderately well drained soil that is moderately slowly permeable. It occurs as narrow to wide, smooth, convex areas on upland hillsides.

In a representative profile the surface layer is brown, medium acid fine sandy loam about 3 inches thick. The subsurface layer is light brown, medium acid fine sandy loam about 4 inches thick. The upper 13 inches of the subsoil is reddish brown, medium acid sandy clay. The next 10 inches is light yellowish brown, neutral clay. The lower

The potential is medium or high for most urban facilities. The chief limitations are the moderate to high shrink-swell potential of the subsoil, the low strength, and the slow percolation rate. Capability subclass IIIe; Sandy Savannah range site.

53—Windthorst fine sandy loam, 2 to 5 percent slopes, eroded. This is a deep, very gently sloping to gently sloping, moderately well drained soil that is moderately slowly permeable and moderately eroded. It occurs as narrow to wide, smooth convex areas on uplands.

Shallow gullies and a few deep gullies have formed. In most areas erosion has removed 30 to 75 percent of the original surface layer. In about 25 percent of the areas, the subsoil is exposed.

In a representative profile the plow layer is pale brown, slightly acid fine sandy loam about 5 inches thick. The upper 21 inches of the subsoil is yellowish red, medium acid sandy clay. The next 12 inches is reddish yellow, moderately alkaline sandy clay with brownish and grayish mottles. The underlying material is massive, moderately alkaline sandy clay interbedded with soft sandstone.

This soil is low in natural fertility and organic matter content. The available water capacity is high.

About 20 percent of this map unit is included areas of soils that are similar to the Windthorst soil, but the upper part of the subsoil is sandy clay loam that is brownish yellow or light yellowish brown or has grayish mottles.

The potential is low for row crops but is medium for small grain, pasture, and hay.

The main concerns in management are controlling erosion and improving soil structure and fertility. Additional erosion can be retarded by terraces, contour farming, grasses and legumes in the crop rotation, high residue crops, and cover crops. Ample crop residue and minimum tillage improve soil structure and fertility. Tame pasture grass is the best way to protect the soil from eroding.

The potential is moderate for urban use. The slow per-

material is massive, grayish, moderately alkaline clay loam interbedded with layers of sandstone.

This soil is generally low in natural fertility and organic matter content. Permeability is moderately slow, and the available water capacity is high. The shrink-swell potential in the subsoil is medium to high.

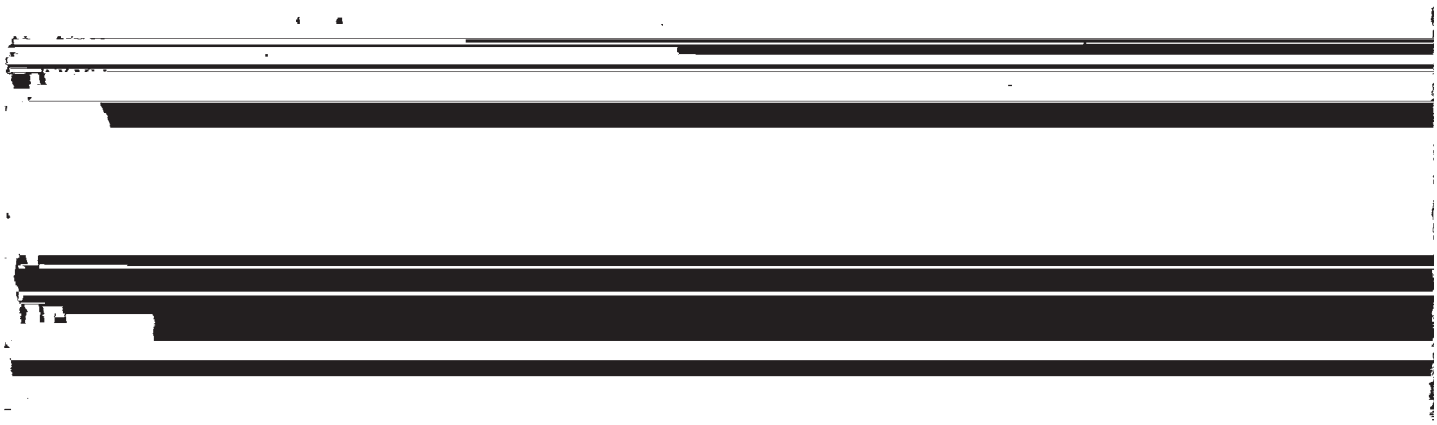
In a representative profile of the Darnell soil the surface layer is dark grayish brown, slightly acid fine sandy loam about 6 inches thick. The subsoil is pale brown, slightly acid fine sandy loam. The upper 10 inches of the subsoil is yellowish red, slightly acid sandy clay loam. The next 16 inches is reddish yellow, medium acid sandy clay loam. The lower 15 inches is reddish yellow, distinctly mottled, slightly acid sandy clay loam. Below this is weakly consolidated sandstone.

Depth to rock ranges from 40 to 60 inches. The availa-

Typically, the surface layer is 4 inches of reddish yellow, moderately alkaline fine sandy loam and 9 inches of light reddish brown, moderately alkaline loamy fine sand. The next layer to a depth of 38 inches is reddish yellow, moderately alkaline stratified fine sandy loam. The underlying material to a depth of 72 inches is stratified reddish yellow, moderately alkaline loamy fine sand.

This soil is low to moderate in natural fertility and organic matter content. Permeability is moderately rapid, and the available water capacity is medium. Tilth is fair and the root zone is deep.

About 20 to 25 percent of this map unit is included areas of a soil that has a coarse texture in the 10- to 40-inch section but is otherwise similar to the Yahola soils. Also included are a few intermingled areas of the

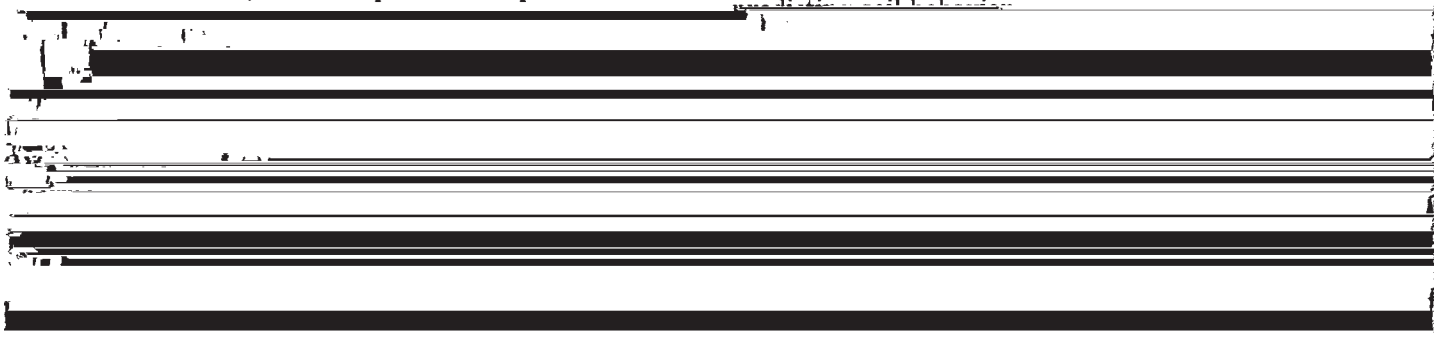


This soil is generally too frequently flooded for most crops. The potential is high for pasture and hay.

The main concerns in management are flooding and erosion. Soil blowing and water erosion are problems unless the soil is protected by a permanent plant cover. Tame pasture grasses respond well to applications of fertilizer, which promote additional plant growth.

The potential is low for urban use. Frequent flooding and rapid percolation are limitations. Capability subclass Vw; Loamy Bottomland range site.

58—Zaneis loam, 3 to 5 percent slopes. This is a



tive grasses or tame pasture is the best way to protect this soil from eroding.

The urban potential is high. The moderate shrink-swell potential in the lower part of the subsoil and the low strength are moderate limitations for some facilities. Capability subclass IIIe; Loamy Prairie range site.

Use and management of the soils

The soil survey is a detailed inventory and evaluation of the most basic resource of the survey area—the soil. It is useful in adjusting land use, including urbanization, to the limitations and potentials of natural resources and the environment. Also, it can help avoid soil-related failures

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

Crops and pasture

By CLIFFORD E. RHOADS, district conservationist, and THEODORE B.

the depth of the root zone, for example, the bedrock underlying Kiti, Darnell, and Woodford soils. Erosion also reduces productivity on soils that tend to be droughty,

Information on the design of erosion control practices for each kind of soil is contained in the Technical Guide, available in local offices of the Soil Conservation Service.

Soil drainage is the major management need on some of the acreage used for crops and pasture in the survey area. Some soils are so wet that crop production is reduced. The somewhat poorly drained Tullahasse and Wilson soils are examples.

Miller, Watonga, and Burleson soils have good natural drainage most of the year, but they tend to dry out slowly after rains. Small areas of wetter soils along drainageways and in swales are commonly included in areas of the moderately well drained Healdton, Miller, and Watonga soils. Artificial drainage is needed in some of the wetter areas.

The design of both surface and subsurface drainage systems depends on the kind of soil. Drains have to be more closely spaced in slowly permeable soils than in more permeable soils. Tile drainage is very slow in Wilson

Grain sorghum, cotton, and soybeans are the row crops. Wheat and oats are the common close-growing crops.

Special crops grown commercially in the survey area are pecans, vegetables, small fruits, tree fruits, and nursery plants. A small acreage throughout the county is used for melons, strawberries, sweet corn, tomatoes, peppers, and other vegetables and small fruits. Apples and peaches are the most important tree fruits grown in the county. Pecans is an important crop on the flood plain soils in the county. Deep soils that have good natural drainage and that warm up early in spring are especially well suited to many vegetables and small fruits. Konawa, Konsil, and Duffau soils are examples.

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

Tame pasture

soils to provide winter and spring forage. These crops are harvested for grain or hay. Usually they are grazed.

Planning a pasture program

A pasture program should be planned to provide the desired amount of forage during each month of the year. A study of the growth habits of the different plants is needed. The months that various kinds of forage plants grow are indicated in figure 9. The percentage of growth for each kind of plant is illustrated. For example, bermudagrass makes 22 percent of its yearly growth in June.

Soils vary in their capacity to produce forage for grazing. The Bunyan soil produces more forage than the Konsil soil, mainly because it furnishes more available moisture to the plant. Table 5 shows the total yearly production of each soil for various kinds of pasture plants in animal unit months (AUM). Bermudagrass pasture on Chickasha loam, 1 to 3 percent slopes, for example, furnishes grazing for one animal unit (AUM) 6.5 months during the year.

In planning a pasture program one must consider the total yearly production of the pasture plant in animal unit months, as listed in table 5, and the amount of growth

trol, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate tillage practices, including time of tillage and seedbed preparation and tilling when soil moisture is favorable; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residues, barnyard manure, and green-manure crops; harvesting crops with the smallest possible loss; and timeliness of all fieldwork.

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

Crops other than those shown in table 5 are grown in the survey area, but estimated yields are not included because the acreage of these crops is small. The local offices of the Soil Conservation Service and the County Extension Service can provide information about the management concerns and productivity of the soils for these crops.

[redacted]

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

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

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

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

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

forbs, or shrubs suitable for grazing or browsing. The following are explanations of column headings in table 6.

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

Dominant in the northern part of the county are the loamy Kiti and Woodford soils, both of which are shallow over hard fractured rock. These soils support mostly mid and tall grasses. Potential productivity is low because of the shallow root zone.

[redacted]

sandy and are deep over soft sandstone. There are large [redacted]

Engineering

By WILLIAM F. HARDESTY and JESSE L. MCMASTERS, civil engineers, Soil Conservation Service.

This section provides information about the use of soils and water management.

The ratings in the engineering tables are based on test

the use of these data, however, should be well understood. First, the data are generally not presented for soil material below a depth of 5 or 6 feet. Also, because of the scale of the detailed map in this soil survey, small areas of soils that differ from the dominant soil may be included in mapping. Thus, these data do not eliminate the need for onsite investigations, testing, and analysis by personnel having expertise in the specific use system

without basements and for dwellings with and without basements. For such structures, soils should be sufficiently stable that cracking or subsidence of the structure from settling or shear failure of the foundation does not occur. These ratings were determined from estimates of the shear strength, compressibility and shrink-swell potential of the soil. Soil texture, plasticity and in-place density, potential frost action, soil wetness, and depth to a

plated.

The information is presented mainly in tables. Table 8 shows, for each kind of soil, the degree and kind of limitations for building site development; table 9, for sanitary facilities; and table 11, for water management. Table 10 shows the suitability of each kind of soil as a source of construction materials.

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

Some of the terms used in this soil survey have a

seasonal high water table were also considered. Soil wetness and depth to a seasonal high water table indicate potential difficulty in providing adequate drainage for basements, lawns, and gardens. Depth to bedrock, slope, and large stones in or on the soil are also important considerations in the choice of sites for these structures and were considered in determining the ratings. Susceptibility to flooding is a serious hazard.

Local roads and streets referred to in table 8 have an all-weather surface that can carry light to medium traffic all year. They consist of a subgrade of the underlying soil

Septic tank absorption fields are subsurface systems of tile or perforated pipe that distribute effluent from a septic tank into the natural soil. Only the soil horizons between depths of 18 and 72 inches are evaluated for this use. The soil properties and site features considered are those that affect the absorption of the effluent and those that affect the construction of the system.

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

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

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

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

Sanitary landfill is a method of disposing of solid waste by placing refuse in successive layers either in excavated trenches or on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil material. Landfill areas are subject to heavy vehicular traffic. Risk of polluting ground water and trafficability affect the suitability of a soil for this use. The best soils have a loamy or silty texture, have moderate to slow permeability, are deep to a seasonal water table, and are not subject to flooding. Clayey soils are likely to be sticky and difficult to spread. Sandy or gravelly soils generally have rapid permeability, which might allow noxious liquids to contaminate ground water. Soil wetness can be a limitation, because operating heavy equipment on a wet soil is difficult. Seepage into the refuse increases the risk of pollution of ground water.

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

Unless otherwise stated, the limitations of table 9 apply only to the soil material within a depth of about 6 feet. If the trench is deeper, a limitation of slight or moderate may not be valid. Site investigation is needed before a site is selected.

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

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

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

Construction materials

The suitability of each soil as a source of roadfill, sand, gravel, and topsoil is indicated in table 10 by ratings of good, fair, or poor. The texture, thickness, and organic-matter content of each soil horizon are important factors in rating soils for use as construction materials. Each soil is evaluated to the depth observed, generally about 6 feet.

Roadfill is soil material used in embankments for roads. Soils are evaluated as a source of roadfill for low embankments, which generally are less than 6 feet high and less exacting in design than high embankments. The ratings reflect the ease of excavating and working the material and the expected performance of the material where it has been compacted and adequately drained. The performance of soil after it is stabilized with lime or cement is not considered in the ratings, but information about some of the soil properties that influence such performance is given in the descriptions of the soil series.

The ratings apply to the soil material between the A horizon and a depth of 5 to 6 feet. It is assumed that soil horizons will be mixed during excavation and spreading. Many soils have horizons of contrasting suitability within their profile. The estimated engineering properties in

table 14 provide specific information about the nature of each horizon. This information can help determine the suitability of each horizon for roadfill.

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

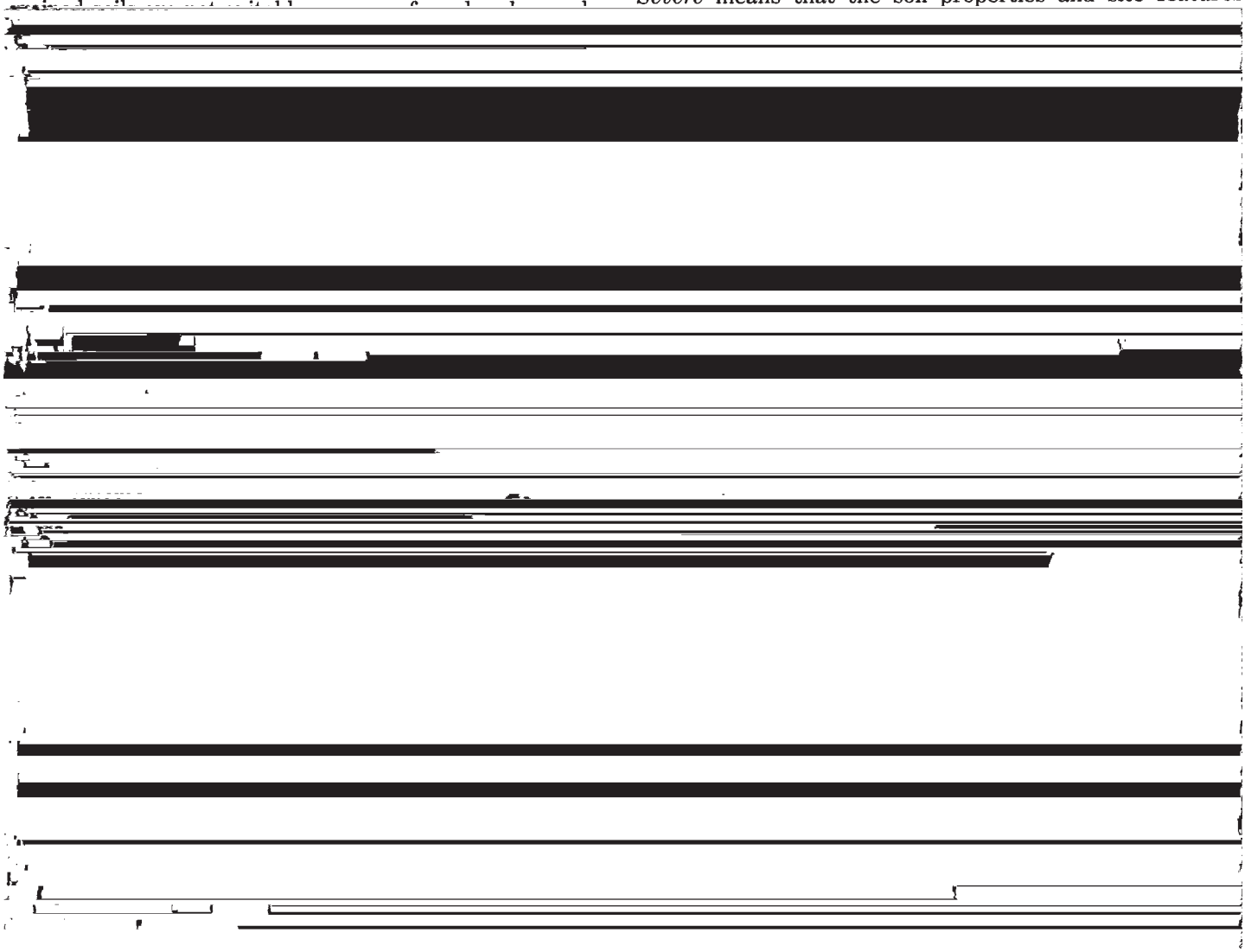
Sand and *gravel* are used in great quantities in many kinds of construction. The ratings in table 10 provide guidance as to where to look for probable sources and are based on the probability that soils in a given area contain sizable quantities of sand or gravel. A soil rated *good* or *fair* has a layer of suitable material at least 3 feet thick, the top of which is within a depth of 6 feet. Coarse fragments of soft bedrock material, such as shale and siltstone, are not considered to be sand and gravel. Fine-

preferred for topsoil because of its organic-matter content. This horizon is designated as A1 or Ap in the soil series descriptions. The absorption and retention of moisture and nutrients for plant growth are greatly increased by organic matter.

Water management

Many soil properties and site features that affect water management practices have been identified in this soil survey. In table 11 the degree of soil limitation and soil and site features that affect use are indicated for each kind of soil. This information is significant in planning, installing, and maintaining water control structures.

Soil and site limitations are expressed as slight, moderate, and severe. *Slight* means that the soil properties and site features are generally favorable for the specified use and that any limitation is minor and easily overcome. *Moderate* means that some soil properties or site features are unfavorable for the specified use but can be overcome or modified by special planning and design. *Severe* means that the soil properties and site features



material; large stones; permeability; ease of establishing vegetation; and resistance to water erosion, soil blowing, soil slipping, and piping.

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

Recreation

By NORMAN E. SMOLA, woodland conservationist, Soil Conservation Service.

The soils of the survey area are rated in table 12 according to limitations that affect their suitability for recreation uses. The ratings are based on such restrictive soil features as flooding, wetness, slope, and texture of the surface layer. Not considered in these ratings, but important in evaluating a site, are location and accessibility of the area, size and shape of the area and its scenic quality, the ability of the soil to support vegetation, access to water, potential water impoundment sites available, and either access to public sewerlines or capacity of the soil to absorb septic tank effluent. Soils subject to flooding are limited, in varying degree, for recreation use by the duration and intensity of flooding and the season when flooding occurs. Onsite assessment of height, duration, intensity, and frequency of flooding is essential in planning recreation facilities.

The degree of the limitation of the soils is expressed as during the period of use, and do not have slopes or stones or boulders that will increase the cost of shaping sites or of building access roads and parking areas.

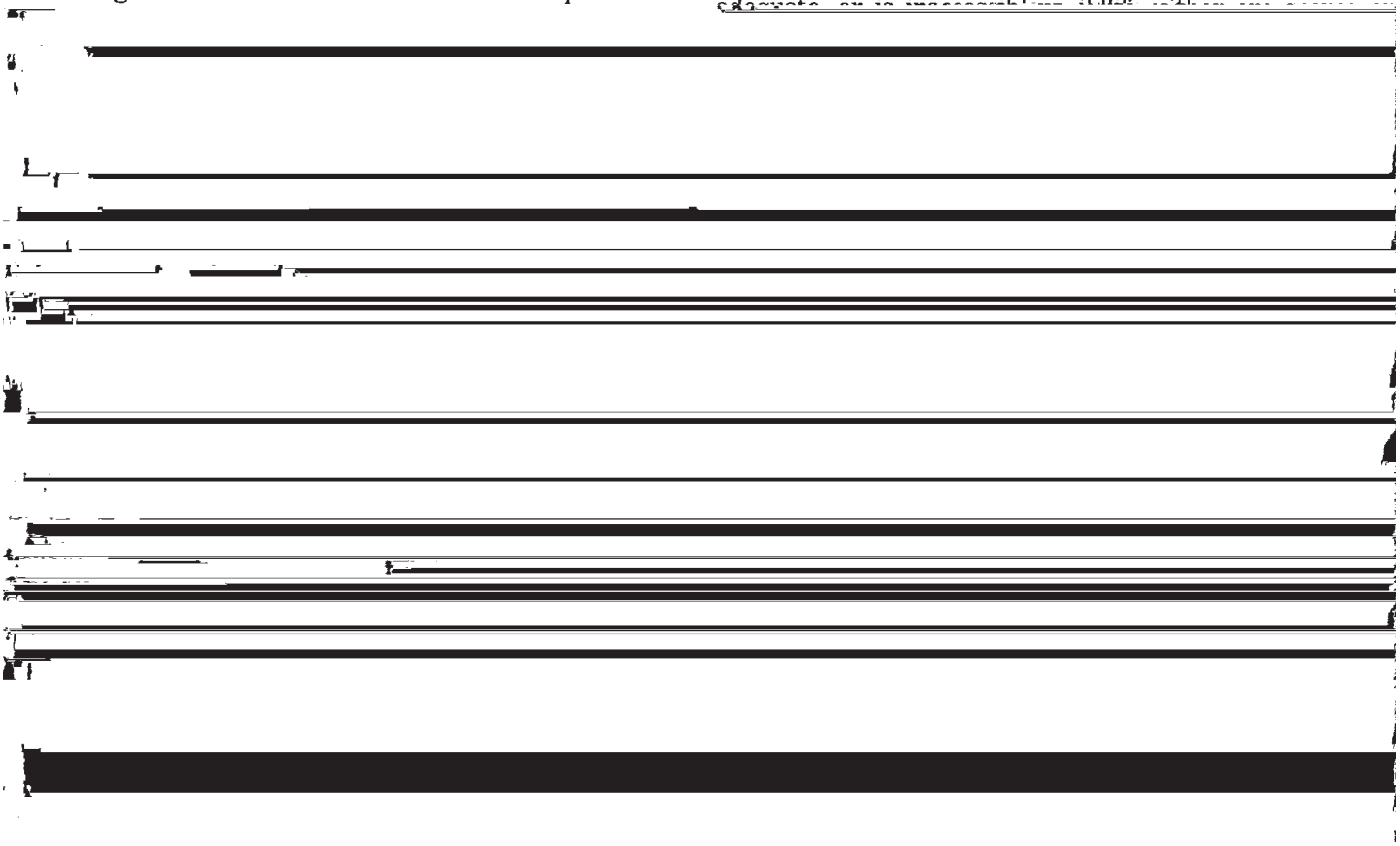
Playgrounds require soils that can withstand intensive foot traffic. The best soils are almost level and are not wet or subject to flooding during the season of use. The surface is free of stones or boulders, is firm after rains, and is not dusty when dry. If shaping is required to obtain a uniform grade,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

Paths and trails for walking, horseback riding, bicycling, and other uses should require little or no cutting and filling. The best soils for this use are those that are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding more than once during the annual period of use. They should have moderate slopes and have few or no stones or boulders on the surface.

Wildlife habitat

By JEROME F. SYKORA, biologist, Soil Conservation Service.

