



United States  
Department of  
Agriculture

Natural Resources  
Conservation  
Service

In cooperation with  
Texas Agricultural  
Experiment Station and  
Texas State Soil and  
Water Conservation  
Board

# Soil Survey of Liberty County, Texas





# How To Use This Soil Survey

## General Soil Map

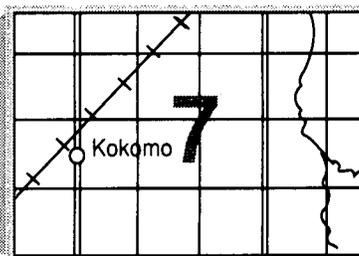
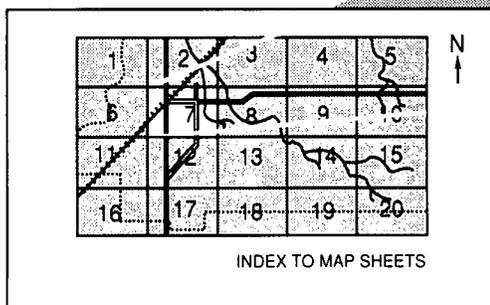
The general soil map, which is the color map preceding the detailed soil maps, shows the survey area divided into groups of associated soils called general soil map units. This map is useful in planning the use and management of large areas.

To find information about your area of interest, locate that area on the map, identify the name of the map unit in the area on the color-coded map legend, then refer to the section **General Soil Map Units** for a general description of the soils in your area.

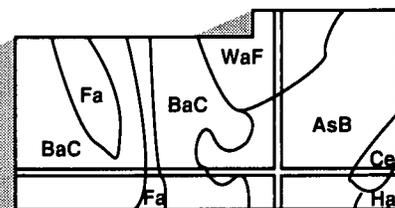
## Detailed Soil Maps

The detailed soil maps follow the general soil map. These maps can be useful in planning the use and management of small areas.

To find information about your area of interest, locate that area on the **Index to Map Sheets**, which precedes the soil maps. Note the number of the map sheet, and turn to that sheet.



Locate your area of interest on the map sheet. Note the map unit symbols that are in that area. Turn to the **Index to Map Units** (see Contents), which lists the map units by symbol and name and shows the page where each map unit is described.



NOTE: Map unit symbols in a soil survey may consist only of numbers or letters, or they may be a combination of numbers and letters.

The **Summary of Tables** shows which table has data on a specific land use for each detailed soil map unit. See **Contents** for sections of this publication that may address your specific needs.

---

This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (formerly the Soil Conservation Service) has leadership for the Federal part of the National Cooperative Soil Survey.

Major fieldwork for this soil survey was completed in 1985. Soil names and descriptions were approved in 1986. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1985. This soil survey was made cooperatively by the Natural Resources Conservation Service, the Texas Agricultural Experiment Station, and the Texas State Soil and Water Conservation Board. It is part of the technical assistance furnished to the Lower Trinity Soil and Water Conservation District.

Soil maps in this survey may be copied without permission. Enlargement of these maps, however, could cause misunderstanding of the detail of mapping. If enlarged, maps do not show the small areas of contrasting soils that could have been shown at a larger scale.

All programs of the Natural Resources Conservation Service are offered on a nondiscriminatory basis, without regard to race, color, national origin, religion, sex, age, marital status, or handicap.

**Cover: Rice, the major crop in Liberty County, in an area of Beaumont clay.**

# Contents

---

<b>Index to map units</b> .....	iv	Dylan series .....	80
<b>Summary of tables</b> .....	v	Estes series .....	81
<b>Foreword</b> .....	vii	Fausse series .....	81
General nature of the county .....	1	Guyton series .....	82
How this survey was made .....	2	Hatliff series .....	82
Map unit composition .....	4	Hockley series .....	83
<b>General soil map units</b> .....	7	Kaman series .....	84
<b>Detailed soil map units</b> .....	15	Katy series .....	84
<b>Prime farmland</b> .....	47	Kemah series .....	85
<b>Use and management of the soils</b> .....	49	Kenefick series .....	86
Crops and pasture .....	49	Kirbyville series .....	87
Rangeland .....	52	Lake Charles series .....	87
Woodland management and productivity .....	54	Landman series .....	88
Woodland understory vegetation .....	56	Mantachie series .....	89
Recreation .....	57	Mocarey series .....	90
Wildlife habitat .....	58	Morey series .....	91
Engineering .....	59	Otanya series .....	92
<b>Soil properties</b> .....	65	Owentown series .....	92
Engineering index properties .....	65	Pluck series .....	93
Physical and chemical properties .....	66	Segno series .....	94
Soil and water features .....	67	Sorter series .....	94
Physical, chemical, and mineralogical analyses of selected soils .....	68	Splendora series .....	95
Engineering index test data .....	68	Spurger series .....	96
<b>Classification of the soils</b> .....	71	Vamont series .....	97
Soil series and their morphology .....	71	Verland series .....	97
Alaga series .....	71	Voss series .....	98
Aldine series .....	72	Waller series .....	98
Anahuac series .....	73	Wockley series .....	99
Aris series .....	74	Woodville series .....	100
Beaumont series .....	75	Yeaton series .....	100
Bernard series .....	75	<b>Formation of the soils</b> .....	103
Bienville series .....	76	Factors of soil formation .....	103
Boykin series .....	76	Processes of horizon differentiation .....	104
Choates series .....	77	Surface geology .....	104
Dallardsville series .....	78	<b>References</b> .....	109
Doucette series .....	79	<b>Glossary</b> .....	111
		<b>Tables</b> .....	119

Issued July 1996

# Index to Map Units

---

AaB—Alaga fine sand, 1 to 3 percent slopes . . . . .	15	LaC—Lake Charles clay, 2 to 5 percent slopes . . . . .	31
AdA—Aldine silt loam, 0 to 2 percent slopes . . . . .	16	LdB—Landman loamy fine sand, 0 to 2 percent	
Ae—Aldine-Aris complex . . . . .	16	slopes . . . . .	31
An—Anahuac-Aris complex . . . . .	17	Ma—Mantachie loam, frequently flooded . . . . .	32
Ar—Aris silt loam . . . . .	18	My—Mocarey-Yeaton complex . . . . .	32
As—Aris loam, depressional . . . . .	18	Ow—Oil-waste land . . . . .	33
Ba—Beaumont clay . . . . .	18	OyB—Otanya fine sandy loam, 1 to 3 percent	
Bd—Beaumont clay, depressional . . . . .	19	slopes . . . . .	33
Be—Bernard clay loam . . . . .	19	Oz—Owentown fine sandy loam, occasionally	
Bm—Bernard-Morey complex . . . . .	21	flooded . . . . .	34
BnB—Bienville loamy fine sand, 0 to 2 percent		Pt—Pits . . . . .	34
slopes . . . . .	21	Pu—Pluck fine sandy loam, frequently flooded . . . . .	34
BvB—Bienville-Kenefick complex, 1 to 3 percent		Sa—Segno fine sandy loam . . . . .	35
slopes . . . . .	22	Sb—Sorter loam . . . . .	35
ByB—Boykin loamy fine sand, 1 to 3 percent		Sd—Sorter-Dallardsville complex . . . . .	35
slopes . . . . .	22	Sk—Sorter-Kirbyville complex . . . . .	36
CoB—Choates loamy fine sand, 1 to 3 percent		Sp—Splendora fine sandy loam . . . . .	37
slopes . . . . .	23	SrB—Spurger fine sandy loam, 0 to 2 percent	
DaB—Dallardsville fine sandy loam, 1 to 3		slopes . . . . .	37
percent slopes . . . . .	23	SwB—Spurger-Waller complex, 0 to 2 percent	
DoB—Doucette loamy fine sand, 1 to 3 percent		slopes . . . . .	38
slopes . . . . .	24	VaA—Vamont silty clay, 0 to 1 percent slopes . . . . .	39
DyC—Dylan clay, 3 to 6 percent slopes . . . . .	24	VaB—Vamont clay, 1 to 3 percent slopes . . . . .	39
Es—Estes clay, frequently flooded . . . . .	24	Vd—Vamont silty clay, depressional . . . . .	40
Fa—Fausse clay, frequently flooded . . . . .	25	Ve—Verland clay loam . . . . .	40
Gu—Guyton silt loam . . . . .	25	Vo—Voss fine sand, occasionally flooded . . . . .	40
Gy—Guyton-Aldine complex . . . . .	25	Vs—Voss fine sand, frequently flooded . . . . .	41
Ha—Hatliff clay loam, occasionally flooded . . . . .	26	Wa—Waller loam . . . . .	41
Ho—Hockley fine sandy loam . . . . .	27	Wc—Waller loam, depressional . . . . .	42
Ka—Kaman clay, occasionally flooded . . . . .	27	Wd—Waller-Dallardsville complex . . . . .	42
Kf—Kaman clay, frequently flooded . . . . .	27	Wk—Waller-Kirbyville complex . . . . .	42
Kg—Katy fine sandy loam . . . . .	28	Wn—Waller-Splendora complex . . . . .	43
Kh—Kemah silt loam . . . . .	28	Wo—Wockley fine sandy loam . . . . .	44
Km—Kemah-Aris complex . . . . .	29	WvB—Woodville fine sandy loam, 1 to 3 percent	
Kn—Kenefick fine sandy loam . . . . .	29	slopes . . . . .	44
Kr—Kirbyville fine sandy loam . . . . .	30	WvD—Woodville fine sandy loam, 5 to 8 percent	
LaA—Lake Charles clay, 0 to 1 percent slopes . . . . .	30	slopes . . . . .	45

# Summary of Tables

---

Temperature and precipitation (table 1) .....	120
Freeze dates in spring and fall (table 2).....	121
Growing season (table 3).....	121
Acreage and proportionate extent of the soils (table 4) .....	122
Prime farmland (table 5).....	123
Land capability and yields per acre of crops and pasture (table 6) .....	124
Rangeland productivity (table 7).....	128
Woodland management and productivity (table 8).....	129
Recreational development (table 9).....	137
Wildlife habitat (table 10).....	142
Building site development (table 11) .....	146
Sanitary facilities (table 12) .....	152
Construction materials (table 13) .....	158
Water management (table 14).....	163
Engineering index properties (table 15) .....	168
Physical and chemical properties of the soils (table 16).....	177
Soil and water features (table 17) .....	182
Physical analysis of selected soils (table 18) .....	186
Chemical analysis of selected soils (table 19).....	188
Clay mineralogy of selected soils (table 20) .....	189
Engineering index test data (table 21) .....	190
Classification of the soils (table 22).....	192



# Foreword

---

This soil survey contains information that can be used in land-planning programs in Liberty County. It contains predictions of soil behavior for selected land uses. The survey also highlights limitations and hazards inherent in the soil, improvements needed to overcome the limitations, and the impact of selected land uses on the environment.

This soil survey is designed for many different users. Farmers, ranchers, foresters, and agronomists can use it to evaluate the potential of the soil and the management needed for maximum food and fiber production. Planners, community officials, engineers, developers, builders, and home buyers can use the survey to plan land use, select sites for construction, and identify special practices needed to ensure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the survey to help them understand, protect, and enhance the environment.

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are shallow to bedrock. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as 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 soil is shown on the detailed soil maps. Each soil in the survey area is described. Information on specific uses is given for each soil. Help in using this publication and additional information are available at the local office of the Natural Resources Conservation Service or the Cooperative Extension Service.

Harry W. Oneth  
State Conservationist  
Natural Resources Conservation Service



# Soil Survey of Liberty County, Texas

By Kirby L. Griffith, Natural Resources Conservation Service

Fieldwork by Paul D. Holland and Tom A. Feuerbacher, soil scientists,  
Natural Resources Conservation Service

United States Department of Agriculture, Natural Resources Conservation Service,  
in cooperation with  
the Texas Agricultural Experiment Station and Texas State Soil and Water  
Conservation Board

LIBERTY COUNTY is in southeastern Texas (fig. 1). It has a total area of 1,177 square miles, or 753,293 acres. Of this total, 4,540 acres is areas of water more than 40 acres in size. Liberty is the county seat. Other towns include Cleveland, Ames, Daisetta, Dayton, Dayton Lakes, Devers, Hardin, Kenefick, North Cleveland, and Plum Grove. In 1990, the population of Liberty County was 52,726.

## General Nature of the County

About 58 percent of the county lies within the Gulf Coast Prairie major land resource area, which is known locally as the coast prairie. The soils in this area are mainly clay loam and clay. Some areas of soils that are silt loam and fine sandy loam occur along bayous and other drainageways. The main crops produced in this area are rice and soybeans.

About 42 percent of the county lies within the Western Gulf Coast Flatwoods major land resource area, which is known locally as the flatwoods. The upland soils have developed primarily from sandy and clayey marine sediments. The area is slightly dissected by drainageways. The surface has low relief and consists mainly of large, nearly level areas that have slow drainage. The flatwoods merge with the coast prairie without a noticeable change in elevation. Woodland is the major land use. Both pine and hardwood timber are produced.

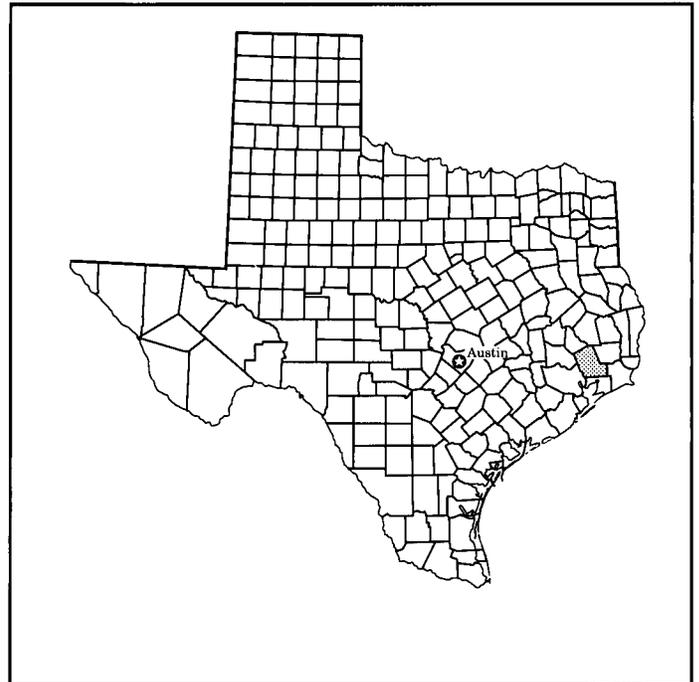


Figure 1.—Location of Liberty County in Texas.

The elevation ranges from 20 feet above sea level in the southern part of the county to 210 feet above sea level in the northern part.

The San Jacinto River is in the northwestern part of the county. The flood plain is 13 miles long and ½ mile wide. The soils along the San Jacinto River are mainly fine sandy loam and loamy fine sand. A few areas of clay soils also occur. Hardwoods cover most of the flood plain. A few small areas have been cleared for pasture.

The Trinity River flows from north to south and divides the county almost in half. The flood plain is about 110,000 acres in size. The soils are mainly clay and are derived primarily from alluvium eroded from the Blackland Prairie. These very dark gray, very poorly drained soils are level or nearly level and frequently to occasionally flooded. Soils that are loamy or sandy are of minor extent. Water-tolerant hardwoods cover most of the area. A few small areas have been cleared for pasture.

### Settlement and Agriculture

Spanish soldiers came to this area in about 1756. They established a settlement named Atascosito to discourage French settlers from Louisiana from moving into the area. In the early 1820's, non-Hispanic Europeans began to settle in this area. By 1831, they had established the town of Liberty. They established Liberty County in 1836 and organized it in 1837. A report in 1835 indicated that the town of Liberty was a source of cotton, sugar, tobacco, indigo, edible grain, vegetables, lumber, and hides.

In the 1800's, most of the area was an open, nearly level coastal prairie of tall and mid grasses. Hardwood timber grew on the flood plains of creeks and rivers. Pines grew only in areas of the sandier soils in the northern part of the county. The major agricultural enterprise was cattle ranching. Another important enterprise was the production of timber. By the late 1800's, canal companies had been established to supply water to the rice industry.

Currently, timber, rice, soybeans, and beef cattle are the principal agricultural commodities.

### Natural Resources

Oil and gas are produced in the southern part of Liberty County (fig. 2). The northern part of the county produces timber for lumber and pulpwood. Sand and gravel are mined on terraces of the Trinity River. The Trinity River, which flows 73 miles through the center of the county, is used for recreational activities and as a source of irrigation water. Part of the Big Thicket National Preserve is in the northeastern part of the county.

### Climate

In Liberty County the long summers are hot and humid. Winters are warm and are only occasionally interrupted by incursions of cold air from the north. Rainfall occurs throughout the year.

Table 1 gives data on temperature and precipitation for the survey area as recorded at Liberty, Texas, in the period 1961 to 1990. Table 2 shows probable dates of the first freeze in fall and the last freeze in spring. Table 3 provides data on length of the growing season.

In winter, the average temperature is 52 degrees F and the average daily minimum temperature is 41 degrees. The lowest temperature on record, which occurred at Liberty on February 2, 1951, is 7 degrees. In summer, the average temperature is 82 degrees and the average daily maximum temperature is 92 degrees. The highest recorded temperature, which occurred at Liberty on August 10, 1962, is 107 degrees.

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

The total annual precipitation is 53.6 inches. Of this, nearly 29 inches, or about 54 percent, usually falls in April through September. The growing season for most crops falls within this period. In 2 years out of 10, the rainfall in April through September is less than 20 inches. The heaviest 1-day rainfall during the period of record was 11.3 inches at Liberty on November 22, 1977. Thunderstorms occur on about 62 days each year.

Snowfall is rare. In 95 percent of the winters, there is no measurable snowfall. The heaviest 1-day snowfall on record was more than 3 inches.

The average relative humidity in midafternoon is about 60 percent. Humidity is higher at night, and the average at dawn is about 90 percent. The sun shines 65 percent of the time possible in summer and 55 percent in winter. The prevailing wind is from the south-southeast. Average windspeed is highest, 9 miles per hour, in spring.

### How This Survey Was Made

This survey was made to provide information about the soils in the survey area. The information includes a description of the soils and their location and a



**Figure 2.—Drilling for oil in an area of Spurger fine sandy loam, 0 to 2 percent slopes. Most of the oil production in Liberty County is in the southern part of the county.**

discussion of the suitability, limitations, and management of the soils for specified uses. Soil scientists observed the steepness, length, and shape of slopes; the general pattern of drainage; the kinds of crops and native plants growing on the soils; and the

kinds of bedrock. They dug many holes to study the soil profile, which is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material from which the soil formed. The unconsolidated material is devoid of

roots and other living organisms and has not been changed by other biological activity.

The soils in the survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil is associated with a particular kind of landscape or with a segment of the landscape. By observing the soils in the survey area and relating their position to specific segments of the landscape, a soil scientist develops a concept, or model, of how the soils were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. The system of taxonomic classification used in the United States is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

While a soil survey is in progress, samples of some of the soils in the area are generally collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet

local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot assure that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

## Map Unit Composition

A map unit delineation on a soil map represents an area dominated by one major kind of soil or an area dominated by two or three kinds of soil. A map unit is identified and named according to the taxonomic classification of the dominant soil or soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural objects. In common with other natural objects, they have a characteristic variability in their properties. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of soils of other taxonomic classes. Consequently, every map unit is made up of the soil or soils for which it is named and some soils that belong to other taxonomic classes. In the detailed soil map units, these latter soils are called inclusions or included soils. In the general soil map units, they are called soils of minor extent.

Most inclusions have properties and behavioral patterns similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting (similar) inclusions. They may or may not be mentioned in the map unit descriptions. Other inclusions, however, have properties and behavior divergent enough to affect use or require different management. These are contrasting

(dissimilar) inclusions. They generally occupy small areas and cannot be shown separately on the soil maps because of the scale used in mapping. The inclusions of contrasting soils are mentioned in the map unit descriptions. A few inclusions may not have been observed and consequently are not mentioned in the descriptions, especially where the soil pattern was so complex that it was impractical to make enough observations to identify all of the kinds of soils on the landscape.

The presence of inclusions in a map unit in no way diminishes the usefulness or accuracy of the soil data. The objective of soil mapping is not to delineate pure taxonomic classes of soils but rather to separate the landscape into segments that have similar use and management requirements. The delineation of such landscape segments on the map provides sufficient information for the development of resource plans, but onsite investigation is needed to plan for intensive uses in small areas.



# General Soil Map Units

---

The general soil map at the back of this publication shows broad areas that have a distinctive pattern of soils, relief, and drainage. Each map unit on the general soil map is a unique natural landscape. Typically, it 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 another but in a different pattern.

The general soil map can be used to compare the suitability of large areas for general land uses. Areas of suitable soils can be identified on the map. Likewise, areas where the soils are not suitable can be identified.

Because of its small scale, the map is not suitable for planning the management of a farm or field or for selecting a site for a road or a building or other structure. The soils in any one map unit differ from place to place in slope, depth, drainage, and other characteristics that affect management.

In this section, each map unit is rated for *cultivated crops*, *woodland*, and *urban uses*. Cultivated crops are those grown extensively in the survey area. Woodland refers to areas of native or introduced trees. Urban uses include residential, commercial, and industrial developments.

## Soils on the Coast Prairie

These soils make up about 57 percent of the county. The major soils are in the Aldine, Anahuac, Aris, Beaumont, Bernard, Lake Charles, Mocarey, Morey, Vamont, and Woodville series. All of these soils formed in clayey and loamy sediments on uplands. The landscape has very little relief. Shallow depressions and low mounds are in some areas. Slopes are mostly less than 3 percent.

These soils are used mainly for cropland. Rice and soybeans are the principal crops. Some areas are used as pasture and hayland. Timber is produced in other areas.

## 1. Aris-Aldine-Anahuac

*Nearly level and very gently sloping, somewhat poorly drained and poorly drained, very slowly permeable, loamy soils*

This map unit makes up about 16 percent of the county. It is about 31 percent Aris soils, 24 percent Aldine soils, 7 percent Anahuac soils, and 38 percent other soils.

Areas of this map unit are predominantly in the northeastern and southeastern parts of the county. Slopes range from 0 to 2 percent.

The Aris soils are in broad, irregularly shaped, nearly level areas and in shallow depressions. Typically, the surface layer is strongly acid, dark gray silt loam about 3 inches thick. The subsurface layer, from a depth of 3 to 5 inches, is very strongly acid, grayish brown silt loam that has yellowish brown and gray mottles. The upper part of the subsoil, from a depth of 5 to 18 inches, is very strongly acid, dark gray silty clay loam that has yellowish brown mottles. The next part, from a depth of 18 to 29 inches, is very strongly acid, dark gray clay loam that has yellowish brown mottles. The lower part, from a depth of 29 to 60 inches, is strongly acid, gray and dark gray clay that has yellowish brown and red mottles.

The Aldine soils are on broad, irregularly shaped, nearly level and very gently sloping mounds and ridges. Typically, the surface layer is strongly acid, dark grayish brown silt loam about 4 inches thick. The subsurface layer, from a depth of 4 to 17 inches, is strongly acid, brown silt loam that has brownish yellow mottles. The upper part of the subsoil, from a depth of 17 to 25 inches, is slightly acid, yellowish brown loam that has strong brown and brownish yellow mottles. The next part, from a depth of 25 to 31 inches, is strongly acid, grayish brown clay that has yellowish brown and red mottles. The lower part, from a depth of 31 to 60 inches, is very strongly acid or strongly acid, gray clay that has yellowish brown, red, and brownish yellow mottles.

The Anahuac soils are on broad, irregularly shaped, nearly level mounds and ridges. Typically, the surface layer is moderately acid, very dark grayish brown silt loam about 8 inches thick. The upper part of the subsurface layer, from a depth of 8 to 16 inches, is strongly acid, dark brown silt loam. The lower part, from a depth of 16 to 37 inches, is strongly acid, brown silt loam that has yellowish brown and grayish brown mottles. The upper part of the subsoil, from a depth of 37 to 62 inches, is very strongly acid and strongly acid, light brownish gray clay that has red and yellowish brown mottles. The lower part, from a depth of 62 to 80 inches, is strongly acid and moderately acid, light gray clay that has yellowish brown and red mottles.