Soils directly affect the kind and amount of vegetation that is available to wildlife as food and cover, and they affect the construction of water impoundments. The kind and abundance of wildlife that populate an area depend largely on the amount and distribution of food, cover, and water. If any one of these elements is missing, is in-



restrictions for the element of wildlife habitat or kind of wildlife are very severe, and that unsatisfactory results can be expected. Wildlife habitat is impractical or even impossible to create, improve, or maintain on soils having such a rating.

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

Grain and seed crops are seed-producing annuals used by wildlife. The major soil properties that affect the growth of grain and seed crops are depth of the root zone, texture of the surface layer, available water capacity, wetness, slope, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of grain and seed crops are corn, wheat, oats, barley, sorghum, millet, cowpeas, soybeans, and sunflowers.

Grasses and legumes are domestic perennial grasses and herbaceous legumes that are planted for wildlife food and cover. Major soil properties that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, flood hazard, and slope. Soil temperature and soil moisture are also considerations. Examples of grasses and legumes are fescue, lovegrass, bromegrass, clover, alfalfa, bluegerass, switchgrass, sericea lespedeza, Korean lespedeza, and crownvetch.

Wild herbaceous plants are native or naturally established grasses and forbs, including weeds, that provide food and cover for wildlife. Major soil properties that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Exam-

soil properties that affect the growth of shrubs are depth of the root zone, available water capacity, salinity, and moisture. Examples of shrubs are roughleaf dogwood, coralberry, plum, and greenbrier.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites, exclusive of submerged or floating aquatics. They produce food or cover for wildlife that use wetland as habitat. Major soil properties affecting wetland plants are texture of the surface layer, wetness, reaction, salinity, slope, and surface stoniness. Examples of wetland plants are smartweed, wild millet, cattail, and rushes, sedges, and reeds.

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

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

Openland habitat consists of cropland, pasture, meadows, and areas that are overgrown with grasses, herbs, shrubs, and vines. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. The kinds of wildlife attracted to these areas include bobwhite quail, meadowlark, field sparrow, killdeer, cottontail, and fox.

Woodland habitat consists of areas of hardwoods or

the profile, they note the thickness and color of the soil material; the texture, or amount of clay, silt, sand, and gravel or other coarse fragments; the structure, or the natural pattern of cracks and pores in the undisturbed soil; and the consistence of the soil material in place under the existing soil moisture conditions. They record the depth of plant roots, determine the pH or reaction of the soil, and identify any free carbonates.

Samples of soil material are analyzed in the laboratory to verify the field estimates of soil properties and to determine all major properties of key soils, especially properties that cannot be estimated accurately by field observation. Laboratory analyses are not conducted for all soil series in the survey area, but laboratory data for many soil series not tested are available from nearby survey areas.

The available field and laboratory data are summarized in tables. The tables give the estimated range of engineering properties, the engineering classifications, and

into 15 classes—eight classes of coarse-grained soils, identified as GW, GP, GM, GC, SW, SP, SM, and SC; six classes of fine-grained soils, identified as ML, CL, OL, MH, CH, and OH; and one class of highly organic soils, identified as Pt. Soils on the borderline between two classes have a dual classification symbol, for example, CL-ML.

The *AASHTO* system classifies soils according to those properties that affect their use in highway construction and maintenance. In this system a mineral soil is classified in one of seven basic groups ranging from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines. At the other extreme, in group A-7, are fine-grained soils. Highly organic soils are classified in group A-8 on the basis of visual inspection.

When laboratory data are available, the A-1, A-2, and A-7 groups are further classified as follows: A-1-a, A-1-b,

Permeability is estimated on the basis of known relationships among the soil characteristics observed in the field—particularly soil structure, porosity, and gradation or texture—that influence the downward movement of water in the soil. The estimates are for vertical water movement when the soil is saturated. Not considered in the estimates is lateral seepage or such transient soil features as plowpans and surface crusts. Permeability of the soil is an important factor to be considered in planning and designing drainage systems, in evaluating the potential of soils for septic tank systems and other waste disposal systems, and in many other aspects of land use and management.

Available water capacity is rated on the basis of soil characteristics that influence the ability of the soil to hold water and make it available to plants. Important characteristics are content of organic matter, soil texture, and soil structure. Shallow-rooted plants are not likely to use the available water from the deeper soil horizons. Available water capacity is an important factor in the choice of kinds of land use and treatment. The soil erodibility factor (K) is a measure of the susceptibility of the soil to erosion by water. Soils having the highest K values are the most erodible. K values range from 0.10 to 0.64. To estimate annual soil loss per acre, the K value of a soil is modified by factors representing plant cover, grade and length of slope, management practices, and climate. The soil-loss tolerance factor (T) is the maximum rate of soil erosion, whether from rainfall or soil blowing, that can occur without reducing crop production or environmental quality. The rate is expressed in tons of soil loss per acre per year.

Wind erodibility groups are made up of soils that have similar properties that affect their resistance to soil blowing if cultivated. The groups are used to predict the susceptibility of soil to blowing and the amount of soil lost as a result of blowing. Soils are grouped according to the following distinctions:

1 Sands, coarse sands, fine sands, and very fine sands

[redacted]

Soil and water features

High water table is the highest level of a saturated

Classification of the soils

[redacted]

Cooperative Soil Survey (*5*) has six categories. Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. In this system the classification is based on the different soil properties that can be observed in the field or those that can be inferred either from other properties that are observable in the field or from the combined data of soil science and other disciplines. The properties selected for the higher categories are the result of soil genesis or of factors that affect soil genesis. In table 18, the soils of the survey area are classified according to the system. Categories of the system are discussed in the following paragraphs.

ORDER. Ten soil orders are recognized as classes in the system. The properties used to differentiate among orders are those that reflect the kind and degree of dominant soil-forming processes that have taken place. Each order is identified by a word ending in *sol*. An example is Entisol. Five of the ten orders are recognized in Carter County.

SUBORDER. Each order is divided into suborders based primarily on properties that influence soil genesis

manent cracks. A family name consists of the name of a subgroup and a series of adjectives. The adjectives are [redacted]

ferentiae. An example is fine-loamy, mixed, thermic Typic Argiustolls.

SERIES. The series consists of soils that formed in a particular kind of material and have horizons that, except for texture of the surface soil or of the underlying substratum, are similar in differentiating characteristics and in arrangement in the soil profile. Among these characteristics are color, texture, structure, reaction, consistence, and mineral and chemical composition.

Soil series and morphology

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

Characteristics of the soil and the material in which it formed are discussed for each series. The soil is then compared to similar soils and to nearby soils of other series. Then a pedon, a small three-dimensional area of soil that is typical of the soil series in the survey area, is described. The detailed descriptions of each soil horizon follow standards in the Soil Survey Manual (*4*). Unless [redacted]

B21t—12 to 24 inches, reddish yellow (7.5YR 6/6) sandy clay loam, strong brown (7.5YR 5/6) moist; weak medium prismatic structure and weak medium subangular blocky; hard, friable; thin clay films on faces of peds; medium acid; gradual smooth boundary.

B22t—24 to 44 inches, reddish yellow (7.5YR 6/8) sandy clay loam, strong brown (7.5YR 5/8) moist; weak medium prismatic structure and weak medium subangular blocky; hard, firm; thin clay films on faces of peds; medium acid; gradual smooth boundary.

B3—44 to 58 inches, reddish yellow (7.5YR 7/8) sandy clay loam, reddish yellow (7.5YR 6/8) moist; weak medium subangular blocky structure; hard, friable; few thin sandstone fragments in the lower part; medium acid; abrupt wavy boundary.

C—58 to 65 inches, light gray (10YR 7/2) sandstone, common medium distinct mottles of reddish yellow (7.5YR 6/8); hard when dry, soft to hard when moist.

Thickness of the soil ranges from 40 to 60 inches and corresponds with the depth to bedrock.

The A horizon is grayish brown, brown, dark brown, or dark grayish brown.

In some profiles a B1 horizon occurs. It has colors and textures similar to those of the B21t horizon. It is neutral to medium acid.

B22t—16 to 42 inches, reddish yellow (5YR 6/6) clay, yellowish red (5YR 4/6) moist; weak medium and coarse blocky structure; very hard, very firm; distinct clay films; few peds with very pale brown (10YR 7/3) coatings; 10 percent by volume flattened and rounded sandstone and chert fragments 2 millimeters to 3 inches in the long axis; few fine and medium black concretions; medium acid; clear wavy boundary.

C—42 to 44 inches, fractured hard sandstone interbedded with hard shale and cherty conglomerate.

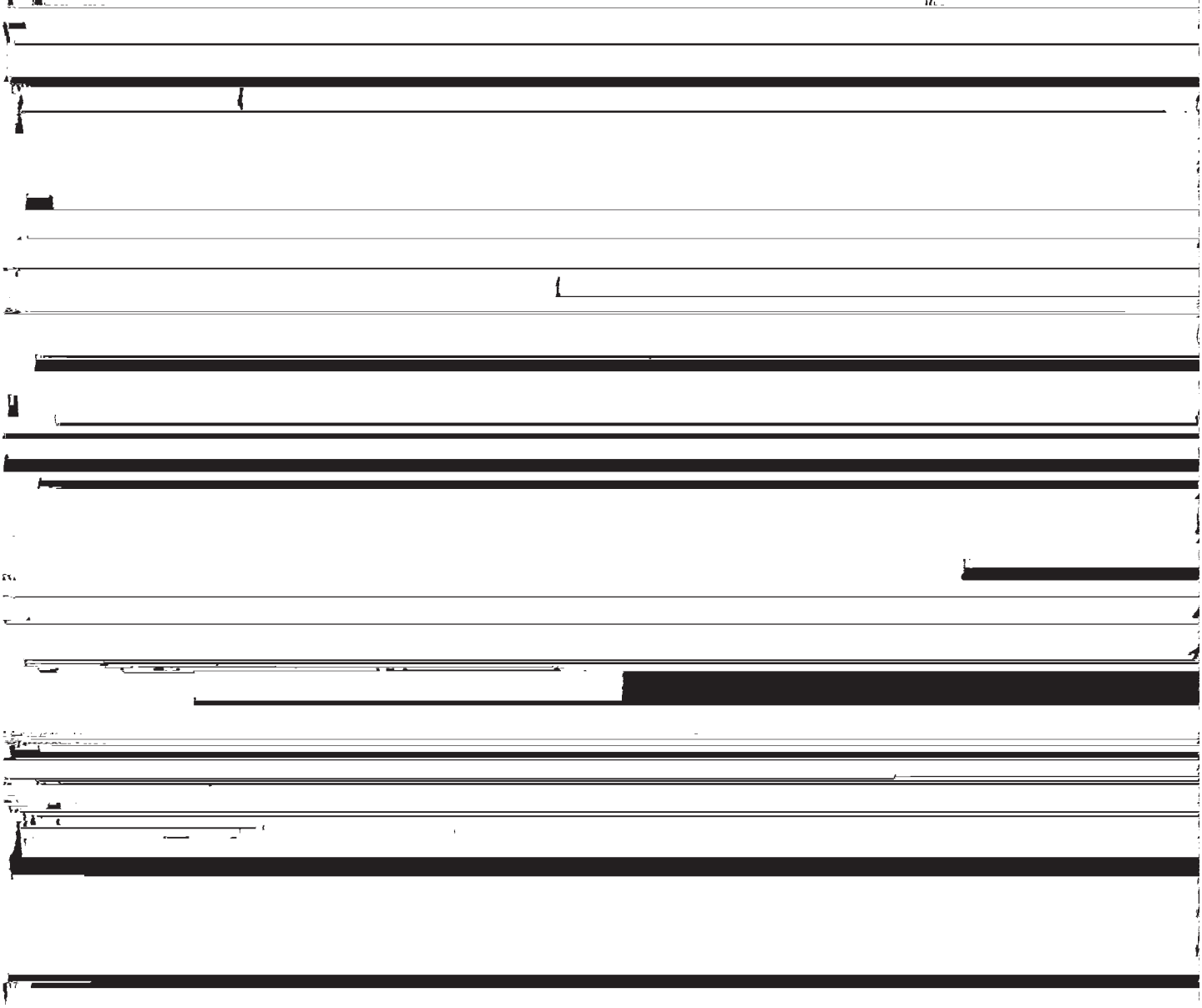
Solum thickness ranges from 40 to 60 inches but is commonly less than 50 inches.

The A1 horizon is pale brown, light brownish gray, grayish brown, or brown.

The A2 horizon is very pale brown, light brownish gray, light brown, or pale brown. The A1 horizon is neutral to medium acid, and the A2 horizon is medium acid through very strongly acid.

The B2t horizon is reddish yellow, yellowish red, or strong brown. The texture is clay or heavy clay loam. Reaction is medium acid or strongly acid. Gravel fragments range from 10 to 25 percent.

Some pedons have a B3 horizon with colors similar to those in the B2t



The A horizon is dark grayish brown, very dark grayish brown, or dark brown. Some pedons are calcareous to noncalcareous in the A horizon. All horizons are moderately alkaline.

The AC horizon is reddish brown, yellowish red, reddish yellow, brown, or strong brown.

The C horizon is similar in color to the AC horizon, and some pedons have red to gray mottles.

This Clarita soil is a taxadjunct to the Clarita series because it has a brownish A horizon in more than 50 percent of the pedons. It is similar enough to Clarita soils in behavior that nothing would be gained by adding another series name.

Clarita soils are similar to Grainola and Tamford soils. Tamford and Grainola soils have colors with higher

Darnell series

The Darnell series consists of shallow, well drained to somewhat excessively drained, moderately rapidly permeable soils. These soils formed in material weathered from sandstone. They are on ridgetops and on side slopes. Slopes range from 2 to 20 percent.

Typical pedon of Darnell fine sandy loam in an area of Windthorst-Darnell complex, 5 to 20 percent slopes, 1,200 feet west and 2,600 feet north of the southeast corner sec. 29, T. 5 S., R. 2 E.:

A1—0 to 2 inches, grayish brown (10YR 5/2) fine sandy loam, very dark

ture; hard, friable; 80 percent by volume flattened sandstone and shale fragments 1 inch to 6 inches in diameter on the long axis; few fine black concretions; very strongly acid; clear wavy boundary.
C—17 to 20 inches, hard sandstone interbedded with hard shales.

Solum thickness is 8 to 20 inches.

The A1 horizon is pale brown, light brownish gray, grayish brown, or brown. It is medium acid through slightly acid. Fragments range from 15 to 45 percent by volume.

The B2 horizon is very pale brown, pale brown, light yellowish brown, light brown, or light brownish gray. It is a loam, silt loam, or silty clay loam that is 50 to 90 percent fragments. It is medium acid through very strongly acid.

The C horizon is fractured sandstone bedrock that is interbedded with layers of hard shale or chert. It is commonly tilted 20 to 50 degrees from horizontal.

The Darnell Variant soil is a variant to the Darnell series because it has more than 35 percent fragments in the control section.

The Darnell Variant is associated with Chigley soils, which have a more clayey subsoil and a thicker solum.

Duffau series

The Duffau series consists of deep, well drained, moderately permeable, gently sloping and sloping soils on uplands. Slopes range from 3 to 8 percent. The soils formed in weakly consolidated sandstone under a cover of trees and tall grasses.

Representative profile of Duffau fine sandy loam in an area of Weatherford-Duffau complex, 3 to 8 percent slopes, 680 feet west and 10 feet north of the southeast corner sec. 35, T. 1 S., R. 3 W.:

A1—0 to 9 inches, brown (10YR 5/3) fine sandy loam, dark brown (10YR 3/3) moist; weak fine granular structure; slightly hard, very friable; slightly acid; clear smooth boundary.
A2—9 to 15 inches, pale brown (10YR 6/3) fine sandy loam, brown (10YR 4/3) moist; weak fine granular structure; slightly hard, very friable; slightly acid; clear smooth boundary.
B21t—15 to 32 inches, yellowish red (5YR 5/6) sandy clay loam, yellowish red (5YR 4/6) moist, weak coarse prismatic structure; hard, firm; clay films on faces of peds; mildly alkaline; gradual smooth boundary.
B22t—32 to 44 inches, yellowish red (5YR 5/6) sandy clay loam, yellowish red (5YR 4/6) moist; few medium faint mottles of reddish brown (5YR 4/4); weak coarse prismatic structure; very hard, firm; thin clay films on faces of peds; neutral; gradual smooth boundary.
B3—44 to 66 inches, reddish yellow (5YR 6/6) sandy clay loam, yellowish red (5YR 5/6) moist; common medium distinct mottles of pink (5YR 7/3) and red (2.5YR 4/6); weak coarse prismatic structure; very hard, firm; slightly acid; gradual wavy boundary.
C—66 to 80 inches, reddish yellow (5YR 7/6) and red (2.5YR 4/6) weakly cemented sandstone; massive; very hard, firm; 5 percent angular and rounded chert gravel; slightly acid.

Depth to sandstone ranges from 60 to about 90 inches.

The A1 horizon is pale brown, brown, grayish brown, or light brownish gray. It is slightly acid to mildly alkaline.

The A2 horizon is slightly lighter in color than the A1 horizon. The A2 horizon is slightly acid through mildly alkaline.

The B2t and B3 horizons are reddish brown, yellowish red, and reddish

Duffau soils are similar to Konawa and Konsil soils. Konawa and Konsil soils have less than 75 percent base saturation in the Bt horizon. Duffau soils are mapped only with Weatherford soils.

Durant series

The Durant series consists of deep, moderately well drained, very slowly permeable soils. The soils formed in material weathered from mostly clays or shales on uplands. Slopes range from 1 to 5 percent. Durant soils are very gently sloping to gently sloping and occur on prairies. They are on broad smooth ridgetops, on hillsides, and in valleys.

Typical pedon of Durant loam, 3 to 5 percent slopes, 600 feet east and 120 feet south of the northwest corner sec. 34, T. 4 S., R. 1 E.:

A1—0 to 10 inches, dark grayish brown (10YR 4/2) loam, very dark brown (10YR 2/2) moist; moderate medium granular structure; hard, friable; medium acid; clear smooth boundary.
B1—10 to 15 inches, dark grayish brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) moist; moderate medium blocky structure; very hard, firm; medium acid; clear smooth boundary.
B21t—15 to 26 inches, brown (10YR 5/3) clay, brown (10YR 4/3) moist; common fine distinct mottles of reddish brown; moderate medium blocky structure; extremely hard, very firm; common bodies and coatings on peds of dark grayish brown; few slickensides; distinct clay films on faces of peds; few fine black concretions and cherty fragments; slightly acid; gradual wavy boundary.
B22t—26 to 55 inches, grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; few medium faint mottles of light yellowish brown (2.5Y 6/4); weak medium blocky structure; extremely hard, very firm; few slickensides; distinct clay films on faces of peds; few fine black concretions; few powdery masses and few fine concretions of calcium carbonate; moderately alkaline; gradual smooth boundary.
B3—55 to 72 inches, light olive brown (2.5Y 5/4) clay, olive brown (2.5Y 4/4) moist; common medium distinct mottles of light brownish gray (10YR 6/2); weak coarse blocky structure; extremely hard, very firm; few fine brown and black concretions; few masses of powdery calcium carbonate; moderately alkaline.

The solum is more than 40 inches thick. Depth to secondary carbonates ranges from 30 to 50 inches.

The A1 horizon is dark gray, dark brown or brown, dark grayish brown, or grayish brown. Texture is dominantly loam but is silt loam in places. Reaction is medium through slightly acid. The A to B boundary is clear or gradual.

The B1 horizon is brown, dark brown, dark grayish brown, grayish brown, or dark yellowish brown. Texture is clay loam or clay. Reaction is medium acid through neutral.

The B2t horizon has similar colors to the B1 horizon but includes yellowish brown, light yellowish brown, or brownish yellow. Mottles are few to common reddish or brownish. Reaction is slightly acid through moderately alkaline.

The B3 horizon has colors like the B2t horizon but includes mottles of grayish brown to light brownish gray. Texture is clay or heavy clay loam. Reaction is mildly or moderately alkaline.

The C horizon in a few pedons is strong brown, reddish yellow, yellowish brown, light yellowish brown, or brownish yellow. There are few to common reddish, brownish, or grayish mottles. Texture is clay or shale. Reaction is moderately alkaline

Steedman and Normangee soils have less than 10 inches of a dark colored surface layer.

Elandco series

The Elandco series consists of deep, moderately perme-

Thickness of the solum exceeds 72 inches.

The A1 horizon is dark brown, dark grayish brown, grayish brown, light brownish gray, or light yellowish brown. It is medium acid through neutral.

The A2 horizon is pinkish gray, light brownish gray, very pale brown, pale brown, pink, or light brown. It is loamy fine sand or fine sand and medium acid through neutral.

Healdton series

The Healdton series consists of deep, moderately well drained, very slowly permeable soils on flood plains. These soils occur on broad, smooth areas under a cover of salt tolerant grasses and scattered trees. Slopes are 0 to 1 percent. The soils formed in material weathered from silty to clayey alluvium. A perched water table occurs at a depth of 6 to 18 inches most of the year.

Typical pedon of Healdton silt loam, 350 feet north and 25 feet east of the southwest corner sec. 35, T. 3 S., R. 2 E.:

Ap—0 to 6 inches, light brownish gray (10YR 6/2) silt loam, dark grayish brown (10YR 4/2) moist; moderate medium platy structure parting to weak medium granular; hard, friable; dark grayish brown (10YR 4/2) coatings on faces of peds; slightly acid; abrupt smooth boundary.

B21t—6 to 10 inches, dark gray (10YR 4/1) silty clay, very dark gray (10YR 3/1) moist; moderate coarse columnar structure parting to moderate medium blocky; extremely hard, very firm; light brownish gray (10YR 6/2) silt coatings on faces of peds and columns; clay films on faces of peds; mildly alkaline; gradual wavy boundary.

B22t—10 to 26 inches, dark gray (10YR 4/1) silty clay, very dark gray (10YR 3/1) moist; moderate medium blocky structure; extremely hard, extremely firm; grayish brown (10YR 5/2) silt coatings on faces of peds; few slickensides; clay films on faces of peds; moderately alkaline; gradual smooth boundary.

B3—26 to 45 inches, brown (10YR 4/3) silty clay, dark brown (10YR 3/3) moist; weak coarse blocky structure; extremely hard, extremely firm; dark gray (10YR 4/1) silt coatings on faces of peds; common films and soft masses of salts; few fine calcium carbonate concretions; moderately alkaline; gradual smooth boundary.

C—45 to 80 inches, brown (10YR 5/3) silty clay, brown (10YR 4/3) moist; massive; extremely hard, extremely firm; few fine soft masses and concretions of calcium carbonate; moderately alkaline.

Solum thickness ranges from 40 to more than 60 inches. Depth to secondary carbonates ranges from 40 to 65 inches. Exchangeable sodium in the B2t horizon ranges from 15 to 25 percent.

The A horizon is light brownish gray, light gray, or pale brown. It is silt loam, loam, or silty clay loam and is slightly acid or neutral. The boundary of the A to Bt horizon is abrupt or clear.

The B2t horizon is dark gray, gray, grayish brown, brown, or dark grayish brown. In some pedons it has brown or pale brown mottles in the upper part and grayish mottles in the lower part. The B2t horizon is silty clay, clay, or silty clay loam, and it ranges from neutral to moderately alkaline.

The B3 and C horizons are brown, dark grayish brown, dark gray, yellowish brown, or strong brown. Some pedons have brownish or grayish mottles. The texture is silty clay, clay, clay loam, or silty clay loam. Reaction is mildly alkaline or moderately alkaline.

Healdton soils are associated with Watonga soils, which are clayey throughout. Wilson soils are similar to Healdton soils, but they are on uplands and have lower concentrations of sodium in the subsoil.

Heiden series

The Heiden series consists of deep, well drained, very slowly permeable soils formed in material weathered from clays or shaly clays. These soils are very gently sloping on ridgetops and swales and sloping to strongly sloping on hillsides. Slopes range from 1 to 12 percent.

Typical pedon of Heiden clay, 1 to 3 percent slopes, 1,900 feet south and 80 feet east of the northwest corner sec. 31, T. 2 S., R. 1 E.:

A1—0 to 9 inches, dark gray (10YR 4/1) clay, very dark gray (10YR 3/1) moist; moderate medium granular structure; very hard, very firm; few cherty fragments; mildly alkaline; clear wavy boundary.

AC1—9 to 30 inches, dark grayish brown (2.5Y 4/2) silty clay, very dark grayish brown (2.5Y 3/2) moist; weak coarse blocky structure; extremely hard, extremely firm; distinct intersecting slickensides; common cracks lined with dark gray (10YR 4/1); common concretions of calcium carbonate; few cherty fragments; moderately alkaline; gradual wavy boundary.

AC2—30 to 44 inches, grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; weak coarse blocky structure; extremely hard, extremely firm; distinct intersecting slickensides; common cracks and bodies with dark gray (10YR 4/1) colors; few soft masses and common concretions of calcium carbonate; few black concretions and cherty fragments; calcareous; moderately alkaline; gradual wavy boundary.

C—44 to 72 inches, light brownish gray (2.5Y 6/2) silty clay, grayish brown (2.5Y 5/2) moist; common medium distinct mottles of olive yellow (2.5Y 6/6); massive; extremely hard, extremely firm; common 1 inch to 6 inch strata of gray to olive yellow shales; common soft masses of calcium carbonate; calcareous; moderately alkaline.

The combined thickness of the A and AC horizons is about 40 to 60 inches. These horizons are the thinnest in the microhighs and thickest in the microlows. Cracks extend from the surface to a depth of several feet when the soil is dry.