Of minor extent in this map unit are Kemah, Guyton, Verland, Katy, Kirbyville, Waller, and Vamont soils. Kemah and Katy soils are on mounds and ridges. Guyton, Verland, Waller, and Vamont soils are in low areas similar to those of the Aris soils. Kirbyville soils are in nearly level areas.

This map unit is used mainly as pasture and hayland. Timber is produced in some areas. Crops are grown in a few areas.

Bahiagrass is the major pasture grass. Applications of fertilizer and lime are needed to maintain yields.

Loblolly pine and shortleaf pine are the main commercial trees harvested for timber. Wetness is a limitation affecting the operation of machinery.

Some areas of these soils are used as cropland. Rice and soybeans are the principal crops.

The wetness and low strength are limitations affecting urban uses.

## 2. Beaumont-Lake Charles

*Nearly level to gently sloping, somewhat poorly drained and poorly drained, very slowly permeable, clayey soils*

This map unit makes up about 15 percent of the county. It is about 59 percent Beaumont soils, 18 percent Lake Charles soils, and 23 percent other soils.

Areas of this map unit are in the southern part of the county. Slopes are mainly less than 1 percent.

The Beaumont soils are mostly in broad, nearly level areas. They are also in some small areas in shallow depressions. Typically, the surface layer is about 28 inches thick. It is dark gray clay that has strong brown mottles. It is moderately acid in the upper part and strongly acid in the lower part. The subsoil, from a depth of 28 to 60 inches, is clay. It is strongly acid and dark gray in the upper part and very strongly acid and gray in the lower part. The lower part of the subsoil has red and strong brown mottles throughout.

The Lake Charles soils are in broad, nearly level to gently sloping areas. Typically, the surface layer is

about 6 inches thick. It is moderately acid, very dark gray clay that has dark brown mottles. The upper part of the subsoil, from a depth of 6 to 36 inches, is neutral and slightly alkaline, very dark gray clay that has mottles in shades of brown, yellow, and red. The lower part, from a depth of 36 to 60 inches, is slightly alkaline, gray clay that has mottles in shades of brown and yellow.

Of minor extent in this map unit are Bernard, Verland, Morey, and Vamont soils. Morey soils are on small pimple mounds. Bernard soils are in broad areas similar to those of the Lake Charles soils. Verland soils are in depressions. Vamont soils are along drainageways.

This map unit is used mainly as cropland. Rice and soybeans are the principal crops. Rice grows well in areas of these soils. Soybeans also grow well if a drainage system is installed.

Some areas of these soils are used as pasture and hayland. Bahiagrass is the principal grass. Applications of fertilizer and lime are needed to maintain yields.

A few areas where pines and hardwoods have encroached produce timber. Loblolly pine is the major commercial species harvested for timber.

Because of the shrink-swell potential, wetness, and low strength, these soils are poorly suited to most urban uses.

## 3. Bernard-Morey-Mocarey

*Nearly level, somewhat poorly drained, very slowly permeable and slowly permeable, loamy soils*

This map unit makes up about 10 percent of the county. It is about 39 percent Bernard soils, 17 percent Morey soils, 15 percent Mocarey soils, and 29 percent other soils.

Areas of this map unit are mostly in the southern part of the county. Slopes are mainly less than 1 percent.

The Bernard soils are in broad, irregularly shaped, nearly level areas of intermounds. Typically, the surface layer is slightly acid, very dark gray clay loam about 6 inches thick. The upper part of the subsoil, from a depth of 6 to 49 inches, is neutral or slightly alkaline, very dark gray clay that has brown and red mottles. The lower part, from a depth of 49 to 72 inches, is moderately alkaline, dark gray or grayish brown clay that has brown, red, and gray mottles.

The Morey soils are on pimple mounds. Typically, the surface layer is neutral, very dark gray silt loam about 8 inches thick. The upper part of the subsoil, from a depth of 8 to 14 inches, is slightly alkaline, dark gray silt loam that has strong brown mottles. The lower part, from a depth of 14 to 60 inches, is moderately alkaline, grayish

brown silty clay loam or silty clay that has yellowish brown and light olive brown mottles.

The Mocarey soils are in nearly level, mounded areas. Typically, the surface layer is neutral to moderately alkaline, very dark gray loam about 12 inches thick. The subsoil is moderately alkaline. It extends to a depth of 80 inches. From a depth of 12 to 18 inches, it is dark gray loam; from a depth of 18 to 24 inches, it is gray loam; from a depth of 24 to 66 inches, it is gray clay loam that has brownish yellow mottles; and from a depth of 66 to 80 inches, it is light gray clay loam that has brownish yellow mottles.

Of minor extent in this map unit are Lake Charles, Beaumont, Yeaton, Kemah, and Aris soils. Lake Charles and Beaumont soils are in broad, nearly level areas. Aris soils are in depressions. Kemah and Yeaton soils are on large mounds.

This map unit is used mainly as cropland. Rice is the principal crop grown.

Some areas of these soils are used as pasture and hayland. Bahiagrass is the most suitable species. Applications of fertilizer and lime are needed to maintain yields.

These soils are poorly suited to urban uses because of wetness, the shrink-swell potential, and low strength.

#### 4. Vamont-Woodville-Aldine

*Nearly level to moderately sloping, somewhat poorly drained and poorly drained, very slowly permeable, clayey and loamy soils*

This map unit makes up about 9 percent of the county. It is about 31 percent Vamont soils, 24 percent Woodville soils, 9 percent Aldine soils, and 36 percent other soils.

Areas of this map unit are mostly long and narrow and are parallel to the Trinity River. Slopes are mainly 1 to 8 percent.

The nearly level and very gently sloping Vamont soils are on ridgetops and at the head of drainageways. Typically, the surface layer is very strongly acid, dark grayish brown silty clay about 3 inches thick. The upper part of the subsoil, from a depth of 3 to 11 inches, is very strongly acid, mottled brownish yellow and grayish brown clay. The next part, from a depth of 11 to 47 inches, is very strongly acid, light brownish gray clay that has strong brown mottles. The lower part, from a depth of 47 to 60 inches, is moderately acid, grayish brown clay that has mottles in shades of brown and red.

The gently sloping to moderately sloping Woodville soils are on ridgetops and side slopes along drainageways. Typically, the surface layer is moderately acid, brown fine sandy loam about 6 inches thick. The subsurface layer, from a depth of 6 to 11 inches, is

strongly acid, very pale brown loam that has brownish yellow mottles. The upper part of the subsoil, from a depth of 11 to 19 inches, is very strongly acid, red clay that has brown and yellow mottles. The lower part, from a depth of 19 to 60 inches, is very strongly acid, mottled red, reddish yellow, pale brown, very pale brown, and brownish yellow clay.

The Aldine soils are nearly level and very gently sloping. Typically, the surface layer is strongly acid, dark grayish brown silt loam about 4 inches thick. The subsurface layer, from a depth of 4 to 17 inches, is strongly acid, brown silt loam that has brownish yellow mottles. The upper part of the subsoil, from a depth of 17 to 25 inches, is slightly acid, yellowish brown loam that has strong brown and brownish yellow mottles. The next part, from a depth of 25 to 31 inches, is strongly acid, grayish brown clay that has yellowish brown and red mottles. The lower part, from a depth of 31 to 60 inches, is strongly acid and very strongly acid, gray clay that has yellowish brown, brownish yellow, and red mottles.

Of minor extent in this map unit are Dylan, Kirbyville, Otanya, Aris, Guyton, Verland, Beaumont, and Waller soils. Dylan soils are on side slopes along drainageways. Kirbyville and Otanya soils are on mounds and low ridges. Aris, Guyton, Verland, Beaumont, and Waller soils are in nearly level areas and along remnant drainageways.

This map unit is used mainly for timber production. Loblolly pine is the principal commercial species harvested for timber.

Some areas of these soils are used as pasture and hayland. Bahiagrass is the principal grass.

These soils are poorly suited to most urban uses because of the shrink-swell potential, wetness, and slope.

#### 5. Vamont-Beaumont

*Nearly level and very gently sloping, somewhat poorly drained and poorly drained, very slowly permeable, clayey soils*

This map unit makes up about 7 percent of the county. It is about 49 percent Vamont soils, 27 percent Beaumont soils, and 24 percent other soils.

Areas of this map unit are in the southeastern part of the county. Slopes are mainly less than 1 percent.

The Vamont soils are on nearly level and very gently sloping ridgetops and at the head of drainageways. Typically, the surface layer is very strongly acid, dark grayish brown silty clay about 3 inches thick. The upper part of the subsoil, from a depth of 3 to 11 inches, is very strongly acid, mottled brownish yellow and grayish brown clay. The next part, from a depth of 11 to 47

inches, is very strongly acid, light brownish gray clay that has strong brown mottles. The lower part, from a depth of 47 to 60 inches, is moderately acid, grayish brown clay that has mottles in shades of brown and red.

The Beaumont soils are in broad, nearly level areas. Typically, the surface layer is about 28 inches thick. It is dark gray clay that has strong brown mottles. It is moderately acid in the upper part and strongly acid in the lower part. The subsoil, from a depth of 28 to 60 inches, is strongly acid and very strongly acid, dark gray and gray clay that has red and strong brown mottles.

Of minor extent in this map unit are Aldine, Aris, Kemah, Verland, and Estes soils. Aldine and Kemah soils are on low ridges and mounds. Verland and Aris soils are in nearly level areas and depressions. Estes soils are on flood plains along streams.

This map unit is used mainly for timber production. The principal commercial trees are loblolly pine and shortleaf pine. Seedling mortality is high. Wetness is a limitation affecting the operation of machinery.

Some areas of these soils are used as pasture and hayland. Bahiagrass is the most suitable species. Applications of fertilizer and lime are needed for maximum forage production.

These soils are poorly suited to urban uses because of the wetness, the shrink-swell potential, and low strength.

## Soils on Flatwoods

These soils make up about 19 percent of the county. The major soils are in the Kirbyville, Sorter, Splendor, Waller, and Wockley series. All of these soils formed in loamy marine sediments on uplands. Most of the landscape is nearly level and has scattered areas of circular low mounds and shallow depressions.

These soils are used mainly for timber production. Loblolly pine and shortleaf pine are the major species. Some areas are used as pasture and hayland and are well suited to these uses. In some areas, however, excessive wetness is a limitation affecting the operation of machinery. The wetness also is a major limitation affecting some urban uses.

### 6. Kirbyville-Waller-Sorter

*Nearly level, somewhat poorly drained and poorly drained, moderately permeable and slowly permeable, loamy soils*

This map unit makes up about 17 percent of the county. It is about 48 percent Kirbyville soils, 26 percent Waller soils, 8 percent Sorter soils, and 18 percent other soils.

Areas of this map unit are in the northern half of the

county. They are in broad, smooth, nearly level areas that have poorly defined drainage patterns. Slopes are typically less than 1 percent. Drainageways are narrow and shallow and are generally clogged with brush and trees. Vegetation typically consists of mixed hardwood and pine forest with a dense understory.

The Kirbyville soils are in nearly level areas. Typically, the surface layer is strongly acid, dark grayish brown fine sandy loam about 4 inches thick. The subsurface layer, from a depth of 4 to 15 inches, is strongly acid, very pale brown fine sandy loam. It has brownish yellow mottles in the lower part. The upper part of the subsoil, from a depth of 15 to 45 inches, is very strongly acid, yellowish brown clay loam that has mottles in shades of red, yellow, and gray. The next part, from a depth of 45 to 57 inches, is very strongly acid, brownish yellow clay loam that has mottles in shades of red and gray. The lower part, from a depth of 57 to 80 inches, is very strongly acid, light brownish gray clay loam that has mottles in shades of brown, red, and yellow. Plinthite nodules occur below a depth of 45 inches.

The Waller soils are in broad, nearly level areas and round depressions. Typically, the surface layer is very strongly acid, grayish brown loam about 8 inches thick. The subsurface layer, from a depth of 8 to 22 inches, is strongly acid, light brownish gray loam that has grayish brown and yellowish brown mottles. The upper part of the subsoil, from a depth of 22 to 36 inches, is strongly acid, grayish brown clay loam that has yellowish brown mottles. The lower part, from a depth of 36 to 60 inches, is very strongly acid, grayish brown clay loam that has yellowish brown mottles.

The Sorter soils are in broad, nearly level areas and depressions. Typically, the surface layer is slightly acid, light brownish gray loam about 3 inches thick. The subsurface layer, from a depth of 3 to 18 inches, is strongly acid, light gray loam that has brownish yellow mottles. The subsoil, from a depth of 18 to 72 inches, is slightly acid loam. It is light gray in the upper part and light brownish gray in the lower part. It has mottles in shades of yellow and red throughout.

Of minor extent in this map unit are Dallardsville, Guyton, and Otanya soils. Dallardsville soils are on large mounds. Guyton soils are in landscape positions similar to those of the Sorter and Waller soils. Otanya soils are on ridgetops.

This map unit is used mainly for timber production. The principal commercial trees are loblolly pine and shortleaf pine. Trees grow well in areas of these soils, but wetness is a limitation affecting the operation of machinery.

Some areas of these soils are used as pasture and

hayland. Bahiagrass is the principal grass. Applications of fertilizer and lime are needed for maximum forage production.

These soils are poorly suited to urban uses because of the wetness and low strength.

## 7. Splendora-Waller-Wockley

*Nearly level, somewhat poorly drained and poorly drained, slowly permeable to moderately slowly permeable, loamy soils*

This map unit makes up about 2 percent of the county. It is about 32 percent Splendora soils, 24 percent Waller soils, 10 percent Wockley soils, and 34 percent other soils.

Areas of this map unit are in the northwestern part of the county. Slopes are mainly less than 1 percent.

The Splendora soils are on broad, low ridges and small mounds. Typically, the surface layer is strongly acid, dark grayish brown fine sandy loam about 6 inches thick. The subsurface layer, from a depth of 6 to 18 inches, is strongly acid, very pale brown fine sandy loam that has mottles in shades of yellow and brown. The upper part of the subsoil, from a depth of 18 to 31 inches, is very strongly acid, brownish yellow sandy clay loam that has mottles in shades of gray and yellow. The next part, from a depth of 31 to 42 inches, is very strongly acid, light yellowish brown sandy clay loam that has mottles in shades of red, gray, and yellow. The lower part, from a depth of 42 to 60 inches, is very strongly acid, brownish yellow sandy clay loam that has mottles in shades of red, gray, and yellow.

The Waller soils are in nearly level areas and round, shallow depressions. Typically, the surface layer is very strongly acid, grayish brown loam about 8 inches thick. The subsurface layer, from a depth of 8 to 22 inches, is strongly acid, light brownish gray loam that has grayish brown and yellowish brown mottles. The upper part of the subsoil, from a depth of 22 to 36 inches, is strongly acid, grayish brown clay loam that has yellowish brown mottles. The lower part, from a depth of 36 to 60 inches, is very strongly acid, grayish brown clay loam that has yellowish brown mottles.

The Wockley soils are in nearly level areas and on mounds. Typically, the surface layer is strongly acid, brown fine sandy loam about 4 inches thick. The subsurface layer, from a depth of 4 to 28 inches, is strongly acid, pale brown fine sandy loam. The upper part of the subsoil, from a depth of 28 to 50 inches, is moderately acid or slightly acid, yellowish brown sandy clay loam that has light brownish gray, light gray, and brownish yellow mottles. The lower part, from a depth of 50 to 60 inches, is strongly acid, mottled reddish yellow,

light gray, and yellowish red sandy clay loam that has nodules of plinthite.

Of minor extent in this map unit are Dallardsville, Sorter, Segno, and Hockley soils. Dallardsville, Segno, and Hockley soils are on ridgetops and mounds. Sorter soils are in nearly level areas and depressions.

Areas of this map unit are used mainly for timber production. The principal commercial trees are loblolly pine and shortleaf pine. Trees grow well in areas of these soils, but the wetness is a limitation affecting the operation of machinery.

Some areas of these soils are used as pasture and hayland. Bahiagrass is the principal grass. Applications of fertilizer and lime are needed for maximum forage production.

These soils are poorly suited to urban uses because of the wetness.

## Soils on Flood Plains

These soils make up about 18 percent of the county and include all the soils along the flood plain of the Trinity River. The major soils are in the Kaman, Fausse, and Mantachie series. All of these soils formed in clayey and loamy alluvium of Holocene Age.

The flood plain along the Trinity River averages about 7 miles in width and extends north and south through the center of the county. The channel meanders, and numerous sloughs and oxbow lakes occur. Most slopes are less than 1 percent.

Hardwoods are the dominant trees. Some areas have been cleared and planted to improved pasture.

Most areas of these soils are frequently flooded. The flooding is a severe limitation affecting urban uses or crop production.

## 8. Kaman-Fausse-Mantachie

*Nearly level, somewhat poorly drained to very poorly drained, very slowly permeable and moderately permeable, clayey and loamy soils*

This map unit makes up about 18 percent of the county. It is about 68 percent Kaman soils, 10 percent Fausse soils, 5 percent Mantachie soils, and 17 percent other soils.

The Kaman soils are in broad, smooth areas. Typically, the upper part of the surface layer is slightly acid, black clay about 5 inches thick. The lower part, from a depth of 5 to 24 inches, is slightly acid, very dark gray clay. The subsoil, from a depth of 24 to 60 inches, is dark gray clay. The upper part is slightly acid. The lower part is neutral and has brown mottles.

The Fausse soils are in low backswamps and on remnants of oxbows. Typically, the surface layer is slightly acid, dark grayish brown clay about 5 inches

thick. The upper part of the subsoil, from a depth of 5 to 15 inches, is neutral, dark gray clay. The lower part, from a depth of 15 to 60 inches, is slightly alkaline, dark gray clay that has grayish brown and dark reddish brown mottles.

The Mantachie soils are on natural levees. Typically, the surface layer is strongly acid, very dark grayish brown loam about 5 inches thick. The subsoil extends to a depth of 60 inches. From a depth of 5 to 13 inches, it is strongly acid, grayish brown loam that has dark grayish brown and yellowish brown mottles; from a depth of 13 to 18 inches, it is strongly acid, brown loam that has grayish brown and yellowish brown mottles; from a depth of 18 to 32 inches, it is very strongly acid, grayish brown loam that has yellowish brown and brown mottles; from a depth of 32 to 60 inches, it is very strongly acid, grayish brown or gray sandy clay loam that has yellowish brown mottles.

Of minor extent in this map unit are Voss, Hatliff, Bienville, Estes, Pluck, and Owentown soils. Bienville and Voss soils are on natural levees and point bars next to streams. Hatliff and Owentown soils are in the higher areas. Estes and Pluck soils are in landscape positions similar to those of the Kaman soils.

Areas of this map unit are used mainly as woodland. A few areas are used as pasture.

Hardwoods are the dominant trees in areas of these soils. The principal trees are water oak, willow oak, cypress, and sweetgum. Wetness and flooding are limitations affecting the production of pine timber.

Some areas of these soils have been cleared and planted to pasture. Common bermudagrass and bahiagrass are the most suitable warm-season grasses. The flooding and the wetness are the main limitations in areas of pasture. Applications of fertilizer and lime are needed to increase forage production.

These soils are poorly suited to crops and to urban uses because of the frequent flooding.

### Soils on Stream Terraces

These soils make up about 5 percent of the county. The major soils are in the Spurger, Bienville, and Kenefick series. All of these soils formed in loamy sediments on nearly level to undulating terraces along the Trinity River. These terraces are adjacent to and slightly higher than the flood plain. Most slopes are less than 3 percent.

These soils are used mainly as pasture and hayland. The production of timber also is a major use. These soils are well suited to pasture and hayland and to the production of timber. They also are well suited to most urban uses. The sandy texture and wetness are limitations in some areas.

## 9. Spurger-Bienville-Kenefick

*Nearly level and very gently sloping, somewhat excessively drained to moderately well drained, slowly permeable to moderately rapidly permeable, loamy and sandy soils*

This map unit makes up 5 percent of the county. It is about 34 percent Spurger soils, 21 percent Bienville soils, 16 percent Kenefick soils, and 29 percent other soils.

The Spurger soils are on low ridgetops and short side slopes. Typically, the surface layer is slightly acid, dark brown fine sandy loam about 3 inches thick. The subsurface layer, from a depth of 3 to 12 inches, is slightly acid, brown fine sandy loam that has reddish yellow mottles. The subsoil extends to a depth of 60 inches. From a depth of 12 to 35 inches, it is moderately acid, yellowish red clay and very strongly acid, yellowish red clay loam and is mottled in shades of red, yellow, brown, and gray; from a depth of 35 to 42 inches, it is very strongly acid, mottled light brownish gray, red, and strong brown sandy clay loam; from a depth of 42 to 50 inches, it is very strongly acid, strong brown sandy clay loam that has red and light gray mottles; and from a depth of 50 to 60 inches, it is slightly acid, light gray loamy sand that has yellowish brown mottles.

The Bienville soils are on broad, low ridges. Typically, the surface layer is strongly acid, dark grayish brown loamy fine sand about 5 inches thick. The upper part of the subsurface layer, from a depth of 5 to 24 inches, is strongly acid, yellowish brown loamy fine sand. The lower part, from a depth of 24 to 40 inches, is moderately acid, dark yellowish brown loamy fine sand. The subsoil, from a depth of 40 to 80 inches, is moderately acid, yellowish brown loamy fine sand that has dark yellowish brown mottles.

The Kenefick soils are in the slightly lower areas between ridges. Typically, the surface layer is very strongly acid, brown fine sandy loam about 4 inches thick. The subsurface layer, from a depth of 4 to 18 inches, is moderately acid fine sandy loam. It is yellowish brown in the upper part and strong brown in the lower part. The upper part of the subsoil, from a depth of 18 to 52 inches, is very strongly acid, red sandy clay loam that has brownish yellow mottles. The next part, from a depth of 52 to 65 inches, is very strongly acid, red fine sandy loam that has brownish yellow mottles. The lower part, from a depth of 65 to 80 inches, is very strongly acid, mottled red, reddish yellow, yellowish brown, and very pale brown, stratified loamy fine sand and fine sandy loam.

Of minor extent in this map unit are Alaga, Kaman, Verland, and Aris soils. Alaga soils are on ridges.

Kaman soils are along drainageways. Aris and Verland soils are in nearly level areas.

This map unit is used mainly as pasture and hayland. Bahiagrass and common bermudagrass are the most suitable species. Applications of fertilizer and lime are needed for maximum production.

Some areas of these soils are used for timber production. Loblolly pine and shortleaf pine are the principal commercial trees.

These soils are well suited to most urban uses. Wetness and the sandy surface layer are limitations affecting some uses.



## Detailed Soil Map Units

---

The map units on the detailed soil maps at the back of this survey represent the soils in the survey area. The map unit descriptions in this section, along with the soil maps, can be used to determine the suitability and potential of a soil for specific uses. They also can be used to plan the management needed for those uses. More information on each map unit, or soil, is given under the heading "Use and Management of the Soils."

Each map unit on the detailed soil maps represents an area on the landscape and consists of one or more soils for which the unit is named.

A symbol identifying the soil precedes the map unit name in the soil descriptions. Each description includes general facts about the soil and gives the principal hazards and limitations to be considered in planning for specific uses.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer or of the underlying material, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer or of the underlying material. They also can differ in slope, stoniness, salinity, wetness, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Vamont clay, 1 to 3 percent slopes, is a phase of the Vamont series.

Some map units are made up of two or more major soils. These map units are called soil complexes. A *soil complex* consists of two or more soils in such an intricate pattern or in such small areas that they cannot be shown separately on the soil maps. The pattern and proportion of the soils are somewhat similar in all areas. Waller-Kirbyville complex is an example.

Most map units include small scattered areas of soils other than those for which the map unit is named. Some of these included soils have properties that differ substantially from those of the major soil or soils. Such differences could significantly affect use and

management of the soils in the map unit. The included soils are identified in each map unit description. Some small areas of strongly contrasting soils are identified by a special symbol on the soil maps.

This survey includes *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Oil-waste land is an example. Miscellaneous areas are shown on the soil maps. Some that are too small to be shown are identified by a special symbol on the soil maps.

Table 4 gives the acreage and proportionate extent of each map unit. Other tables (see "Summary of Tables") give properties of the soils and the limitations, capabilities, and potentials for many uses. The Glossary defines many of the terms used in describing the soils.

**AaB—Alaga fine sand, 1 to 3 percent slopes.** This very gently sloping soil is on ridges of stream terraces along the flood plain of the Trinity River and other major streams. Areas are usually oblong or elongated. They range from 15 to 100 acres in size.

Typically, the surface layer is very friable, moderately acid, brown fine sand about 8 inches thick. The underlying material, to a depth of 60 inches, is very friable loamy sand. It is dark yellowish brown and strongly acid in the upper part and light yellowish brown and slightly acid in the lower part.

This soil is somewhat excessively drained. Surface runoff is slow, and permeability is rapid. The available water capacity is low. Water erosion is a slight hazard.

Included with this soil in mapping are small oval or circular depressional areas of wet, sandy soils. Included soils make up less than 15 percent of the map unit.

The Alaga soil is mainly used as woodland. It is moderately suited to loblolly pine. The sandy texture is a limitation affecting the use of equipment when harvesting or planting trees. Seedlings grow well if competing vegetation is controlled or removed through site preparation, prescribed burning, applications of herbicide, cutting, or girdling.

This soil is moderately suited to pasture and hayland. Low fertility and droughtiness are the main limitations. Bahiagrass is the most suitable species. Applications of

fertilizer and lime and good grazing management are needed for maximum production of forage.

This soil is well suited to most urban uses, but it is poorly suited as a site for sanitary facilities because of the hazard of seepage.

This soil is in capability subclass IIIs, and the woodland ordination symbol is 8S.

**AdA—Aldine silt loam, 0 to 2 percent slopes.** This nearly level and very gently sloping soil is on uplands of the coast prairie. Areas are elongated or oval. They range from 25 to 400 acres in size.

Typically, the surface layer is very friable, strongly acid, dark grayish brown silt loam that has brownish yellow mottles. It is about 4 inches thick. The subsurface layer, to a depth of 17 inches, is very friable, strongly acid, brown silt loam that has brownish yellow mottles. The upper part of the subsoil, from a depth of 17 to 25 inches, is friable, slightly acid, yellowish brown loam that has strong brown and brownish yellow mottles. The next part, from a depth of 25 to 31 inches, is firm, strongly acid, grayish brown clay that has yellowish brown and red mottles. The lower part, from a depth of 31 to 60 inches, is extremely firm or very firm, very strongly acid or strongly acid, gray clay that has yellowish brown, red, and brownish yellow mottles.

This soil is somewhat poorly drained. Surface runoff is slow, and permeability is very slow. The available water capacity is high. A perched water table is generally at a depth of 1.5 to 2.5 feet during the winter and spring. The hazard of water erosion is slight.

Included with this soil in mapping are small areas of Aris, Guyton, Katy, and Kemah soils. Aris and Guyton soils are in nearly level and depressional areas. They are gray throughout. Katy soils are on the higher ridges. They are less gray than the Aldine soil. Kemah soils are on intermounds. They are clayey near the surface. Included soils make up less than 20 percent of the map unit.

The Aldine soil is mainly used as pasture and hayland. Bahiagrass and common bermudagrass are the most suitable species. Applications of fertilizer and lime are needed for maximum production of forage. Overgrazing or grazing when the soil is too wet can cause surface compaction and poor tilth. Proper stocking rates, pasture rotation, deferred grazing, and restricted use during wet periods help to keep the pasture in good condition.

This soil is well suited to loblolly pine and slash pine. The wetness is a limitation affecting the operation of equipment when harvesting or planting trees. Seedlings survive and grow well if competing vegetation is controlled or removed through site preparation,

prescribed burning, applications of herbicide, cutting, or girdling.

This soil is poorly suited to most urban uses because of the wetness, low strength, and the shrink-swell potential. These limitations can be overcome by proper design and installation.

This soil is in capability subclass IIIw, and the woodland ordination symbol is 9W.

**Ae—Aldine-Aris complex.** These nearly level soils are in mounded areas of the coast prairie and flatwoods. Most areas are broad. They are as much as 1,500 acres in size. Slopes are 0 to 1 percent.

The Aldine soil is on mounds, intermounds, and ridges. It makes up about 60 percent of the unit. The Aris soil is on wet flats that are slightly lower on the landscape than the Aldine soil. It makes up about 25 percent of the unit. These soils occur as areas so intricately mixed that mapping them separately is not practical at the scale used.

Typically, the surface layer of the Aldine soil is very friable, very strongly acid, dark grayish brown fine sandy loam that has brown mottles. It is about 3 inches thick. The subsurface layer, from a depth of 3 to 21 inches, is very friable fine sandy loam. It is very strongly acid and light yellowish brown in the upper part and strongly acid and pale brown in the lower part. The lower part also has mottles in shades of yellow and brown. The upper part of the subsoil, from a depth of 21 to 29 inches, is very friable, very strongly acid loam that has yellow and brown mottles. The lower part, from a depth of 29 to 60 inches, is very firm, very strongly acid, light brownish gray clay that has mottles in shades of red and yellow.

The Aldine soil is somewhat poorly drained. Surface runoff is slow, and permeability is very slow. The available water capacity is high. A perched water table is generally at a depth of 1.5 to 2.5 feet during the winter and spring. The hazard of water erosion is slight.

Typically, the surface layer of the Aris soil is very friable, moderately acid, light brownish gray silt loam about 3 inches thick. The subsurface layer, to a depth of 21 inches, is very friable, very strongly acid, light brownish gray silt loam that has mottles in shades of brown. The upper part of the subsoil, from a depth of 21 to 25 inches, is firm, strongly acid, gray silty clay loam that has mottles in shades of brown. The lower part, from a depth of 25 to 60 inches, is extremely firm, strongly acid, dark gray silty clay that has mottles in shades of red and brown.

The Aris soil is poorly drained. Surface runoff is slow, and permeability is very slow. The available water capacity is high. A perched water table is generally

within a depth of 2 feet during the winter. The hazard of erosion is slight.

Included with these soils in mapping are areas of Anahuac soils on mounds. Anahuac soils have a thick, dark surface layer. They make up about 15 percent of the map unit.

The Aldine and Aris soils are mainly used as pasture and hayland. Bahiagrass and common bermudagrass are the most suitable species. Applications of fertilizer and lime are needed for maximum production of forage. Overgrazing or grazing when the soil is too wet can cause surface compaction and poor tilth. Proper stocking rates, pasture rotation, deferred grazing, and restricted use during wet periods help to keep the pasture in good condition.

These soils are well suited to loblolly pine and slash pine. The wetness is a limitation affecting the operation of equipment when harvesting or planting trees. Seedlings survive and grow well if competing vegetation is controlled or removed through site preparation, prescribed burning, applications of herbicide, cutting, or girdling.

These soils are poorly suited to most urban uses because of the wetness, low strength, and the shrink-swell potential. These limitations can be overcome by proper design and installation.

The Aldine soil is in capability subclass IIIw, and the Aris soil is in capability subclass IVw. The woodland ordination symbol is 9W for both soils.

**An—Anahuac-Aris complex.** These nearly level soils are in mounded areas of the coast prairie. Areas are irregular in shape. They range from 20 to 1,000 acres in size. Slopes are 0 to 1 percent.

The Anahuac soil is on mounds and ridges. It makes up about 50 percent of the unit. The Aris soil is in intermound and depressional areas. It makes up about 35 percent of the unit. These soils occur as areas so intricately mixed that mapping them separately is not practical at the scale used.

Typically, the surface layer of the Anahuac soil is very friable, moderately acid, very dark grayish brown silt loam about 8 inches thick. The upper part of the subsurface layer, from a depth of 8 to 16 inches, is very friable, strongly acid, dark brown silt loam. The next part, from a depth of 16 to 33 inches, is very friable, strongly acid and very strongly acid, brown silt loam that has yellowish brown and grayish brown mottles. The lower part, from a depth of 33 to 37 inches, is firm, strongly acid, brown loam. The upper part of the subsoil, from a depth of 37 to 62 inches, is very strongly acid and strongly acid, very firm, light brownish gray clay that has red and yellowish brown mottles. The lower part, from a depth of 62 to 80 inches, is strongly

acid and moderately acid, very firm, light gray clay that has yellowish brown and red mottles.

The Anahuac soil is somewhat poorly drained. Surface runoff is slow, and permeability is very slow. The available water capacity is high. A perched water table is generally at a depth of 1.5 to 2.5 feet during the winter and spring. The hazard of water erosion is slight.

Typically, the surface layer of the Aris soil is very friable, strongly acid, dark grayish brown silt loam about 3 inches thick. The subsurface layer extends to depth of 20 inches. It is very friable and very strongly acid. The upper part of the subsurface layer is dark grayish brown loam, and the lower part is brown silt loam that has yellowish brown mottles. The upper part of the subsoil, from a depth of 20 to 24 inches, is firm, very strongly acid, gray silty clay loam that has red and yellowish brown mottles. The next part, from a depth of 24 to 54 inches, is very firm, very strongly acid or strongly acid, dark gray clay that has red and yellowish brown mottles. The lower part, from a depth of 54 to 62 inches, is very firm, moderately acid, light brownish gray clay that has red and yellowish brown mottles.

The Aris soil is poorly drained. Surface runoff is slow, and permeability is very slow. The available water capacity is high. A perched water table is generally within a depth of 2 feet during the winter and spring. The hazard of water erosion is slight.

Included with these soils in mapping are small areas of Aldine, Guyton, Katy, Kemah, and Verland soils. Aldine, Kemah, and Katy soils are on mounds and ridges. Guyton and Verland soils are in intermound and depressional areas. Included soils make up less than 15 percent of the map unit.

The Anahuac and Aris soils are mainly used as pasture and hayland. Bahiagrass and common bermudagrass are the most suitable species. Applications of fertilizer and lime are needed for maximum production of forage. Overgrazing or grazing when the soil is too wet can cause surface compaction and poor tilth. Proper stocking rates, pasture rotation, deferred grazing, and restricted use during wet periods help to keep the pasture in good condition.

These soils are well suited to loblolly pine and slash pine. The wetness is a limitation affecting the operation of equipment when harvesting or planting trees. Seedlings survive and grow well if competing vegetation is controlled or removed through site preparation, prescribed burning, applications of herbicide, cutting, or girdling.

These soils are poorly suited to most urban uses because of the wetness, low strength, and the shrink-swell potential. These limitations can be overcome by proper design and installation.

The Anahuac soil is in capability subclass IIIw, and

the Aris soil is in capability subclass IVw. The woodland ordination symbol is 9W for both soils.

**Ar—Aris silt loam.** This nearly level soil is on broad flats along drainageways. Areas are long and narrow or irregular in shape. They range from 25 to 400 acres in size. Slopes are 0 to 1 percent.

Typically, the surface layer is very friable, strongly acid, dark gray silt loam about 3 inches thick. The subsurface layer, from a depth of 3 to 5 inches, is very friable, very strongly acid, grayish brown silt loam that has yellowish brown and gray mottles. The upper part of the subsoil, from a depth of 5 to 18 inches, is firm, very strongly acid, dark gray silty clay loam that has yellowish brown mottles. The next part, from a depth of 18 to 29 inches, is firm, very strongly acid, dark gray clay loam that has yellowish brown mottles. The lower part, from a depth of 29 to 60 inches, is very firm, strongly acid, gray and dark gray clay that has yellowish brown and red mottles.

This soil is poorly drained. Surface runoff is slow, and permeability is very slow. The available water capacity is high. A perched water table is generally at a depth of 2 feet during the winter and spring. The hazard of water erosion is slight.

Included with this soil in mapping are small circular mounds of Aldine and Anahuac soils. Aldine soils have a surface layer that is thicker and not so gray as that of the Aris soil. Anahuac soils have a thick, dark surface layer. Also included are small circular areas of an Aris soil that is ponded. Included soils make up less than 15 percent of the map unit.

The Aris soil is mainly used as cropland. It is well suited to rice and soybeans in areas where adequate drainage outlets are available. This soil is well suited to rice because it is very slowly permeable. Little land leveling is needed to evenly flood the soil. A well designed system of surface water management includes planting rows in the proper direction to take advantage of the natural slope, installing a drainage system, land leveling, and irrigating. Incorporating crop residue into the surface layer helps to maintain good tilth. Applications of fertilizer are needed for maximum crop production.

This soil is well suited to loblolly pine and slash pine. Wetness is a limitation affecting the operation of equipment when harvesting or planting trees. Seedlings survive and grow well if competing vegetation is controlled or removed through site preparation, prescribed burning, applications of herbicide, cutting, or girdling.

This soil is moderately suited to pasture and hayland. Bahiagrass and common bermudagrass are the most suitable species. Applications of fertilizer and lime are

needed for maximum production of forage. Grazing when the soil is too wet, however, can cause surface compaction and poor tilth. Proper stocking rates, pasture rotation, deferred grazing, and restricted use during wet periods help to keep the pasture in good condition.

This soil is poorly suited to urban uses because of the wetness, low strength, and the shrink-swell potential. These limitations can be partially overcome by proper design and installation.

This soil is in capability subclass IVw and the Lowland range site. The woodland ordination symbol is 9W.

**As—Aris loam, depressional.** This nearly level soil is in depressions and remnant drainageways of the coast prairie. Areas are oval or long and narrow. They range from 15 to 100 acres in size. Slopes are 0 to 1 percent.

Typically, the surface layer is friable, strongly acid, very dark grayish brown loam about 3 inches thick. The subsurface layer is friable, very strongly acid, grayish brown loam about 6 inches thick. The subsoil extends to a depth of 60 inches. From a depth of 6 to 24 inches, it is firm, strongly acid, gray clay loam that has yellowish brown mottles; from a depth of 24 to 32 inches, it is firm, moderately acid, grayish brown clay loam that has yellowish brown mottles; from a depth of 32 to 40 inches, it is firm, moderately acid, light brownish gray clay loam that has yellowish brown mottles; and from a depth of 40 to 60 inches, it is firm, neutral, light brownish gray clay that has yellowish brown and strong brown mottles.

This soil is poorly drained. Permeability is very slow. The available water capacity is high. A perched water table is generally within a depth of 2 feet or the soil is ponded during the winter and spring. The hazard of water erosion is slight.

Included with this soil in mapping are small areas of Aldine soils on small pimple mounds. They have a thicker surface layer than the Aris soil. Included soils make up less than 10 percent of the map unit.

The Aris soil is mainly used for wildlife habitat. It is poorly suited to timber production, pasture, cropland, and to urban uses because of excessive wetness. It is saturated during the winter and for extended periods after heavy rainfall.

This soil is in capability subclass VIw and the Lowland range site.

**Ba—Beaumont clay.** This nearly level soil is in broad areas of the coast prairie. Areas range from 200 to 1,500 acres in size. Slopes are 0 to 1 percent.

Typically, the surface layer is very firm, dark gray clay that has strong brown mottles. It is about 28 inches thick. It is moderately acid in the upper part and strongly acid in the lower part. The subsoil extends to a depth of 60 inches. The upper part of the subsoil is very firm, strongly acid, dark gray clay, and the lower part is very firm, very strongly acid, gray clay that has red and strong brown mottles throughout.

This soil is poorly drained. Surface runoff and permeability are very slow. The available water capacity is high. An apparent water table is generally within a depth of 2 feet during the winter and spring. The hazard of water erosion is slight.

Included with this soil in mapping are small areas of Bernard, Lake Charles, Verland, and Vamont soils. Lake Charles and Bernard soils are in the slightly higher positions on the landscape. They have a thick, very dark gray surface layer. Verland soils are in landscape positions similar to those of the Beaumont soil. They have a surface layer of clay loam. Vamont soils are in the slightly higher positions on the landscape. They are more yellow in the upper part than the Beaumont soil. Included soils make up less than 10 percent of the map unit.

The Beaumont soil is mainly used as cropland. It is well suited to rice and soybeans in areas where adequate drainage outlets are available. This soil is well suited to rice because it is very slowly permeable. Little land leveling is needed to evenly flood the soil. A well designed system of surface water management includes planting rows in the proper direction to take advantage of the natural slope, installing a drainage system, land leveling, and irrigating. Incorporating crop residue into the surface layer helps to maintain good tilth. Applications of fertilizer are needed for maximum crop production.

In some areas pine and hardwoods have encroached. The soil is well suited to loblolly pine. Competing vegetation should be controlled to achieve maximum timber production. The wetness is a limitation affecting the operation of harvesting equipment.

This soil is well suited to pasture and hayland. Bahiagrass and common bermudagrass are the most suitable species. Applications of fertilizer and lime and good grazing management are needed for maximum production of forage.

This soil is poorly suited to urban uses because of the wetness, low strength, and the shrink-swell potential. These limitations can be partially overcome by proper design and installation.

This soil is in capability subclass IIIw and the Blackland range site. The woodland ordination symbol is 9W.

**Bd—Beaumont clay, depressional.** This nearly level soil is in depressions enclosed by levees. Areas are generally rectangular. They range from 50 to 150 acres in size. Slopes are 0 to 1 percent.

Typically, the upper part of the surface layer, to a depth of 8 inches, is very firm, very strongly acid, dark gray clay. The lower part, from a depth of 8 to 17 inches, is very firm, moderately acid, dark gray clay that has brown mottles. The upper part of the subsoil, from a depth of 17 to 38 inches, is very firm, strongly acid, dark gray clay that has mottles in shades of brown and red. The lower part, from a depth of 38 to 60 inches, is slightly acid and slightly alkaline, very firm, gray clay that has mottles in shades of red and brown.

This soil is poorly drained. Surface runoff and permeability are very slow. The available water capacity is high. An apparent water table is generally within a depth of 1 foot, or the soil is ponded during the spring, fall, and winter. The hazard of water erosion is slight.

This soil is mainly used for crawfish production and wildlife habitat.

This soil is poorly suited to urban uses because of the wetness, low strength, and the shrink-swell potential. The limitations can be partially overcome by proper design and installation.

This soil is in capability subclass VIw and the Lowland range site.

**Be—Bernard clay loam.** This nearly level soil is in areas of the coast prairie. Areas are elongated or irregular in shape. They range from 15 to 500 acres in size. Slopes are 0 to 1 percent.

Typically, the surface layer is firm, slightly acid, very dark gray clay loam about 6 inches thick. The subsoil is extremely firm clay that has brown and red mottles. The upper part, from a depth of 6 to 27 inches, is very dark gray and neutral. The next part, from a depth of 27 to 49 inches, is very dark gray and slightly alkaline. The lower part, from a depth of 49 to 57 inches, is dark gray and moderately alkaline.

This soil is somewhat poorly drained. Surface runoff and permeability are very slow. The available water capacity is high. An apparent water table is generally at a depth of 0.5 foot to 2.0 feet during the winter. The hazard of water erosion is slight.

Included with this soil in mapping are small areas of Beaumont, Lake Charles, Morey, Mocarey, and Yeaton soils. Morey, Mocarey, and Yeaton soils are on small pimple mounds. Morey soils are not so clayey as the Bernard soil. Mocarey soils have more carbonates than the Bernard soil. Yeaton soils have a yellowish subsoil. Beaumont and Lake Charles soils are clayey throughout. Beaumont soils are in the slightly lower positions on the landscape. Lake Charles soils are in



**Figure 3.—Soybeans in an area of Bernard clay loam.**

landscape positions similar to those of the Bernard soil. Included soils make up less than 20 percent of the map unit.

The Bernard soil is mainly used as cropland. It is well suited to rice and soybeans in areas where adequate drainage outlets are available (fig. 3). This soil is well suited to rice because it is very slowly permeable. Little land leveling is needed to evenly flood the soil. A well designed system of surface water management includes planting rows in the proper direction to take advantage of the natural slope, installing a drainage system, land

leveling, and irrigating. Incorporating crop residue into the surface layer helps to maintain good tilth. Applications of fertilizer are needed for maximum crop production.

In some areas pine and hardwoods have encroached. The soil is well suited to loblolly pine. The dominant trees are loblolly pine and water oak. Competing vegetation should be controlled to achieve maximum production. The wetness is a moderate limitation affecting the operation of harvesting equipment.

This soil is well suited to pasture and hayland. Bahiagrass and common bermudagrass are the most suitable species. Applications of fertilizer and lime and good grazing management are needed for maximum production of forage.

The soil is poorly suited to urban uses because of the wetness, the shrink-swell potential, and low strength. These limitations can be partially overcome by proper design and installation.

This soil is in capability subclass IIw and the Blackland range site. The woodland ordination symbol is 9W.

**Bm—Bernard-Morey complex.** These nearly level soils are in mounded areas of the coast prairie. Areas are broad to irregular in shape. They range from 20 to 1,500 acres in size. Slopes are 0 to 1 percent.

The Bernard soil is on intermounds. It makes up about 55 percent of the unit. The Morey soil is on small pimple mounds. It makes up about 25 percent of the unit. These soils occur as areas so intricately mixed that mapping them separately is not practical at the scale used.

Typically, the surface layer of the Bernard soil is firm, neutral, very dark gray clay loam about 5 inches thick. The upper part of the subsoil, from a depth of 5 to 36 inches, is very firm, slightly alkaline, very dark gray clay. The lower part, from a depth of 36 to 60 inches, is very firm, moderately alkaline, dark gray clay. Mottles in shades of brown occur throughout the subsoil.

The Bernard soil is somewhat poorly drained. Surface runoff and permeability are very slow. The available water capacity is high. A water table is generally at a depth of 0.5 foot to 2.0 feet during the winter. The hazard of water erosion is slight.

Typically, the surface layer of the Morey soil is friable, neutral, very dark gray silt loam about 8 inches thick. The upper part of the subsoil, from a depth of 8 to 14 inches, is firm, slightly alkaline, dark gray silt loam that has strong brown mottles. The lower part, from a depth of 14 to 60 inches, is very firm, moderately alkaline, grayish brown silty clay loam and silty clay that has yellowish brown and light olive brown mottles.

The Morey soil is somewhat poorly drained. Surface runoff and permeability are slow. The available water capacity is high. A water table is generally at a depth of 1.5 to 2.5 feet during the winter. The hazard of water erosion is slight.

Included with this soil in mapping are small areas of Lake Charles, Mocarey, and Yeaton soils. Lake Charles soils are in landscape positions similar to those of the Bernard soil. They are clayey throughout. Yeaton soils are on large mounds. They have a yellowish subsoil. Mocarey soils have carbonates within a depth of 20

inches. Included soils make up less than 20 percent of the map unit.

The Bernard and Morey soils are mainly used as cropland. They are well suited to rice and soybeans in areas where adequate drainage outlets are available. These soils are well suited to rice because the soils have slow or very slow permeability and because the mounds are small and easily leveled. Some areas become salty after leveling, but these areas can become productive in a few years if properly managed. A well designed system of surface water management includes planting rows in the proper direction to take advantage of the natural slope, installing a drainage system, land leveling, and irrigating. Incorporating crop residue into the surface layer helps to maintain good tilth. Applications of fertilizer are needed for maximum crop production.

In some areas pine and hardwoods have encroached. These soils are well suited to loblolly pine. Competing vegetation should be controlled. The wetness is a limitation affecting the operation of harvesting equipment.

These soils are moderately suited to pasture and hayland. Bahiagrass and common bermudagrass are the most suitable species. Applications of fertilizer and good grazing management are needed for maximum production of forage.

These soils are poorly suited to urban uses because of the wetness, the shrink-swell potential, and low strength. These limitations can be partially overcome by proper design and installation.

The Bernard soil is in capability subclass IIw and the Blackland range site. The Morey soil is in capability subclass IIIw and the Loamy Prairie range site. The woodland ordination symbol for both soils is 9W.

**BnB—Bienville loamy fine sand, 0 to 2 percent slopes.** This nearly level and very gently sloping soil is on stream terraces. Areas are oval or elongated. They range from 15 to 200 acres in size.

Typically, the surface layer is very friable, strongly acid, dark grayish brown loamy fine sand about 5 inches thick. The upper part of the subsurface layer, from a depth of 5 to 24 inches, is very friable, strongly acid, yellowish brown loamy fine sand. The lower part, from a depth of 24 to 40 inches, is very friable, moderately acid, dark yellowish brown loamy fine sand. The subsoil, from a depth of 40 to 80 inches, is very friable, moderately acid, yellowish brown loamy fine sand that has dark yellowish brown mottles.

This soil is somewhat excessively drained. Surface runoff is slow, and permeability is moderately rapid. The available water capacity is low. An apparent water table is generally at a depth of 4 to 6 feet during the winter

and spring. The hazard of water erosion is slight.