The A1 horizon is dark gray, dark grayish brown, very dark grayish brown, or very dark gray. When colors are dark gray or very dark gray, it is less than 12 inches thick. It ranges from neutral through moderately alkaline and is calcareous in some pedons.

The AC horizon is dark grayish brown, grayish brown, brown, light olive brown, or yellowish brown. Some pedons have brownish to grayish mottles. Most pedons are calcareous in some part. Texture is clay or silty clay.

The C horizon is light brownish gray, dark grayish brown, light olive brown, yellowish brown, or olive brown. Most pedons have yellowish to grayish mottles. The texture is clay, silty clay, or shaly clay.

Heiden soils are similar to Burleson, Tamford, and Watonga soils. Burleson and Watonga soils have a thicker grayish surface layer. Watonga soils are on flood plains. Tamford soils have redder hues throughout. Burleson, Clarita, and Wilson soils are generally associated with Heiden soils.

Kemp series

The Kemp series consists of deep, moderately well drained, moderately permeable, nearly level to very gently sloping soils. These soils are on flood plains that are subject to flooding. They formed in mostly loamy alluvium under a cover of trees with an understory of native grasses. Slopes are 0 to 2 percent. The water table occurs at a depth of 2 to 3 feet for most of the year.

Representative profile of Kemp loam in an area of Kemp and Tullahassee soils, 1,050 feet west and 150 feet south of the northeast corner sec. 21, T. 5 S., R. 3 E.:

A11—0 to 6 inches, pale brown (10YR 6/3) loam, brown (10YR 4/3) moist; weak fine granular structure; hard, very friable; few faint strata of light brownish gray (10YR 6/2); slightly acid; clear smooth boundary.

A12—6 to 20 inches, pale brown (10YR 6/3) loam, brown (10YR 4/3) moist; weak coarse subangular blocky structure; very hard, very friable; few peds with white (10YR 8/2) coatings; slightly acid; clear smooth boundary.

Ab—20 to 48 inches, grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; few fine faint brown and few fine distinct

gray and brownish yellow mottles; weak coarse subangular blocky structure; very hard, friable; neutral; gradual smooth boundary.

C—48 to 72 inches, gray (10YR 6/1) silty clay loam, dark gray (10YR 4/1) moist; common medium distinct brownish yellow (10YR 6/6) mottles; massive; extremely hard, very firm; few black concretions; slightly acid.

Thickness of the A1 horizon ranges from 18 to 35 inches.

The A11 horizon is pale brown, light yellowish brown, light brown, or reddish yellow. It is stratified with lighter and darker colors. It is a loam, fine sandy loam, loamy fine sand, or silt loam and is medium acid

Kiti soils are similar to Woodford soils. Woodford soils formed in material weathered from fractured sandstone. Kiti soils are mapped with Scullin, Grainola, and Rock outcrop. They are associated with the Lawton Variant and Woodford soils.

Konawa series

The Konawa series consists of deep, well drained, moderately permeable soils formed in material weathered

Slopes are smooth and convex on broad nearly level to very gently sloping ridgetops and gently sloping to sloping hillsides. Slopes range from 0 to 8 percent.

Typical pedon of Konsil loamy fine sand, 3 to 8 percent slopes, 1,440 feet north and 120 feet east of the southwest corner sec. 35, T. 5 S., R. 2 W.:

A1—0 to 6 inches, dark grayish brown (10YR 4/2) loamy fine sand, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; soft, very friable; some mixing of A2 horizon colors; slightly acid; clear smooth boundary.

A2—6 to 14 inches, pale brown (10YR 6/3) loamy fine sand, brown (10YR 5/3) moist; weak fine granular structure; soft, very friable; some mixing of A1 horizon colors; slightly acid; clear smooth boundary.

B21t—14 to 27 inches, reddish yellow (5YR 6/6) sandy clay loam, yellowish red (5YR 5/6) moist; weak coarse prismatic structure breaking to moderate medium subangular blocky; very hard, firm; clay films on faces of peds; medium acid; gradual smooth boundary.

B22t—27 to 36 inches, reddish yellow (5YR 6/6) sandy clay loam, yellowish red (5YR 5/6) moist; common medium distinct red (2.5YR 4/6) mottles; weak coarse prismatic structure breaking to weak medium subangular blocky; very hard, firm; clay films on faces of peds; medium acid; gradual smooth boundary.

B23t—36 to 42 inches, reddish yellow (5YR 6/6) sandy clay loam, yellowish red (5YR 5/6) moist; common medium distinct red (2.5YR 4/6) and light yellowish brown (10YR 6/4) mottles; weak coarse prismatic structure; very hard, firm; patchy clay films on faces of peds; few iron-manganese oxide concretions; medium acid; gradual wavy boundary.

B24t—42 to 65 inches, reddish yellow (7.5YR 6/6) sandy clay loam, strong brown (7.5YR 5/6) moist; common medium distinct pale brown (10YR 6/3) mottles; weak coarse prismatic structure; hard, friable; slightly acid; gradual wavy boundary.

C—65 to 70 inches, reddish yellow (7.5YR 6/8) weakly cemented sandstone, strong brown (7.5YR 5/8) moist; common medium distinct

A1—0 to 11 inches, very dark grayish brown (10YR 3/2) clay loam, very dark brown (10YR 2/2) moist; moderate fine granular structure; very hard, friable; few fine black concretions; neutral; gradual smooth boundary.

B21t—11 to 23 inches, reddish brown (5YR 4/4) clay, dark reddish brown (5YR 3/4) moist; weak medium blocky structure; very hard, very firm; common very dark grayish brown coatings on faces of peds; distinct clay films; few fine black concretions; few cherty fragments; neutral; gradual smooth boundary.

B22t—23 to 50 inches, reddish brown (5YR 4/4) clay dark reddish brown (5YR 3/4) moist; moderate medium blocky structure; very hard, very firm; many faces of peds with dark reddish brown coatings; distinct clay films; few fine and medium black concretions; few cherty fragments; mildly alkaline; diffuse smooth boundary.

B3—50 to 80 inches, reddish brown (5YR 5/4) clay, reddish brown (5YR 4/4) moist; weak coarse blocky structure; very hard, very firm; few bodies and streaks of reddish brown; few concretions and masses of calcium carbonate; few cherty fragments; calcareous; moderately alkaline.

Depth to rock is more than 60 inches. Secondary carbonates occur at depths of 40 to 60 inches. Chert fragments range from 0 to 5 percent in all horizons.

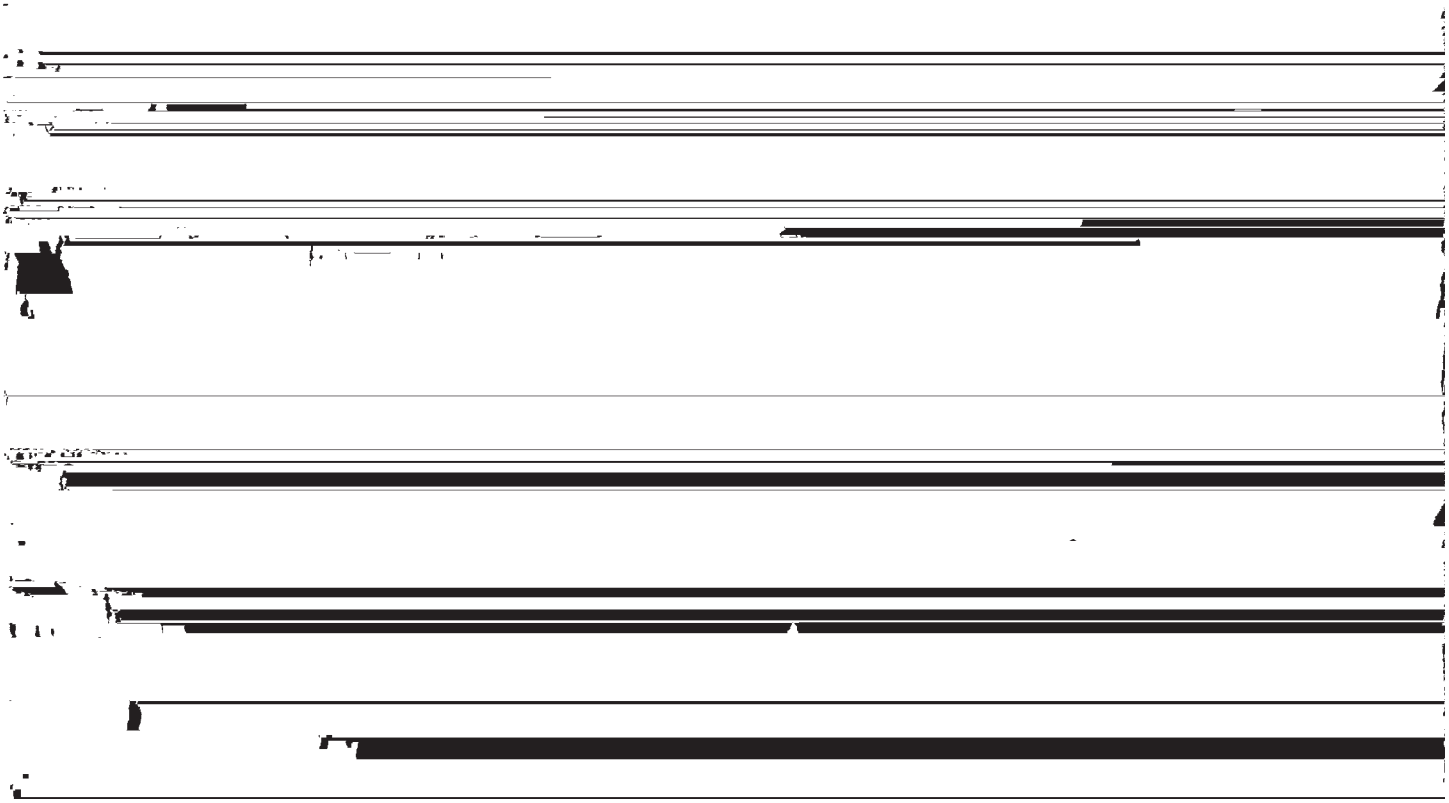
The A horizon is very dark grayish brown, dark brown, dark reddish gray, reddish brown, dark reddish brown, or dark grayish brown. The A horizon ranges from slightly acid through neutral. The A horizon to B horizon boundary is clear or gradual.

The B21t horizon is dark reddish brown, reddish brown, dark brown, or brown. It is clay, heavy clay loam, silty clay, or heavy silty clay loam. This horizon is neutral to mildly alkaline.

The B22t horizon is dark reddish brown, reddish brown, brown, or dark brown. It is clay or silty clay and ranges from neutral to moderately alkaline.

The B3 horizon is reddish brown or brown and is faintly mottled in some pedons. It is clay or silty clay.

The Lawton Variant is similar to Renfrow soils. Renfrow soils are more slowly permeable and have a more compact clayey subsoil than Lawton Variant soils.



Thickness of the solum ranges from 35 to 60 inches.

The A horizon is dark reddish gray, reddish brown, or brown. In some areas 10 to 12 inches of recent deposits occur on the surface.

The B2 horizon is reddish brown, yellowish red, or brown. It is clay or silty clay.

The C horizon is light reddish brown, reddish brown, yellowish red, or brown. It is silty clay, clay loam, or clay.

Miller soils occur on narrow to wide areas on flood plains. They are associated with Yahola and Weswood soils and are similar to Watonga soils. Watonga soils have grayish colors and lack calcareous reaction in the surface layer.

Normangee series

The Normangee series consists of deep, moderately well drained, very slowly permeable, very gently sloping to gently sloping soils on uplands. Slopes range from 3 to 5 percent. These soils developed in clays or partly weathered shales under native grasses and scattered trees.

Representative profile of Normangee loam, 2 to 5 percent slopes, eroded, 60 feet south and 300 feet west of the northeast corner sec. 8, T. 3 S., R. 1 E.:

Ap—0 to 6 inches, grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; very hard, friable; slightly acid; clear smooth boundary.

B21t—6 to 27 inches, brown (10YR 5/3) clay, brown (10YR 4/3) moist; common medium distinct mottles of yellowish red (5YR 5/6); moderate medium blocky structure; extremely hard, extremely firm; clay films and grayish brown (10YR 5/2) coatings on many faces of peds; some black concretions and cherty gravel; medium acid; gradual wavy boundary.

B22t—27 to 55 inches, brown (10YR 5/3) clay, brown (10YR 4/3) moist; few medium faint mottles of yellowish brown (10YR 5/4); weak medium blocky structure; extremely hard, extremely firm; clay films and a few grayish brown (10YR 5/2) coatings on faces of peds; few slickensides; few black concretions; few fine masses and concretions of calcium carbonate; some chert gravel; moderately alkaline; gradual wavy boundary.

C—55 to 80 inches, brownish yellow (10YR 6/6) clay, yellowish brown (10YR 5/6) moist; many medium distinct mottles of gray (10YR 6/1); massive; extremely hard, extremely firm; few masses and concretions of calcium carbonate; some black concretions and chert gravel; moderately alkaline.

rant soils have a dark colored surface layer more than 10 inches thick. Steedman soils have a solum less than 40 inches thick.

Pulaski series

The Pulaski series consists of deep, well drained, moderately rapidly permeable, nearly level or very gently sloping soils on flood plains. Slopes are 0 to 2 percent. The soils formed in recent deposits of loamy or sandy alluvium under a cover of trees.

Representative profile of the Pulaski fine sandy loam, [illegible] sec. 26, T. 5 S., R. 3 W.:

A1—0 to 8 inches, light brownish gray (10YR 6/2) fine sandy loam, dark grayish brown (10YR 4/2) moist; weak fine granular structure; hard, very friable; medium acid; clear smooth boundary.

AC—8 to 24 inches, reddish brown (5YR 5/4) fine sandy loam, dark reddish brown (5YR 3/4) moist; weak coarse prismatic structure parting to weak coarse subangular blocky; hard, very friable; medium acid; gradual smooth boundary.

C—24 to 60 inches, reddish yellow (5YR 6/8) fine sandy loam, yellowish red (5YR 4/8) moist; massive; slightly hard, very friable; few thin strata of darker soil; medium acid.

Thickness of the soil ranges from 12 to 42 inches.

The A1 horizon is brown, grayish brown, light brownish gray, pale brown, reddish brown, or light brown. It is fine sandy loam or loam with or without strata of sandier or more clayey layers. It is medium acid through neutral.

The AC and C horizons are brown, pale brown, light brown, reddish yellow, reddish brown, or light reddish brown. The AC horizon is fine sandy loam or loam and medium acid through neutral. The C horizon is fine sandy loam, loamy fine sand, or loam and medium acid through moderately alkaline. Stratification can occur in any layer.

Pulaski soils occur on mostly narrow flood plains that are occasionally or frequently flooded for brief periods. They are associated with Bunyan and Elandco soils and are similar to Yahola, Weswood, and Bunyan soils. Yahola soils are calcareous throughout. Weswood and Bunyan soils have more than 18 percent clay in the upper 40 inches.

Renfrow series

B22t—30 to 42 inches, red (2.5YR 5/6) clay, red (2.5YR 4/6) moist; moderate medium blocky structure; extremely hard, extremely firm; few slickensides; distinct clay films on faces of peds; few fine black concretions; few fine powdery masses of calcium carbonate near lower boundary; moderately alkaline; gradual smooth boundary.

B3—42 to 65 inches, red (2.5YR 4/6) clay, dark red (2.5YR 3/6) moist; few medium distinct mottles and bodies of light reddish brown

Gravel content ranges from about 3 to 10 percent. The soil is medium acid through slightly acid.

The B1 or B21t horizon is brown, dark brown, reddish yellow, reddish brown, yellowish red, or red. It is gravelly or flaggy clay loam, gravelly or flaggy clay, clay loam, or clay, with 35 to 45 percent clay and few to 15 percent limestone fragments. It is medium acid through mildly alkaline.

The B22t horizon is similar in color and clay content to the B21t

Similar soils are Renfrow, Durant, and Normangee soils, which have a solum more than 40 inches thick. Renfrow and Durant soils have more than 10 inches of a dark colored mollic epipedon in the surface layer and upper subsoil.

Stephenville series

The Stephenville series consists of moderately deep, well drained, moderately permeable, very gently sloping to sloping soils on uplands. The soils formed in material weathered from sandstone under a cover of trees and an understory of native grasses. Slopes range from 2 to 8 percent.

Representative profile of the Stephenville soil in an area of Stephenville-Darnell complex, 2 to 8 percent slopes, 2,500 feet north and 920 feet east of the southwest corner sec. 8, T. 1 S., R. 3 W.:

Representative profile of Tamford clay loam in an area of Tamford-Grainola complex, 5 to 12 percent slopes, 200 feet north and 70 feet west of the southeast corner sec. 33, T. 4 S., R. 3 W.:

A1—0 to 6 inches, reddish gray (5YR 5/2) clay loam, dark reddish brown (5YR 3/2) moist; weak fine blocky structure; very hard, very firm; slightly acid; clear wavy boundary.

AC1—6 to 30 inches, reddish brown (2.5YR 4/4) clay, dark reddish brown (2.5YR 3/4) moist; weak coarse blocky structure; extremely hard, extremely firm; common slickensides that intersect in the lower part; few masses and concretions of calcium carbonate; reddish gray soil material in some vertical cracks; moderately alkaline; gradual wavy boundary.

AC2—30 to 54 inches, reddish brown (2.5YR 5/4) clay, reddish brown (2.5YR 4/4) moist; weak coarse blocky structure; extremely hard, extremely firm; few intersecting slickensides; common masses and concretions of calcium carbonate; calcareous; moderately alkaline; gradual wavy boundary.

C—54 to 72 inches, red (10R 5/6) clay, red (10R 4/6) moist; massive; extremely hard, extremely firm; common bodies and thin strata of

A12—13 to 20 inches, pale brown (10YR 6/3) fine sandy loam, brown (10YR 4/3) moist; common medium faint mottles of very pale brown (10YR 7/4); weak medium subangular blocky structure; hard, very friable; few thin strata of very pale brown and brown; slightly acid; clear smooth boundary.

AC—20 to 40 inches, very pale brown (10YR 7/4) loamy fine sand, yellowish brown (10YR 5/4) moist; common medium distinct mottles of light brownish gray (10YR 6/2); weak coarse subangular blocky structure; slightly hard, very friable; few thin strata of pale brown and light brownish gray fine sandy loam; slightly acid; clear smooth boundary.

IIAb—40 to 65 inches, grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; common medium distinct mottles of light brown (7.5YR 6/4) and gray (N 6/0); massive; very hard, friable; few thin strata of light yellowish brown; saturated with water;

The A and AC horizons combined are 40 to 60 inches thick. Intersecting slickensides occur within 20 to 40 inches of the soil surface. Distance between center of the microhigh and center of the microlow is 8 to 12 feet.

The upper part of the A horizon is silty clay or silty clay loam. The lower part of the A horizon is silty clay and clay. Color of the A1 horizon is dark gray, very dark gray, and gray. In some pedons the lower part of the thicker A1 horizons has very dark grayish brown, grayish brown, and dark brown colors. Reaction ranges from neutral through moderately alkaline. The A horizon is 12 inches thick in the microhighs and 40 inches thick in the microlows.

The AC horizon is brown, dark brown, dark grayish brown, dark yellowish brown, or yellowish brown. It is mildly alkaline to moderately alkaline. The AC horizon contains secondary carbonates and is calcareous in some pedons. Cracks in the AC horizon are commonly filled with colors like the A1 horizon.

The B2t horizon is reddish yellow, yellowish red, or red. Brownish or reddish mottles occur in some pedons. The soil is neutral through strongly acid.

The B3 horizon has colors similar to the those of the B2t horizon and has none to common brownish to reddish mottles. It is medium acid through neutral. Less than 10 percent is fragments of sandstone less than 3 inches in diameter. Some pedons lack a B3 horizon.

The C horizon is weakly cemented sandstone.

Weatherford soils are similar to Konsil, Konawa, and Stephenville soils. Konsil and Konawa soils are more than 60 inches deep. Stephenville soils are 20 to 40 inches deep. Associated soils are Darnell, Duffau, Stephenville, and Windthorst soils.

Weswood series

The Weswood series consists of deep, well drained, moderately permeable, nearly level soils of the flood plains. The soils formed in loamy alluvium under a cover of trees. They occur as narrow to wide elongated areas near the major streams. Slopes are 0 to 1 percent.

Typical profile of Weswood silt loam, 1,550 feet east and 75 feet north of the southwest corner sec. 17, T. 3 S., R. 3 E.:

Ap—0 to 6 inches, light brown (7.5YR 6/4) silt loam, brown (7.5YR 4/4) moist; weak medium granular structure; very hard, friable; calcareous; moderately alkaline; clear smooth boundary.

AC—6 to 40 inches, light brown (7.5YR 6/4) silt loam, brown (7.5YR 4/4) moist; weak medium subangular blocky structure; very hard, friable; few 1/2 inch to 2 inch strata of pink (7.5YR 7/4) fine sandy loam; calcareous; moderately alkaline; gradual smooth boundary.

C—40 to 80 inches, light brown (7.5YR 6/4) silt loam, brown (7.5YR 4/4) moist; massive; hard, friable; common 1 inch to 4 inch strata of brown (10YR 5/3) fine sandy loam; calcareous; moderately alkaline.

Thickness of the solum ranges from 30 to 60 inches.

The Ap and AC horizons are reddish brown, yellowish red, light brown, or brown. Thin strata include fine sandy loam, loam, or clay loam.

The C horizon has colors similar to those of the A or AC horizons, including reddish yellow. In most areas it is silt loam, loam, or fine sandy loam, but in some it is silty clay loam.

This soil is a taxadjunct to the Weswood series because Weswood soils typically have well expressed cambic horizons; otherwise, it has

Ap—0 to 8 inches, gray (10YR 5/1) silt loam, very dark gray (10YR 3/1) moist; massive when dry, moderate fine granular structure when moist; hard, friable; medium acid; abrupt smooth boundary.

B21t—8 to 26 inches, very dark gray (10YR 3/1) silty clay, black (10YR 2/1) moist; moderate medium blocky structure; extremely hard, extremely firm; distinct clay films; few slickensides; few cherty fragments; neutral; gradual smooth boundary.

B22t—26 to 52 inches, grayish brown (10YR 5/2) silty clay, dark grayish brown (10YR 4/2) moist; moderate medium blocky structure; extremely hard, extremely firm; distinct clay films; few slickensides; few cherty fragments; few masses and concretions of calcium carbonate; moderately alkaline; gradual smooth boundary.

B3—52 to 80 inches, reddish yellow (7.5YR 6/6) clay, strong brown (7.5YR 5/6) moist; common medium distinct mottles of grayish brown (10YR 5/2) and brownish yellow (10YR 6/6); weak coarse blocky structure; extremely hard, extremely firm; few slickensides; few cherty fragments; few masses and concretions of calcium carbonate; moderately alkaline.

Solum thickness is more than 60 inches. Cracks more than 1 centimeter wide extend from the surface to a depth of 2 to 4 feet during the dry season.

The A horizon is gray, dark gray, grayish brown, or dark grayish brown. It is medium acid to neutral.

The B21t horizon is very dark gray, dark gray, or gray. In some profiles it has brownish or yellowish mottles. It is silty clay or clay and neutral or slightly acid.

The B22t horizon is grayish brown, dark grayish brown, brown, or dark brown. It is silty clay or clay that is neutral to moderately alkaline.

The B3 horizon is reddish yellow, yellowish red, dark brown, brown, yellowish brown, or dark yellowish brown. It is clay, silty clay, clay loam, or silty clay loam and has secondary carbonates.

Wilson soils are similar to Healdton soils, which are on flood plains and have high concentrations of sodium salts in the subsoil. Associated soils are Burleson and Heiden soils.

Windthorst series

The Windthorst series consists of deep, moderately well drained, moderately slowly permeable, very gently sloping to moderately steep soils on uplands. These soils formed in material weathered from mostly clays or shaly clays under a cover of trees and an understory of native grasses. Slopes range from 1 to 20 percent.

(10YR 6/3); weak medium blocky structure; extremely hard, very firm; patchy clay films on faces of peds; few soft masses of calcium carbonate below 45 inches; few fine and medium black concretions; moderately alkaline; gradual smooth boundary.

C—54 to 65 inches, brownish yellow (10YR 6/6) sandy clay, yellowish brown (10YR 5/6) moist; common medium distinct gray (10YR 6/1) mottles; massive; extremely hard, very firm; 10 percent by volume of soft gravelly sandstone fragments; many fine black masses and concretions; moderately alkaline.

Thickness of the solum ranges from 35 to 60 inches.

The A1 horizon is grayish brown, dark grayish brown, brown, or dark brown. Colors are slightly lighter in cultivated areas. The soil is medium acid to neutral.

The A2 horizon is very pale brown, pale brown, light yellowish brown, light brownish gray, or light brown. It is dominantly fine sandy loam but in places is loam. The reaction is medium acid through neutral.

The B21t horizon is reddish brown, yellowish red, or red. It is clay or sandy clay and medium acid through slightly acid.

The B22t horizon is brownish yellow, light yellowish brown, yellowish red, or reddish yellow. It has none to common reddish, brownish, or yellowish mottles. It is clay or sandy clay and medium acid through mildly alkaline.

The B3t horizon is similar in color and texture to the B22t horizon. It has few to common brownish, reddish, or grayish mottles. It is neutral to moderately alkaline.