Included with this soil in mapping are small areas of Kenefick, Spurger, and Waller soils. Kenefick and Spurger soils are on low ridges. They have clayey subsoils. Waller soils are in depressions. They are gray throughout. Included soils make up less than 20 percent of the map unit.

The Beinville soil is mainly used as pasture and hayland. Bahiagrass and common bermudagrass are the most suitable species. Applications of fertilizer and lime and good grazing management are needed for maximum production of forage.

This soil is well suited to loblolly pine. During dry periods, the sandy texture is a limitation affecting the operation of equipment for harvesting and planting.

This soil is moderately suited to most urban uses. The seasonal high water table is a limitation on sites for septic tank absorption fields. This limitation can be overcome by proper design and installation.

This soil is in capability subclass IIs, and the woodland ordination symbol is 10S.

**BvB—Bienville-Kenefick complex, 1 to 3 percent slopes.** These gently undulating soils are on stream terraces. Areas are oval or elongated. They range from 15 to 150 acres in size.

The Bienville soil is on long, narrow ridges. It makes up about 40 percent of the unit. The Kenefick soil is in the lower areas between the ridges. It makes up about 35 percent of the unit. These soils occur as areas so intricately mixed that mapping them separately is not practical at the scale used.

Typically, the surface layer of the Bienville soil is very friable, slightly acid, dark brown loamy fine sand about 3 inches thick. The subsurface layer, from a depth of 3 to 36 inches, is very friable, slightly acid, dark yellowish brown loamy fine sand. The subsoil, from a depth of 36 to 80 inches, is very friable, slightly acid, yellowish brown loamy fine sand that has thin strata of dark yellowish brown sandy clay loam.

The Bienville soil is somewhat excessively drained. Surface runoff is slow, and permeability is moderately rapid. The available water capacity is low. An apparent water table is generally at a depth of 4 to 6 feet during the winter and spring. The hazard of water erosion is slight.

Typically, the surface layer of the Kenefick soil is friable, slightly acid, dark brown fine sandy loam about 4 inches thick. The subsurface layer, from a depth of 4 to 26 inches, is very friable, slightly acid, dark yellowish brown fine sandy loam. The subsoil extends to a depth of 58 inches. From a depth of 26 to 32 inches, it is firm, strongly acid, yellowish red sandy clay loam; from a depth of 32 to 37 inches, it is very firm, very strongly

acid, red clay loam; from a depth of 37 to 40 inches, it is firm, very strongly acid, mottled red, gray, and brown sandy clay loam; and from a depth of 40 to 58 inches, it is friable, very strongly acid sandy clay loam that has red and gray mottles. The underlying material, from a depth of 58 to 72 inches, is very friable, very strongly acid, yellowish brown loamy fine sand.

The Kenefick soil is well drained. Surface runoff is slow, and permeability is moderate. The available water capacity also is moderate. The hazard of water erosion is slight.

Included with this soil in mapping are small areas of Spurger and Waller soils. Spurger soils are in landscape positions slightly lower than those of the Kenefick soil. They have gray mottles in the upper part of the subsoil. Waller soils are in nearly level and depressional areas. They are gray throughout. Included soils make up less than 25 percent of the map unit.

The Beinville and Kenefick soils are mainly used as pasture and hayland. Bahiagrass and common bermudagrass are the most suitable species. Applications of fertilizer and lime and good grazing management are needed for maximum production of forage.

These soils are well suited to loblolly pine. The sandy texture is a limitation affecting the operation of equipment for harvesting and planting.

These soils are well suited to urban uses.

The Bienville soil is in capability subclass IIs, and the Kenefick soil is in capability subclass IIe. The woodland ordination symbol is 10S in areas of the Beinville soil and 10A in areas of the Kenefick soil.

**ByB—Boykin loamy fine sand, 1 to 3 percent slopes.** This very gently sloping soil is on uplands. Areas are irregular in shape. They range from 15 to 100 acres in size.

Typically, the surface layer is very friable, very strongly acid, dark brown loamy fine sand about 7 inches thick. The subsurface layer, from a depth of 7 to 22 inches, is very friable, moderately acid, yellowish brown loamy fine sand. The subsoil, from a depth of 22 to 60 inches, is firm, very strongly acid, red sandy clay loam that has brownish yellow mottles.

This soil is well drained. Surface runoff is slow. Permeability is rapid in the upper part and moderate in the lower part. The available water capacity is moderate. The hazard of water erosion is slight.

Included with this soil in mapping are small areas of Landman, Choates, and Doucette soils. Landman soils are in the slightly higher positions. They have a sandy surface layer that is thicker than that of the Boykin soil. Doucette soils are in landscape positions similar to those of the Boykin soil. They have a yellowish brown

subsoil that contains plinthite. Choates soils are on side slopes along drainageways. They have a yellow subsoil that has gray mottles. Included soils make up less than 20 percent of the map unit.

The Boykin soil is mainly used for timber production. The soil is well suited to loblolly pine. The sandy texture is a limitation affecting the operation of equipment for harvesting and planting. Seedling mortality is a moderate limitation. Good site preparation can help to overcome this limitation. Pine trees grow well after they have been established.

This soil is moderately suited to pasture and hayland that support bahiagrass and common bermudagrass. Applications of fertilizer and lime and good grazing management are needed for maximum production of forage.

This soil is well suited to urban uses.

This soil is in capability subclass III<sub>s</sub>, and the woodland ordination symbol is 9S.

**CoB—Choates loamy fine sand, 1 to 3 percent slopes.** This very gently sloping soil is on uplands. Areas are irregular in shape. They range from 20 to 100 acres in size.

Typically, the surface layer is loose, slightly acid, grayish brown loamy fine sand about 4 inches thick. The subsurface layer, from a depth of 4 to 29 inches, is loose, slightly acid, very pale brown, loamy fine sand. The upper part of the subsoil, from a depth of 29 to 50 inches, is friable and firm, strongly acid, and very strongly acid, brownish yellow sandy clay loam that has mottles in shades of brown, yellow, and gray. The lower part, from a depth of 50 to 60 inches, is firm, very strongly acid, mottled red, gray, and yellow sandy clay loam.

This soil is somewhat poorly drained. Surface runoff is slow. Permeability is rapid in the upper part and moderate or moderately slow in the lower part. The available water capacity is moderate. An apparent water table is generally at a depth of 1.5 to 2.5 feet during the winter and spring. The hazard of water erosion is slight.

Included with this soil in mapping are small areas of Boykin, Doucette, Kirbyville, Otanya, Sorter, and Waller soils. Boykin, Doucette, and Otanya soils are in the slightly higher positions. They do not have gray mottles in the upper 30 inches. Kirbyville soils are in landscape positions similar to those of the Choates soil. They do not have a thick, sandy surface layer. Sorter and Waller soils are in nearly level areas and along drainageways. They are gray throughout. Included soils make up less than 20 percent of the map unit.

The Choates soil is mainly used for timber production. It is suited to loblolly pine and to hardwoods grown for commercial use. Competing vegetation may

need to be controlled to establish stands. The sandy texture and seasonal wetness are limitations affecting the operation of equipment for harvesting and planting.

This soil is well suited to pasture and hayland. Bahiagrass and common bermudagrass are the most suitable species. Applications of fertilizer and lime and good grazing management are needed for maximum production of forage.

This soil is poorly suited to urban uses. The wetness is a severe limitation. This limitation can be overcome by proper design and installation.

This soil is in capability subclass III<sub>w</sub>, and the woodland ordination symbol is 9W.

**DaB—Dallardsville fine sandy loam, 1 to 3 percent slopes.** This very gently sloping soil is on broad side slopes along drainageways. Areas are elongated. They range from 20 to 150 acres in size.

Typically, the surface layer is very friable, strongly acid, brown fine sandy loam about 3 inches thick. The subsurface layer, from a depth of 3 to 20 inches, is very friable, strongly acid, yellowish brown fine sandy loam. The subsoil, from a depth of 20 to 60 inches, is very friable, strongly acid, brownish yellow fine sandy loam that has yellowish red and light gray mottles.

This soil is somewhat poorly drained. Surface runoff is slow. Permeability is moderately rapid in the upper part and moderately slow in the lower part. The available water capacity is moderate. A perched water table is generally at a depth of 1 to 2 feet during the winter and spring. The hazard of water erosion is slight.

Included with this soil in mapping are small areas of Kirbyville, Otanya, Sorter, and Waller soils. Kirbyville soils are in landscape positions similar to those of the Dallardsville soil. They have a subsoil of sandy clay loam within a depth of 30 inches. Otanya soils are in the slightly higher positions on the landscape. They do not have gray mottles within a depth of 30 inches. Sorter and Waller soils are in nearly level and depressional areas. They are gray throughout. Included soils make up less than 10 percent of the map unit.

The Dallardsville soil is mainly used for timber production. It is suited to loblolly pine and to hardwoods, such as sweetgum and water oak, grown for commercial use. The wetness is a limitation affecting the operation of equipment for harvesting and planting. Competing vegetation may need to be controlled to establish and improve stands.

This soil is well suited to pasture and hayland. Bahiagrass and common bermudagrass are the most suitable species. Applications of fertilizer and lime and good grazing management are needed for maximum production of forage.

The soil is only moderately suited to urban uses

because of the wetness. This limitation can be overcome by proper design and installation.

This soil is in capability subclass IIw, and the woodland ordination symbol is 9W.

**DoB—Doucette loamy fine sand, 1 to 3 percent slopes.** This very gently sloping soil is on uplands. Areas are elongated or irregular in shape. They range from 15 to 150 acres in size.

Typically, the surface layer is very friable, moderately acid, dark grayish brown loamy fine sand about 3 inches thick. The subsurface layer, from a depth of 3 to 28 inches, is very friable, moderately acid, loamy fine sand. It is yellowish brown in the upper part and light yellowish brown in the lower part. The subsoil, from a depth of 28 to 60 inches, is firm, very strongly acid, strong brown sandy clay loam that has mottles in shades of red and gray.

This soil is well drained. Surface runoff is slow, and permeability is moderate. The available water capacity also is moderate. The hazard of water erosion is slight.

Included with this soil in mapping are small areas of Boykin and Choates soils. Boykin soils are in landscape positions similar to those of the Doucette soil. They have a red subsoil. Choates soils are in the slightly lower positions on the landscape. They have gray mottles within a depth of 30 inches. Included soils make up less than 20 percent of the map unit.

The Doucette soil is mainly used for timber production. The soil is well suited to loblolly pine. Seedling mortality is a moderate limitation. Good site preparation can help to overcome this limitation.

This soil is well suited to pasture and hayland. Bahiagrass and common bermudagrass are the most suitable species. Applications of fertilizer and lime and good grazing management are needed for maximum production of forage.

This soil is well suited to urban uses. Seepage is a moderate limitation affecting some uses.

This soil is in capability subclass IIIs, and the woodland ordination symbol is 9S.

**DyC—Dylan clay, 3 to 6 percent slopes.** This gently sloping and moderately sloping soil is on side slopes along major drainageways. Areas are elongated or irregular in shape. They range from 20 to 200 acres in size.

Typically, the surface layer is very firm, slightly alkaline, dark grayish brown clay about 4 inches thick. The subsoil extends to a depth of 60 inches. From a depth of 4 to 14 inches, it is extremely firm, neutral, brownish yellow clay that has brown, yellow, and red mottles; from a depth of 14 to 26 inches, it is extremely firm, slightly alkaline, yellowish brown clay; from a depth

of 26 to 52 inches, it is extremely firm, moderately alkaline, brownish yellow and yellowish brown clay that has mottles in shades of brown, yellow, and gray; and from a depth of 52 to 60 inches, it is extremely firm, moderately alkaline, strong brown clay that has gray mottles. Concretions of calcium carbonate are common between a depth of 26 to 52 inches, but they are few between a depth of 52 to 60 inches.

This soil is somewhat poorly drained. Surface runoff is rapid, and permeability is very slow. The available water capacity is high. The hazard of water erosion is moderate.

Included with this soil in mapping are small areas of Vamont and Woodville soils. Vamont soils are in the less sloping, higher positions on the landscape. They are more acid than the Dylan soil. Woodville soils are in landscape positions similar to those of the Dylan soil. They have a red subsoil that has gray mottles. Included soils make up less than 10 percent of the map unit.

The Dylan soil is mainly used for timber production. It is moderately suited to loblolly pine and shortleaf pine and to hardwoods, such as sweetgum. The clayey texture and wetness are limitations affecting the operation of equipment. The seedling mortality rate is high because of the clayey texture and alkalinity.

This soil is moderately suited to pasture and hayland. Bahiagrass and common bermudagrass are the most suitable species. Applications of fertilizer and good grazing management are needed for maximum production of forage.

This soil is poorly suited to urban uses because of the wetness, the shrink-swell potential, and low strength. These severe limitations can be partially overcome by proper design and installation.

This soil is in capability subclass IVE, and the woodland ordination symbol is 8C.

**Es—Estes clay, frequently flooded.** This nearly level soil is on flood plains along rivers and streams. Areas are long and narrow. They range from 20 to 1,000 acres in size. Slopes are 0 to 1 percent.

Typically, the surface layer is very firm, strongly acid, dark grayish brown clay about 4 inches thick. The upper part of the subsoil, from a depth of 4 to 8 inches, is very firm, very strongly acid, grayish brown clay that has yellowish red and strong brown mottles. The lower part, from a depth of 8 to 60 inches, is very firm, very strongly acid, light brownish gray clay that has mottles in shades of red, brown, and yellow.

This soil is poorly drained. Surface runoff is slow, and permeability is very slow. The available water capacity is high. A perched water table is generally above a depth of 1.5 feet, or the soil is ponded during the winter and spring. The soil is flooded several times

a year. Most periods of flooding are for 7 days or longer. The hazard of water erosion is slight.

Included with this soil in mapping are small areas of Mantachie soils. Mantachie soils are in landscape positions similar to those of the Estes soil. They are less clayey. Included soils make up less than 20 percent of the map unit.

The Estes soil is mainly in areas of hardwood forests. It is not suited to pine but is well suited to hardwoods, such as sweetgum, water oak, willow oak, and green ash, grown for commercial use. The wetness and flooding are limitations affecting the management and harvest of timber.

This soil is poorly suited to urban uses because of the flooding and the wetness.

This soil is in capability subclass Vw, and the woodland ordination symbol is 8W.

**Fa—Fausse clay, frequently flooded.** This nearly level soil is in low backswamps and on remnants of oxbows along the flood plains of streams. Areas are elongated and narrow. They range from 15 to 150 acres in size. Slopes are 0 to 1 percent.

Typically, the surface layer is very firm, slightly acid, dark grayish brown clay about 5 inches thick. The upper part of the subsoil, from a depth of 5 to 15 inches, is extremely firm, neutral, dark gray clay. The lower part, from a depth of 15 to 60 inches, is extremely firm, slightly alkaline, dark gray clay that has grayish brown and dark reddish brown mottles.

This soil is very poorly drained. Surface runoff is slow, and permeability is very slow. The available water capacity is high. An apparent water table is generally within a depth of 1.5 feet, or the soil is ponded. The soil is flooded several times a year for brief to very long periods. The hazard of water erosion is slight.

Included with this soil in mapping are small areas of Estes and Kaman soils and Mantachie soils that are in higher positions. Estes soils are more acid and lighter in color throughout than the Fausse soil. Kaman soils are black or very dark gray. Mantachie soils are loamy. They are lighter in color than the Fausse soil. Included soils make up less than 10 percent of the map unit.

The Fausse soil is mainly used for water-tolerant hardwoods, such as bald cypress, water tupelo, and red maple. Because of wetness, the use of heavy equipment is restricted for 8 to 12 months in most years.

This soil is poorly suited to urban uses because of flooding.

This soil is in capability subclass VIIw, and the woodland ordination symbol is 4W.

**Gu—Guyton silt loam.** This nearly level soil is in broad, plane to slightly convex areas of uplands. These areas are oval. They range from 45 to 500 acres in size. Slopes are 0 to 1 percent.

Typically, the surface layer is very friable, strongly acid, pale brown silt loam about 3 inches thick. The subsurface layer, from a depth of 3 to 23 inches, is very friable, very strongly acid, light brownish gray silt loam that has strong brown mottles. The subsoil, from a depth of 23 to 72 inches, is firm, very strongly acid, light brownish gray silty clay loam that has yellowish brown mottles.

This soil is poorly drained. Surface runoff is very slow. Permeability is moderate in the upper part and slow in the lower part. The available water capacity is high. A perched water table is generally within a depth of 1.5 feet during the winter and spring. The hazard of water erosion is slight.

Included with this soil in mapping are small areas of Aldine, Aris, and Verland soils. Aldine soils are on pimple mounds. They are better drained than the Guyton soil. Aris and Verland soils are in landscape positions similar to those of the Guyton soil. They have clayey subsoils. Included soils make up less than 20 percent of the map unit.

The Guyton soil is mainly used for timber production. The soil is well suited to loblolly pine and to hardwoods, such as sweetgum, green ash, and willow oak, grown for commercial use. Wetness is a limitation affecting the operation of equipment for harvesting or planting. Plant competition is a severe problem. Competing vegetation may need to be controlled and the site prepared to establish and improve stands of pine trees.

This soil is moderately suited to pasture and hayland. Bahiagrass and common bermudagrass are the most suitable species. Applications of fertilizer and lime and good grazing management are needed for maximum production of forage.

This soil is poorly suited to urban uses because of excessive wetness. This limitation can be partially overcome by proper design and installation.

This soil is in capability subclass IIIw, and the woodland ordination symbol is 8W.

**Gy—Guyton-Aldine complex.** These nearly level soils are in mounded areas of the coast prairie. Areas are broad to irregular in shape. They range from 25 to 500 acres in size. Slopes are 0 to 1 percent.

Guyton soils are in nearly level and slightly depressional areas. They make up about 50 percent of the unit. Aldine soils are on mounds and intermounds. They make up about 40 percent of the unit. These soils

occur as areas so intricately mixed that mapping them separately is not practical at the scale used.

Typically, the surface layer of the Guyton soil is very friable, strongly acid, grayish brown silt loam about 3 inches thick. The subsurface layer, from a depth of 3 to 7 inches, is very friable, very strongly acid, grayish brown silt loam that has mottles in shades of brown. The upper part of the subsoil, from a depth of 7 to 23 inches, is firm, very strongly acid, light gray silty clay loam that has mottles in shades of brown. The lower part, from a depth of 23 to 60 inches, is extremely firm, very strongly acid, gray clay loam that has mottles in shades of brown.

The Guyton soil is very poorly drained. Surface runoff is very slow. Permeability is moderate in the upper part and slow in the lower part. The available water capacity is high. A perched water table is generally within a depth of 1.5 feet during the winter and spring. The hazard of water erosion is slight.

Typically, the surface layer of the Aldine soil, to a depth of 8 inches, is very friable, strongly acid, dark brown silt loam. The subsurface layer, from a depth of 8 to 17 inches, is very friable, very strongly acid, brown very fine sandy loam that has mottles in shades of brown. The upper part of the subsoil, from a depth of 17 to 35 inches, is very friable, very strongly acid, grayish brown loam that has mottles in shades of brown. The next part, from a depth of 35 to 42 inches, is firm, very strongly acid, light gray silty clay that has mottles in shades of red and brown. The lower part, from a depth of 42 to 60 inches, is extremely firm, very strongly acid, light gray clay that has mottles in shades of red and brown.

The Aldine soil is somewhat poorly drained. Surface runoff is slow, and permeability is very slow. The available water capacity is high. A perched water table is generally at a depth of 1.5 to 2.5 feet during the winter and spring. The hazard of water erosion is slight.

Included with these soils in mapping are areas of Verland and Aris soils. The Verland and Aris soils are in landscape positions similar to those of the Guyton soil. They are more clayey throughout. Included soils make up less than 10 percent of the map unit.

The Guyton and Aldine soils are mainly used for timber production. They are well suited to loblolly pine and to hardwoods, such as sweetgum, green ash, and willow oak, grown for commercial use. Wetness is a limitation affecting the operation of equipment for harvesting or planting. Competing vegetation may need to be controlled and sites prepared to establish and improve stands of pine trees.

These soils are moderately suited to pasture and hayland. Bahiagrass and common bermudagrass are the most suitable species. Applications of fertilizer and

lime are needed for maximum production of forage.

These soils are poorly suited to urban uses. The main limitations are the wetness, low strength, and the shrink-swell potential. These limitations can be partially overcome by proper design and installation.

These soils are in capability subclass IIIw. The woodland ordination symbol is 8W in areas of the Guyton soil and 9W in areas of the Aldine soil.

**Ha—Hatcliff clay loam, occasionally flooded.** This nearly level soil is on flood plains along rivers and major creeks. Areas are long and narrow. They range from 50 to 400 acres in size. Slopes are 0 to 1 percent.

Typically, the surface layer is firm, neutral, very dark grayish brown clay loam about 3 inches thick. The underlying material extends to a depth of 60 inches. From a depth of 3 to 17 inches, it is firm, slightly acid, yellowish brown and dark yellowish brown loam; from a depth of 17 to 37 inches, it is loose, slightly acid, yellowish brown loamy fine sand; from a depth of 37 to 56 inches, it is very friable, slightly acid, yellowish brown loam; and from a depth of 56 to 60 inches, it is loose, slightly acid, light yellowish brown loamy fine sand.

This soil is moderately well drained. Surface runoff is slow, and permeability is moderately rapid. The available water capacity is medium. An apparent water table is generally within a depth of 2 feet during the winter and spring. The soil is flooded once every 2 to 10 years for brief periods during the winter and spring. The hazard of water erosion is slight.

Included with this soil in mapping are small areas of Mantachie, Owentown, Pluck, and Voss soils. Owentown soils are in the slightly higher positions on the landscape. They are more acid than the Hatcliff soil. Mantachie and Pluck soils are in the lower positions on the landscape. They are gray throughout. Voss soils are on sand bars. They are sandy throughout. Included soils make up less than 20 percent of the map unit.

The Hatcliff soil is mainly used for timber production. The soil is well suited to loblolly pine and slash pine and to hardwoods, such as sweetgum, sycamore, water oak, and cottonwood, grown for commercial use. Wetness is a limitation affecting the operation of equipment for harvesting or planting.

This soil is moderately suited to pasture and hayland. Bahiagrass and common bermudagrass are the most suitable species. Applications of fertilizer and lime and good grazing management are needed for maximum production of forage.

This soil is poorly suited to urban uses because of the flooding and the wetness.

This soil is in capability subclass IIw, and the woodland ordination symbol is 10W.

**Ho—Hockley fine sandy loam.** This nearly level soil is in broad upland areas of the flatwoods. Areas are oval or elongated. They range from 15 to 200 acres in size. Slopes are 0 to 1 percent.

Typically, the surface layer is very friable, strongly acid, dark grayish brown fine sandy loam about 3 inches thick. The upper part of the subsurface layer, from a depth of 3 to 14 inches, is very friable, strongly acid, brown fine sandy loam. The lower part, from a depth of 14 to 23 inches, is very friable, moderately acid, pale brown fine sandy loam. The subsoil, from a depth of 23 to 72 inches, is firm, strongly acid, sandy clay loam. It is yellowish brown in the upper part and light yellowish brown in the lower part. It has grayish brown, red, and yellowish brown mottles.

This soil is moderately well drained. Surface runoff is slow, and permeability is moderately slow. The available water capacity is high. A perched water table is generally at a depth of 3.5 to 5.0 feet during the winter and spring. The hazard of water erosion is slight.

Included with this soil in mapping are small areas of Sorter, Splendora, and Waller soils. Splendora soils are in the lower positions on the landscape. They have gray mottles in the upper horizons. Sorter and Waller soils are in nearly level and depressional areas. They are gray throughout. Included soils make up less than 20 percent of the map unit.

The Hockley soil is mainly used for timber production. It is well suited to loblolly pine, sweetgum, southern red oak, and black walnut. No limitations or hazards affect the management or harvest of timber.

This soil is well suited to pasture and hayland. Bahiagrass and common bermudagrass are the most suitable species. Applications of fertilizer and lime and good grazing management are needed for maximum production of forage.

This soil is moderately suited to most urban uses. The main limitations are the wetness and low strength. These limitations can be overcome by proper design and installation.

This soil is in capability subclass IIs, and the woodland ordination symbol is 9A.