The C horizon is soft shale, sandy clays, or heavy clay loams, with or without interbedded layers of sandstone.

Windthorst soils occur on broad upland areas of smooth ridge crests and smooth or rocky side slopes. They are associated with Darnell, Stephenville, and Weatherford soils and are similar to Chigley soils. Chigley soils are gravelly and formed in cherty conglomerates with interbedded layers of hard shale or sandstone.

Woodford series

The Woodford series consists of very shallow to shallow, well drained, moderately permeable soils on uplands. These soils formed in material weathered from sandstone. They are on sloping ridgetops to moderately steep hillsides. Slopes range from 5 to 20 percent.

Typical pedon of Woodford silt loam, 5 to 20 percent slopes, 700 feet west of the southeast corner sec. 29, T. 2 S., R. 1 E.:

A11—0 to 7 inches, very dark gray (10YR 3/1) silt loam, black (10YR 2/1) moist; strong medium granular structure; hard, very friable; many fine roots; 15 percent by volume of fragments of sandstone greater than 3 inches in diameter and 5 percent by volume of fragments of sandstone 2 mm to 3 inches in diameter; mildly alkaline; clear wavy boundary.

A12—7 to 17 inches, dark gray (10YR 4/1) very channery silt loam, very dark gray (10YR 3/1) moist; strong medium granular structure; hard, very friable; many fine roots; 40 percent by volume of fragments of sandstone greater than 3 inches in diameter and 25 percent by volume of fragments of sandstone 2 mm to 3 inches in diameter; mildly alkaline; abrupt wavy boundary.

R—17 to 20 inches, brown (10YR 4/3) hard fractured sandstone.

Depth to sandstone bedrock ranges from 5 to 20 inches.

The A horizon is very dark gray, very dark grayish brown, dark grayish brown, dark brown, brown, or dark gray. It ranges from slightly acid to moderately alkaline. Fragments of sandstone greater than 3 inches in diameter range from 10 to 60 percent. Fragments 2 millimeters to 3 inches in diameter range from 0 to 30 percent by volume.

The R layer is hard fractured sandstone. It is brown, yellowish brown, or brownish yellow. It is tilted from 20 to 70 degrees from horizontal.

Woodford soils are associated with and are similar to Kiti soils. Kiti soils formed in material weathered from limestone.

Yahola series

The Yahola series consists of deep, well drained, moderately rapidly permeable soils formed in slightly altered calcareous loamy alluvium. These soils are on flood plains of the Washita River. Slopes are nearly level to very gentle and range from 0 to 3 percent.

Typical pedon of Yahola fine sandy loam in an area of Yahola soils, 3,170 feet west and 150 feet south of the northeast corner sec. 12, T. 4 S., R. 3 E.:

A11—0 to 4 inches, reddish yellow (5YR 6/6) fine sandy loam, reddish brown (5YR 4/4) moist; weak fine granular structure; slightly hard, very friable; calcareous; moderately alkaline; clear smooth boundary.

A12—4 to 13 inches, light reddish brown (5YR 6/4) loamy fine sand, reddish brown (5YR 4/4) moist; very weak fine granular structure; soft, very friable; few bodies of fine sand; calcareous; moderately alkaline; gradual smooth boundary.

C1—13 to 38 inches, reddish yellow (5YR 6/6) fine sandy loam, yellowish red (5YR 4/6) moist; massive; slightly hard, very friable; few thin strata of loamy fine sand; calcareous; moderately alkaline; abrupt smooth boundary.

C2—38 to 72 inches, reddish yellow (5YR 6/6) loamy fine sand, yellowish red (5YR 4/6) moist; massive; soft, very friable; few 2 to 4 inch strata of reddish brown fine sandy loam; calcareous; moderately alkaline.

Solum thickness is 8 to 20 inches.

The A1 horizon is dominantly fine sandy loam but in places is loamy fine sand. Colors are reddish brown, light reddish brown, reddish yellow, or light brown.

The C horizon has colors similar to those of the A horizon. Texture is fine sandy loam or loam in the 10- to 40-inch control section. In the lower part of the C horizon, the texture is fine sandy loam, loam, or loamy fine sand. Thin strata of coarser or finer texture occur throughout this horizon.

Yahola soils are similar to Bunyan, Pulaski, and Weswood soils. Bunyan and Weswood soils have more loamy textures in the upper 40-inch control section. Pulaski soils are not calcareous throughout the soil. Associated soils are Miller and Weswood soils.

Zaneis series

The Zaneis series consists of deep, well drained, moderately permeable, gently sloping soils on uplands. The soils formed on hillsides and narrow ridge crests in material weathered from weakly consolidated sandstone and sandy shale under native grass. Slopes range from 3 to 5 percent.

Representative profile of Zaneis loam, 3 to 5 percent slopes, 90 feet west and 1,100 feet south of the northeast corner sec. 6. T. 5 S., R. 3 W.:

A1—0 to 12 inches, brown (10YR 5/3) loam, dark brown (10YR 3/3) moist; weak fine granular structure; slightly hard, very friable; neutral; gradual smooth boundary.

B1—12 to 27 inches, reddish brown (5YR 4/4) clay loam, dark reddish brown (5YR 3/4) moist; weak medium subangular blocky structure; hard, friable; few fine black concretions; neutral; gradual smooth boundary.

B2t—27 to 39 inches, reddish brown (5YR 5/4) clay loam, reddish brown (5YR 4/4) moist; weak medium prismatic structure parting to weak

Moisture and warm temperatures have been sufficient to promote the formation of distinct horizons in many of the

Processes of soil formation

Active processes that have influenced the formation of horizons in the soils of Carter County are (1) accumulation of organic matter, (2) leaching of calcium carbonates and bases, and (3) translocation of silicate clay minerals. In most soils, more than one of these processes have been active in the development of the horizons.

The addition of organic matter by native grasses has contributed to the granular structure of the surface layer. Durant soils, for example, have a granular surface layer high in organic matter content. Konsil soils, which formed under trees, have less organic matter than Durant soils.

Leaching of carbonates and bases is active in the formation of soils. The accumulation of calcium carbonates and bases in the lower part of the B horizon of Durant soils indicates the depth to which water has percolated.

(4) United States Department of Agriculture. 1951. Soil survey manual. U.S. Dep. Agric. Handb. 18, 503 pp., illus. [Supplements replacing pp. 173-188 issued May 1962.]
(5) United States Department of Agriculture. 1975. Soil taxonomy: a basic system of soil classification for making and interpreting soil surveys. Soil Conserv. Serv., U.S. Dep. Agric. Handb. 436, 754 pp., illus.

Glossary

ABC soil. A soil having an A, a B, and a C horizon.

AC soil. A soil having only an A and a C horizon. Commonly such soil formed in recent alluvium or on steep rocky slopes.

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are

sloping sides, a rounded crown, and a dish-shaped channel along the upper side. It may be nearly level or have a grade toward one or both ends.

Calcareous soil. A soil containing enough calcium carbonate (commonly with magnesium carbonate) to effervesce (fizz) visibly when treated with cold, dilute hydrochloric acid. A soil having measurable amounts of calcium carbonate or magnesium carbonate.

Capillary water. Water held as a film around soil particles and in tiny spaces between particles. Surface tension is the adhesive force that holds capillary water in the soil.

Catena. A sequence, or "chain," of soils on a landscape that formed in similar kinds of parent material but have different characteristics

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

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

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

Cemented.—Hard; little affected by moistening.

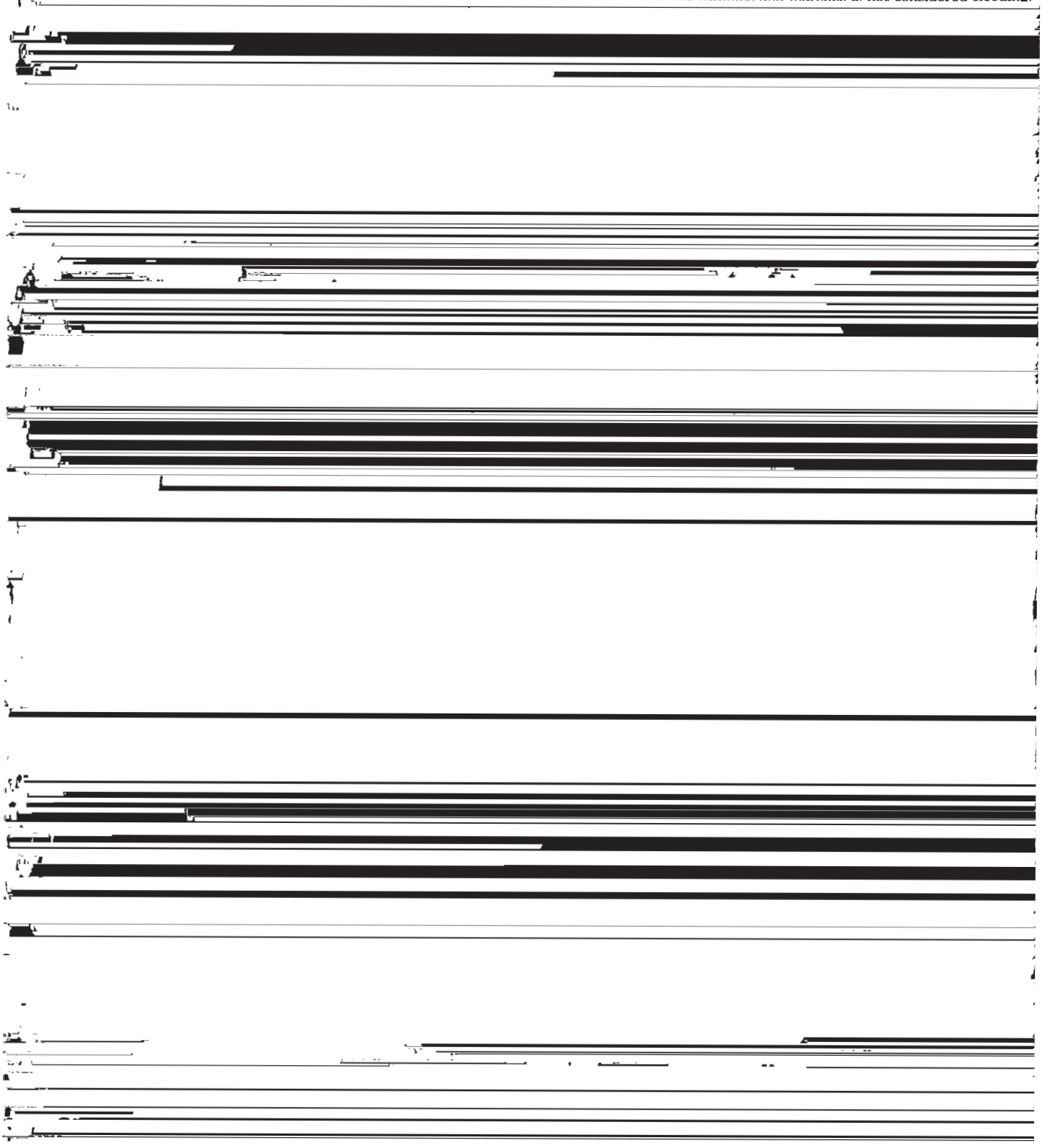
Contour stripcropping (or contour farming). Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Control section. The part of the soil on which classification is based.

cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall, or a combination of these.

Very poorly drained. Water is removed from the soil so slowly

of more than once in 2 years. Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, and *long* if more than 7 days. Probable dates are expressed in months; *November-May*, for example, means that flooding can occur during the period November through May. Water standing for short periods after rainfall or commonly covering swamps and marshes is not considered flooding.



browner colors than those in the A horizon; or (4) by a combination of these. The combined A and B horizons are generally called the solum, or true soil. If a soil lacks a B horizon, the A horizon alone is the solum.

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

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

Hummocky. Refers to a landscape of hillocks, separated by low sags, having sharply rounded tops and steep sides. Hummocky relief resembles rolling or undulating relief, but the tops of ridges are narrower and the sides are shorter and less even.

Humus. The well decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups. Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered, but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

Impervious soil. A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and

Lacustrine deposit (geology). Material deposited in lake water and exposed when the water level is lowered or the elevation of the land is raised.

Large stones. Rock fragments 10 inches (25 centimeters) or more across. Large stones adversely affect the specified use.

Leaching. The removal of soluble material from soil or other material by percolating water.

Light textured soil. Sand and loamy sand.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Loess. Fine grained material, dominantly of silt-sized particles, deposited by wind.

Low strength. Inadequate strength for supporting loads.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Metamorphic rock. Rock of any origin altered in mineralogical composition, chemical composition, or structure by heat, pressure, and movement. Nearly all such rocks are crystalline.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is greater than that of organic soil.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

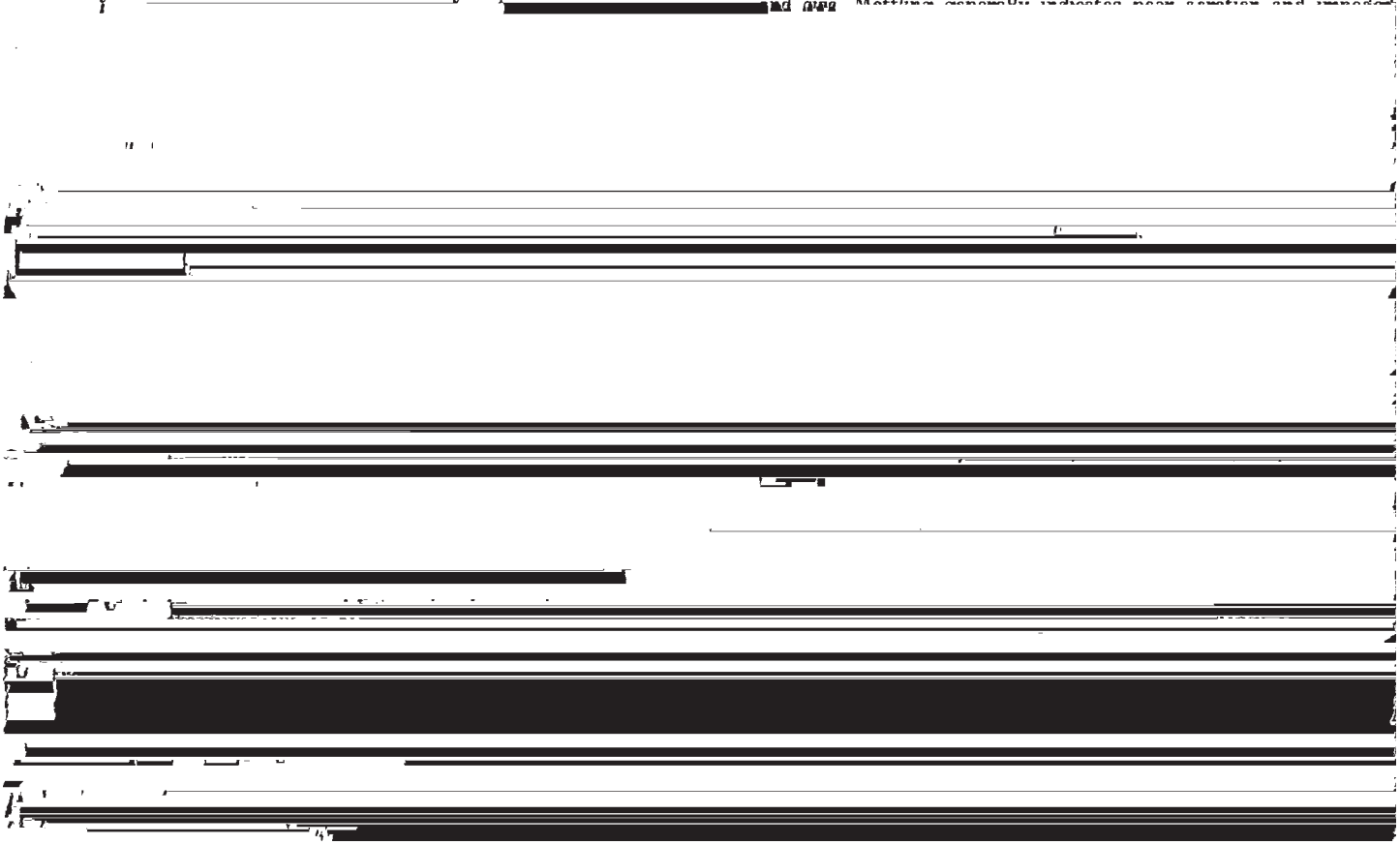
Miscellaneous areas. Areas that have little or no natural soil, are too nearly inaccessible for orderly examination, or cannot otherwise be feasibly classified.

Moderately coarse textured (moderately light textured) soil. Sandy loam and fine sandy loam.

Moderately fine textured (moderately heavy textured) soil. Clay loam, sandy clay loam, and silty clay loam.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded



Percs slowly. The slow movement of water through the soil adversely affecting the specified use.

Permeability. The quality that enables the soil to transmit water or air, measured as the number of inches per hour that water moves through the soil. Terms describing permeability are *very slow* (less than 0.06 inch), *slow* (0.06 to 0.20 inch), *moderately slow* (0.2 to 0.6 inch), *moderate* (0.6 to 2.0 inches), *moderately rapid* (2.0 to 6.0 inches), *rapid* (6.0 to 20 inches), and *very rapid* (more than 20 inches).

Phase, soil. A subdivision of a soil series or other unit in the soil classification system based on differences in the soil that affect its management. A soil series, for example, may be divided into phases on the bases of differences in slope, stoniness, thickness, or some other characteristic that affects management. These differences are too small to justify separate series.

pH value. (See Reaction, soil). A numerical designation of acidity and alkalinity in soil.

Piping. Moving water of subsurface tunnels or pipelike cavities in the soil.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from a semisolid to a plastic state.

Plowpan. A compacted layer formed in the soil directly below the plowed layer.

Polypedon. A volume of soil having properties within the limits of a soil series, the lowest and most homogeneous category of soil taxonomy. A "soil individual."

Poorly graded. Refers to soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Poor outlets. Surface or subsurface drainage outlets difficult or expensive to install.

Productivity (soil). The capability of a soil for producing a specified plant or sequence of plants under a specified system of management. Productivity is measured in terms of output, or harvest, in relation to input.

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

Range (or rangeland). Land that, for the most part, produces native plants suitable for grazing by livestock; includes land supporting some forest trees.

Range condition. The health or productivity of forage plants on a given range, in terms of the potential productivity under normal climate and the best practical management. Condition classes generally recognized are—*excellent*, *good*, *fair*, and *poor*. The classification is based on the percentage of original, or assumed climax vegetation on a site, as compared to what has been observed to grow on it when well managed.

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

Reaction, soil. The degree of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degree of acidity or alkalinity is expressed as—

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

Regolith. The unconsolidated mantle of weathered rock and soil material on the earth's surface; the loose earth material above the solid rock. Soil scientists regard as soil only the part of the regolith that is modified by organisms and other soil-building forces. Most engineers describe the whole regolith, even to a great depth, as "soil."

Relief. The elevations or inequalities of a land surface, considered collectively.

Residuum (residual soil material). Unconsolidated, weathered, or partly weathered mineral material that accumulates over disintegrating rock.

Rill. A steep sided channel resulting from accelerated erosion. A rill is generally a few inches deep and not wide enough to be an obstacle to farm machinery.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Rooting depth. Shallow root zone. The soil is shallow over a layer that greatly restricts roots. See Root zone.

Root zone. The part of the soil that can be penetrated by plant roots.

Runoff. The precipitation discharged in stream channels from a drainage area. The water that flows off the land surface without sinking in is called surface runoff; that which enters the ground before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Saline-alkali soil. A soil that contains a harmful concentration of salts and exchangeable sodium; contains harmful salts and is strongly alkaline; or contains harmful salts and exchangeable sodium and is very strongly alkaline. The salts, exchangeable sodium, and alkaline reaction are in the soil in such location that growth of most crop plants is less than normal.

Saline soil. A soil containing soluble salts in an amount that impairs growth of plants. A saline soil does not contain excess exchangeable sodium.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone. Sedimentary rock containing dominantly sand-size particles.

Saprolite (geology). Soft, earthy, clay-rich, thoroughly decomposed rock formed in place by chemical weathering of igneous and metamorphic rock. In soil survey, the term saprolite is applied to any unconsolidated residual material underlying the soil and grading to hard bedrock below.

Sedimentary rock. Rock made up of particles deposited from suspension in water. The chief kinds of sedimentary rock are conglomerate, formed from gravel; sandstone, formed from sand; shale, formed from clay; and limestone, formed from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sand is consolidated into sandstone.

Seepage. The rapid movement of water through the soil. Seepage adversely affects the specified use.

Sequum. A sequence consisting of an illuvial horizon and the overlying eluvial horizon.

Series, soil. A group of soils, formed from a particular type of parent material, having horizons that, except for the texture of the A or surface horizon, are similar in all profile characteristics and in arrangement in the soil profile. Among these characteristics are color, texture, structure, reaction, consistence, and mineralogical and chemical composition.

Shale. Sedimentary rock formed by the hardening of a clay deposit.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and runoff water.

Shrink-swell. The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silica. A combination of silicon and oxygen. The mineral form is called quartz.

Silica-alumina ratio. The molecular ratio of silica to alumina in soil, clay, or any alumino-silicate mineral.

Silica-sesquioxide ratio. The ratio of the number of molecules of silica to the number of molecules of alumina and iron oxide. The more highly weathered soils or their clay fractions in warm-temperate, humid regions, and especially those in the tropics, generally have a low ratio.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that

grained (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Stubble mulch. Stubble or other crop residue left on the soil, or partly

Water table, apparent. A thick zone of free water in the soil. An apparent water table is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil.

Water table, artesian. A water table under hydrostatic head, generally beneath an impermeable layer. When this layer is penetrated, the water level rises in an uncased borehole.

Water table, perched. A water table standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

Well graded. Refers to a soil or soil material consisting of particles well distributed over a wide range in size or diameter. Such a soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

Wilting point (or permanent wilting point. The moisture content of soil, on an ovendry basis, at which a plant (specifically sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

Illustrations

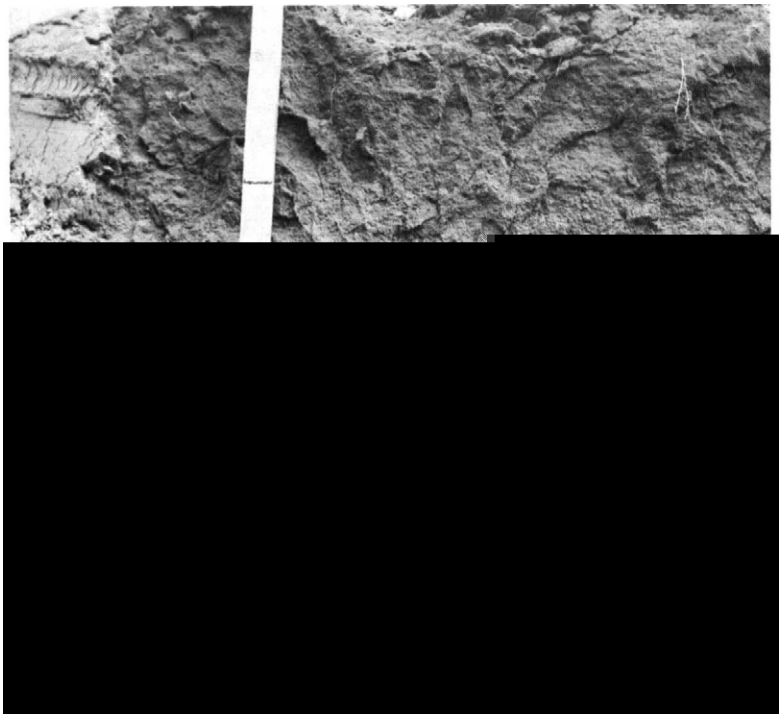
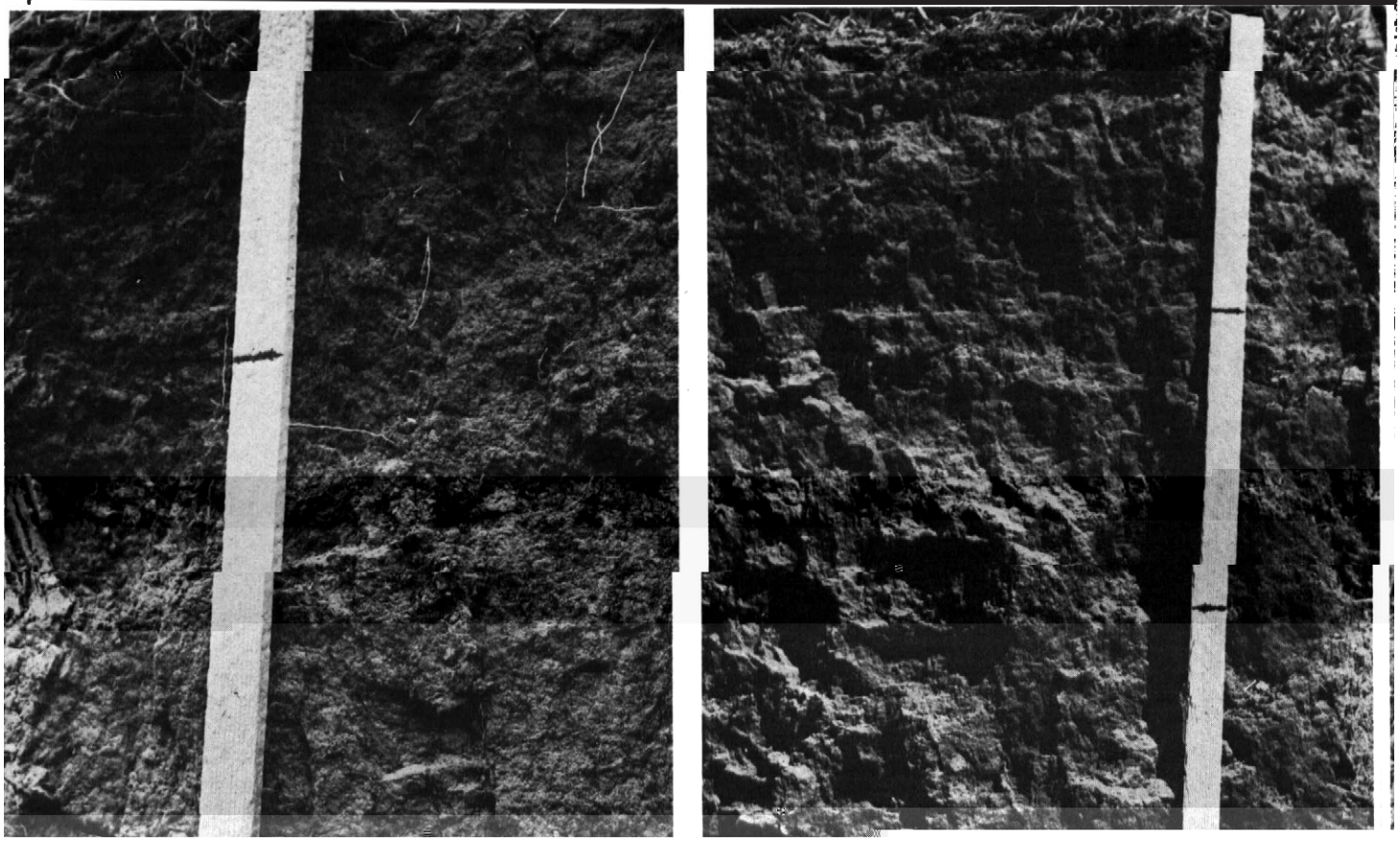


Figure 1.—Profile of Chickasha loam, 1 to 3 percent slopes.