**Ka—Kaman clay, occasionally flooded.** This nearly level soil is along the flood plains of the Trinity River and other large streams. Areas range from 150 to 3,000 acres in size. Slopes are 0 to 1 percent.

Typically, the surface layer is extremely firm, moderately acid, very dark gray clay about 20 inches thick. The subsoil, from a depth of 20 to 60 inches, is extremely firm, slightly acid clay that has mottles in shades of brown.

This soil is poorly drained. Surface runoff and permeability are very slow. The available water capacity

is high. An apparent water table is generally at a depth of 1.5 to 3.0 feet. The soil is flooded once every 2 to 10 years for brief periods during the fall, winter, and spring. The hazard of water erosion is slight.

Included with this soil in mapping are small areas of Estes, Fausse, Mantachie, Owentown, and Voss soils. Estes and Mantachie soils are in landscape positions similar to those of the Kaman soil. Mantachie soils are loamy throughout. Estes soils are more acid than the Kaman soil. Fausse soils are on remnants of oxbows. They are very poorly drained. Owentown soils are in the slightly higher positions on the landscape. They are more sandy than the Kaman soil. Voss soils are on sand bars. They are sandy throughout. Included soils make up less than 10 percent of the map unit.

The Kaman soil is mainly used for woodland grazing and production of hardwoods. It is moderately suited to trees, such as sweetgum, willow oak, green ash, and bald cypress, grown for commercial use. The wetness and the clayey texture are severe limitations affecting the operation of equipment for much of the year. Areas of this soil also are used as wildlife habitat.

This soil is moderately suited to pasture and hayland. Bahiagrass and common bermudagrass are the most suitable species. Applications of fertilizer and lime and good grazing management are needed for maximum production of forage.

This soil is poorly suited to urban uses. The main limitations are the flooding, the shrink-swell potential, the wetness, and low strength.

This soil is in capability subclass IIw, and the woodland ordination symbol is 6W.

**Kf—Kaman clay, frequently flooded.** This nearly level soil is along the flood plains of the Trinity River and other large streams. Areas are long and broad. They are as much as 6,000 acres in size. Slopes are 0 to 1 percent.

Typically, the surface layer is extremely firm, slightly acid clay about 24 inches thick. It is black in the upper part and very dark gray in the lower part. The subsoil, from a depth of 24 to 60 inches, is extremely firm, dark gray clay. The upper part is slightly acid, and the lower part is neutral and has brown mottles.

This soil is poorly drained. Surface runoff and permeability are very slow. The available water capacity is high. An apparent water table is generally at a depth of 1.5 to 3.0 feet. The soil is flooded for long periods during the fall, winter, and spring. The hazard of water erosion is slight.

Included with this soil in mapping are small areas of Estes, Fausse, Mantachie, and Voss soils. Estes and Mantachie soils are in the slightly higher positions on the landscape. Mantachie soils are loamy throughout.

Estes soils are more acid than the Kaman soil. Fausse soils are on remnants of oxbows. They are very poorly drained. Voss soils are on sand bars. They are sandy throughout. Included soils make up less than 10 percent of the map unit.

The Kaman soil is in areas of hardwood forest. It is mainly used for wildlife habitat and woodland grazing. It is moderately suited to bald cypress and green ash. The wetness is a severe limitation affecting the operation of equipment for much of the year.

This soil is in capability subclass Vw, and the woodland ordination symbol is 6W.

**Kg—Katy fine sandy loam.** This nearly level soil is in broad areas on uplands of the coast prairie. Slopes are mostly less than 1 percent. Areas are elongated or oval. They range from 20 to 150 acres in size. Slopes are 0 to 1 percent.

Typically, the surface layer is very friable, moderately acid, dark grayish brown fine sandy loam about 3 inches thick. The upper part of the subsurface layer, from a depth of 3 to 12 inches, is very friable, moderately acid, dark brown fine sandy loam. The lower part, from a depth of 12 to 23 inches, is very friable, moderately acid, brown fine sandy loam. The upper part of the subsoil, from a depth of 23 to 29 inches, is firm, moderately acid, yellowish brown clay loam that has red and grayish brown mottles. The next part, from a depth of 29 to 52 inches, is firm, strongly acid, grayish brown clay loam that has red and yellowish brown mottles. The lower part, from a depth of 52 to 60 inches, is firm, strongly acid, mottled red, gray, brown, and yellow clay loam.

This soil is moderately well drained. Surface runoff is slow. Permeability is moderate in the upper part and slow in the lower part. The available water capacity is high. The hazard of water erosion is slight.

Included with this soil in mapping are small areas of Aldine and Aris soils. Aris soils are in nearly level areas. They are gray throughout. Aldine soils are on small pimple mounds and intermounds. They have gray colors nearer the surface than the Katy soil. Included soils make up less than 20 percent of the map unit.

The Katy soil is mainly used as cropland. It is well suited to rice and soybeans in areas where adequate drainage outlets are available. A well designed system of surface water management includes planting rows in the proper direction to take advantage of the natural slope, installing a drainage system, land leveling, and irrigating. Incorporating crop residue into the surface layer helps to maintain good tilth. Applications of fertilizer are needed for maximum crop production.

In some areas pine and hardwoods have encroached. The soil is well suited to loblolly pine,

sweetgum, and water oak. Competing vegetation may need to be controlled to establish stands of pine trees. The wetness is a limitation affecting the operation of harvesting equipment.

This soil is well suited to pasture and hayland. Bahiagrass and bermudagrass are the most suitable species. Applications of fertilizer and lime and good grazing management are needed for maximum production of forage.

The soil is poorly suited to urban uses. The major limitations are the slow permeability and low strength. These limitations can be overcome by proper design and installation.

This soil is in capability subclass IIw and the Loamy Prairie range site. The woodland ordination symbol is 9W.

**Kh—Kemah silt loam.** This nearly level soil is in broad areas on uplands of the coast prairie. Areas are elongated to irregular in shape. They range from 20 to 75 acres in size. Slopes are 0 to 1 percent.

Typically, the surface layer is very friable, strongly acid, dark grayish brown silt loam about 8 inches thick. The subsurface layer, from a depth of 8 to 18 inches, is very friable, strongly acid, grayish brown silt loam that has strong brown and yellowish brown mottles. The upper part of the subsoil, from a depth of 18 to 42 inches, is very firm, strongly acid, dark gray clay that has red, brown, and gray mottles. The lower part, from a depth of 42 to 60 inches, is very firm, strongly acid, gray clay that has mottles in shades of brown and red.

This soil is somewhat poorly drained. Surface runoff is slow, and permeability is very slow. The available water capacity is high. A perched water table is generally at a depth of 0.5 foot to 1.5 feet during the winter. The hazard of water erosion is slight.

Included with this soil in mapping are small areas of Aldine and Aris soils. Aldine soils are on pimple mounds. They are less clayey in the upper part of the subsoil than the Kemah soil. Aris soils are in depressions. They have a thicker surface layer than the Kemah soil. Included soils make up less than 15 percent of the map unit.

The Kemah soil is mainly used for cropland. It is well suited to rice and soybeans in areas where adequate drainage outlets are available. This soil is well suited to rice because it is very slowly permeable. Little land leveling is needed to evenly flood the soil. A well designed system of surface water management includes planting rows in the proper direction to take advantage of the natural slope, installing a drainage system, land leveling, and irrigating. Incorporating crop residue into the surface layer helps to maintain good tilth.

Applications of fertilizer are needed for maximum crop production.

This soil is well suited to pasture and hayland. Bahiagrass and bermudagrass are the most suitable species. Applications of fertilizer and lime and good grazing management are needed for maximum production of forage.

This soil is well suited to loblolly pine and slash pine and to hardwoods, such as sweetgum and water oak, grown for commercial use. Wetness is a limitation affecting the operation of equipment for harvesting and planting. Competing vegetation may need to be controlled to establish stands of pine trees.

This soil is poorly suited to urban uses. The main limitations are the wetness, the shrink-swell potential, and low strength. These limitations can be partially overcome by proper design and installation.

This soil is in capability subclass IIIw and the Loamy Prairie range site. The woodland ordination symbol is 9W.

**Km—Kemah-Aris complex.** These nearly level soils are on mounded uplands of the coast prairie. Areas are broad. They range from 25 to 1,200 acres in size. Slopes are 0 to 1 percent.

Kemah soils are on small pimple mounds and intermounds. They make up about 55 percent of the unit. Aris soils are in nearly level and depressional areas. They make up about 40 percent of the unit. These soils occur as areas so intricately mixed that mapping them separately is not practical at the scale used.

Typically, the surface layer of the Kemah soil is friable, strongly acid, dark grayish brown loam about 7 inches thick. The subsurface layer, from a depth of 7 to 19 inches, is friable, strongly acid, dark grayish brown loam that has mottles in shades of brown. The upper part of the subsoil, from a depth of 19 to 31 inches, is very firm, strongly acid, grayish brown clay that has red and brown mottles. The lower part, from a depth of 31 to 60 inches, is firm, strongly acid, light brownish gray clay loam that has red and brown mottles.

The Kemah soil is somewhat poorly drained. Surface runoff is slow, and permeability is very slow. The available water capacity is high. A perched water table is generally at a depth of 0.5 foot to 1.5 feet during the winter. The hazard of water erosion is slight.

Typically, the surface layer of the Aris soil is friable, strongly acid, dark grayish brown loam about 10 inches thick. The subsurface layer, from a depth of 10 to 18 inches, is friable, slightly acid, dark grayish brown loam. The subsoil, from a depth of 18 to 60 inches, is very firm, slightly acid gray clay that has mottles in shades of red and brown.

The Aris soil is poorly drained. Surface runoff is slow, and permeability is very slow. The available water capacity is high. A perched water table is generally within a depth of 2 feet during the winter. The hazard of water erosion is slight.

Included with these soils in mapping are small areas of Aldine and Anahuac soils. Aldine and Anahuac soils are on large mounds. They have a thicker surface layer than the Kemah and Aris soils. Included soils make up less than 5 percent of the map unit.

The Kemah and Aris soils are mainly used as pasture and hayland and are well suited to these uses. Bahiagrass and common bermudagrass are the most suitable species. Applications of fertilizer and lime and good grazing management are needed for maximum production of forage.

These soils are used as cropland. They are well suited to rice and soybeans in areas where adequate drainage outlets are available. The soils are well suited to rice because they are very slowly permeable. Little land leveling is needed to evenly flood the soil. A well designed system of surface water management includes planting rows in the proper direction to take advantage of the natural slope, installing a drainage system, land leveling, and irrigating. Incorporating crop residue into the surface layer helps to maintain good tilth. Applications of fertilizer are needed for maximum crop production.

These soils are well suited to loblolly pine and slash pine. Wetness is a limitation affecting the operation of equipment for harvesting and planting. Competing vegetation may need to be controlled to establish stands of pine trees.

These soils are poorly suited to urban uses. The wetness is the main limitation. This limitation can be partially overcome by proper design and installation.

The Kemah soil is in capability subclass IIIw, and the Aris soil is in capability subclass IVw. The Kemah soil is in the Loamy Prairie range site, and the Aris soil is in the Lowland range site. The woodland ordination symbol is 9W for both soils.

**Kn—Kenefick fine sandy loam.** This nearly level soil is on stream terraces. Areas are irregular in shape. They range from 15 to 250 acres in size. Slopes are 0 to 1 percent.

Typically, the surface layer is very friable, very strongly acid, brown fine sandy loam about 4 inches thick. The subsurface layer, from a depth of 4 to 18 inches, is very friable, moderately acid, fine sandy loam. It is yellowish brown in the upper part and strong brown in the lower part. The upper part of the subsoil, from a depth of 18 to 52 inches, is very firm, very strongly acid, red sandy clay loam that has brownish yellow

mottles. The lower part, from a depth of 52 to 65 inches, is friable, very strongly acid, red fine sandy loam that has brownish yellow mottles. The underlying material, from a depth of 65 to 80 inches, is very friable, very strongly acid, mottled red, reddish yellow, yellowish brown, and very pale brown stratified loamy fine sand and fine sandy loam.

This soil is well drained. Surface runoff is slow, and permeability is moderate. The available water capacity also is moderate. The hazard of water erosion is slight.

Included with this soil in mapping are small areas of Bienville, Spurger, and Waller soils. Bienville soils are on ridges. They are sandy throughout. Spurger soils are in the slightly lower positions on the landscape. They have subsoils that are red and gray and mottled. Waller soils are in nearly level areas and depressions. They are gray throughout. Included soils make up less than 20 percent of the map unit.

The Kenefick soil is well suited to loblolly pine and to hardwoods, such as sweetgum and southern red oak, grown for commercial use. No significant limitations or hazards affect timber management.

This soil is well suited to pasture and hayland. Bahiagrass and bermudagrass are the most suitable species. Applications of fertilizer and lime and good grazing management are needed for maximum production of forage.

This soil is moderately suited to urban uses. The shrink-swell potential and low strength are moderate limitations that can be overcome by proper design and installation.

This soil is in capability class I, and the woodland ordination symbol is 10A.

**Kr—Kirbyville fine sandy loam.** This nearly level soil is in broad upland areas. Areas are irregular in shape. They range from 75 to 1,500 acres in size. Slopes are 0 to 1 percent.

Typically, the surface layer is very friable, strongly acid, dark grayish brown fine sandy loam about 4 inches thick. The subsurface layer, from a depth of 4 to 15 inches, is very friable, strongly acid, very pale brown fine sandy loam. It has brownish yellow mottles in the lower part. The upper part of the subsoil, from a depth of 15 to 45 inches, is firm, very strongly acid, yellowish brown clay loam that has mottles in shades of red, yellow, and gray. The next part, from a depth of 45 to 57 inches, is firm, very strongly acid, brownish yellow clay loam that has mottles in shades of red and gray. The lower part, from a depth of 57 to 80 inches, is very firm, very strongly acid, light brownish gray clay loam that has mottles in shades of brown, yellow, and red. Plinthite occurs below a depth of 45 inches.

This soil is somewhat poorly drained. Surface runoff

is slow, and permeability is moderate. The available water capacity is high. A perched water table is generally at a depth of 1.5 to 2.5 feet, mainly in the winter. The hazard of water erosion is slight.

Included with this soil in mapping are small areas of Dallardsville, Otanya, Sorter, and Waller soils. Dallardsville soils are in landscape positions similar to those of the Kirbyville soil. They have less clay in the upper part of the subsoil than the Kirbyville soil. Otanya soils are in the higher positions on the landscape. They do not have gray mottles in the upper 30 inches. Sorter and Waller soils are in nearly level and depressional areas. They are gray throughout. Included soils make up less than 20 percent of the map unit.

The Kirbyville soil is mainly used for timber production. It is well suited to slash and loblolly pine and to hardwoods, such as sweetgum and southern red oak, grown for commercial use. Wetness is a limitation affecting the operation of equipment on this soil. Competing vegetation may need to be controlled to establish stands of pine trees.

This soil is well suited to pasture and hayland. Bahiagrass and bermudagrass are the most suitable species. Applications of fertilizer and lime and good grazing management are needed for maximum production of forage.

This soil is moderately suited to most urban uses because of the wetness. This limitation can be partially overcome by proper design and installation.

This soil is in capability subclass IIw, and the woodland ordination symbol is 11W.

#### **LaA—Lake Charles clay, 0 to 1 percent slopes.**

This nearly level soil is in broad areas of the coast prairie. Areas are irregular in shape. They range from 20 to 1,200 acres in size.

Typically, the surface layer is very firm, moderately acid, very dark gray clay that has dark brown mottles. It is about 6 inches thick. The upper part of the subsoil, from a depth of 6 to 36 inches, is very firm, neutral or slightly alkaline, very dark gray clay that has mottles in shades of brown, yellow, and red. The lower part, from a depth of 36 to 60 inches, is very firm, slightly alkaline, gray clay that has mottles in shades of brown and yellow.

This soil is somewhat poorly drained. Surface runoff and permeability are very slow. The available water capacity is high. The hazard of water erosion is slight.

Included with this soil in mapping are small areas of Beaumont, Bernard, Mocarey, Morey, Vamont, and Verland soils. Beaumont and Verland soils are somewhat wetter than the Lake Charles soil. They are in the lower positions on the landscape. Verland soils are much lighter in color than the Lake Charles soil.

Bernard and Vamont soils are in landscape positions similar to those of the Lake Charles soil. They have a surface layer of clay loam. Mocreay and Morey soils are on small pimple mounds. They are loamy. Vamont soils have mottles in shades of yellow and brown in the subsoil. Included soils make up less than 10 percent of the map unit.

The Lake Charles soil is mainly used as cropland. It is well suited to rice and soybeans in areas where adequate drainage outlets are available. This soil is well suited to rice because it is very slowly permeable. Little land leveling is needed to evenly flood the soil. A well designed system of surface water management includes planting rows in the proper direction to take advantage of the natural slope, installing a drainage system, land leveling, and irrigating. Incorporating crop residue into the surface layer helps to maintain good tilth. Applications of fertilizer are needed for maximum crop production.

In some areas pine and hardwoods have encroached. The soil is moderately suited to loblolly pine and slash pine. Wetness is a limitation affecting the operation of equipment for harvesting or planting. The seedling mortality rate is high because of the clayey texture and alkalinity.

The soil is well suited to pasture and hayland. Bahiagrass and bermudagrass are the most suitable species. Applications of fertilizer and lime and good grazing management are needed for maximum production of forage.

This soil is poorly suited to urban uses. The main limitations are low strength and the shrink-swell potential. These limitations can be partially overcome by proper design and installation.

This soil is in capability subclass IIw and the Blackland range site. The woodland ordination symbol is 8C.

#### **LaC—Lake Charles clay, 2 to 5 percent slopes.**

This gently sloping soil is in areas along drainageways of the coast prairie. Areas are elongated or irregular in shape. They range from 20 to 150 acres in size.

Typically, the surface layer is very firm, neutral, very dark gray clay that has brown mottles. It is about 36 inches thick. The subsoil, from a depth of 36 to 60 inches, is very firm, slightly alkaline, dark gray clay that has mottles in shades of brown, red, and yellow.

This soil is somewhat poorly drained. Surface runoff is medium, and permeability is very slow. The available water capacity is high. The hazard of water erosion is moderate.

Included with this soil in mapping are small areas of Beaumont and Vamont soils. Beaumont soils are somewhat wetter than the Lake Charles soil. They are

in the lower positions on the landscape. Vamont soils are in landscape positions similar to those of the Lake Charles soil. They have a subsoil that has mottles in shades of yellow and brown. Included soils make up less than 10 percent of the map unit.

The Lake Charles soil is mainly used as pasture and hayland. It is well suited to bahiagrass and bermudagrass. Applications of fertilizer and lime and good grazing management are needed for maximum production of forage.

This soil is used for cropland. It is well suited to soybeans. Farming on the contour and constructing terraces are needed to control erosion. Applications of fertilizer are needed for maximum production of forage.

In some areas pine and hardwoods have encroached. The soil is moderately suited to loblolly pine and slash pine. Wetness is a limitation affecting the operation of equipment for harvesting or planting trees. The seedling mortality rate is high because of the clayey texture and alkalinity.

This soil is poorly suited to urban uses. The main limitations are low strength and the shrink-swell potential. These limitations can be partially overcome by proper design and installation.

This soil is in capability subclass IIIe and the Blackland range site. The woodland ordination symbol is 8C.

**LdB—Landman loamy fine sand, 0 to 2 percent slopes.** This nearly level and very gently sloping soil is on uplands and stream terraces. Areas are oval or elongated. They range from 20 to 75 acres in size.

Typically, the surface layer is very friable, strongly acid, brown loamy fine sand about 3 inches thick. The subsurface layer, from a depth of 3 to 52 inches, is very friable, strongly acid, loamy fine sand. It is light yellowish brown in the upper part and very pale brown in the lower part. The upper part of the subsoil, from a depth of 52 to 60 inches, is friable, very strongly acid, light gray sandy clay loam that is mottled in shades of red, brown, and yellow. The lower part, from a depth of 60 to 72 inches, is friable, very strongly acid, sandy clay loam that is mottled in shades of gray, brown, yellow, and red.

This soil is moderately well drained. Surface runoff is very slow. Permeability is rapid in the surface and subsurface layer and moderately slow in the subsoil. The available water capacity is low. A perched water table is generally at a depth of 4 to 6 feet during the fall, winter, and spring. The hazard of water erosion is slight.

Included with this soil in mapping are small areas of Dallardsville, Segno, Splendora, and Sorter soils. Segno, Splendora, and Dallardsville soils are in

landscape positions similar to those of the Landman soil. They are loamy throughout. Sorter soils are in nearly level areas and along drainageways. They are loamy and gray throughout. Included soils make up less than 15 percent of the map unit.

The Landman soil is mainly used for timber production. It is well suited to loblolly pine. The sandy texture can limit the operation of equipment during dry periods. The seedling mortality rate may be more than 25 percent during dry years because of the low available water capacity.

This soil is moderately suited to pasture and hayland. Bahiagrass and bermudagrass are the most suitable species. Applications of fertilizer and lime and proper grazing management are needed for maximum production of forage.

This soil is moderately suited to most urban uses, but it is poorly suited as a site for sanitary facilities because of seepage.

This soil is in capability subclass IIIs, and the woodland ordination symbol is 9S.

**Ma—Mantachie loam, frequently flooded.** This nearly level soil is on flood plains along rivers and streams. Areas are long and narrow. They range from 30 to 500 acres in size. Slopes are 0 to 1 percent.

Typically, the surface layer is very friable, strongly acid, very dark grayish brown loam about 5 inches thick. The subsoil extends to a depth of 60 inches. From a depth of 5 to 13 inches, it is very friable, strongly acid, grayish brown loam that has dark grayish brown and yellowish brown mottles; from a depth of 13 to 18 inches, it is very friable, strongly acid, brown loam that has grayish brown and yellowish brown mottles; from a depth of 18 to 32 inches, it is very friable, very strongly acid, grayish brown loam that has yellowish brown and brown mottles; and from a depth of 32 to 60 inches, it is firm, very strongly acid, grayish brown and gray sandy clay loam that has yellowish brown mottles.

This soil is somewhat poorly drained. Surface runoff is slow, and permeability is moderate. The available water capacity is high. A water table is generally at a depth of 1.0 to 1.5 feet during the winter. The soil is flooded at least once every 2 years, mostly during the winter. The hazard of water erosion is slight.

Included with this soil in mapping are small areas of Estes, Fausse, Kaman, Owentown, and Voss soils. Estes, Fausse, and Kaman soils are clayey throughout. Estes soils are in landscape positions similar to those of the Mantachie soil. Fausse soils are on remnants of oxbows. Kaman soils are in the lower positions on the landscape. Owentown soils are in the higher positions on the landscape. They are mostly in shades of brown. Voss soils are on sand bars. They are sandy

throughout. Included soils make up less than 20 percent of the map unit.

The Mantachie soil is mainly used for the production of mixed hardwoods and for wildlife habitat. It is well suited to trees, such as water oak, cherrybark oak, and green ash, grown for commercial use. The wetness is a limitation affecting the operation of equipment for harvesting.

This soil is poorly suited to urban uses. The main limitations are flooding and the wetness.

This soil is in capability subclass Vw, and the woodland ordination symbol is 9W.

**My—Mocarey-Yeaton complex.** These nearly level soils are in broad mounded areas of the coast prairie. Areas are generally oblong. They range from 500 to 1,500 acres in size. Slopes are 0 to 1 percent.

The Mocarey soil is on intermounds. It makes up about 65 percent of the unit. The Yeaton soil is on circular and elongated mounds. It makes up about 15 percent of the unit. These soils occur as areas so intricately mixed that mapping them separately is not practical at the scale used.

Typically, the surface layer of the Mocarey soil is firm, very dark gray loam about 12 inches thick. The upper part is neutral, and the lower part is moderately alkaline. The subsoil extends to a depth of 80 inches. From a depth of 12 to 18 inches, it is firm, moderately alkaline dark gray loam; from a depth of 18 to 24 inches, it is firm, moderately alkaline, gray loam; from a depth of 24 to 66 inches, it is firm, moderately alkaline, gray clay loam that has brownish yellow mottles; and from a depth of 66 to 80 inches, it is firm, moderately alkaline, light gray clay loam that has brownish yellow mottles. Concretions of calcium carbonate occur below a depth of 12 inches.

The Mocarey soil is somewhat poorly drained. Surface runoff is very slow, and permeability is slow. The available water capacity is high. A perched water table is generally at a depth of 1.5 to 2.0 feet during the winter and spring. The hazard of water erosion is slight.

Typically, the surface layer of the Yeaton soil is friable, neutral, dark gray loam about 8 inches thick. The subsurface layer, from a depth of 8 to 13 inches, is friable, slightly alkaline, dark grayish brown loam that has light olive brown mottles. The subsoil extends to a depth of 80 inches. From a depth of 13 to 22 inches, it is very firm, neutral, olive yellow clay loam that has light olive brown and light brownish gray mottles; from a depth of 22 to 33 inches, it is very firm, slightly alkaline, light olive brown clay loam that has light brownish gray and yellowish brown mottles; from a depth of 33 to 61 inches, it is firm, moderately alkaline, light brownish gray loam that has mottles in shades of brown and

yellow; and from a depth of 61 to 80 inches, it is firm, moderately alkaline light yellowish brown silt loam that has brownish yellow, light gray, very pale brown, and yellowish brown mottles. Concretions of calcium carbonate occur below a depth of 22 inches.

The Yeaton soil is somewhat poorly drained. Surface runoff is very slow, and permeability is slow. The available water capacity is high. A perched water table is generally at a depth of 1.0 to 1.5 feet during the winter. The hazard of water erosion is slight.

Included with these soils in mapping are small areas of Aris, Bernard, Kemah, and Morey soils. Aris soils are in the slightly lower, concave positions on the landscape. They have red mottles throughout the subsoil. They are more acid than the Mocarey and Yeaton soils. Bernard soils are in landscape positions similar to those of the Mocarey soil. They do not have concretions of calcium carbonate within a depth of 35 inches. Morey and Kemah soils are in landscape positions similar to those of the Yeaton soil. They are dominantly gray throughout. Included soils make up less than 20 percent of the map unit.

The Mocarey and Yeaton soils are mainly used as cropland. They are well suited to rice and moderately suited to soybeans in areas where adequate drainage outlets are available. These soils are well suited to rice because they are relatively easy to level. Some areas of the Yeaton soil become salty after leveling, but these areas can become productive in a few years if properly managed. A well designed system of surface water management includes planting rows in the proper direction to take advantage of the natural slope, installing a drainage system, land leveling, and irrigating. Incorporating crop residue into the surface layer helps to maintain good tilth. Applications of fertilizer are needed for high yields.

In mounded areas where pines have encroached, these soils are moderately suited to loblolly pine and to hardwoods, such as water oak, ash, and sweetgum, grown for commercial use. The seedling mortality rate of pine trees is high because of the alkalinity and wetness. The wetness also is a limitation affecting the operation of planting and logging equipment.

These soils are well suited to pasture and hayland. Bahiagrass and common bermudagrass are the most suitable species. Applications of fertilizer and good grazing management are needed for maximum production of forage. Wetness is a limitation affecting the operation of equipment.

These soils are poorly suited to urban uses because of the wetness, the shrink-swell potential, and low strength. These limitations can be partially overcome by proper design and installation.

The Mocarey soil is in capability subclass IIIw, and

the Yeaton soil is in capability subclass IIw. The woodland ordination symbol is 6W in areas of the Mocarey soil and 8W in areas of the Yeaton soil. Both soils are in the Loamy Prairie range site.

**Ow—Oil-waste Land.** This map unit consists of small areas of various soils that have been disturbed by oil mining activities. Slopes are variable but mostly range from 0 to 2 percent.

The soils in this map unit have been damaged by heavy machinery. They have been contaminated with oil, salt brine, drilling mud, and sludge.

The productivity of these soils has been virtually destroyed, and very little vegetation remains. Generally, reclaiming these areas with vegetation or for urban development is possible but costly.

No capability subclass, range site, or woodland ordination symbol is assigned to this map unit.

**OyB—Otanya fine sandy loam, 1 to 3 percent slopes.** This very gently sloping soil is on broad ridges and mounds of the flatwoods. Areas are irregularly shaped. They range from 40 to 1,200 acres in size.

Typically, the surface layer is very friable, slightly acid, dark brown fine sandy loam about 6 inches thick. The subsurface layer, from a depth of 4 to 12 inches, is very friable, slightly acid, light yellowish brown fine sandy loam. The upper part of the subsoil, from a depth of 12 to 60 inches, is firm, very strongly acid or strongly acid, brownish yellow sandy clay loam that has reddish mottles. The lower part, from a depth of 60 to 80 inches, is firm, very strongly acid, reddish yellow and brownish yellow sandy clay loam that has mottles in shades of red and gray.

This soil is moderately well drained. Surface runoff is slow, and permeability is moderately slow. The available water capacity is high. A perched water table is generally at a depth of 3 to 5 feet during the winter and spring. The hazard of water erosion is slight.

Included with this soil in mapping are small areas of Dallardsville, Kirbyville, Sorter, and Waller soils. Kirbyville and Dallardsville soils are in the slightly lower positions on the landscape. They have gray mottles within a depth of 30 inches. Sorter and Waller soils are in nearly level areas. They are gray throughout. Included soils make up less than 20 percent of the map unit.

The Otanya soil is mainly used as woodland. Loblolly pine, sweetgum, water oak, and willow oak are the dominant trees. The soil is well suited to these species. The main species grown for commercial use is loblolly pine. No significant limitations or hazards affect timber management.

This soil is well suited to pasture and hayland.

Bahiagrass and common bermudagrass are the most suitable species. Applications of fertilizer and lime and good grazing management are needed for maximum production of forage.

This soil is moderately suited to most urban uses. The main limitations are the wetness and the moderately slow permeability. These limitations can be partially overcome by proper design and installation.

This soil is in capability subclass IIe, and the woodland ordination symbol is 9A.

**Oz—Owentown fine sandy loam, occasionally flooded.** This nearly level soil is on flood plains along streams and rivers. Areas are narrow and long. They range from 50 to 250 acres in size. Slopes are 0 to 1 percent.

Typically, the surface layer is very friable, strongly acid, brown fine sandy loam about 4 inches thick. The upper part of the subsoil, from a depth of 4 to 28 inches, is very friable, strongly acid, yellowish brown fine sandy loam. The next part, from a depth of 28 to 36 inches, is loose, strongly acid, yellowish brown loamy fine sand that has mottles in shades of brown, yellow, and gray. The lower part, from a depth of 36 to 60 inches, is loose, strongly acid, brown loamy fine sand that has mottles in shades of brown, yellow, and gray.

This soil is moderately well drained. Surface runoff is slow, and permeability is moderate. The available water capacity is high. An apparent water table is generally at a depth of 2.5 to 4.0 feet during the fall, winter, and spring. The soil is flooded once every 2 to 10 years for brief periods during the winter and spring. The hazard of water erosion is slight.

Included with this soil in mapping are small areas of Mantachie and Voss soils. Mantachie soils are in the lower positions on the landscape. They are gray throughout. Voss soils are in landscape positions similar to those of the Owentown soil. They are sandy throughout. Included soils make up less than 20 percent of the map unit.

The Owentown soil is mainly used for timber production. It is well suited to loblolly pine and hardwoods, such as sweetgum and southern red oak. The occasional flooding is the major limitation affecting the harvest of timber.

This soil is well suited to pasture and hayland. Bahiagrass and common bermudagrass are the most suitable species. Applications of fertilizer and lime and good grazing management are needed for maximum production.

This soil is poorly suited to urban uses. Flooding and seepage are severe limitations.

This soil is in capability subclass IIw, and the woodland ordination symbol is 11A.

**Pt—Pits.** This map unit is mainly on stream terraces along the Trinity River. Areas are rectangular or oblong. They range from 20 to 150 acres in size.

Pits were excavated during mining operations for sand and gravel. They have nearly vertical walls and are 5 to 15 feet deep. Some pits are filled with water and are used for fishing. Other areas that were once pits have been reclaimed and are used as pastures. Mining is still in progress in some areas.

No capability subclass, range site, or woodland ordination symbol is assigned to this map unit.

**Pu—Pluck fine sandy loam, frequently flooded.** This nearly level soil is on flood plains along rivers and major creeks. Areas are long and narrow. They range from 30 to 160 acres in size. Slopes are 0 to 1 percent.

Typically, the upper part of the surface layer, to a depth of 3 inches, is friable, moderately acid, dark grayish brown fine sandy loam. The lower part, from a depth of 3 to 12 inches, is firm, neutral, dark grayish brown silty clay loam that has yellowish brown mottles. The subsoil, from a depth of 12 to 60 inches, is firm, slightly alkaline, dark gray clay loam that has yellowish brown and gray mottles.

This soil is poorly drained. Surface runoff is slow, and permeability is moderate. The available water capacity also is moderate. An apparent water table is generally within a depth of 1.5 feet during the winter and spring. The soil is frequently flooded for long periods during the winter. The hazard of water erosion is slight.

Included with this soil in mapping are small areas of Hatliff, Kaman, Mantachie, Owentown, and Voss soils. Hatliff, Mantachie, and Owentown are in the higher positions on the landscape. They are not so gray in the upper part as the Pluck soil. Voss soils are on sand bars. They are sandy throughout. Kaman soils are in landscape positions similar to those of the Pluck soil. They are clayey throughout. Included soils make up less than 20 percent of the map unit.

The Pluck soil is mainly used for timber production. It is moderately suited to sweetgum, water oak, green ash, and loblolly pine. Wetness and flooding are limitations affecting the operation of equipment for harvesting or planting. Competing vegetation may need to be controlled to establish stands of pine trees. The seedling mortality rate is high because of the wetness. Bedding can improve the survival of seedlings.

This soil is moderately suited to pasture and hayland. Bahiagrass and common bermudagrass are the most suitable species. Applications of fertilizer and lime and good grazing management are needed for maximum production of forage. The wetness and the flooding are limitations affecting the operation of equipment.

This soil is poorly suited to most urban uses. The flooding and the wetness are the main limitations.

This soil is in capability subclass Vw, and the woodland ordination symbol is 9W.

**Sa—Segno fine sandy loam.** This nearly level soil is on broad, low ridges in the uplands. Areas are irregular in shape. They range from 30 to 500 acres in size. Slopes are 0 to 1 percent.

Typically, the surface layer is very friable, strongly acid, brown fine sandy loam about 3 inches thick. The subsurface layer, from a depth of 3 to 17 inches, is very friable, slightly acid, very pale brown fine sandy loam. The subsoil, from a depth of 17 to 60 inches, is firm, moderately acid, yellowish brown sandy clay loam that has mottles in shades of gray, yellow, brown, and red. It has more than 5 percent plinthite.

This soil is moderately well drained. Surface runoff is slow, and permeability is moderately slow. The available water capacity is moderate. A perched water table is generally at a depth of 2 to 3 feet during the winter and spring. The hazard of water erosion is slight.

Included with this soil in mapping are small areas of Dallardsville, Hockley, Sorter, Splendor, Waller, and Wockley soils. Hockley soils are in landscape positions similar to those of the Segno soil. They have a thicker surface layer than the Segno soil. Dallardsville, Splendor, and Wockley soils are in the slightly lower positions on the landscape. They have gray mottles within a depth of 30 inches. Sorter and Waller soils are in nearly level and depressional areas. They are gray throughout. Included soils make up less than 25 percent of the map unit.

The Segno soil is mainly used for timber production. It is well suited to loblolly pine and to hardwoods, such as sweetgum and southern red oak, grown for commercial use. No significant limitations affect timber management.

This soil is well suited to pasture and hayland. Bahiagrass and common bermudagrass are the most suitable species. Applications of fertilizer and lime and good grazing management are needed for maximum production of forage.

This soil is moderately suited to most urban uses. The main limitations are low strength and the wetness. These limitations can be partially overcome by proper design and installation.

This soil is in capability subclass IIs, and the woodland ordination symbol is 9A.

**Sb—Sorter loam.** This nearly level soil is in slightly depressed areas of the flatwoods. Areas are broad and irregular in shape. They range from 20 to 1,300 acres in

size. Slopes are plane or convex. They are less than 1 percent.

Typically, the surface layer is very friable, slightly acid, light brownish gray loam about 3 inches thick. The subsurface layer, from a depth of 3 to 18 inches, is very friable, strongly acid, light gray loam that has brownish yellow mottles. The subsoil, from a depth of 18 to 72 inches, is friable, slightly acid loam. It is light gray in the upper part and light brownish gray in the lower part. Mottles in shades of yellow occur throughout the subsoil.

This soil is poorly drained. Permeability is slow. The available water capacity is high. A perched water table is generally within a depth of 2.5 feet, or the soil is ponded during the fall, winter, and spring. The hazard of water erosion is slight.

Included with this soil in mapping are small areas of Dallardsville and Kirbyville soils. Dallardsville soils are on high mounds. They are less gray than the Sorter soil. Kirbyville soils are on lower mounds. They have plinthite in the lower part of the subsoil. Included soils make up less than 15 percent of the map unit.

The Sorter soil is mainly used for timber production. It is well suited to loblolly pine and slash pine and to hardwoods, such as sweetgum and water oak, grown for commercial use. The wetness is a severe limitation affecting the operation of equipment for harvesting or planting trees. The seedling mortality rate is high in wet years. Bedding can improve the survival of seedlings. Competing vegetation may need to be controlled to establish stands of pine trees.

This soil is moderately suited to pasture and hayland. Bahiagrass and common bermudagrass are the most suitable species. Applications of fertilizer and lime and good grazing management are needed for maximum production of forage.

This soil is poorly suited to most urban uses. The main limitations are the wetness and the slow permeability. These limitations can be partially overcome by proper design and installation.

This soil is in capability subclass IVw, and the woodland ordination symbol is 9W.

**Sd—Sorter-Dallardsville complex.** These nearly level soils are on mounds of the flatwoods. Areas are broad and irregular in shape. They range from 75 to 600 acres in size. Slopes are 0 to 1 percent.

The Sorter soil is in broad, nearly level areas. It makes up about 55 percent of the unit. The Dallardsville soil is on circular mounds that are 25 to 60 feet across and 3 to 5 feet higher than the surrounding areas. It makes up about 30 percent of the unit. These soils occur as areas so intricately mixed that mapping them separately is not practical at the scale used.

Typically, the surface layer of the Sorter soil is friable, moderately acid, dark gray loam about 5 inches thick. The subsurface layer, from a depth of 5 to 20 inches, is friable, slightly acid, gray loam that has yellowish brown mottles. The upper part of the subsoil, from a depth of 20 to 52 inches, is friable, slightly acid, light brownish gray loam that is mottled in shades of yellow, brown, and gray. The lower part, from a depth of 52 to 80 inches, is very friable, slightly acid, brown and light brownish gray loam. It has mottles in shades of brown and yellow.

The Sorter soil is poorly drained. Permeability is slow. The available water capacity is high. A perched water table is generally within a depth of 2.5 feet, or the soil is ponded during the fall, winter, and spring. The hazard of water erosion is slight.

Typically, the surface layer of the Dallardsville soil is very friable, extremely acid, grayish brown fine sandy loam about 6 inches thick. The subsurface layer, from a depth of 6 to 28 inches, is very friable, strongly acid, light yellowish brown fine sandy loam. The upper part of the subsoil, from a depth of 28 to 52 inches, is very friable, strongly acid, light yellowish brown fine sandy loam that is mottled in shades of brown, yellow, and gray. The next part, from a depth of 52 to 68 inches, is friable, very strongly acid, pale brown loam. The lower part, from a depth of 68 to 80 inches, is friable, strongly acid loam that is mottled in shades of brown, yellow, and red.

The Dallardsville soil is somewhat poorly drained. Surface runoff is slow, and permeability is moderately slow. The available water capacity is moderate. A perched water table is generally at a depth of 1 to 2 feet during the winter and spring. The hazard of water erosion is slight.

Included with these soils in mapping are small areas of Kirbyville and Otanya soils. Otanya soils are in the higher positions on the landscape. They are better drained than the Sorter and Dallardsville soils. Kirbyville soils are in landscape positions similar to those of the Dallardsville soil. They have plinthite in the lower part of the subsoil. Included soils make up less than 15 percent of the map unit.

The Sorter and Dallardsville soils are mainly used for timber production. Loblolly pine and sweetgum grow well in areas of the Dallardsville soil. Water oak and willow oak are the dominant trees in areas of the wet, poorly drained Sorter soil. The main species grown for commercial use on both soils is loblolly pine. The wetness is a limitation affecting the production of pine. It makes harvest difficult. Bedding can improve the survival of seedlings in the poorly drained areas. Competing vegetation may need to be controlled to establish stands of pine trees.

These soils are moderately suited to pasture and hayland. Bahiagrass and common bermudagrass are the most suitable species. Applications of fertilizer and lime and proper grazing management are needed for maximum production of forage.

This unit is poorly suited to urban uses. The main limitation is the wetness. This limitation can be partially overcome by proper design and installation.

The Sorter soil is in capability subclass IVw, and the Dallardsville soil is in capability subclass IIw. The woodland ordination symbol is 9W for both soils.

**Sk—Sorter-Kirbyville complex.** These nearly level soils are in mounded areas of the flatwoods. Areas are broad and irregular in shape. They range from 40 to 1,200 acres in size. Slopes are 0 to 1 percent.

The Sorter soil is on low intermounds. It makes up about 55 percent of the unit. The Kirbyville soil is on circular mounds that are 100 to 200 feet apart, 20 to 60 feet across, and 2 to 4 feet higher than the surrounding soils. It makes up about 35 percent of the unit. These soils occur as areas so intricately mixed that mapping them separately is not practical at the scale used.

Typically, the surface layer of the Sorter soil is friable, very strongly acid, grayish brown silt loam about 4 inches thick. The subsurface layer, from a depth of 4 to 10 inches, is friable, very strongly acid, light brownish gray silt loam. The upper part of the subsoil, from a depth of 10 to 31 inches, is friable, very strongly acid, grayish brown silt loam that has brown and yellowish brown mottles. The lower part, from a depth of 31 to 60 inches, is friable, very strongly acid, light brownish gray silt loam that has brown and yellowish brown mottles.

The Sorter soil is poorly drained. Permeability is slow. The available water capacity is high. A perched water table is generally within a depth of 2.5 feet, or the soil is ponded during the fall, winter, or spring. The hazard of water erosion is slight.

Typically, the surface layer of the Kirbyville soil is friable, very strongly acid, brown fine sandy loam about 5 inches thick. The subsurface layer, to a depth of 12 inches, is friable, strongly acid, dark yellowish brown fine sandy loam that has mottles in shades of brown. The subsoil, from a depth of 12 to 60 inches, is firm, very strongly acid, yellowish brown sandy clay loam that has mottles in shades of red and brown.

The Kirbyville soil is somewhat poorly drained. Surface runoff is slow, and permeability is moderate. The available water capacity is high. A perched water table is generally at a depth of 1.5 to 2.5 feet during the winter. The hazard of water erosion is slight.

Included with this soil in mapping are small areas of Dallardsville and Otanya soils. Dallardsville soils are in landscape positions similar to those of the Kirbyville

soil. They are loamy throughout. Otanya soils are in the slightly higher positions on the landscape. They do not have gray mottles within a depth of 30 inches. Included soils make up less than 10 percent of the map unit.

The Sorter and Kirbysville soils are mainly used for timber production. They are well suited to loblolly pine, slash pine, sweetgum, and water oak. The wetness is a limitation affecting the operation of equipment for harvesting or planting. The seedling mortality rate in areas of the poorly drained Sorter soil may be high. Bedding can improve the survival of seedlings. Competing vegetation may need to be controlled to establish stands of pine trees.

These soils are moderately suited to pasture and hayland. Bahiagrass and common bermudagrass are the most suitable species. Applications of fertilizer and lime and good grazing management are needed for maximum production of forage. The wetness and ponding are limitations affecting production. Installing a drainage system can help to overcome these limitations.

This unit is poorly suited to urban uses because of the wetness, the ponding, and the slow permeability. These limitations can be partially overcome by proper design and installation.

The Sorter soils are in capability subclass IVw, and the Kirbyville soils are in capability subclass IIw. The woodland ordination symbol is 9W in areas of the Sorter soil and 11W in areas of the Kirbyville soil.

**Sp—Splendora fine sandy loam.** This nearly level soil is in broad areas of the flatwoods. Areas are irregular in shape. They range from 20 to 1,700 acres in size. Slopes are 0 to 1 percent.

Typically, the surface layer is very friable, strongly acid, dark grayish brown fine sandy loam about 6 inches thick. The subsurface layer, from a depth of 6 to 18 inches, is very friable, strongly acid, very pale brown fine sandy loam that has mottles in shades of yellow and brown. The upper part of the subsoil, from a depth of 18 to 31 inches, is firm, very strongly acid, brownish yellow sandy clay loam that has mottles in shades of gray and yellow. The next part, from a depth of 31 to 42 inches, is firm, very strongly acid, light yellowish brown sandy clay loam that has mottles in shades of red, gray, and yellow. The lower part, from a depth of 42 to 60 inches, is firm, very strongly acid, brownish yellow sandy clay loam that has mottles in shades of red, gray, and yellow.

This soil is somewhat poorly drained. Surface runoff and permeability are slow. The available water capacity is moderate. A perched water table is generally at a depth of 0.5 foot to 2.0 feet during the winter and spring. The hazard of water erosion is slight.

Included with this soil in mapping are small areas of Hockley, Segno, Sorter, Waller, and Wockley soils. Hockley and Segno soils are in the slightly higher positions on the landscape. They do not have gray mottles. Wockley soils are in landscape positions similar to those of the Splendora soil. They are not brittle in the subsoil. Sorter and Waller soils are in the slightly lower positions on the landscape. They are gray throughout. Included soils make up less than 20 percent of the map unit.

The Splendora soil is mainly used for timber production. It is well suited to loblolly pine and slash pine and to hardwoods, such as sweetgum, water oak, and southern red oak, grown for commercial use. The wetness is a limitation affecting the seedling mortality rate. It also is a limitation affecting the operation of equipment for harvesting or planting.

This soil is moderately suited to pasture and hayland. Bahiagrass and common bermudagrass are the most suitable species. Applications of fertilizer and lime and good grazing management are needed for maximum production of forage.

This soil is poorly suited to urban uses because of the wetness. This limitation can be partially overcome by proper design and installation.

This soil is in capability subclass IIw, and the woodland ordination symbol is 9W.

**SrB—Spurger fine sandy loam, 0 to 2 percent slopes.** This nearly level and very gently sloping soil is on low ridges of stream terraces along the flood plains of the Trinity River and large local streams. Areas are generally oblong. They range from 10 to 1,500 acres in size.

Typically, the surface layer is very friable, slightly acid, dark brown fine sandy loam about 3 inches thick. The subsurface layer, from a depth of 3 to 12 inches, is very friable, slightly acid, brown fine sandy loam that has reddish yellow mottles. The subsoil extends to a depth of 60 inches. From a depth of 12 to 24 inches, it is firm, moderately acid and strongly acid, yellowish red clay that has mottles in shades of red, brown, yellow, and gray; from a depth of 24 to 35 inches, it is firm, very strongly acid, yellowish red clay loam that has mottles in shades of red and brown; from a depth of 35 to 42 inches, it is firm, very strongly acid, mottled light brownish gray, red, and strong brown sandy clay loam; from a depth of 42 to 50 inches, it is firm, very strongly acid, strong brown sandy clay loam that has red and light gray mottles; and from a depth of 50 to 60 inches, it is loose, slightly acid, light gray loamy sand that has yellowish brown mottles.

This soil is moderately well drained. Surface runoff is medium, and permeability is slow. The available water

capacity is high. A perched water table is generally at a depth of 2.5 to 3.5 feet during the winter. The hazard of water erosion is moderate.

Included with this soil in mapping are small areas of Alaga, Bienville, Kaman, Kenefick, and Waller soils. Alaga, Bienville, and Kenefick soils are in the slightly higher positions on the landscape. Alaga and Bienville soils are sandy throughout. Kenefick soils do not have gray mottles within a depth of 30 inches. Waller soils are in the lower positions on the landscape. They are gray throughout. Kaman soils are on flood plains along streams. They are clayey throughout. Included soils make up less than 20 percent of the map unit.