Figure 2.—Native grass meadow on Clarita soil. This Blackclay Prairie range site has gilgai microrelief.



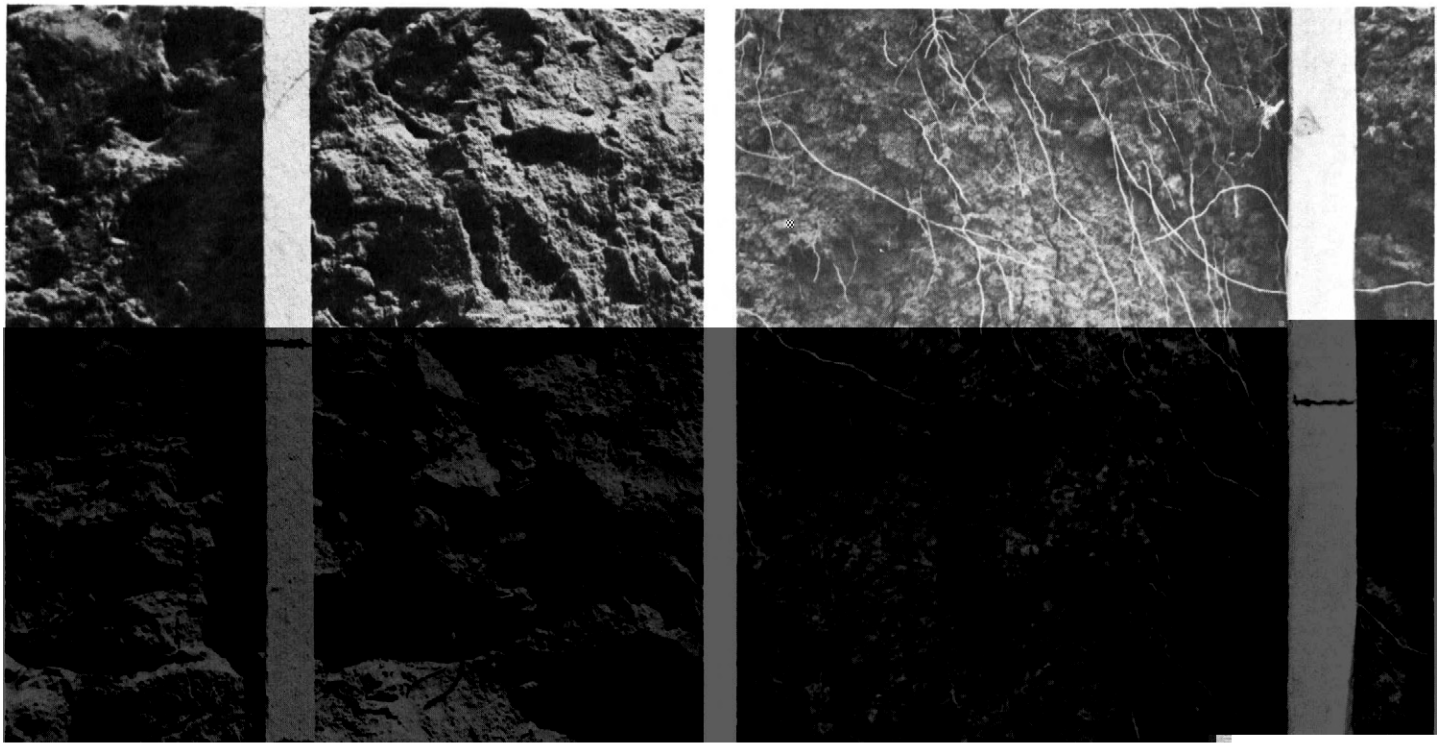


Figure 5.—Profile of the shallow Darnell soil in the Stephenville-Darnell complex.

Figure 6.—Profile of the Grainola soil in the Tamford-Grainola complex.

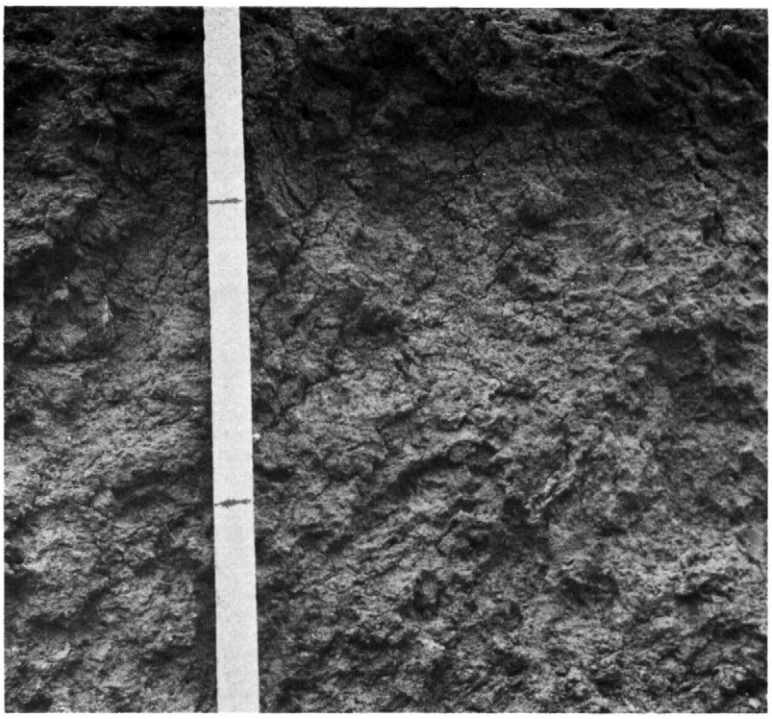


Figure 7.—Profile of Wilson silt loam, 1 to 3 percent slopes.

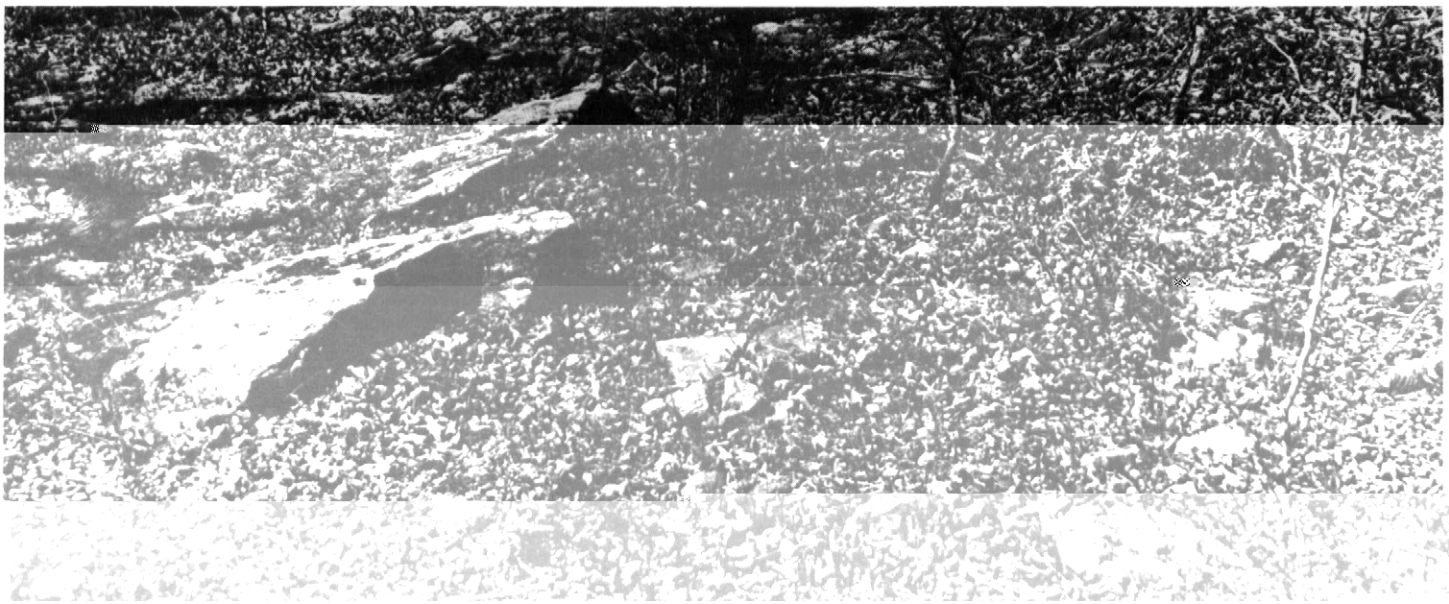


Figure 8.—Typical area of the Windthorst-Darnell complex. Stones and boulders are on the surface.

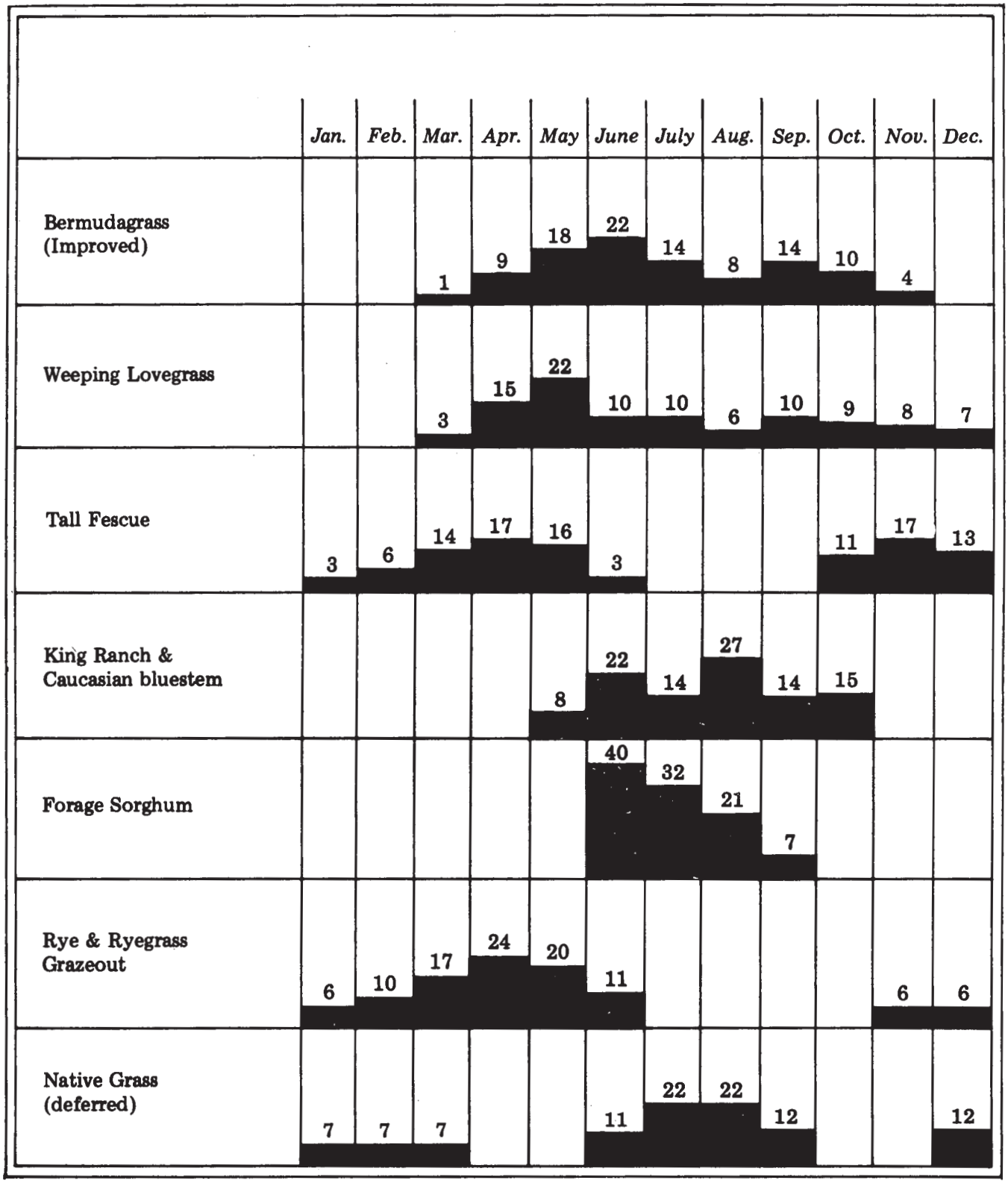


Figure 9.—Forage calendar showing percentage of use.

Tables

TABLE 1.--TEMPERATURE AND PRECIPITATION DATA

Month	Temperature[1]					Precipitation[1]			
	Average	Average	Average	2 years in 10 will have--	Average number of	Average	2 years in 10 will have--	Average number of	Average

TABLE 2.--FREEZE DATES IN SPRING AND FALL

Probability	Temperature[1]		
	24 F or lower	28 F or lower	32 F or lower
Last freezing temperature in spring:			
1 year in 10 later than--	March 17	April 1	April 7
2 years in 10 later than--	March 10	March 26	April 1
5 years in 10 later than--	February 25	March 14	March 22
First freezing temperature in fall:			
1 year in 10 earlier than--	November 15	November 5	October 28
2 years in 10 earlier than--	November 23	November 13	November 2
5 years in 10 earlier than--	December 8	November 28	November 13

[1]Recorded in the period 1951-74 at Ardmore, Okla.

TABLE 3.--GROWING SEASON LENGTH

Probability	Daily minimum temperature during growing season[1]		
	Higher than 24 F	Higher than 28 F	Higher than 32 F
	Days	Days	Days
9 years in 10	260	228	212
8 years in 10	269	239	220
5 years in 10	286	259	236
2 years in 10	303	279	252
1 year in 10	312	290	260

[1]Recorded in the period 1951-74 at Ardmore, Okla.

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
1	Bergstrom silt loam	5,504	1.0
2	Bergstrom silty clay loam	2,714	0.5
3	Bunyan loam	7,960	1.5
4	Burleson clay, 0 to 1 percent slopes	1,702	0.3
5	Chickasha loam, 1 to 3 percent slopes	7,500	1.4
6	Chickasha loam, 3 to 5 percent slopes	1,869	0.3
7	Chickasha loam, 2 to 5 percent slopes, eroded	5,762	1.1
8	Chigley-Darnell Variant complex, 10 to 30 percent slopes	2,157	0.4
9	Clarita silty clay, 3 to 5 percent slopes	4,656	0.9
10	Dale silt loam	3,224	0.6
11	Durant loam, 1 to 3 percent slopes	9,084	1.7
12	Durant loam, 3 to 5 percent slopes	1,723	0.3
13	Elandco clay loam	5,785	1.1
14	Eufaula fine sand, 5 to 15 percent slopes	1,372	0.3
15	Healdton silt loam	3,286	0.6
16	Heiden clay, 1 to 3 percent slopes	5,183	1.0
17	Heiden clay, 5 to 12 percent slopes	9,667	1.8
18	Kemp and Tullahassee soils	3,521	0.7
19	Kiti-Grainola complex, 5 to 20 percent slopes	8,571	1.6
20	Kiti-Rock outcrop complex, 5 to 30 percent slopes	23,234	4.3

TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE

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

Soil name and map symbol	Grain sorghum	Peanuts	Winter wheat	Alfalfa hay	Improved bermuda-grass	Weeping lovegrass	King Ranch and caucasian bluestem
	Bu	Lb	Bu	Ton	AUM*	AUM	AUM
1, 2---- Bergstrom	70	---	45	4.0	7.5	7.5	---
3---- Bunyan	65	1,600	35	3.5	8.0	---	---
4---- Burleson	70	---	30	2.5	5.5	---	4.0
5---- Chickasha	40	1,200	25	---	6.5	7.0	4.0
6---- Chickasha	35	1,000	20	---	6.0	6.5	3.5
7---- Chickasha	---	---	15	---	5.0	5.5	---
8---- Chigley	---	---	---	---	---	---	---
9---- Clarita	50	---	26	---	5.0	---	3.5
10**---- Dale	50	1,700	35	3.5	7.5	7.5	---
11---- Durant	50	1,000	35	---	6.0	6.5	4.0
12---- Durant	45	---	30	---	5.5	6.0	3.5
13---- [illegible]	70	---	45	4.0	6.5	---	---
[illegible]							
14---- Eufaula	---	---	---	---	3.5	5.5	---
15---- Healdton	---	---	15	---	3.5	---	---
16---- Heiden	68	---	35	2.2	5.5	---	4.0
17---- [illegible]					[illegible]		[illegible]
[illegible]							
Heiden							
18---- [illegible]	---	---	---	---	8.0	---	---

TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and	Grain sorghum	Peanuts	Winter wheat	Alfalfa hay	Improved bermuda-	Weeping lovegrass	King Ranch and caucasian

TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Grain sorghum	Peanuts	Winter wheat	Alfalfa hay	Improved bermuda-grass	Weeping lovegrass	King Ranch and caucasian bluestem
	Bu	Lb	Bu	Ton	AUM*	AUM	AUM
47---Weatherford	---	---	15	---	5.0	6.0	---
48---Weswood	65	1,500	45	4.5	8.0	7.5	---
49---Wilson	45	---	25	---	5.0	4.5	3.5
50---Wilson	45	---	25	---	5.0	4.5	3.5
51---Windthorst	45	1,100	25	---	5.5	7.5	---
52---Windthorst	35	1,000	20	---	5.0	7.0	---
53---Windthorst	30	800	15	---	4.0	5.0	---
54---Windthorst	---	---	---	---	---	---	---
55---Windthorst	---	---	---	---	4.5	5.5	---
56---Woodford	---	---	---	---	---	---	---
57---Yahola	---	---	---	---	8.0	---	---
58---Zaneis	40	1,000	25	---	6.0	6.5	3.0

* Animal-unit-month: The amount of forage or feed required to feed one animal unit (one cow, one horse, one mule, five sheep, or five goats) for a period of 30 days.

** Yields are for areas protected from flooding.

*** See mapping unit description for the composition and behavior of the mapping unit.

TABLE 6.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES

[Soils not listed do not support rangeland vegetation suited to grazing

Soil name and map symbol	Range site name	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
[illegible]	Loamy Bottomland	Favorable	7,500	Virginia wildrye	15

TABLE 6.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site name	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
10---------- Dale	Loamy Bottomland----------	Favorable Normal Unfavorable	8,500 6,100 4,500	Big bluestem---------- Indiangrass---------- Switchgrass---------- Little bluestem---------- Eastern gamagrass---------- Tall dropseed---------- Beaked panicum---------- Compassplant---------- Heath aster---------- Sedge----------	25 15 15 10 5 5 5 5 5 5
11, 12---------- Durant	Loamy Prairie----------	Favorable Normal Unfavorable	6,500 4,550 3,250	Little bluestem---------- Big bluestem---------- Indiangrass---------- Switchgrass---------- Canada wildrye---------- Sideoats grama---------- Blue grama---------- Tall dropseed---------- Lespedeza---------- Dotted gayfeather----------	25 20 10 10 5 5 5 5 5 5
13----------	Loamy Bottomland----------	Favorable	7,500	Indiangrass----------	20

TABLE 6.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

		Lb/acre	Pct

[redacted]

Soil name and map symbol	Range site name	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
26*:					
Weatherford	Eroded Sandy Savannah	Favorable	3,000	Little bluestem	30
		Normal	2,200	Big bluestem	10
		Unfavorable	1,500	Indiangrass	10
				Sideoats grama	5
				Silver bluestem	5
				Scribner panicum	5
				Texas needlegrass	5
				Arizona cottontop	5
27	Loamy Prairie	Favorable	5,500	Little bluestem	25
Lawton Variant		Normal	3,700	Big bluestem	20
		Unfavorable	2,500	Indiangrass	10
				Switchgrass	10
				Canada wildrye	5
				Sideoats grama	5
				Blue grama	5
				Tall dropseed	5
				Lespedeza	5
				Dotted gayfeather	5
28, 29*	Heavy Bottomland	Favorable	5,000	Big bluestem	25
Miller		Normal	3,200	Switchgrass	15
		Unfavorable	2,000	Indiangrass	15
				Prairie cordgrass	10
				Western wheatgrass	5

TABLE 6.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site name	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
36*:		Favorable	6,500	Indiangrass	20

TABLE 6.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site name	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight Lb/acre		Pct
42*:					
Tamford	Redclay Prairie	Favorable	3,200	Little bluestem	25
		Normal	2,100	Sideoats grama	15
		Unfavorable	1,400	Big bluestem	10
				Indiangrass	5
				Switchgrass	5
				Blue grama	5
				Buffalograss	5
				Longspike tridens	5
Grainola	Shallow Prairie	Favorable	2,800	Little bluestem	30
		Normal	2,000	Big bluestem	15
		Unfavorable	1,400	Indiangrass	10
				Switchgrass	10
				Tall dropseed	5
				Scribner panicum	5
				Sideoats grama	5
				Prairie-clover	5
43	Heavy Bottomland	Favorable	5,500	Big bluestem	25
Watonga		Normal	4,000	Switchgrass	15
		Unfavorable	2,500	Indiangrass	15
				Prairie cordgrass	10
				Western wheatgrass	5
				Tall dropseed	5
				Sunflower	5
				Goldenrod	5
				Sedge	5
44, 45, 46	Sandy Savannah	Favorable	5,500	Little bluestem	30
Weatherford		Normal	4,500	Big bluestem	10
		Unfavorable	3,000	Indiangrass	10
				Sideoats grama	5
				Silver bluestem	5
				Scribner panicum	5
				Texas needlegrass	5
				Arizona cottontop	5
47*:					
Weatherford	Sandy Savannah	Favorable	5,500	Little bluestem	30
		Normal	4,500	Big bluestem	10
		Unfavorable	3,000	Indiangrass	10
				Sideoats grama	5
				Silver bluestem	5
				Scribner panicum	5
				Texas needlegrass	5
				Arizona cottontop	5
Duffau	Sandy Savannah	Favorable	5,500	Little bluestem	30
		Normal	4,500	Big bluestem	10
		Unfavorable	3,000	Indiangrass	10
				Sideoats grama	5
				Silver bluestem	5
				Scribner panicum	5
				Texas needlegrass	5
				Arizona cottontop	5
48	Loamy Bottomland	Favorable	7,000	Indiangrass	20
Weswood		Normal	5,500	Switchgrass	15

TABLE 6.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site name	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
49, 50---------- Wilson	Claypan Prairie----------	Favorable Normal Unfavorable	4,800 3,200 2,200	Little bluestem---------- Indiangrass---------- Big bluestem---------- Virginia wildrye---------- Vine-mesquite---------- Florida paspalum---------- Sideoats grama---------- Texas needlegrass---------- Silver bluestem----------	45 10 10 5 5 5 5 5 5
51, 52, 53---------- Windthorst	Sandy Savannah----------	Favorable Normal Unfavorable	4,500 3,200 2,000	Little bluestem---------- Big bluestem---------- Indiangrass---------- Sideoats grama----------	30 10 10 5

TABLE 6.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site name	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
57*---------- Yahola	Loamy Bottomland----------	Favorable Normal Unfavorable	7,000 4,900 2,500	Big bluestem---------- Indiangrass---------- Switchgrass----------	25 15 15
				Little bluestem----------	10
				Eastern gamagrass----------	5
				Tall dropseed----------	5
				Beaked panicum----------	5
				Compassplant----------	5
				Sedge----------	5
				Heath aster----------	5

TABLE 7.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS

[Absence of an entry means the species does not grow well on the soil]

Soil name and map symbol	Expected heights of specified trees at 20 years of age							
	Eastern redcedar	Green ash	Eastern cottonwood	Loblolly pine	Osage-orange	Shortleaf pine	Austrian pine	American plum
	Ft	Ft	Ft	Ft	Ft	Ft	Ft	Ft
1, 2--Bergstrom	25	35	60	---	30	35	---	10
3--Bunyan	35	50	75	45	20	30	35	12
4--Burleson	25	---	---	---	25	---	---	---
5, 6, 7--Chickasha	20	--	--	20	--	20	20	8
8*:								
Chigley	20	--	--	--	--	25	20	--
Darnell Variant	--	--	--	--	--	--	--	--
9--Clarita	25	--	--	--	25	--	--	--
10--Dale	35	55	--	--	--	40	35	--
11, 12--Durant	20	--	--	--	20	--	--	--
13--Elandco	25	35	60	--	30	--	--	10
14--Eufaula	15	--	--	--	--	--	20	12
15--Healdton	--	--	--	--	--	--	--	--
16, 17--Heiden	15	--	--	--	15	--	--	--
18*:								
Kemp	25	50	75	--	25	--	--	--
Tullahassee	25	55	70	30	25	--	--	--
19*:								
Kiti	--	--	--	--	--	--	--	--
Grainola	15	--	--	--	--	--	--	--
20*:								
Kiti	--	--	--	--	--	--	--	--

TABLE 7.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Expected heights of specified trees at 20 years of age							
	Eastern redcedar	Green ash	Eastern cottonwood	Loblolly pine	Osage-orange	Shortleaf pine	Austrian pine	American plum
	Ft	Ft	Ft	Ft	Ft	Ft	Ft	Ft
27---------- Lawton Variant	20	---	---	---	20	---	---	---
28, 29*---------- Miller	25	40	60	---	25	40	---	---
30, 31, 32---------- Normangee	15	---	---	---	18	---	---	---
33*---------- Oil-waste land	---	---	---	---	---	---	---	---
34*---------- Pits	---	---	---	---	---	---	---	---
35---------- Pulaski	25	30	60	40	20	35	30	---
36*: Pulaski----------	---	30	60	40	---	35	30	---
Bunyan----------	---	50	75	45	20	---	35	---
37, 38----------	15	---	---	---	15	---	---	---

TABLE 7.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Expected heights of specified trees at 20 years of age							
	Eastern redcedar	Green ash	Eastern cottonwood	Loblolly pine	Osage-orange	Shortleaf pine	Austrian pine	American plum
	Ft	Ft	Ft	Ft	Ft	Ft	Ft	Ft
55*:								
Windthorst	15	--	--	--	15	--	--	--
Weatherford	25	--	--	25	20	--	20	8
56--- Woodford	--	--	--	--	--	--	--	--
57*--- Yahola	30	--	60	40	--	35	30	--
58--- Zaneis	25	--	--	--	20	--	--	--

* See mapping unit description for the composition and behavior of the mapping unit.