The Spurger soil is mainly used as pasture and hayland. Bahiagrass and common bermudagrass are the most suitable species. Applications of fertilizer and lime and good grazing management are needed for maximum production of forage.

This soil is well suited to loblolly pine and slash pine and to trees, such as sweetgum and southern red oak, grown for commercial use. Wetness is a limitation affecting the operation of equipment for harvesting or planting. Competing vegetation may need to be controlled to establish stands of pine trees.

This soil is moderately suited to most urban uses because of the shrink-swell potential, the wetness, and low strength. These limitations can be partially overcome by proper design and installation.

This soil is in capability subclass IIIe, and the woodland ordination symbol is 11W.

**SwB—Spurger-Waller complex, 0 to 2 percent slopes.** These nearly level and very gently sloping soils are on stream terraces. Areas are broad and irregular in shape. They range from about 50 to 300 acres in size.

The Spurger soil is on very gently sloping ridges that are 30 to 100 feet across and 2 to 4 feet higher than the surrounding soils. It makes up about 60 percent of the unit. The Waller soil is in broad, nearly level and depressional areas. It makes up about 30 percent of the unit. These soils occur as areas so intricately mixed that mapping them separately is not practical at the scale used.

Typically, the surface layer of the Spurger soil is very friable, moderately acid, dark yellowish brown fine sandy loam about 3 inches thick. The subsurface layer, from a depth of 3 to 12 inches, is friable, moderately acid, yellowish brown fine sandy loam. The subsoil extends to a depth of 80 inches. From a depth of 12 to 33 inches, it is firm, very strongly acid, red clay that has gray, brown, and yellow mottles; from a depth of 33 to 52 inches, it is firm, very strongly acid, strong brown sandy clay loam that has mottles in shades of gray,

brown, and yellow; from a depth of 52 to 60 inches, it is firm, strongly acid, yellowish brown sandy clay loam that has mottles in shades of brown and gray; and from a depth of 60 to 80 inches, it is very friable, strongly acid brownish yellow loamy sand that has mottles in shades of brown.

The Spurger soil is moderately well drained. Surface runoff is medium, and permeability is slow. The available water capacity is high. A perched water table is generally at a depth of 2.5 to 3.5 feet during the winter. The hazard of water erosion is moderate.

Typically, the surface layer of the Waller soil is firm, strongly acid, dark grayish brown loam that has mottles in shades of brown. It is about 5 inches thick. The upper part of the subsoil, from a depth of 5 to 35 inches, is firm, strongly acid, grayish brown and dark gray loam that has mottles in shades of brown and yellow. The lower part, from a depth of 35 to 60 inches, is very firm, moderately acid, grayish brown clay loam that has mottles in shades of brown and yellow.

The Waller soil is poorly drained. Surface runoff and permeability are slow. The available water capacity is high. A perched water table is generally within a depth of 2.5 feet during the fall, winter, and spring. The hazard of water erosion is slight.

Included with this soil in mapping are small areas of Alaga, Bienville, and Kenefick soils. Alaga and Bienville soils are in the slightly higher positions on the landscape. They are sandy throughout. Kenefick soils are in landscape positions similar to those of the Spurger soil. They do not have gray mottles. Included soils make up less than 10 percent of the map unit.

The Spurger and Waller soils are mainly used for pasture. Bahiagrass and common bermudagrass are moderately suited to these soils. Applications of fertilizer and lime can increase forage yields. Wetness is the major limitation affecting pasture production.

Loblolly pine and sweetgum grow well in areas of the Spurger soil. Water oak and willow oak are the dominant trees in areas of the wet, poorly drained Waller soil. The main species grown for commercial use on both soils is loblolly pine. The wetness is a limitation affecting the production of pine. It makes harvest difficult. The seedling mortality rate may be high in areas of the poorly drained Waller soil. Bedding can improve the survival of pine seedlings.

This unit is poorly suited to urban uses because of the wetness. This limitation can be partially overcome by proper design and installation.

The Spurger soil is in capability subclass IIIe, and the Waller soil is in capability subclass IVw. The woodland ordination symbol is 11W in areas of the Spurger soil and 9W in areas of the Waller soil.

**VaA—Vamont silty clay, 0 to 1 percent slopes.** This nearly level soil is on uplands and stream terraces. Areas are broad and irregular in shape. They range from 15 to 1,200 acres in size.

Typically, the surface layer is firm, very strongly acid, dark grayish brown silty clay about 3 inches thick. The upper part of the subsoil, from a depth of 3 to 11 inches, is very firm, very strongly acid, mottled brownish yellow and grayish brown clay. The next part, from a depth of 11 to 47 inches, is extremely firm, very strongly acid, light brownish gray clay that has strong brown mottles. The lower part, from a depth of 47 to 60 inches, is extremely firm, moderately acid, grayish brown clay. Mottles are in shades of brown and red.

This soil is somewhat poorly drained. Surface runoff is slow, and permeability is very slow. The available water capacity is high. An apparent water table is generally at a depth of 1.5 to 3.0 feet during the fall and winter. The hazard of water erosion is slight.

Included with this soil in mapping are small areas of Beaumont, Dylan, Lake Charles, and Verland soils. Lake Charles soils are in landscape positions similar to those of the Vamont soil. They have a thick, very dark gray surface layer. Beaumont and Verland soils are in the slightly lower positions on the landscape. They are dominantly gray throughout. Also, Verland soils have a loamy surface layer. Dylan soils are on side slopes along drainageways. They are alkaline. Included soils make up less than 15 percent of the map unit.

The Vamont soil is mainly used for timber production. It is well suited to loblolly pine and to hardwoods, such as sweetgum, willow oak, and green ash, grown for commercial use. Seedling mortality and plant competition are moderate limitations. The wetness is a limitation affecting the operation of equipment for planting and harvesting.

This soil is well suited to pasture and hayland. Bahiagrass and common bermudagrass are the most suitable species. Applications of fertilizer and lime and good grazing management are needed for maximum production of forage.

If this soil is used as cropland, it is well suited to rice and soybeans in areas where adequate drainage outlets are available. The soil is well suited to rice because it is very slowly permeable. Little land leveling is needed to evenly flood the soil. A well designed system of surface water management includes planting rows in the proper direction to take advantage of the natural slope, installing a drainage system, land leveling, and irrigating. Incorporating crop residue into the surface layer helps to maintain good tilth. Applications of fertilizer are needed for maximum crop production.

This soil is poorly suited to urban uses. The main limitations are the wetness, low strength, and the

shrink-swell potential. These limitations can be partially overcome by proper design and installation.

This soil is in capability subclass IIIw and the Blackland range site. The woodland ordination symbol is 9W.

**VaB—Vamont clay, 1 to 3 percent slopes.** This very gently sloping soil is on broad uplands. Areas are irregular in shape. They range from 25 to 500 acres in size.

Typically, the surface layer is very firm, strongly acid, very dark grayish brown clay about 3 inches thick. The subsoil extends to a depth of 60 inches. From a depth of 3 to 8 inches, it is very firm, strongly acid, pale brown clay that has mottles in shades of gray and brown; from a depth of 8 to 23 inches, it is very firm, strongly acid, yellowish brown clay that has light gray and strong brown mottles; from a depth of 23 to 35 inches, it is very firm, strongly acid, light gray clay that has strong brown and yellowish brown mottles; from a depth of 35 to 44 inches, it is very firm, slightly acid, yellowish brown clay that has mottles in shades of gray and brown; and from a depth of 44 to 60 inches, it is very firm, slightly alkaline, light olive brown clay that has gray and brownish yellow mottles.

This soil is somewhat poorly drained. Surface runoff is medium, and permeability is very slow. The available water capacity is high. An apparent water table is generally at a depth of 1.5 to 3.0 feet during the fall and winter. The hazard of water erosion is moderate.

Included with this soil in mapping are small areas of Aldine, Dylan, and Lake Charles soils. Lake Charles soils are in landscape positions similar to those of the Vamont soil. They have a very dark gray surface layer. Aldine soils are in the slightly lower positions on the landscape. They have a loamy surface layer. Dylan soils are on side slopes along drainageways. They are more alkaline than the Vamont soil. Included soils make up less than 15 percent of the map unit.

The Vamont soil is mainly used for timber production. It is well suited to loblolly pine and to hardwoods, such as sweetgum, willow oak, and green ash, grown for commercial use. Seedling mortality and plant competition are moderate limitations. The wetness is a limitation affecting the operation of equipment for planting and harvesting.

Soybeans is the major crop grown on this soil. Applications of fertilizer and lime are needed for good yields. Constructing terraces and farming on the contour can help to control erosion.

This soil is well suited to pasture and hayland. Bahiagrass and common bermudagrass are the most suitable species. Applications of fertilizer and lime and

good grazing management are needed for maximum production of forage.

This soil is poorly suited to urban uses. The main limitations are the wetness, low strength, and the shrink-swell potential. These limitations can be partially overcome by proper design and installation.

This soil is in capability subclass IIIe and the Blackland range site. The woodland ordination symbol is 9W.

**Vd—Vamont silty clay, depressional.** This nearly level soil is in broad areas of the coast prairie. Areas are irregular in shape. They range from 50 to 5,000 acres in size. Slopes are 0 to 1 percent.

Typically, the surface layer is very firm, moderately acid, very dark grayish brown silty clay about 3 inches thick. The upper part of the subsoil, from a depth of 3 to 13 inches, is very firm, very strongly acid, pale brown clay that has red and yellowish brown mottles. The lower part, from a depth of 13 to 60 inches, is extremely firm, very strongly acid, light brownish gray clay that has red and yellowish brown mottles.

This soil is poorly drained. Permeability is very slow. The available water capacity is high. An apparent water table is generally within a depth of 1 foot, or the soil is ponded during the fall, winter, and spring. The hazard of water erosion is slight.

Included with this soil in mapping are small areas of Beaumont and Verland soils. These soils are in the slightly lower positions on the landscape. Beaumont soils have darker colors than the Vamont soil. Verland soils have a surface layer of clay loam. Included soils make up less than 10 percent of the map unit.

The Vamont soil is mainly used for timber production. Loblolly pine, water oak, and willow oak grow well. It is very difficult to reestablish loblolly pines because of the wetness and plant competition.

This soil is poorly suited to most urban uses because of the wetness and the shrink-swell potential. These limitations can be partially overcome by proper design and installation.

This soil is in capability subclass IVw and the Lowland range site.

**Ve—Verland clay loam.** This nearly level soil is in plane to slightly concave areas of the coast prairie. Areas are irregular in shape. They range from 50 to 500 acres in size. Slopes are 0 to 1 percent.

Typically, the surface layer is firm, moderately acid, grayish brown clay loam about 3 inches thick. The upper part of the subsoil, from a depth of 3 to 27 inches, is very firm, moderately acid, light brownish gray clay that has strong brown and reddish yellow mottles. The lower part, from a depth of 27 to 60 inches, is very

firm, moderately acid, gray clay that has mottles in shades of brown, red, yellow, and gray.

This soil is somewhat poorly drained. Surface runoff is slow, and permeability is very slow. The available water capacity is high. An apparent water table is generally within 1 foot of the surface during the winter and spring. The hazard of water erosion is slight.

Included with this soil in mapping are small areas of Aldine and Vamont soils. Aldine soils are on pimple mounds. They have a surface layer that is not so clayey as that of the Verland soil. Vamont soils are in the slightly higher positions on the landscape. They have subsoil colors in shades of brown, yellow, and gray. Included soils make up less than 15 percent of the map unit.

The Verland soil is mainly used as cropland. It is well suited to rice and soybeans if adequate drainage outlets are available. The soil is well suited to rice because it is very slowly permeable. Little land leveling is needed to evenly flood the soil. A well designed system of surface water management includes planting rows in the proper direction to take advantage of the natural slope, installing a drainage system, land leveling, and irrigating. Incorporating crop residue into the surface layer helps to maintain good tilth. Applications of fertilizer are needed for maximum crop production.

In areas where the Verland soil is used for timber production, hardwoods are dominant. If the site is adequately prepared and competing vegetation is controlled, the soil is moderately suited to loblolly pine. The wetness is a limitation affecting the operation of equipment for planting and harvesting.

This soil is moderately suited to pasture and hayland. Bahiagrass and common bermudagrass are the most suitable species. The main limitation is the wetness. Applications of fertilizer and lime and good grazing management are needed for maximum production of forage.

This soil is poorly suited to urban uses. The main limitations are the wetness, the shrink-swell potential, and low strength. These limitations can be partially overcome by proper design and installation.

This soil is in capability subclass IVw and the Lowland range site. The woodland ordination symbol is 8W.

**Vo—Voss fine sand, occasionally flooded.** This nearly level soil is along the flood plain of the Trinity River and other large streams. Areas are generally long and narrow. They range from 50 to 500 acres in size. Slopes are 0 to 1 percent.

Typically, the surface layer is loose, neutral, dark grayish brown fine sand about 3 inches thick. The underlying material, to a depth of 60 inches, is loose,

neutral fine sand. It is pale brown from a depth of 3 to 9 inches, light brownish gray from a depth of 9 to 34 inches, and light gray from a depth of 34 to 60 inches.

This soil is moderately well drained. Surface runoff is slow, and permeability is rapid. The available water capacity is very low. An apparent water table is generally at a depth of 2 to 5 feet during the fall, winter, and spring. The soil is flooded once every 2 to 10 years for brief periods. The hazard of water erosion is slight.

Included with this soil in mapping are small areas of Mantachie soils. Mantachie soils are in the slightly lower positions on the landscape. They are loamy. They make up less than 15 percent of the map unit.

The Voss soil is mainly used for timber production. It is moderately suited to loblolly pine, cottonwood, sycamore, and red oak.

This soil is moderately suited to pasture and hayland. Bahiagrass or common bermudagrass are the most suitable species. Applications of fertilizer and good grazing management are needed for maximum production of forage.

This soil is poorly suited to urban uses. The main limitations are flooding, wetness, and excessive drainage.

This soil is in capability subclass IVw, and the woodland ordination symbol is 9W.

**Vs—Voss fine sand, frequently flooded.** This nearly level soil is along the flood plain of the Trinity River and major streams. Areas are generally long and narrow. They range from 20 to 150 acres in size. Slopes are 0 to 1 percent.

Typically, the surface layer is loose, neutral, grayish brown fine sand about 4 inches thick. The underlying material, from a depth of 4 to 60 inches, is loose, neutral, pale brown fine sand.

This soil is moderately well drained. Surface runoff is slow, and permeability is rapid. The available water capacity is very low. An apparent water table is generally at a depth of 2 to 5 feet during the fall, winter, and spring. The soil is frequently flooded for long periods. The hazard of water erosion is slight.

Included with this soil in mapping are small areas of Mantachie soils. Mantachie soils are in the slightly lower positions on the landscape. They are loamy. They make up less than 15 percent of the map unit.

The Voss soil is mainly used for recreational development. Some areas are used as a source of sand for golf courses, highway construction, and concrete fill.

This soil is moderately suited to loblolly pine and to hardwoods, such as cottonwood, sycamore, black willow, and green ash, grown for commercial use. The very low available water capacity and low natural fertility

are limitations affecting seedling mortality. The deep sandy texture is a limitation affecting the operation of equipment for harvesting or planting.

This soil is poorly suited to urban uses because of the frequent flooding.

This soil is in capability subclass VIw, and the woodland ordination symbol is 9W.

**Wa—Waller loam.** This nearly level soil is in broad areas of the flatwoods. Areas are irregular in shape. They range from 20 to 2,200 acres in size. Slopes are 0 to 1 percent.

Typically, the surface layer is very friable, very strongly acid, grayish brown loam about 8 inches thick. The subsurface layer, from a depth of 8 to 22 inches, is very friable, strongly acid, light brownish gray loam that has grayish brown and yellowish brown mottles. The upper part of the subsoil, from a depth of 22 to 36 inches, is very firm, strongly acid, grayish brown clay loam that has yellowish brown mottles. The lower part, from a depth of 36 to 60 inches, is very firm, very strongly acid, grayish brown clay loam that has yellowish brown mottles.

This soil is poorly drained. Surface runoff and permeability are slow. The available water capacity is high. A perched water table is generally within a depth of 2.5 feet during the fall, winter, and spring. The hazard of water erosion is slight.

Included with this soil in mapping are small areas of Dallardsville, Kirbyville, and Splendora soils. These soils are in the slightly higher positions on the landscape. They are better drained than the Waller soil. They have colors mostly in shades of yellow and brown. Included soils make up less than 20 percent of the map unit.

The Waller soil is mainly used for hardwood and pine production. Hardwoods are the dominant trees. The main species of hardwoods are willow oak, water oak, green ash, and sweetgum. The seedling mortality rate of pines is high because of the prolonged wetness. Seedlings grow well once they are established. The wetness is the main limitation affecting the production and harvest of timber.

The wetness is the major limitation affecting pasture and hayland. Bahiagrass and common bermudagrass are the most suitable species. Applications of fertilizer and lime and good grazing management are needed for maximum production of forage.

The Waller soil is poorly suited to urban uses. The wetness is the main limitation. This limitation can be partially overcome by proper design and installation.

This soil is in capability subclass IVw, and the woodland ordination symbol is 9W.

**Wc—Waller loam, depressional.** This nearly level soil is in depressions of the flatwoods. Areas are round or elongated. They range from 10 to 80 acres in size. Slopes are 0 to 1 percent.

Typically, the surface layer is very friable, strongly acid, grayish brown loam about 8 inches thick. The subsurface layer, from a depth of 8 to 12 inches, is very friable, strongly acid, light brownish gray fine sandy loam. The upper part of the subsoil, from a depth of 12 to 22 inches, is firm, strongly acid, light brownish gray clay loam. The lower part, from a depth of 22 to 60 inches, is firm, strongly acid, grayish brown clay loam that has yellowish brown and strong brown mottles.

This soil is poorly drained. Permeability is slow. The available water capacity is high. A perched water table is generally within a depth of 1 foot, or the soil is ponded during the fall, winter, and spring. The hazard of water erosion is slight.

Included with this soil in mapping are small areas of Sorter soils. Sorter soils are in landscape positions similar to those of the Waller soil. Also, they have a less clayey subsoil. Included soils make up less than 10 percent of the map unit.

The Waller soil is mainly used for wildlife habitat. Mixed hardwoods are the dominant trees.

This soil is poorly suited to urban uses because of the wetness. This limitation can be partially overcome by proper design and installation.

This soil is in capability subclass Vlw.

**Wd—Waller-Dallardsville complex.** These nearly level soils are in broad mounded areas of stream terraces and the flatwoods. Areas are irregular in shape. They range from 30 to 500 acres in size. Slopes are 0 to 1 percent.

The Waller soil is in nearly level and depressional areas. It makes up about 50 percent of the unit. The Dallardsville soil is on mounds. It makes up about 35 percent of the unit. These soils occur as areas so intricately mixed that mapping them separately is not practical at the scale used.

Typically, the surface layer of the Waller soil is friable, very strongly acid, grayish brown loam about 2 inches thick. The subsurface layer, from a depth of 2 to 6 inches, is friable, very strongly acid, light brownish gray loam. The subsoil extends to a depth of 60 inches. From a depth of 6 to 16 inches, it is firm, strongly acid, light gray sandy clay loam that has strong brown and yellowish brown mottles; from a depth of 16 to 30 inches, it is firm, strongly acid, light brownish gray clay loam that has strong brown and red mottles; from a depth of 30 to 42 inches, it is firm, strongly acid, light gray sandy clay loam that has strong brown and red mottles; and from a depth of 42 to 60 inches, it is firm,

very strongly acid, light brownish gray sandy clay loam that has red and strong brown mottles.

The Waller soil is poorly drained. Surface runoff and permeability are slow. The available water capacity is high. A perched water table is generally within a depth of 2.5 feet during the fall, winter, and spring. The hazard of water erosion is slight.

Typically, the surface layer of the Dallardsville soil is very friable, strongly acid, dark brown fine sandy loam about 4 inches thick. The upper part of the subsurface layer, from a depth of 4 to 13 inches, is very friable, very strongly acid, dark brown fine sandy loam. The lower part, from a depth of 13 to 27 inches, is very friable, very strongly acid, yellowish brown fine sandy loam. The upper part of the subsoil, from a depth of 27 to 47 inches, is very friable, very strongly acid, brownish yellow loam that has mottles in shades of red, gray, and yellow. The lower part, from a depth of 47 to 72 inches, is firm, very strongly acid, light brownish gray sandy clay loam that has mottles in shades of red and brown.

The Dallardsville soil is somewhat poorly drained. Surface runoff is slow, and permeability is moderately slow. The available water capacity is moderate. A perched water table is generally at a depth of 1 to 2 feet during the winter and spring. The hazard of water erosion is slight.

Included with this soil in mapping are small areas of Kirbyville and Otanya soils. Otanya soils are in the slightly higher positions on the landscape. They do not have gray mottles within a depth of 30 inches. Kirbyville soils are in the slightly higher positions on the landscape. They have plinthite in the subsoil. Included soils make up less than 15 percent of the map unit.

The Waller and Dallardsville soils are mainly used for timber production. They are well suited to loblolly pine and slash pine and to hardwoods, such as water oak, willow oak, sweetgum, and green ash, grown for commercial use. Competing vegetation may need to be controlled to establish stands of pine trees.

These soils are moderately suited to pasture and hayland. Bahiagrass and common bermudagrass are the most suitable species. Applications of fertilizer and lime and good grazing management are needed for maximum production of forage.

These soils are poorly suited to urban uses because of the wetness. This limitation can be partially overcome by proper design and installation.

The Waller soils are in capability subclass IVw, and the Dallardsville soils are in capability subclass IIw. The woodland ordination symbol is 9W for both soils.

**Wk—Waller-Kirbyville complex.** These nearly level soils are in broad mounded areas of the flatwoods. Areas are irregular in shape. They range from 100 to

6,000 acres in size. Slopes are 0 to 1 percent.

The Waller soil is in nearly level and depressional areas. It makes up about 50 percent of the unit. The Kirbyville soil is on mounds that are 2 to 4 feet higher than the surrounding soils. It makes up about 35 percent of the unit. These soils occur as areas so intricately mixed that mapping them separately is not practical at the scale used.

Typically, the surface layer of the Waller soil is very friable, very strongly acid, grayish brown loam that has faint yellowish brown mottles. It is about 5 inches thick. The subsurface layer, from a depth of 5 to 23 inches, is very friable, strongly acid, grayish brown loam that has faint yellowish brown mottles. The upper part of the subsoil, from a depth of 23 to 44 inches, is firm, very strongly acid, grayish brown clay loam that has gray and yellowish brown mottles. The lower part, from a depth of 44 to 60 inches, is firm, very strongly acid, dark yellowish brown clay loam that has gray and yellowish brown mottles.

The Waller soil is poorly drained. Surface runoff and permeability are slow. The available water capacity is high. A perched water table is generally within a depth of 2.5 feet during the fall, winter, and spring. The hazard of water erosion is slight.

Typically, the surface layer of the Kirbyville soil is very friable, strongly acid, brown fine sandy loam about 10 inches thick. The subsurface layer, from a depth of 10 to 21 inches, is very friable, strongly acid light yellowish brown fine sandy loam. The upper part of the subsoil, from a depth of 21 to 28 inches, is firm, strongly acid, yellowish brown sandy clay loam that has faint yellowish brown mottles. The lower part, from a depth of 28 to 60 inches, is very firm, very strongly acid, yellowish brown sandy clay loam that has mottles in shades of gray, brown, yellow, and red.

The Kirbyville soil is somewhat poorly drained. Surface runoff is slow, and permeability is moderate. The available water capacity is high. A perched water table is generally at a depth of 1.5 to 2.5 feet during the winter and spring. The hazard of water erosion is slight.

Included with these soils in mapping are small areas of Dallardsville and Otanya soils. Dallardsville and Otanya soils are in the slightly higher positions on the landscape. Dallardsville soils are fine sandy loam throughout. Otanya soils do not have gray mottles within a depth of 30 inches. Included soils make up less than 15 percent of the mapped area.

The Waller and Kirbyville soils are mainly used for timber production. They are well suited to loblolly pine and to hardwoods, such as sweetgum, water oak, and green ash, grown for commercial use. The wetness is a limitation affecting the operation of equipment for harvesting or planting. The seedling mortality rate is

high because of the prolonged wetness. Seedlings grow well once they are established. Competing vegetation may need to be controlled to establish stands of pine trees.