TABLE 8.--BUILDING SITE DEVELOPMENT

[redacted]

TABLE 8.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
19*:					
Kiti	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock, slope.
Grainola	Severe: too clayey, slope.	Severe: slope, shrink-swell, low strength.	Severe: low strength, slope, shrink-swell.	Severe: low strength, slope, shrink-swell.	Severe: low strength, slope, shrink-swell.
20*:					
Kiti	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.
Rock outcrop.					
21, 22 Konawa	Slight	Slight	Slight	Slight	Moderate: low strength.
23 Konawa	Slight	Slight	Slight	Moderate: slope.	Moderate: low strength.
24, 25 Konsil	Slight	Moderate: low strength.	Moderate: low strength.	Moderate: low strength.	Severe: low strength.
26*:					
Konsil	Slight	Moderate: low strength.	Moderate: low strength.	Moderate: low strength.	Severe: low strength.
Weatherford	Slight	Slight	Slight	Moderate: slope.	Moderate: low strength.
27 Lawton Variant	Severe: too clayey.	Severe: low strength, shrink-swell.	Severe: low strength, shrink-swell.	Severe: low strength, shrink-swell.	Severe: low strength, shrink-swell.
28, 29* Miller	Severe: floods, too clayey.	Severe: floods, shrink-swell, low strength.	Severe: floods, shrink-swell, low strength.	Severe: floods, shrink-swell, low strength.	Severe: low strength, shrink-swell.
30, 31, 32 Normangee	Severe: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, corrosive.	Severe: shrink-swell, low strength.
33*. Oil-waste land.					
34*. Pits.					
35 Pulaski	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Moderate: floods, low strength.
36*:					
Pulaski	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.
Bunyan	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.
37, 38 Renfrow	Severe: too clayey.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.

See footnote at end of table.

TABLE 8.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
39*: Soullin	Severe: depth to rock.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength, depth to rock.	Severe: shrink-swell, low strength.	Severe: low strength, shrink-swell.
Kiti	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.
40 Steedman	Severe: wetness, too clayey.	Severe: wetness, shrink-swell, low strength.	Severe: wetness, shrink-swell, low strength.	Severe: shrink-swell, low strength, slope.	Severe: low strength, shrink-swell.
41*: Stephenville	Moderate: depth to rock, slope.	Moderate: slope.	Moderate: depth to rock, slope.	Severe: slope.	Moderate: slope, low strength.
Darnell	Moderate: depth to rock, slope.	Moderate: depth to rock, slope.	Moderate: depth to rock, slope.	Severe: slope.	Moderate: depth to rock, slope, low strength.
42*: Tamford	Severe: too clayey.	Severe: low strength, shrink-swell.	Severe: low strength, shrink-swell.	Severe: low strength, slope, shrink-swell.	Severe: low strength, shrink-swell.
Grainola	Severe: too clayey, slope.	Severe: slope, shrink-swell, low strength.	Severe: low strength, slope, shrink-swell.	Severe: low strength, slope, shrink-swell.	Severe: low strength, slope, shrink-swell.
43 Watonga	Severe: too clayey.	Severe: floods, shrink-swell, low strength.	Severe: floods, shrink-swell, low strength.	Severe: floods, shrink-swell, low strength.	Severe: shrink-swell, low strength.
44 Weatherford	Slight	Slight	Slight	Slight	Moderate: low strength.
45 Weatherford	Slight	Slight	Slight	Moderate: slope.	Moderate: low strength.
46 Weatherford	Slight	Slight	Slight	Slight	Moderate: low strength.
47*: Weatherford	Slight	Slight	Slight	Moderate: slope.	Moderate: low strength.
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

TABLE 8.--BUILDING SITE DEVELOPMENT--Continued

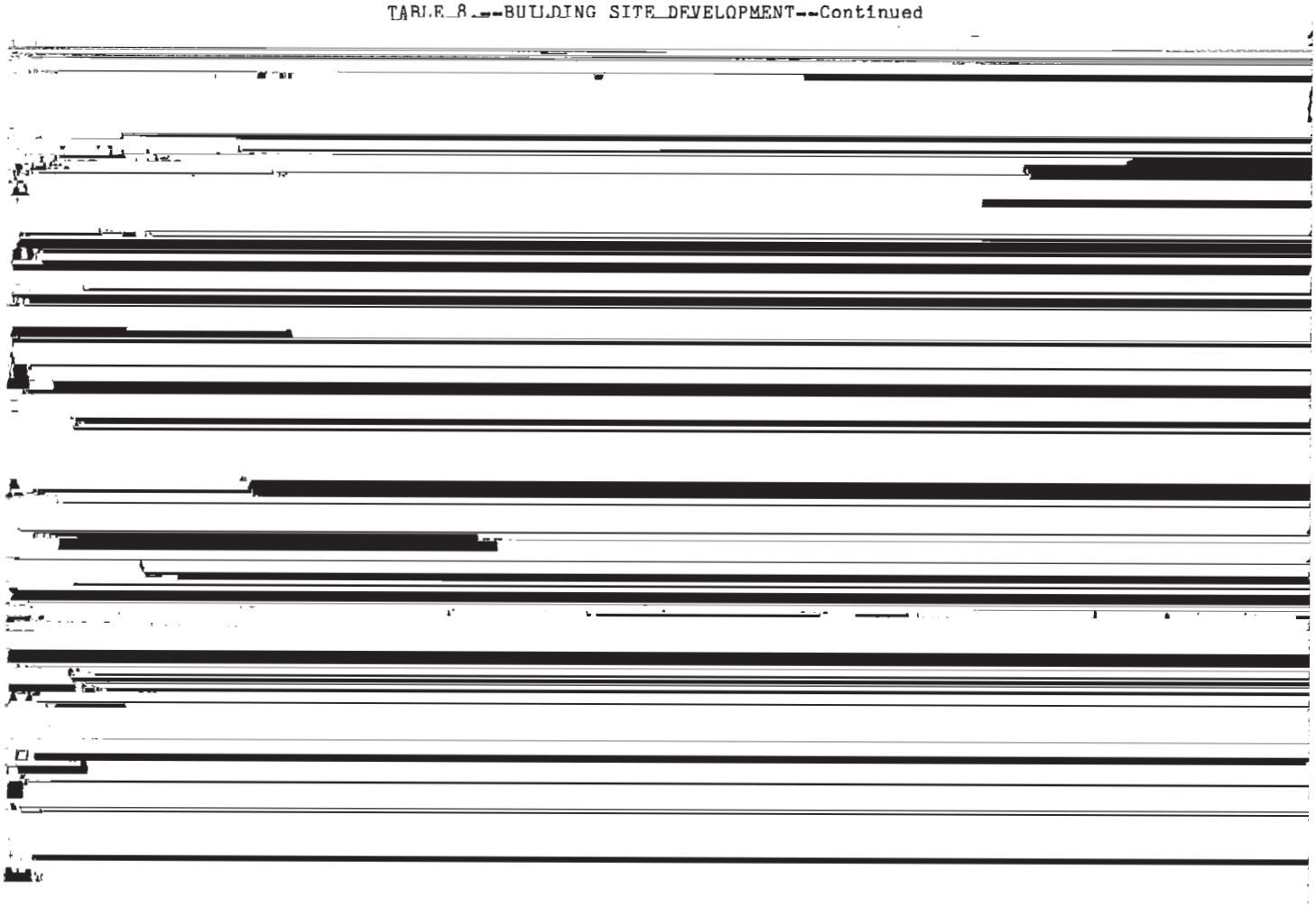


TABLE 9.--SANITARY FACILITIES

[Some of the terms used in this table to describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," "good," "fair," and other terms used to rate soils. Absence of an entry means soil was not rated]

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
1--- Bergstrom	Severe: floods.	Severe: seepage, floods.	Severe: floods.	Severe: floods.	Good.
2--- Bergstrom	Severe: floods.	Severe: seepage, floods.	Severe: floods.	Severe: floods.	Fair: too clayey.
3--- Bunyan	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Good.
4--- Burleson	Severe: percs slowly.	Slight---	Severe: too clayey.	Slight---	Poor: too clayey.
5, 6, 7--- Chickasha	Moderate: depth to rock.	Moderate: seepage, depth to rock.	Moderate: depth to rock.	Slight---	Good.
8*:					
Chigley---	Severe: percs slowly, wetness.	Severe: slope.	Severe: too clayey, depth to rock.	Moderate: wetness.	Poor: hard to pack, too clayey.
Darnell Variant---	Severe: depth to rock, slope.	Severe: depth to rock, slope, small stones.	Severe: slope, depth to rock.	Severe: slope.	Poor: thin layer, slope, small stones.
9--- Clarita	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight---	Poor: too clayey.
10--- Dale	Moderate: floods.	Moderate: seepage.	Moderate: floods.	Moderate: floods.	Good.
11, 12--- Durant	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight---	Poor: too clayey.
13--- Elandco	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Fair: too clayey.
14--- Eufaula	Moderate: slope.	Severe: seepage.	Severe: seepage.	Severe: seepage.	Poor: too sandy.
15--- Healdton	Severe: percs slowly, floods.	Severe: floods.	Severe: floods, too clayey.	Severe: floods.	Poor: too clayey, area reclaim.
16--- Heiden	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight---	Poor: too clayey.
17--- Heiden	Severe: percs slowly.	Severe: slope.	Severe: too clayey.	Moderate: slope.	Poor: too clayey.
18*:					
Kemp---	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Good.
Tullahassee---	Severe: floods, wetness.	Severe: wetness, floods, seepage.	Severe: floods, wetness, seepage.	Severe: wetness, floods, seepage.	Good.

See footnote at end of table.

TABLE 9.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
19*:					
Kiti	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Moderate: slope.	Poor: thin layer, small stones.
Grainola	Severe: percs slowly, slope, depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock, too clayey.	Severe: slope.	Poor: too clayey, slope.
20*:					
Kiti	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: slope.	Poor: thin layer, small stones.
Rock outcrop.					
21, 22, 23 Konawa	Slight	Severe: seepage.	Severe: seepage.	Slight	Good.
24, 25 Konsil	Moderate: percs slowly.	Moderate: seepage.	Slight	Slight	Fair: too sandy.
26*:					
Konsil	Moderate: percs slowly.	Moderate: seepage.	Slight	Slight	Fair: too sandy.

TABLE 9.--SANITARY FACILITIES--Continued

TABLE 9.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
55*:					
Windthorst	Severe: percs slowly.	Severe: slope.	Moderate: too clayey.	Slight	Fair: too clayey.
Weatherford	Moderate: depth to rock.	Severe: slope, seepage.	Moderate: depth to rock.	Slight	Fair: area reclaim.
56	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock, small stones.	Moderate: slope.	Poor: thin layer, small stones.
Woodford					
57*	Severe: floods.	Severe: seepage, floods.	Severe: floods, seepage.	Severe: floods, seepage.	Good.
Yahola					
58	Severe: percs slowly.	Moderate: depth to rock, slope.	Moderate: too clayey, depth to rock.	Slight	Fair: thin layer.
Zaneis					

* See mapping unit description for the composition and behavior of the mapping unit.

TABLE 10.--CONSTRUCTION MATERIALS

[Some of the terms used in this table to describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," and "poor." Absence of an entry means soil was not rated]

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
1, 2--- Bergstrom	Fair: shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: too clayey.
3--- Bunyan	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
4--- Burleson	Poor: shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey.
5, 6, 7--- Chickasha	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
8*:				
Chigley---	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: thin layer, small stones.
Darnell Variant---	Poor: thin layer.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: small stones, slope.
9--- Clarita	Poor: low strength, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey.
10--- Dale	Fair: low strength, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
11, 12--- Durant	Poor: shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer, too clayey.
13--- Elandco	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: too clayey.
14--- Eufaula	Good	Poor: excess fines.	Unsuited: excess fines.	Poor: too sandy.
15---	Poor:	Unsuited:	Unsuited:	Poor:
Healdton	low strength, shrink-swell, area reclaim.	excess fines.	excess fines.	thin layer.
16, 17--- Heiden	Poor: shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey.
18*:				
Kemp---	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
Tullahassee---	Fair: wetness,	Unsuited: excess fines.	Unsuited: excess fines.	Good.

TABLE 10.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
20*:				
Kiti	Poor: thin layer.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: small stones, slope.
Rock outcrop.				
21, 22, 23--- Konawa	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
24, 25--- Konsil	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too sandy.
26*:				
Konsil	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too sandy.
Weatherford	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
27--- Lawton Variant	Poor: low strength, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: too clayey, thin layer.
28, 29*--- Miller	Poor: low strength, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey.
30, 31, 32--- Normangee	Poor: shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey.
33*. Oil-waste land.				
34*. Pits.				
35--- Pulaski	Fair: low strength.	Poor: excess fines.	Unsuited: excess fines.	Good.
36*:				
Pulaski	Fair: low strength.	Poor: excess fines.	Unsuited: excess fines.	Good.
Bunyan	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
37, 38--- Renfrow	Poor: low strength, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
39*:				
Scullin	Poor: shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: thin layer, small stones.
Kiti	Poor: thin layer.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: small stones.
40--- Steedman	Poor: low strength, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: thin layer.
41*:				
Stephenville	Fair: thin layer, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer, slope.

See footnote at end of table.

TABLE 10.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
41*:				
Darnell	Fair: low strength, thin layer.	Unsuited: excess fines, thin layer.	Unsuited: excess fines, thin layer.	Fair: thin layer, slope.
42*:				
Tamford	Poor: low strength, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: too clayey, slope.
Grainola	Poor: low strength, shrink-swell, thin layer.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
43--- Watonga	Poor: low strength, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey.
44, 45, 46--- Weatherford	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
47*:				
Weatherford	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
Duffau	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
48--- Weswood	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
49, 50--- Wilson	Poor: shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey.
51, 52, 53--- Windthorst	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
54*:				
Windthorst	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
Darnell	Fair: thin layer, large stones.	Unsuited: excess fines, thin layer.	Unsuited: excess fines, thin layer.	Poor: large stones.
55*:				
Windthorst	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
Weatherford	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
56--- Woodford	Poor: thin layer.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: small stones.
57*--- Yahola	Fair: low strength.	Poor: excess fines.	Unsuited: excess fines.	Good.
58--- Zaneis	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.

* See mapping unit description for the composition and behavior of the mapping unit.

TABLE 11.--WATER MANAGEMENT

[Some of the terms used in this table to describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry means soil was not evaluated]

Soil name and map symbol	Limitations for--			Features affecting--		
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Irrigation	Terraces and diversions	Grassed waterways
1, 2---------- Bergstrom	Moderate: seepage.	Moderate: compressible, piping.	Severe: deep to water.	Floods----------	Floods----------	Favorable.
3---------- Bunyan	Moderate: seepage.	Moderate: piping.	Severe: deep to water.	Floods----------	Not needed------	Favorable.
4---------- Burleson	Slight----------	Moderate: unstable fill, hard to pack.	Severe: deep to water.	Slow intake-----	Percs slowly----	Percs slowly.
5, 6, 7---------- Chickasha	Moderate: depth to rock, seepage.	Moderate: thin layer.	Severe: deep to water.	Erodes easily	Erodes easily	Erodes easily.
8*: Chigley----------	Moderate: depth to rock, seepage.	Moderate: unstable fill, compressible.	Severe: slow refill.	Erodes easily, slow intake.	Erodes easily, percs slowly.	Percs slowly.
Darnell Variant--	Severe: depth to rock.	Severe: thin layer.	Severe: no water.	Erodes easily, rooting depth, slope.	Depth to rock, erodes easily, slope.	Not needed.
9---------- Clarita	Slight----------	Severe: unstable fill, compressible, low strength.	Severe: no water.	Slow intake, erodes easily.	Percs slowly, erodes easily.	Percs slowly, erodes easily.
10---------- Dale	Moderate: seepage.	Moderate: unstable fill, piping, compressible.	Severe: deep to water.	Favorable-------	Favorable-------	Favorable.
11, 12---------- Durant	Slight----------	Severe: piping, compressible.	Severe: no water.	Slow intake-----	Percs slowly----	Percs slowly.
13---------- Elandco	Severe: seepage.	Moderate: piping.	Severe: deep to water.	Floods----------	Not needed------	Favorable.
14---------- Eufaula	Severe: seepage.	Moderate: unstable fill, piping.	Severe: no water.	Seepage, fast intake, droughty.	Seepage, fast intake, droughty.	Erodes easily, droughty, fast intake.
15---------- Healdton	Slight----------	Severe: erodes easily, shrink-swell.	Severe: no water.	Excess salt, slow intake.	Erodes easily	Excess salt, percs slowly.

TABLE 11.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--			Features affecting--		
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Irrigation	Terraces and diversions	Grassed waterways
19*:						
Kiti	Severe: depth to rock.	Severe: thin layer.	Severe: deep to water.	Droughty, rooting depth.	Not needed	Not needed.
Grainola	Slight	Severe:	Severe:	Slow intake	Ponds slowly	Ponds slowly
20*:						
Kiti	Severe: depth to rock.	Severe: thin layer.	Severe: deep to water.	Droughty, rooting depth.	Not needed	Not needed.
Rock outcrop.						
21, 22, 23- Konawa	Severe: seepage.	Moderate: low strength, unstable fill, piping.	Severe: deep to water.	Erodes easily	Erodes easily	Erodes easily.
24, 25- Konsil	Moderate: seepage.	Moderate: piping.	Severe: no water.	Erodes easily	Erodes easily	Favorable.
26*:						
Konsil	Moderate: seepage.	Moderate: piping.	Severe: no water.	Erodes easily	Erodes easily	Favorable.
Weatherford	Moderate: seepage, depth to rock.	Moderate: erodes easily, piping.	Severe: no water.	Erodes easily	Erodes easily	Erodes easily.

TABLE 11.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--			Features affecting--		
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Irrigation	Terraces and diversions	Grassed waterways
39*:						
Kiti	Severe: depth to rock.	Severe: thin layer.	Severe: deep to water.	Droughty, rooting depth.	Not needed	Not needed.
40 Steedman	Slight	Severe: compressible, shrink-swell.	Severe: no water.	Slow intake, slope.	Percs slowly	Percs slowly.
41*:						
Stephenville	Severe: depth to rock.	Moderate: thin layer.	Severe: no water.	Slope	Slope	Slope.
Darnell	Severe: depth to rock, seepage.	Severe: thin layer.	Severe: no water.	Slope, rooting depth.	Slope, rooting depth.	Slope.
42*:						
Tamford	Slight	Severe: compressible, piping, shrink-swell.	Severe: no water.	Slow intake	Percs slowly	Percs slowly.
Grainola	Slight	Severe: compressible, shrink-swell.	Severe: no water.	Slow intake, slope.	Percs slowly, slope.	Percs slowly, slope.
43 Watonga	Slight	Moderate: unstable fill, compressible.	Severe: no water.	Slow intake, floods.	Not needed	Favorable.
44, 45, 46 Weatherford	Moderate: seepage, depth to rock.	Moderate: erodes easily, piping.	Severe: no water.	Erodes easily	Erodes easily	Erodes easily.
47*:						
Weatherford	Moderate: seepage, depth to rock.	Moderate: erodes easily, piping.	Severe: no water.	Erodes easily	Erodes easily	Erodes easily.
Duffau	Moderate: seepage.	Moderate: erodes easily, piping.	Severe: no water.	Erodes easily	Erodes easily	Erodes easily.
48 Weswood	Moderate: seepage.	Moderate: piping, erodes easily.	Severe: deep to water.	Floods	Favorable	Favorable.
49, 50 Wilson	Slight	Moderate: unstable fill.	Severe: no water.	Percs slowly, slow intake.	Percs slowly	Percs slowly.
51, 52, 53 Windthorst	Moderate: seepage.	Moderate: compressible.	Severe: no water.	Percs slowly, erodes easily.	Percs slowly, erodes easily.	Percs slowly, erodes easily.
54*:						
Windthorst	Moderate: seepage.	Moderate: compressible.	Severe: no water.	Percs slowly, erodes easily.	Percs slowly, erodes easily.	Percs slowly, erodes easily.
Darnell	Severe: depth to rock, seepage.	Severe: thin layer.	Severe: no water.	Slope	Slope	Slope.
55*:						
Windthorst	Moderate: seepage.	Moderate: compressible.	Severe: no water.	Percs slowly, erodes easily.	Percs slowly, erodes easily.	Percs slowly, erodes easily.
Weatherford	Moderate: seepage, depth to rock.	Moderate: erodes easily, piping.	Severe: no water.	Erodes easily	Erodes easily	Erodes easily.

See footnote at end of table.

TABLE 11.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--			Features affecting--		
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Irrigation	Terraces and diversions	Grassed waterways
56--Woodford	Severe: depth to rock.	Severe: thin layer.	Severe: no water.	Rooting depth, slope.	Depth to rock	Rooting depth.
57*--Yahola	Severe: seepage.	Moderate: unstable fill, seepage, piping.	Severe: deep to water.	Floods	Not needed	Not needed.
58--Zaneis	Moderate: seepage, depth to rock.	Moderate: thin layer, unstable fill, piping.	Severe: no water.	Erodes easily	Erodes easily, percs slowly.	Erodes easily, percs slowly.

* See mapping unit description for the composition and behavior of the mapping unit.

TABLE 12.--RECREATIONAL DEVELOPMENT

[Some of the terms used in this table to describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry means soil was not rated]

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
1 Bergstrom	Severe: floods.	Severe: floods.	Moderate: floods.	Slight.
2 Bergstrom	Severe: floods.	Severe: floods.	Moderate: floods.	Moderate: too clayey.
3 Bunyan	Severe: floods.	Moderate: floods.	Moderate: floods.	Slight.
4 Burleson	Severe: percs slowly, too clayey.	Severe: too clayey.	Severe: percs slowly, too clayey.	Severe: too clayey.
5, 6, 7 Chickasha	Slight	Slight	Moderate: slope.	Slight.
8*: Chigley	Severe: percs slowly, slope.	Severe: small stones, slope.	Severe: small stones, slope.	Moderate: slope.
Darnell Variant	Severe: slope.	Severe: slope.	Severe: slope, depth to rock, small stones.	Moderate: slope.
9 Clarita	Severe: percs slowly.	Severe: too clayey.	Severe: percs slowly.	Severe: too clayey.
10	Slight	Slight	Slight	Slight.
11, 12 Durant	Severe: percs slowly.	Slight	Severe: percs slowly.	Slight.
13 Elandco	Severe: floods.	Moderate: floods.	Moderate: floods.	Moderate: too clayey.
14 Eufaula	Moderate: too sandy.	Moderate: too sandy.	Severe: too sandy.	Severe: too sandy.
15 Healdton	Severe: floods, percs slowly.	Severe: floods, dusty.	Severe: percs slowly.	Moderate: dusty.
16, 17 Heiden	Severe: too clayey, percs slowly.	Severe: too clayey.	Severe: too clayey, percs slowly.	Severe: too clayey.
18*: Kemp	Severe: floods.	Moderate: floods.	Severe: floods.	Moderate: floods.
Tullahassee	Severe: floods.	Severe: floods.	Severe: floods.	Moderate: wetness, floods.

TABLE 12.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
19*: Grainola	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope, too clayey.
20*: Kiti	Severe: slope.	Severe: slope.	Severe: depth to rock, small stones.	Moderate: small stones.
Rock outcrop.				
21, 22	Slight	Slight	Slight	Slight

TABLE 12.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
39*:				
Scullin	Moderate: percs slowly.	Slight	Moderate: percs slowly, slope, depth to rock.	Slight.
Kiti	Moderate: small stones.	Moderate: small stones.	Severe: depth to rock, small stones.	Moderate: small stones.
40 Steedman	Moderate: percs slowly, slope.	Moderate: slope, too clayey.	Severe: slope.	Moderate: too clayey.
41*:				
Stephenville	Slight	Slight	Moderate: slope.	Slight.
Darnell	Slight	Slight	Severe: depth to rock, slope.	Slight.
42*:				
Tamford	Severe: percs slowly.	Moderate: too clayey.	Severe: percs slowly, slope.	Moderate: too clayey.
Grainola	Moderate: percs slowly.	Moderate: too clayey.	Severe: slope.	Moderate: too clayey.
43 Watonga	Severe: percs slowly, too clayey.	Severe: too clayey.	Severe: percs slowly, too clayey.	Severe: too clayey.
44 Weatherford	Slight	Slight	Moderate: slope.	Slight.
45, 46 Weatherford	Slight	Slight	Moderate: slope.	Slight.
47*:				
Weatherford	Slight	Slight	Severe: slope.	Slight.
Duffau	Slight	Slight	Severe: slope.	Slight.
48 Weswood	Severe: floods.	Severe: floods.	Moderate: floods.	Slight.
49, 50 Wilson	Severe: percs slowly, wetness.	Moderate: wetness.	Severe: percs slowly, wetness.	Moderate: wetness.
51 Windthorst	Moderate: percs slowly.	Slight	Moderate: percs slowly.	Slight.
52, 53 Windthorst	Moderate: percs slowly.	Slight	Moderate: percs slowly.	Slight.
54*:				
Windthorst	Severe: percs slowly, slope.	Moderate: slope.	Severe: slope.	Slight.
Darnell	Severe: large stones, slope.	Severe: slope.	Severe: depth to rock, large stones.	Severe: large stones.

See footnote at end of table.

TABLE 12.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
55*: Windthorst	Moderate:	Slight	Severe:	Slight

TABLE 13.--WILDLIFE HABITAT POTENTIALS

[See text for definitions of "good," "fair," "poor," and "very poor." Absence of an entry indicates the soil was not rated]

Soil name and map symbol	Potential for habitat elements								Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
1, 2----------Bergstrom	Good	Good	Fair	---	---	Fair	Poor	Very poor.	Good	---	Very poor.	Fair.
3----------Bunyan	Good	Good	Good	---	---	Good	Poor	Very poor.	Good	---	Very poor.	Good.
4----------Burleson	Good	Good	Poor	---	---	Poor	Very poor.	Very poor.	Fair	---	Very poor.	Poor.
5, 6, 7----------Chickasha	Good	Good	Good	---	---	Fair	Poor	Very poor.	Good	---	Very poor.	Fair.

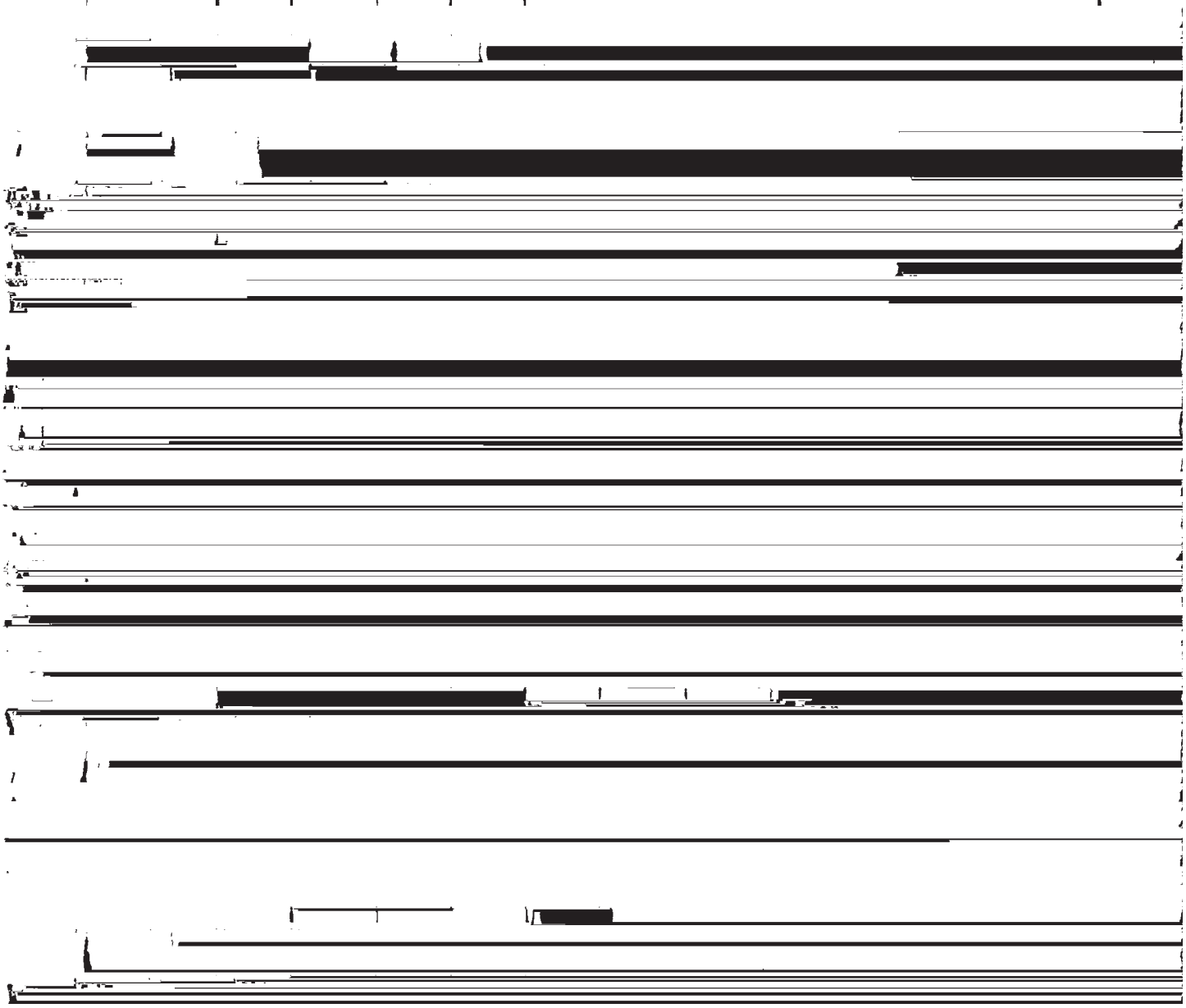


TABLE 13.--WILDLIFE HABITAT POTENTIALS--Continued

Soil name and map symbol	Potential for habitat elements								Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
20*: Rock outcrop	---	---	---	---	---	---	---	---	---	---	---	---
21, 22--- Konawa	Good	Good	Good	---	---	Good	Poor	Very poor.	Good	---	Very poor.	Good.
23---	Fair	Good	Good	---	---	Good	Poor	Very	Good	---	Very	Good.

TABLE 13.--WILDLIFE HABITAT POTENTIALS--Continued

Soil name and map symbol	Potential for habitat elements								Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
42*:												
Tamford	Fair	Good	Fair	---	---	Poor	Very poor.	Very poor.	Fair	---	Very poor.	Poor.
Grainola	Poor	Fair	Fair	---	---	Fair	Very poor.	Very poor.	Fair	---	Very poor.	Fair.
43 Watonga	Fair	Fair	Poor	---	---	Fair	Poor	Poor	Fair	---	Poor	Fair.
44 Weatherford	Good	Good	Good	---	---	Good	Poor	Very poor.	Good	---	Very poor.	Good.
45, 46 Weatherford	Fair	Good	Good	---	---	Good	Poor	Very poor.	Good	---	Very poor.	Good.
47*:												
Weatherford	Fair	Good	Good	---	---	Good	Poor	Very poor.	Good	---	Very poor.	Good.
Duffau	Fair	Good	Good	---	---	Good	Poor	Very poor.	Good	---	Very poor.	Good.
48 Weswood	Good	Good	Fair	---	---	Good	Poor	Very poor.	Good	---	Very poor.	Fair.
49, 50 Wilson	Fair	Fair	Good	---	---	Fair	Fair	Fair	Fair	---	Fair	Fair.
51 Windthorst	Good	Good	Good	---	---	Good	Poor	Very poor.	Good	---	Very poor.	Good.
52 Windthorst	Fair	Good	Good	---	---	Good	Poor	Very poor.	Good	---	Very poor.	Good.
53 Windthorst	Fair	Good	Good	---	---	Good	Poor	Very poor.	Good	---	Very poor.	Good.
54*:												
Windthorst	Poor	Fair	Good	---	---	Good	Poor	Very poor.	Fair	---	Very poor.	Good.
Darnell	Very poor.	Very poor.	Fair	---	---	Fair	Very poor.	Very poor.	Poor	---	Very poor.	Fair.
55*:												
Windthorst	Poor	Fair	Good	---	---	Good	Poor	Very poor.	Fair	---	Very poor.	Good.
Weatherford	Poor	Fair	Good	---	---	Good	Poor	Very poor.	Fair	---	Very poor.	Good.
56 Woodford	Very poor.	Poor	Fair	---	---	Very poor.	Poor	Very poor.	Poor	---	Very poor.	Very poor.
57* Yahola	Poor	Fair	Fair	---	---	Good	Poor	Very poor.	Fair	---	Very poor.	Fair.
58 Zaneis	Good	Good	Good	---	---	Fair	Poor	Very poor.	Good	---	Very poor.	Fair.

*This mapping unit is made up of two or more dominant kinds of soil. See mapping unit description for the composition and behavior of the whole mapping unit.

TABLE 14.--ENGINEERING PROPERTIES AND CLASSIFICATIONS

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

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
1---------- Bergstrom	0-24	Silt loam--------	CL	A-4, A-6, A-7-6	0	95-100	95-100	95-100	85-97	28-46	8-25
	24-72	Silty clay loam, silt loam, clay loam.	CL	A-6, A-7	0	95-100	95-100	95-100	85-97	32-46	12-25
2---------- Bergstrom	0-60	Silty clay loam	CL	A-4, A-6, A-7-6	0	95-100	95-100	95-100	85-97	28-46	8-25
3---------- Bunyan	0-24	Loam----------	SM-SC, SC, CL, CL-ML	A-4, A-6	0	100	95-100	70-95	40-75	20-35	3-16
	24-50	Stratified clay loam to fine sandy loam.	SC, CL, ML	A-4, A-6	0	100	95-100	80-100	40-95	20-40	8-25
	50-72	Stratified clay loam to fine sandy loam.	SC, CL, ML	A-6, A-7	0	100	95-100	80-95	45-95	30-45	11-25
4----------	0-40	Clay----------	CH, MH	A-7-6	0-2	83-100	80-100	80-100	80-95	51-80	27-55

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

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
8*:											
Chigley	0-6	Gravelly loam	SM, SC	A-2, A-4	0	65-80	55-70	50-65	20-40	<30	NP-9
	6-42	Sandy clay, clay, gravelly clay.	CL, CH, SC	A-4, A-6, A-7	0	70-95	60-92	55-85	36-75	25-60	8-35
	42-44	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Darnell Variant	0-5	Channery loam	CL, GC, SC	A-2, A-4, A-6	0-15	50-75	50-75	45-75	32-75	30-37	9-14
	5-17	Very channery clay loam, very channery silt loam, very channery silty clay loam.	GC, GP-GC	A-2	0-15	10-35	10-35	10-35	7-35	30-40	9-15
	17-20	Weathered bedrock.	---	---	---	---	---	---	---	---	---
9 Clarita	0-45	Silty clay	CL, CH, MH	A-7	0	95-100	95-100	90-100	80-95	45-70	25-45
	45-80	Clay	CL, CH, MH	A-7	0	80-100	80-100	75-100	70-95	40-70	20-45
10 Dale	0-15	Silt loam	ML, CL	A-4, A-6, A-7	0	100	100	96-100	65-98	30-43	8-20
	15-72	Silt loam, loam, silty clay loam.	ML, CL	A-4, A-6, A-7	0	100	100	96-100	65-98	30-43	8-20
11 Durant	0-10	Loam	CL, ML	A-4, A-6	0	100	100	96-100	65-97	28-40	4-20
	10-16	Clay loam, silty clay loam, clay	CL, CH, MH, ML	A-6, A-7	0	100	100	96-100	80-98	37-70	15-38
	16-80	Clay	CL, CH, MH, ML	A-7	0	100	100	96-100	90-95	45-70	19-38
12 Durant	0-10	Loam	CL, ML	A-4, A-6	0	100	100	96-100	65-97	28-40	4-20
	10-15	Clay loam, silty clay loam, clay.	CL, CH, MH, ML	A-6, A-7	0	100	100	96-100	80-98	37-70	15-38
	15-72	Clay	CL, CH, MH, ML	A-7	0	100	100	96-100	90-95	45-70	19-38
13 Elandco	0-7	Clay loam	CL, ML, CL-ML	A-4, A-6, A-7-6	0	100	100	95-100	85-95	25-45	4-20
	7-65	Silty clay loam, clay loam, silt loam.	CL, ML, CL-ML	A-4, A-6, A-7-6	0	100	100	95-100	75-90	20-45	4-16
14 Eufaula	0-80	Fine sand	SM, SP-SM	A-2, A-3	0	100	98-100	82-100	5-35	---	NP

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

Soil name and map symbol	Depth	USDA texture	Unified	AASHTO	ments > 3 inches	sieve number-- 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
18*:											
Kemp	0-48	Loam	SM-SC, CL-ML, CL, SC	A-4, A-6	0	100	100	90-100	40-80	20-35	7-20
	48-72	Silty clay loam, clay loam, loam.	CL, ML	A-6	0	100	100	85-95	51-80	25-50	11-30
Tullahassee	0-13	Loam	SM, SC, ML, CL	A-4	0	100	98-100	90-100	36-85	<30	NP-10
	13-65	Fine sandy loam, loam.	SM, SC, ML, CL	A-4	0	100	98-100	90-100	36-85	<30	NP-10
19*:											
Kiti	0-15	Flaggy silty clay loam, very flaggy silty clay loam.	CL, ML	A-4, A-6	45-75	85-95	80-90	75-85	65-85	30-40	8-17
	15-20	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Grainola	0-9	Gravelly clay loam.	CL, SC, GC	A-6, A-7	0-55	40-95	40-95	40-95	36-90	37-50	15-25
	9-20	Silty clay, silty clay loam, clay.	CL, CH	A-7	0	75-100	75-100	75-98	73-98	41-70	20-40
	20-30	Silty clay, silty clay loam, clay.	CL, CH, SC, GC	A-2, A-7	0	20-90	20-90	20-85	18-85	41-70	20-40
	30-65	Weathered bedrock.	---	---	---	---	---	---	---	---	---
20*:											
Kiti	0-15	Channery silty clay loam, very flaggy silty clay loam.	CL, ML	A-4, A-6	45-75	85-95	80-90	75-85	65-85	30-40	8-17
	15-18	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop.											
21	0-12	Fine sandy loam	SP-SM, ML	A-4	0	98-100	98-100	90-100	40-60	<26	NP-7
Konawa	12-40	Fine sandy loam,	SP-SC, CL	A-4, A-6	0	98-100	98-100	85-100	40-60	21-34	4-14

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

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
24---------- Konsil	0-14	Loamy fine sand loam, fine sandy loam.	SM, SM-SC	A-2, A-4	0	90-100	90-99	50-75	20-40	<25	NP-4
	65-80	Weathered bedrock.	---	---	---	---	---	---	---	---	---
25---------- Konsil	0-14	Loamy fine sand	SM, SM-SC	A-2, A-4	0	90-100	90-99	50-75	20-40	<25	NP-4
	14-65	Sandy clay loam, loam, fine sandy loam.	CL, SC	A-6	0	90-100	90-99	85-95	40-60	28-40	11-20
	65-70	Weathered bedrock.	---	---	---	---	---	---	---	---	---
26*.											
Konsil----------	0-5	Loamy fine sand	SM, SM-SC	A-2, A-4	0	90-100	90-99	50-75	20-40	<25	NP-4
	5-75	Sandy clay loam, loam, fine sandy loam.	CL, SC	A-6	0	90-100	90-99	85-95	40-60	28-40	11-20
	75-85	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Weatherford--------	0-5	Fine sandy loam	SM, SM-SC, ML, CL-ML	A-4, A-2-4	0	95-100	95-100	75-90	30-60	<25	NP-7
	5-40	Sandy clay loam, clay loam.	SC, CL	A-6	0	95-100	95-100	80-100	36-60	30-40	15-24
	40-48	Sandy clay loam, clay loam, fine sandy loam.	SC, CL	A-4, A-6	0	95-100	95-100	80-100	40-65	20-40	8-20
	48-55	Weathered bedrock.	---	---	---	---	---	---	---	---	---
27---------- Lawton Variant	0-11	Clay loam--------	CL	A-6, A-7	0	90-100	90-100	90-100	80-90	34-43	13-20
	11-23	Clay, silty clay, silty clay loam.	CL	A-6, A-7	0	90-100	90-100	90-100	90-98	37-50	15-25
	23-80	Clay, silty clay	CL, CH	A-7	0	90-100	90-100	90-100	90-99	41-60	18-34
28---------- Miller	0-44	Silty clay-------	CL, CH	A-6, A-7	0	100	98-100	96-100	80-99	35-60	15-35
	44-72	Clay, silty clay, silty clay loam.	CL, CH	A-7	0	100	98-100	96-100	90-99	41-65	20-40
29*---------- Miller	0-45	Clay-------------	CL, CH	A-6, A-7	0	100	98-100	96-100	80-99	35-60	15-35
	45-72	Clay, silty	CL, CH	A-7	0	100	98-100	96-100	90-99	41-65	20-40
		clay loam.									
30---------- Normangee	0-8	Loam-------------	CL	A-6, A-7	0	98-100	96-100	90-100	55-85	30-48	11-25
	8-60	Clay-------------	CL, CH	A-7	0	98-100	98-100	90-100	70-96	44-80	22-58
31---------- Normangee	0-6	Loam-------------	CL	A-6, A-7	0	98-100	96-100	90-100	55-85	30-48	11-25
	6-80	Clay-------------	CL, CH	A-7	0	98-100	98-100	90-100	70-96	44-80	22-58
32----------	0-6	Clay loam--------	CL	A-6, A-7	0	98-100	96-100	90-100	55-85	30-48	11-25

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

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
35---------- Pulaski	0-8	Fine sandy loam	SM, SC, ML, CL	A-4	0	100	95-100	90-100	36-85	<30	NP-10
	8-60	Fine sandy loam, loam.	SM, SC, ML, CL	A-4	0	100	95-100	90-100	36-85	<30	NP-10
36*:											
Pulaski----------	0-20	Fine sandy loam	SM, SC, ML, CL	A-4	0	100	95-100	90-100	36-85	<30	NP-10
	20-60	Fine sandy loam, loam.	SM, SC, ML, CL	A-4	0	100	95-100	90-100	36-85	<30	NP-10
Bunyan----------	0-24	Fine sandy loam	SM-SC, SC, CL, CL-ML	A-4, A-6	0	100	95-100	70-95	40-75	20-35	3-16
	24-60	Stratified clay loam to fine sandy loam.	SC, CL, ML	A-4, A-6	0	100	95-100	80-100	40-95	20-40	8-25
37---------- Renfrow	0-8	Silt loam--------	ML, CL	A-4, A-6	0	100	100	96-100	65-97	30-37	8-14
	8-12	Clay loam, silty clay loam.	CL	A-6, A-7	0	100	100	96-100	80-98	37-49	15-26
	12-65	Clay, silty clay, silty clay loam.	ML, CL, CH, MH	A-6, A-7	0	100	100	96-100	80-99	37-70	15-38
38---------- Renfrow	0-11	Silt loam--------	ML, CL	A-4, A-6	0	100	100	96-100	65-97	30-37	8-14
	11-18	Clay loam, silty clay loam.	CL	A-6, A-7	0	100	100	96-100	80-98	37-49	15-26
	18-60	Clay, silty clay, silty clay loam.	ML, CL, CH, MH	A-6, A-7	0	100	100	96-100	80-99	37-70	15-38
39*:											
Soullin----------	0-11	Clay loam--------	CL-ML, CL	A-4, A-6	0	75-95	55-93	55-80	55-65	23-34	6-14

[redacted]

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

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
42*:											
Tamford	0-6	Clay loam	CL	A-6, A-7	0	100	100	96-100	80-98	37-50	15-26
	6-54	Clay loam, silty clay loam, clay.	CL	A-6, A-7	0	100	100	96-100	80-98	37-50	15-26
	54-72	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Grainola	0-3	Silty clay loam	CL, SC, GC	A-6, A-7	0-55	40-95	40-95	40-95	36-90	37-50	15-25
	3-20	Silty clay loam, silty clay, clay loam.	CL, CH	A-7	0-15	75-90	75-90	75-90	70-90	41-70	20-40
	20-32	Silty clay, silty clay loam, clay.	CL, CH	A-7	0	75-100	75-100	75-98	73-98	41-70	20-40
	32-72	Weathered bedrock.	---	---	---	---	---	---	---	---	---
43 Watonga	0-80	Silty clay	CL, CH	A-7	0	100	98-100	96-100	80-99	41-70	20-45
44 Weatherford	0-8	Fine sandy loam	SM, SM-SC, ML, CL-ML	A-4, A-2-4	0	95-100	95-100	75-90	30-60	<25	NP-7
	8-50	Sandy clay loam, clay loam.	SC, CL	A-6	0	95-100	95-100	80-100	36-60	30-40	15-24
	50-60	Weathered bedrock.	---	---	---	---	---	---	---	---	---
45 Weatherford	0-11	Fine sandy loam	SM, SM-SC, ML, CL-ML	A-4, A-2-4	0	95-100	95-100	75-90	30-60	<25	NP-7
	11-44	Sandy clay loam, clay loam.	SC, CL	A-6	0	95-100	95-100	80-100	36-60	30-40	15-24
	44-50	Weathered bedrock.	---	---	---	---	---	---	---	---	---
46 Weatherford	0-4	Fine sandy loam	SM, SM-SC,	A-4, A-2-4	0	95-100	95-100	75-90	30-60	<25	NP-7

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

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3	Percentage passing sieve number--				Liquid limit	Plas-ticity
			Unified	AASHTO							
	In				Pct					Pct	
48---------- Weswood	0-6	Silt loam---------	CL, CL-ML	A-4, A-6	0	100	100	95-100	70-95	20-35	4-15
	6-80	Silt loam, silty clay loam.	CL	A-6, A-7	0	100	100	90-100	70-98	30-46	11-26
49---------- Wilson	0-8	Silt loam---------	CL, CL-ML	A-4, A-6	0	95-100	85-100	80-100	60-96	24-36	7-18
	8-80	Silty clay, clay, clay loam.	CL, CH	A-7-6 A-6	0	90-100	80-100	80-100	95-65	40-55	21-35
50---------- Wilson	0-8	Silt loam---------	CL, CL-ML	A-4, A-6	0	95-100	85-100	80-100	60-96	24-36	7-18
	8-60	Silty clay, clay	CL, CH	A-7-6, A-6	0	95-100	90-100	85-100	70-90	40-57	24-35
51---------- Windthorst	0-11	Fine sandy loam	SM, SM-SC, CL-ML	A-4	0	95-100	90-100	75-100	36-75	<28	NP-7
	11-34	Clay, sandy clay, clay loam.	CL, CH	A-6, A-7-6	0	95-100	95-100	85-100	51-90	35-53	20-35
	34-65	Sandy clay loam, clay, fine sandy loam.	SC, CL	A-4, A-6, A-7-6	0	85-100	80-100	75-100	36-90	25-45	8-28
52---------- Windthorst	0-5	Fine sandy loam	SM, SM-SC, CL-ML	A-4	0	95-100	90-100	75-100	36-75	<28	NP-7
	5-32	Clay, sandy clay, clay loam.	CL, CH	A-6, A-7-6	0	95-100	95-100	85-100	51-90	35-53	20-35
	32-47	Sandy clay loam, clay, fine sandy loam.	SC, CL	A-4, A-6, A-7-6	0	85-100	80-100	75-100	36-90	25-45	8-28
	47-62	Stratified variable.	---	---	---	---	---	---	---	---	---
53---------- Windthorst	0-6	Fine sandy loam	SM, SM-SC, CL-ML	A-4	0	95-100	90-100	75-100	36-75	<28	NP-7
	6-26	Clay, sandy clay, clay loam.	CL, CH	A-6, A-7-6	0	95-100	95-100	85-100	51-90	35-53	20-35
	26-65	Sandy clay loam, clay, fine sandy loam.	SC, CL	A-4, A-6, A-7-6	0	85-100	80-100	75-100	36-90	25-45	8-28
54*: Windthorst---------	0-3	Fine sandy loam	SM, SM-SC, CL-ML	A-4	0	95-100	90-100	75-100	36-75	<28	NP-7
	3-28	Clay, sandy	CL, CH	A-6,	0	95-100	95-100	85-100	51-90	35-53	20-35

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

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
55*:											
Windthorst	0-6	Fine sandy loam	SM, SM-SC, CL-ML	A-4	0	95-100	90-100	75-100	36-75	<28	NP-7
	6-42	Clay, sandy clay, clay loam.	CL, CH	A-6, A-7-6	0	95-100	95-100	85-100	51-90	35-53	20-35
	42-65	Stratified variable.	---	---	---	---	---	---	---	---	---
Weatherford	0-9	Fine sandy loam	SM, SM-SC, ML, CL-ML	A-4, A-2-4	0	95-100	95-100	75-90	30-60	<25	NP-7
	9-55	Sandy clay loam, clay loam.	SC, CL	A-6	0	95-100	95-100	80-100	36-60	30-40	15-24
	55-65	Weathered bedrock.	---	---	---	---	---	---	---	---	---
56 Woodford	0-17	Silt loam, very channery silt loam.	CL, SC, GC	A-2, A-4, A-6	10-65	45-90	45-90	40-90	30-85	25-33	7-12
	17-20	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
57* Yahola	0-13	Fine sandy loam	SM, SC, ML, CL	A-4	0	100	95-100	90-100	36-85	<30	NP-10
	13-38	Fine sandy loam, loam.	SM, SC, ML, CL	A-4	0	100	95-100	90-100	36-85	<30	NP-10
	38-72	Fine sandy loam, loam, loamy fine sand.	SM, SC, ML, CL	A-4, A-2	0	100	95-100	90-100	15-85	<30	NP-10
58 Zaneis	0-12	Loam	SM, SC, ML, CL	A-4	0	100	98-100	94-100	36-85	<31	NP-10
	12-39	Loam, clay loam, sandy clay loam.	SC, CL, CL-ML, SM-SC	A-4, A-6	0	100	100	90-100	36-90	25-40	7-18
	39-48	Clay loam, sandy clay loam, fine sandy loam.	SM, SC, ML, CL	A-4, A-6	0-7	90-100	90-100	85-100	36-90	20-40	2-18
	48-72	Weathered bedrock.	---	---	---	---	---	---	---	---	---

* See mapping unit description for the composition and behavior of the mapping unit.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS

[The symbol < means less than; > means greater than. The erosion tolerance factor (T) is for the entire profile. Absence of an entry means data were not available or were not estimated]

Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Risk of corrosion		Erosion factors		Wind erodibility group
						Uncoated steel	Concrete	K	T	
	In	In/hr	In/in	pH						
1----------	0-24	0.6-2.0	0.16-0.20	7.9-8.4	Moderate	Moderate	Low-------	0.37	5	---
Bergstrom	24-72	0.6-2.0	0.16-0.20	7.9-8.4	Moderate	Moderate	Low-------	0.43		
2----------	0-60	0.6-2.0	0.16-0.20	7.9-8.4	Moderate	Moderate	Low-------	0.37	5	---
Bergstrom										
3----------	0-24	2.0-6.0	0.11-0.15	6.1-7.3	Low--------	Low-------	Low-------	0.43	5	---
Bunyan	24-50	0.6-2.0	0.15-0.19	5.6-8.4	Low--------	Moderate	Low-------	0.43		
	50-72	0.6-2.0	0.18-0.22	6.6-8.4	Low--------	Moderate	Low-------	0.43		
4----------	0-40	<0.06	0.12-0.18	5.6-8.4	High-------	High------	Low-------	0.32	5	---
Burleson	40-80	<0.06	0.12-0.18	7.4-8.4	High-------	High------	Low-------	0.32		
5----------	0-12	2.0-6.0	0.13-0.17	5.6-7.3	Low--------	Low-------	Moderate	0.37	4	---
Chickasha	12-24	0.6-2.0	0.14-0.18	5.6-7.3	Low--------	Moderate	Moderate	0.37		
	24-58	0.6-2.0	0.13-0.17	5.6-8.4	Low--------	Moderate	Moderate	0.37		
	58-60	---	---	---	----------	----------	----------	---		
6----------	0-12	2.0-6.0	0.13-0.17	5.6-7.3	Low--------	Low-------	Moderate	0.37	4	---
Chickasha	12-25	0.6-2.0	0.14-0.18	5.6-7.3	Low--------	Moderate	Moderate	0.37		
	25-44	0.6-2.0	0.13-0.17	5.6-8.4	Low--------	Moderate	Moderate	0.37		
	44-72	---	---	---	----------	----------	----------	---		
7----------	0-11	2.0-6.0	0.13-0.17	5.6-7.3	Low--------	Low-------	Moderate	0.37	4	---
Chickasha	11-32	0.6-2.0	0.14-0.18	5.6-7.3	Low--------	Moderate	Moderate	0.37		
	32-48	0.6-2.0	0.13-0.17	5.6-8.4	Low--------	Moderate	Moderate	0.37		
	48-52	---	---	---	----------	----------	----------	---		
8*:										
Chigley-------	0-6	2.0-6.0	0.09-0.13	5.1-7.3	Low--------	Moderate	Low-------	0.32	4	---
	6-42	0.2-0.6	0.14-0.18	5.1-7.8	Moderate	High------	Moderate	0.28		
	42-44	0.6-2.0	0.10-0.14	6.6-8.4	Moderate	High------	Low-------	---		
Darnell Variant---	0-5	0.6-2.0	0.10-0.20	5.6-6.5	Low--------	Low-------	Moderate	0.32	1	---
	5-17	0.6-2.0	0.05-0.15	4.5-6.0	Low--------	Low-------	Moderate	0.32		
	17-20	---	---	---	----------	----------	----------	---		
9----------	0-45	<0.06	0.12-0.20	6.6-8.4	High-------	High------	Low-------	0.43	4	---
Clarita	45-80	<0.06	0.12-0.18	7.9-8.4	High-------	High------	Low-------	0.37		
10---------	0-15	0.6-2.0	0.15-0.24	6.1-8.4	Moderate	Moderate	Low-------	0.37	5	---
Dale	15-72	0.6-2.0	0.15-0.24	6.6-8.4	Moderate	Moderate	Low-------	0.37		
11---------	0-10	0.60-2.0	0.15-0.24	5.6-6.5	Low--------	High------	Moderate	0.49	5	---
Durant	10-16	<0.06	0.12-0.22	5.1-6.5	Moderate	High------	Moderate	0.43		
	16-80	<0.06	0.12-0.18	5.6-8.4	High-------	High------	Moderate	0.37		
12---------	0-10	0.60-2.0	0.15-0.24	5.6-6.5	Low--------	High------	Moderate	0.49	5	---
Durant	10-15	<0.06	0.12-0.22	5.1-6.5	Moderate	High------	Moderate	0.43		
	15-72	<0.06	0.12-0.18	5.6-8.4	High-------	High------	Moderate	0.37		
13---------	0-7	0.6-2.0	0.15-0.22	6.6-8.4	Moderate	Moderate	Low-------	0.37	5	---
Elandco	7-65	0.6-2.0	0.15-0.22	7.4-8.4	Moderate	Moderate	Low-------	0.43		
14---------	0-80	6.0-20.0	0.05-0.11	5.1-7.3	Low--------	Low-------	Moderate	0.17	5	1

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

Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Risk of corrosion		Erosion factors		Wind erodibility group
						Uncoated steel	Concrete	K	T	
	In	In/hr	In/in	pH						
17----------	0-7	<0.06	0.15-0.20	7.4-8.4	Very high	High------	Low-------	0.32	5	---
Heiden	7-72	<0.06	0.12-0.20	7.9-8.4	Very high	High------	Low-------	0.32		
18*:										
Kemp----------	0-48	0.6-2.0	0.13-0.20	5.1-6.5	Low--------	Moderate	Moderate	0.28	5	---
	48-72	0.6-2.0	0.12-0.18	5.1-7.3	Moderate	Moderate	Moderate	0.28		
Tullahassee-------	0-13	2.0-6.0	0.12-0.16	5.6-6.5	Low--------	Moderate	Moderate	0.32	5	---
	13-65	2.0-6.0	0.12-0.16	5.6-6.5	Low--------	Moderate	Moderate	0.32		
19*:										
Kiti----------	0-15	0.6-2.0	0.07-0.11	6.6-8.4	Moderate	Moderate	Low-------	0.28	1	---
	15-20	---	---	---	----------	----------	----------	---		
Grainola----------	0-9	0.2-0.6	0.10-0.20	7.4-8.4	Moderate	High------	Low-------	0.37	3	---
	9-20	0.06-0.2	0.12-0.20	7.4-8.4	High-------	High------	Low-------	---		
	20-30	0.06-0.2	0.05-0.18	7.4-8.4	High-------	High------	Low-------	---		
	30-65	---	---	---	----------	----------	----------	---		
20*:										
Kiti----------	0-15	0.6-2.0	0.07-0.11	6.6-8.4	Moderate	Moderate	Low-------	0.28	1	---
	15-18	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		
Rock outcrop.										
21----------	0-12	2.0-6.0	0.11-0.15	5.6-6.5	Low--------	Low-------	Moderate	0.24	5	---
Konawa	12-40	2.0-6.0	0.11-0.15	5.1-7.3	Low--------	Low-------	Moderate	0.24		
	40-80	6.0-20.0	0.07-0.11	5.1-7.3	Low--------	Low-------	Moderate	0.24		
22----------	0-10	2.0-6.0	0.11-0.15	5.6-6.5	Low--------	Low-------	Moderate	0.24	5	---
Konawa	10-60	0.6-2.0	0.12-0.16	5.1-6.0	Low--------	Moderate	Moderate	0.32		
	60-72	2.0-6.0	0.11-0.15	5.1-7.3	Low--------	Low-------	Moderate	0.24		
23----------	0-13	2.0-6.0	0.11-0.15	5.6-6.5	Low--------	Low-------	Moderate	0.24	5	---
Konawa	13-50	0.6-2.0	0.12-0.16	5.1-6.0	Low--------	Moderate	Moderate	0.32		
	50-72	2.0-6.0	0.11-0.15	5.1-7.3	Low--------	Low-------	Moderate	0.24		
24----------	0-14	6.0-20	0.07-0.11	6.1-7.8	Low--------	Low-------	Low-------	0.20	5	2
Konsil	14-65	0.6-2.0	0.12-0.19	5.1-6.5	Moderate	Low-------	Moderate	0.32		
	65-80	---	---	---	----------	----------	----------	---		
25----------	0-14	6.0-20	0.07-0.11	6.1-7.8	Low--------	Low-------	Low-------	0.20	5	2
Konsil	14-65	0.6-2.0	0.12-0.19	5.1-6.5	Moderate	Low-------	Moderate	0.32		
	65-70	---	---	---	----------	----------	----------	---		
26*:										
Konsil----------	0-5	6.0-20	0.07-0.11	6.1-7.8	Low--------	Low-------	Low-------	0.20	5	2
	5-75	0.6-2.0	0.12-0.19	5.1-6.5	Moderate	Low-------	Moderate	0.32		
	75-85	---	---	---	----------	----------	----------	---		
Weatherford-------	0-5	2.0-6.0	0.11-0.15	6.1-7.3	Low--------	Low-------	Low-------	0.43	3	---
	5-40	0.6-2.0	0.12-0.19	5.6-6.5	Low--------	Low-------	Moderate	0.49		
	40-48	0.6-2.0	0.10-0.15	5.6-6.5	Low--------	Low-------	Moderate	0.49		
	48-55	---	---	---	----------	----------	----------	---		

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

Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Risk of corrosion		Erosion factors		Wind erodibility group
						Uncoated steel	Concrete	K	T	
	In	In/hr	In/in	pH						
30----------	0-8	0.06-0.2	0.15-0.20	5.6-7.3	Moderate	High------	Low-------	0.32	4	---
Normangee	8-60	<0.06	0.12-0.18	5.6-8.4	High-------	High------	Low-------	0.32		
31----------	0-6	0.06-0.2	0.15-0.20	5.6-7.3	Moderate	High------	Low-------	0.32	4	---
Normangee	6-80	<0.06	0.12-0.18	5.6-8.4	High-------	High------	Low-------	0.32		
32----------	0-6	0.06-0.2	0.15-0.20	5.6-7.3	Moderate	High------	Low-------	0.32	4	---
Normangee	6-72	<0.06	0.12-0.18	5.6-8.4	High-------	High------	Low-------	0.32		
33*. Oil-waste land										
34*. Pits										
35----------	0-8	2.0-6.0	0.12-0.16	5.6-7.3	Low--------	Low-------	Moderate	0.32	5	---
Pulaski	8-60	2.0-6.0	0.12-0.16	5.6-7.3	Low--------	Low-------	Moderate	0.32		
36*:										
Pulaski----------	0-20	2.0-6.0	0.12-0.16	5.6-7.3	Low--------	Low-------	Moderate	0.32	5	---
	20-60	2.0-6.0	0.12-0.16	5.6-7.3	Low--------	Low-------	Moderate	0.32		
Bunyan----------	0-24	2.0-6.0	0.11-0.15	6.1-7.3	Low--------	Low-------	Low-------	0.43	5	---
	24-60	0.6-2.0	0.15-0.19	5.6-8.4	Low--------	Moderate	Low-------	0.43		
37----------	0-8	0.6-2.0	0.15-0.24	6.1-7.8	Low--------	Low-------	Low-------	0.49	4	---
Renfrow	8-12	0.2-0.6	0.15-0.22	6.1-7.8	Moderate	Moderate	Low-------	0.43		
	12-65	<0.06	0.12-0.22	6.1-8.4	High-------	High------	Low-------	0.43		
38----------	0-11	0.6-2.0	0.15-0.24	6.1-7.8	Low--------	Low-------	Low-------	0.49	4	---
Renfrow	11-18	0.2-0.6	0.15-0.22	6.1-7.8	Moderate	Moderate	Low-------	0.43		
	18-60	<0.06	0.12-0.22	6.1-8.4	High-------	High------	Low-------	0.43		
39*:										
Soullin----------	0-11	0.6-2.0	0.15-0.19	5.6-6.5	Low--------	Low-------	Moderate	0.32	2	---
	11-34	0.6-2.0	0.12-0.16	5.6-6.5	Moderate	Moderate	Moderate	0.32		
	34-44	---	---	---	----------	----------	----------	---		
Kiti----------	0-17	0.6-2.0	0.07-0.11	6.6-8.4	Moderate	Moderate	Low-------	0.28	1	---
	17-28	---	---	---	----------	----------	----------	---		
40----------	0-4	0.2-0.6	0.12-0.20	5.1-6.5	Moderate	Moderate	Moderate	0.32	3	---
Steedman	4-36	0.06-0.2	0.12-0.18	5.6-8.4	High-------	High------	Low-------	0.32		
	36-50	---	---	---	----------	----------	----------	---		
41*:										
Stephenville-------	0-12	2.0-6.0	0.11-0.15	5.1-7.3	Low--------	Low-------	Moderate	0.24	3	---
	12-25	0.6-2.0	0.11-0.17	5.1-6.5	Low--------	Moderate	Moderate	0.32		
	25-42	---	---	---	----------	----------	----------	---		
Darnell----------	0-6	2.0-6.0	0.12-0.16	5.1-7.3	Low--------	Low-------	Moderate	0.20	2	---
	6-13	2.0-6.0	0.12-0.16	5.1-7.3	Low--------	Low-------	Moderate	0.32		
	13-18	---	---	---	----------	----------	----------	---		
42*:										
Tamford----------	0-6	0.06-0.6	0.12-0.20	6.1-8.4	High-------	High------	Low-------	0.43	4	---
	6-54	<0.06	0.12-0.18	7.4-8.4	High-------	High------	Low-------	0.37		
	54-72	---	---	---	----------	----------	----------	---		
Grainola----------	0-3	0.2-0.6	0.10-0.20	7.4-8.4	Moderate	High------	Low-------	0.37	3	---
	3-20	0.06-0.2	0.10-0.20	7.4-8.4	High-------	High------	Low-------	0.32		
	20-32	0.06-0.2	0.12-0.20	7.4-8.4	High-------	High------	Low-------	---		
	32-72	---	---	---	----------	----------	----------	---		
43----------	0-80	<0.06	0.15-0.19	6.6-8.4	High-------	High------	Low-------	0.43	5	---

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

Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Risk of corrosion		Erosion factors		Wind erodibility group
						Uncoated steel	Concrete	K	T	
	In	In/hr	In/in	pH						
44----------	0-8	2.0-6.0	0.11-0.15	6.1-7.3	Low--------	Low-------	Low-------	0.43	3	---
Weatherford	8-50	0.6-2.0	0.12-0.19	5.6-6.5	Low--------	Low-------	Moderate	0.49		
	50-60	---	---	---	----------	----------	----------	---		
45----------	0-11	2.0-6.0	0.11-0.15	6.1-7.3	Low--------	Low-------	Low-------	0.43	3	---
Weatherford	11-44	0.6-2.0	0.12-0.19	5.6-6.5	Low--------	Low-------	Moderate	0.49		
	44-50	---	---	---	----------	----------	----------	---		
46----------	0-4	2.0-6.0	0.11-0.15	6.1-7.3	Low--------	Low-------	Low-------	0.43	3	---
Weatherford	4-58	0.6-2.0	0.12-0.19	5.6-6.5	Low--------	Low-------	Moderate	0.49		
	58-65	---	---	---	----------	----------	----------	---		
47*:										
Weatherford-------	0-11	2.0-6.0	0.11-0.15	6.1-7.3	Low--------	Low-------	Low-------	0.43	3	---
	11-56	0.6-2.0	0.12-0.19	5.6-6.5	Low--------	Low-------	Moderate	0.49		
	56-72	---	---	---	----------	----------	----------	---		
Duffau----------	0-15	2.0-6.0	0.11-0.15	6.1-7.8	Low--------	Low-------	Low-------	0.43	5	---
	15-66	0.6-2.0	0.12-0.19	6.1-7.8	Low--------	Moderate	Low-------	0.32		
	66-80	0.6-2.0	0.10-0.15	6.1-7.8	Low--------	Moderate	Low-------	0.32		
48----------	0-6	0.6-2.0	0.15-0.20	7.9-8.4	Low--------	High------	Low-------	0.43	5	---
Weswood	6-80	0.6-2.0	0.15-0.22	7.9-8.4	Low--------	High------	Low-------	0.43		
49----------	0-8	0.2-0.6	0.15-0.20	5.6-7.8	Low--------	High------	Low-------	0.43	5	---
Wilson	8-80	<0.06	0.14-0.20	5.6-7.8	High-------	High------	Low-------	0.37		
50----------	0-8	0.2-0.6	0.15-0.20	5.6-7.8	Low--------	High------	Low-------	0.43	5	---
Wilson	8-60	<0.06	0.14-0.20	5.6-7.8	High-------	High------	Low-------	0.37		
51----------	0-11	0.6-2.0	0.12-0.17	5.6-7.3	Low--------	Low-------	Low-------	0.49	5	---
Windthorst	11-34	0.2-0.6	0.15-0.20	5.6-7.3	Moderate	High------	Low-------	0.37		
	34-65	0.2-0.6	0.12-0.20	5.6-8.4	Moderate	Moderate	Low-------	0.37		
52----------	0-5	0.6-2.0	0.12-0.17	5.6-7.3	Low--------	Low-------	Low-------	0.49	5	---
Windthorst	5-32	0.2-0.6	0.15-0.20	5.6-7.3	Moderate	High------	Low-------	0.37		
	32-47	0.2-0.6	0.12-0.20	5.6-8.4	Moderate	Moderate	Low-------	0.37		
	47-62	---	---	---	----------	----------	----------	---		
53----------	0-6	0.6-2.0	0.12-0.17	5.6-7.3	Low--------	Low-------	Low-------	0.49	5	---
Windthorst	6-26	0.2-0.6	0.15-0.20	5.6-7.3	Moderate	High------	Low-------	0.37		
	26-65	0.2-0.6	0.12-0.20	5.6-8.4	Moderate	Moderate	Low-------	0.37		
54*:										
Windthorst---------	0-3	0.6-2.0	0.12-0.17	5.6-7.3	Low--------	Low-------	Low-------	0.49	5	---
	3-28	0.2-0.6	0.15-0.20	5.6-7.3	Moderate	High------	Low-------	0.37		
	28-48	0.2-0.6	0.12-0.20	5.6-8.4	Moderate	Moderate	Low-------	0.37		
	48-52	---	---	---	----------	----------	----------	---		
Darnell----------	0-6	2.0-6.0	0.12-0.16	5.1-7.3	Low--------	Low-------	Moderate	0.15	2	---
	6-16	2.0-6.0	0.12-0.16	5.1-7.3	Low--------	Low-------	Moderate	0.32		
	16-28	---	---	---	----------	----------	----------	---		
55*:										
Windthorst---------	0-6	0.6-2.0	0.12-0.17	5.6-7.3	Low--------	Low-------	Low-------	0.49	5	---
	6-42	0.2-0.6	0.15-0.20	5.6-7.3	Moderate	High------	Low-------	0.37		

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

Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Risk of corrosion		Erosion factors		Wind erodibility group
						Uncoated steel	Concrete	K	T	
	In	In/hr	In/in	pH						
57* Yahola	0-13	2.0-6.0	0.12-0.16	7.4-8.4	Low	Low	Low	0.32	5	---
	13-38	2.0-6.0	0.12-0.16	7.9-8.4	Low	Low	Low	0.32		
	38-72	2.0-6.0	0.07-0.16	7.9-8.4	Low	Low	Low	0.32		
58 Zaneis	0-12	0.6-2.0	0.11-0.20	5.6-7.3	Low	Low	Low	0.37	4	---
	12-39	0.2-0.6	0.12-0.20	5.6-7.3	Moderate	Moderate	Low	0.37		
	39-48	0.2-2.0	0.11-0.20	6.1-7.8	Moderate	Moderate	Low	0.32		
	48-72	---	---	---	---	---	---	---		

* See mapping unit description for the composition and behavior of the mapping unit.

TABLE 16.--SOIL AND WATER FEATURES

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

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness
					Ft			In	
26*: Weatherford	B	None	---	---	>6.0	---	---	40-60	Rippable
27--- Lawton Variant	C	None	---	---	>6.0	---	---	>60	---
28, 29*--- Miller	D	Common	Brief	Mar-Sep	>6.0	---	---	>60	---
30, 31, 32--- Normangee	D	None	---	---	>6.0	---	---	>60	---
33*. Oil-waste land.									
34*. Pits.									
35--- Pulaski	B	Occasional	Very brief	Mar-Aug	>6.0	---	---	>60	---
36*: Pulaski	B	Frequent	Very brief	Mar-Aug	>6.0	---	---	>60	---
Bunyan	B	Frequent	Brief	May-Oct	>6.0	---	---	>60	---
37, 38--- Renfrow	D	None	---	---	>6.0	---	---	>60	---
39*: Scullin	C	None	---	---	>6.0	---	---	20-40	Hard
Kiti	C	None	---	---	>6.0	---	---	4-20	Hard
40--- Steedman	D	None	---	---	0.5-1.0	Perched	Nov-Mar	20-40	Rippable
41*: Stephenville	B	None	---	---	>6.0	---	---	20-40	Rippable
Darnell	C	None	---	---	>6.0	---	---	10-20	Rippable
42*: Tamford	D	None	---	---	>6.0	---	---	>60	---
Grainola	D	None	---	---	>6.0	---	---	20-40	Rippable
43--- Watonga	D	Occasional	Very brief	Mar-Sep	>6.0	---	---	>60	---
44, 45, 46--- Weatherford	B	None	---	---	>6.0	---	---	40-60	Rippable
47*: Weatherford	B	None	---	---	>6.0	---	---	40-60	Rippable
Duffau	B	None	---	---	>6.0	---	---	>60	Rippable
48--- Weswood	B	Occasional	Brief	Mar-Sep	>6.0	---	---	>60	---
49, 50--- Wilson	D	None	---	---	0-1.0	Perched	Nov-Mar	>60	---
51, 52, 53--- Windthorst	C	None	---	---	>6.0	---	---	>60	---

See footnote at end of table.

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

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness
					Ft			In	
54*:									
Windthorst	C	None	---	---	>6.0	---	---	>60	---
Darnell	C	None	---	---	>6.0	---	---	10-20	Rippable
55*:									
Windthorst	C	None	---	---	>6.0	---	---	>60	---
Weatherford	B	None	---	---	>6.0	---	---	40-60	Rippable
56 Woodford	C	None	---	---	>6.0	---	---	5-20	Hard
57* Yahola	B	Frequent	Very brief	Mar-Aug	>6.0	---	---	>60	---
58 Zaneis	B	None	---	---	>6.0	---	---	40-60	Rippable

* See mapping unit description for the composition and behavior of the mapping unit.

TABLE 17.--ENGINEERING TEST DATA

[redacted]

TABLE 18.--CLASSIFICATION OF THE SOILS

[redacted]

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