These soils are well suited to pasture and hayland. Bahiagrass and common bermudagrass are the most suitable species. Applications of fertilizer and lime and good grazing management are important for maximum production.

These soils are poorly suited to urban uses because of the wetness. This limitation can be partially overcome by proper design and installation.

The Waller soil is in capability subclass IVw, and the Kirbyville soil is in capability subclass IIw. The woodland ordination symbol is 9W in areas of the Waller soil and 11W in areas of the Kirbyville soil.

**Wn—Waller-Splendora complex.** These nearly level soils are on mounds of the flatwoods. Areas are irregular in shape. They range from 50 to 1,000 acres in size. Slopes are 0 to 1 percent.

The Waller soil is in nearly level areas. It makes up about 55 percent of the unit. The Splendora soil is on mounds and ridges that are 1 to 3 feet higher than the surrounding soils. It makes up about 30 percent of the unit. These soils occur as areas so intricately mixed that mapping them separately is not practical at the scale used.

Typically, the surface layer of the Waller soil is very friable, strongly acid, grayish brown loam about 3 inches thick. It has gray and yellowish brown mottles. The subsurface layer, from a depth of 3 to 12 inches, is very friable, strongly acid, grayish brown loam that has yellowish brown mottles. The upper part of the subsoil, from a depth of 12 to 34 inches, is firm, strongly acid, grayish brown sandy clay loam that has yellowish brown mottles. The next part, from a depth of 34 to 55 inches, is very firm, very strongly acid, light gray sandy clay loam that has mottles in shades of yellow, brown, and gray. The lower part, from a depth of 55 to 60 inches, is very firm, very strongly acid clay loam that has mottles in shades of yellow, brown, and gray.

The Waller soil is poorly drained. Surface runoff and permeability are slow. The available water capacity is high. A perched water table is generally within a depth of 2.5 feet during the fall, winter, and spring. The hazard of water erosion is slight.

Typically, the surface layer of the Splendora soil is very friable, strongly acid, dark grayish brown fine sandy loam about 8 inches thick. The upper part of the subsurface layer, from a depth of 8 to 28 inches, is very friable, strongly acid, brown fine sandy loam that is mottled in shades of gray, brown, and yellow. The next part, from a depth of 28 to 43 inches, is firm, very

strongly acid, brown sandy clay loam that is mottled in shades of gray, brown, and yellow. The lower part, from a depth of 43 to 72 inches, is very firm, very strongly acid, grayish brown clay loam that has yellowish brown mottles. Brittle masses make up 25 to 50 percent of the lower part.

The Splendora soil is somewhat poorly drained. Surface runoff and permeability are slow. The available water capacity is moderate. A perched water table is generally at a depth of 0.5 foot to 2.0 feet during the winter and spring. The hazard of water erosion is slight.

Included with this soil in mapping are small areas of Dallardsville, Hockley, Segno, and Wockley soils. These soils are in the slightly higher positions on the landscape. Dallardsville soils are slightly better drained than the Waller and Splendora soils. Wockley, Hockley, and Segno soils have plinthite in the subsoil.

The Waller and Splendora soils are mainly used for timber production. They are well suited to loblolly pine and slash pine and to hardwoods, such as sweetgum, willow oak, and green ash, grown for commercial use. The wetness is a limitation affecting the operation of equipment for harvesting or planting. The seedling mortality rate is high because of the prolonged wetness. Competing vegetation may need to be controlled to establish stands of pine trees.

These soils are moderately suited to pasture and hayland. Bahiagrass and common bermudagrass are the most suitable species. The wetness is the major limitation. Applications of fertilizer and lime and good grazing management are needed for maximum production of forage.

These soils are poorly suited to urban uses because of the wetness. This limitation can be partially overcome by proper design and installation.

The Waller soils are in capability subclass IVw, and the Splendora soil is in capability subclass IIw. The woodland ordination symbol is 9W for both soils.

**Wo—Wockley fine sandy loam.** This nearly level soil is in broad, plane to slightly concave areas of the flatwoods. Areas are irregular in shape. They range from 25 to 150 acres in size. Slopes are 0 to 1 percent.

Typically, the surface layer of the Wockley soil is very friable, strongly acid, brown fine sandy loam about 4 inches thick. The subsurface layer, from a depth of 4 to 28 inches, is very friable, strongly acid, pale brown fine sandy loam. The upper part of the subsoil, from a depth of 28 to 50 inches, is firm, moderately acid and slightly acid, yellowish brown sandy clay loam that has gray and brownish yellow mottles. The lower part, from a depth of 50 to 60 inches, is firm, strongly acid, mottled reddish yellow, light gray, and yellowish red sandy clay loam that has plinthite.

This soil is somewhat poorly drained. Surface runoff is slow, and permeability is moderately slow. The available water capacity is high. A perched water table is generally within a depth of 2 feet during the fall and winter. The hazard of water erosion is slight.

Included with this soil in mapping are small areas of Dallardsville, Hockley, Segno, Splendora, and Waller soils. Hockley, Segno, and Dallardsville soils are in the slightly higher positions on the landscape. Hockley and Segno soils do not have gray mottles within a depth of 30 inches. Dallardsville soils are fine sandy loam throughout. Splendora soils are in the slightly lower positions on the landscape. They have a brittle subsoil. Waller soils are in depressions. They are gray throughout. Included soils make up less than 20 percent of the map unit.

The Wockley soil is mainly used for timber production. It is well suited to loblolly pine and slash pine and to hardwoods, such as sweetgum and southern red oak, grown for commercial use. The wetness is a limitation affecting the operation of equipment for harvesting or planting.

This soil is well suited to pasture and hayland. Bahiagrass and common bermudagrass are the most suitable species. Applications of fertilizer and lime and good grazing management are needed for maximum production of forage.

This soil is poorly suited to urban uses because of the wetness. These problems can be partially overcome by proper design and installation.

This soil is in capability subclass IIIw, and the woodland ordination symbol is 9W.

**WvB—Woodville fine sandy loam, 1 to 3 percent slopes.** This very gently sloping soil is on broad uplands. Areas are irregular in shape. They range from 25 to 150 acres in size.

Typically, the surface layer is friable, moderately acid, brown fine sandy loam about 6 inches thick. The subsurface layer, from a depth of 6 to 11 inches, is friable, strongly acid, very pale brown loam that has brownish yellow mottles. The upper part of the subsoil, from a depth of 11 to 19 inches, is firm, very strongly acid, red clay that has pale brown and yellow mottles. The lower part, from a depth of 19 to 60 inches, is firm, very strongly acid, mottled red, reddish yellow, pale brown, very pale brown, and brownish yellow clay.

This soil is somewhat poorly drained. Surface runoff is medium, and permeability is very slow. The available water capacity is moderate. A perched water table is generally at a depth of 2.5 to 4.0 feet during the winter. The hazard of water erosion is moderate.

Included with this soil in mapping are small areas of Dylan and Vamont soils. Dylan soils are on side slopes

below the Woodville soil. They are more alkaline than the Woodville soil. Vamont soils are in the slightly lower, nearly level positions on the landscape. They are clayey throughout. Included soils make up less than 15 percent of the map unit.

The Woodville soil is mainly used for timber production. It is well suited to loblolly pine and slash pine and to hardwoods, such as sweetgum and cherrybark oak, grown for commercial use. The wetness and low strength are moderate limitations affecting the operation of equipment for harvesting. Competing vegetation may need to be controlled to establish stands of pine trees.

This soil is moderately suited to bahiagrass and common bermudagrass. Applications of fertilizer and lime and good grazing management are needed for maximum production.

This soil is poorly suited to urban uses because of the wetness, low strength, and the shrink-swell potential. These limitations can be partially overcome by proper design and installation.

This soil is in capability subclass IIIe, and the woodland ordination symbol is 9C.

**WvD—Woodville fine sandy loam, 5 to 8 percent slopes.** This moderately sloping soil is on uplands along drainageways. Areas are generally long and narrow. They range from 50 to 500 acres in size.

Typically, the surface layer is very friable, very strongly acid, very dark grayish brown fine sandy loam about 3 inches thick. The subsurface layer, from a depth of 3 to 6 inches, is very friable, very strongly acid, brown fine sandy loam that has strong brown mottles. The subsoil extends to a depth of 72 inches. From a depth of 6 to 30 inches, it is very firm, very strongly acid, red clay that has mottles in shades of gray,

yellow, and brown; from a depth of 30 to 47 inches, it is very firm, very strongly acid, mottled red, gray, yellow, and brown clay; from a depth of 47 to 58 inches, it is very firm, moderately acid, strong brown clay that has light brownish gray and red mottles; and from a depth of 58 to 72 inches, it is very firm, slightly alkaline, strong brown clay that has light brownish gray mottles.

This soil is somewhat poorly drained. Surface runoff is rapid, and permeability is very slow. The available water capacity is moderate. An apparent water table is generally at a depth of 2.5 to 4.0 feet during the winter. The hazard of water erosion is severe.

Included with this soil in mapping are small areas of Dylan soils. Dylan soils are in landscape positions similar to those of the Woodville soil. They are clayey throughout. Included soils make up less than 10 percent of the map unit.

The Woodville soil is mainly used for timber production. It is well suited to loblolly pine and slash pine and to hardwoods, such as sweetgum and cherrybark oak, grown for commercial use. The clayey subsoil is a limitation affecting the operation of equipment for harvesting or planting. Competing vegetation may need to be controlled to establish stands of pine trees.

This soil is moderately suited to pasture and hayland. Bahiagrass and common bermudagrass are the most suitable species. Applications of fertilizer and lime and proper grazing management are needed for maximum production.

This soil is poorly suited to most urban uses. The main limitations are the slope, the shrink-swell potential, and the wetness. These limitations can be partially overcome by proper design and installation.

This soil is in capability subclass VIe, and the woodland ordination symbol is 9C.



## Prime Farmland

---

In this section, prime farmland is defined and the soils in Liberty County that are considered prime farmland are listed.

Prime farmland is one of several kinds of important farmland defined by the U.S. Department of Agriculture. It is of major importance in meeting the Nation's short- and long-range needs for food and fiber. The acreage of high-quality farmland is limited, and the U.S. Department of Agriculture recognizes that government at local, State, and Federal levels, as well as individuals, must encourage and facilitate the wise use of our Nation's prime farmland.

Prime farmland soils, as defined by the U.S. Department of Agriculture, are soils that are best suited to food, feed, forage, fiber, and oilseed crops. Such soils have properties that favor the economic production of sustained high yields of crops. The soils need only to be treated and managed by acceptable farming methods. The moisture supply must be adequate, and the growing season must be sufficiently long. Prime farmland soils produce the highest yields with minimal expenditure of energy and economic resources. Farming these soils results in the least damage to the environment.

Prime farmland soils may presently be used as cropland, pasture, or woodland or for other purposes. They are used for food or fiber or are available for these uses. Urban or built-up land, public land, and water areas cannot be considered prime farmland. Urban or built-up land is any contiguous unit of land 10 acres or more in size that is used for such purposes as

housing, industrial, and commercial sites, sites for institutions or public buildings, small parks, golf courses, cemeteries, railroad yards, airports, sanitary landfills, sewage treatment plants, and water-control structures. Public land is land not available for farming in National forests, National parks, military reservations, and State parks.

Prime farmland soils usually receive an adequate and dependable supply of moisture from precipitation or irrigation. The temperature and growing season are favorable. The acidity or alkalinity level of the soils is acceptable. The soils have few or no rocks and are permeable to water and air. They are not excessively erodible or saturated with water for long periods and are not frequently flooded during the growing season. The slope ranges mainly from 0 to 5 percent.

The map units listed in table 5 are considered prime farmland in Liberty County. The location of each map unit is shown on the detailed soil maps at the back of this publication. The extent of each unit is given in table 4. The soil qualities that affect use and management are described in the section "Detailed Soil Map Units." This list does not constitute a recommendation for a particular land use.

Some soils that have a seasonal high water table qualify as prime farmland only in areas where this limitation has been overcome by drainage measures. The need for these measures is indicated in parentheses after the map unit name in table 5. Onsite evaluation is needed to determine whether or not this limitation has been overcome by corrective measures.



# Use and Management of the Soils

---

This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. Also, it can help to prevent soil-related failures in land uses.

In preparing a soil survey, soil scientists, conservationists, engineers, and others collect extensive field data about the nature and behavioral characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis for predicting soil behavior.

Information in this section can be used to plan the use and management of soils for crops and pasture; as rangeland and woodland; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreational facilities; and for wildlife habitat. It can be used to identify the potentials and limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties.

Planners and others using soil survey information can evaluate the effect of specific land uses on productivity and on the environment in the survey area. The survey can help planners to maintain or create a land use pattern that is in harmony with nature.

Contractors can use this survey to locate sources of sand and gravel, roadfill, and topsoil. They can use it to identify areas where bedrock, wetness, or very firm soil layers can cause difficulty in excavation.

Health officials, highway officials, engineers, and others may also find this survey useful. The survey can help them plan the safe disposal of wastes and locate sites for pavements, sidewalks, campgrounds, playgrounds, lawns, and trees and shrubs.

## Crops and Pasture

Tom Smith, district conservationist, and Wilbur E. Bohmfalk, conservation agronomist, Natural Resources Conservation Service, helped prepare this section.

General management needed for crops and pasture is suggested in this section. The crops or pasture plants

best suited to the soils, including some not commonly grown in the survey area, are identified and the system of land capability classification used by the Natural Resources Conservation Service is explained. Estimated yields of the main crops and hay and pasture plants are listed for each soil in table 6.

Planners of management systems for individual fields or farms should consider the detailed information given in the description of each soil under the heading "Detailed Soil Map Units." Specific information can be obtained from the local office of the Natural Resources Conservation Service or the Texas Agricultural Extension Service.

In 1991, about 275,000 acres in the county was used as cropland or pasture. Of this total, about 75,000 acres was used as permanent pasture and about 200,000 acres was used as cropland. About 140,000 acres was used as irrigated cropland. Crops included soybeans, grain sorghum, corn, and rice.

A variety of vegetable crops are grown commercially in the county. Many soils are suited to other specialty crops, such as blackberries and grapes. Areas of well drained soils are suitable for pecan trees.

Information about specialty crops can be obtained from the local offices of the Texas Agricultural Extension Service and the Natural Resources Conservation Service.

In 1985, the county had about 56,000 acres of urban and built-up land. This acreage has steadily increased each year, mainly because of the area's proximity to Houston. Also, landowners are keeping some land idle for future urban development. Many subdivisions have been developed or planned. Conversion to urban land reduces the acreage available for crops and pasture.

## Cropland

In Liberty County, the main management concerns in areas of cropland are establishing drainage systems and maintaining tilth and fertility. Erosion is a hazard on only a few soils in the county. During the summer, moisture conservation is a management concern in years when rainfall is considerably below average.

In many areas that are suitable for cropland, surface

runoff is very slow because most of the soils are nearly level and are slowly permeable or very slowly permeable. These soils remain wet for prolonged periods after rains. Farming operations, such as preparing seedbeds, planting, and harvesting, are difficult to accomplish because of the wetness. The prolonged wetness also delays germination, affects the growth of plants, and reduces productivity.

Properly installed drainage systems are needed to remove excess water from cropland. Many areas are not drained because adequate outlets are not available. Before a drainage system is installed, the availability of adequate outlets should be determined and the direction and arrangement of rows should be considered. Planning the system so that it does not hinder the operation of farm equipment is important.

Organic matter helps to maintain tilth and fertility. It increases the available water capacity and the rate of water infiltration and improves aeration. It decreases the runoff rate and helps to control erosion. It improves the conditions needed for seed germination. Good management of crop residue can maintain the content of organic matter.

Leaving crop residue on the surface helps to protect the soil against crusting and the impact of raindrops. A thick crust reduces the rate of water intake and interferes with the emergence of seedlings. Crop residue minimizes compaction caused by farm machinery.

In most areas some form of conservation tillage is recommended. Conservation tillage reduces the number of trips over the field with farm equipment, leaves more crop residue on the surface than conventional tillage methods, and reduces tillage costs.

Water erosion is a moderate to severe hazard on a few soils in the county. It is a management concern in these areas. The erosion removes the fertile upper part of the soil and results in sedimentation of ditches, bayous, creeks, and rivers. Because sheet erosion by water in areas of cropland may not be apparent, it is generally underestimated. In the nearly level areas, normal cropping sequences and tillage practices help to control erosion. In the more sloping areas, erosion can be controlled by more intensive management. Because these areas are small and erosion-control practices are expensive, most landowners use these areas for pasture and woodland rather than crops. Managing clay soils, such as the Lake Charles and Beaumont soils, is difficult because they can only be tilled within a very narrow range in moisture content. Plowing when the soils are too wet or too dry results in the formation of clods, which can interfere with good seedbed preparation. Plowing when the soils are too wet can also result in the formation of a plowpan. This

compacted layer restricts the penetration of roots and the movement of air and water through the soil.

Although many of the soils in the county area are wet for long periods, soil moisture needs to be conserved during years when summer rainfall is below normal. Moisture can be conserved through timely planting, appropriate tillage practices, and effective use of crop residue.

All of the soils in the county used for cultivated crops benefit from applications of commercial fertilizer. The kind and amount of fertilizer needed varies according to the type of soil, the crop, the expected level of yields, the previous land use, and the season of the year. Additional applications of nitrogen fertilizer are needed if the amount of crop residue is abundant because a large amount of nitrogen is tied up by the microorganisms that decompose organic matter and convert it into humus. The additional fertilizer ensures that enough nitrogen is available for both the microorganisms and the growing crop. The nitrogen used by these organisms is not lost but is released later in the season.

Most of the soils in Liberty County have a favorable reaction, or pH range, for the commonly grown crops. Soils in areas where plants do well under alkaline conditions may benefit from the application of lime.

Applications of fertilizer and lime for all soils should be based on the results of soil tests, the needs of the crop, and on the expected level of yields. The local offices of the Texas Agricultural Extension Service and the Natural Resources Conservation Service office can help to determine the kind and amount of fertilizer and lime to apply.

A rotation cropping system is another management practice used to improve soil tilth and protect the soil during heavy rains. It also helps to control weeds, insects, and plant diseases. Crops that return small amounts of residue to the soil are grown in rotation with crops that return large amounts of residue. In Liberty County, rice is commonly grown in rotation with soybeans or pasture. The most common rotations are rice-soybeans, rice-pasture, and grain sorghum-soybeans. With good management, these cropping systems will produce good yields indefinitely.

Many soils in the county are well suited to rice because they are nearly level and have a very slowly permeable subsoil. Most of the rice is grown in the southern part of the county in areas of the Beaumont, Lake Charles, Bernard, and Verland soils.

The management practices used in the production of rice differ from those used for other crops because rice is grown under irrigation by flooding. Good soil aeration is important while the plants are young; therefore, fields are not flooded until the plants are about 6 inches tall.

After plants have reached this height, the crop is continuously flooded until shortly before harvest. A good surface drainage system is needed for the early development of plants and for timely seedbed preparation, planting, and harvesting. A well designed surface drainage system is needed to drain the excess water from irrigation and rainfall that accumulates in the field during the early development of plants and during harvest.

When growing rice, land forming and constructing irrigation levees are common practices. Land forming smooths the surface of the land by establishing a uniform grade so that a uniform water depth can be maintained between levees. When properly designed and installed, land forming can make effective use of rainfall and improve surface drainage.

Because rice is continuously flooded from May until shortly before harvest, chemicals and fertilizer are applied by aircraft.

### **Pasture and Hayland**

Pensacola bahiagrass and common bermudagrass are the most widely grown pasture grasses in Liberty County. These warm-season grasses are adapted to a variety of soils and can tolerate marginal drainage.

Overseeding pastures with a legume, such as white clover, can improve the quality of forage. Some forage for winter grazing can be provided by overseeding with ryegrass.

Good pasture management practices include applying fertilizer, maintaining proper grazing heights of plants, controlling weeds and brush, rotational grazing, maintaining adequate livestock water supplies, and establishing surface drainage. The amount of fertilizer to apply should be based on the type of soil, the species of plants, and the expected level of yields.

The most common weeds in areas of pasture include Chinese tallow, smutgrass, and a variety of broadleaf weeds. They can be controlled through good grazing management, applications of herbicide, and mowing.

In Liberty County, hay is produced from improved bermudagrass, bahiagrass, and forage sorghum. Good hay production requires applications of fertilizer. Forage must be cut at the proper time to provide high-quality hay, and the cutting height must be adequate to maintain plant vigor and permit timely regrowth.

### **Yields per Acre**

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 6. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic

factors. The land capability classification also is shown in the table.

The yields are based mainly on the experience and records of farmers, conservationists, and extension agents. Available yield data from nearby counties and results of field trials and demonstrations are also considered.

The management needed to obtain the indicated yields of the various crops depends on the kind of soil and the crop. Management can include drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate and timely tillage; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residue, barnyard manure, and green manure crops; and harvesting that ensures the smallest possible loss.

For yields of irrigated crops, it is assumed that the irrigation system is adapted to the soils and to the crops grown, that good-quality irrigation water is uniformly applied as needed, and that tillage is kept to a minimum.

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

Crops other than those shown in table 6 are grown in the survey area, but estimated yields are not listed because the acreage of such crops is small. The local office of the Natural Resources Conservation Service or of the Texas Agricultural Extension Service can provide information about the management and productivity of the soils for those crops.

### **Land Capability Classification**

Land capability classification shows, in a general way, the suitability of soils for use as cropland. Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The criteria used in grouping the soils do not include major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor do they include possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for rangeland, for woodland, or for engineering purposes.

In the capability system, soils are generally grouped at three levels—capability class, subclass, and unit.

Only class and subclass are used in this survey.

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

Class I soils have few limitations that restrict their use.

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

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

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

Class V soils are not likely to erode, but they 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 miscellaneous areas have limitations that nearly preclude their use for commercial crop production.

*Capability subclasses* are soil groups within one class. They are designated by adding a small letter, *e*, *w*, *s*, or *c*, to the class numeral, for example, IIe. The letter *e* shows that the main hazard is the risk of erosion unless a close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in only some parts of the United States, shows that the chief limitation is climate that is very cold or very dry.

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

The capability classification of each map unit is given in the section "Detailed Soil Map Units" and in the yields table.

## Rangeland

In areas of rangeland the native vegetation consists of a wide variety of grasses, grasslike plants, forbs, shrubs, and trees. Rangeland receives no regular or

frequent cultural treatment. The composition and production of the plant community is determined by the soils, climate, topography, overstory canopy, and grazing management. Management to conserve soil and water and to improve production is accomplished by balancing the number of livestock with forage production and rotating livestock to allow desirable plants to improve vigor, produce seed, and establish seedlings.

About 30 percent of Liberty County was originally a true open prairie composed of tall grasses, legumes, and forbs. This area is part of what is now known as the Gulf Coast Prairie major land resource area and consists of map units 1, 2, 3, 4, and 5 on the Liberty County general soil map.

Wildfire and grazing by large ruminant animals were a natural part of the rangeland ecosystem. The tall grass prairie evolved through repeated cycles of burning and grazing, which perpetuated tall grasses, forbs, and legumes.

After settlement, a number of events affected the rangeland in the county. Most of the coast prairie was plowed and planted to crops. Wildfires were suppressed. Fences were constructed, and domestic livestock were confined at very heavy stocking rates. These factors resulted in overgrazing of the tall-growing, more productive grasses and led to a rapid increase in the lower quality vegetation. Only remnants of the original plant species still grow in protected areas.

## Range Sites and Condition Classes

A *range site* is a distinctive kind of rangeland that produces a characteristic vegetation that differs from the climax vegetation on other range sites in kind, amount, and proportion of range plants. Soils that produce about the same kinds and amounts of forage make up a range site. Soil properties that affect moisture supply and plant nutrients have the greatest influence on the productivity of range plants. Soil reaction, ponding, flooding, salt content, and a seasonal high water table can affect plant composition, vigor, and productivity.

The climax vegetation on the range site is the stabilized plant community that reproduces itself and changes very little as long as the environment remains unchanged. Throughout the county the climax vegetation consists of the plants that grew in the area before settlement. The most productive combination of forage plants on a range site is generally the climax vegetation.

Range management requires a knowledge of the soil and the climax vegetation. It also requires an evaluation of the present range condition. Range condition is

determined by comparing the present plant community with the climax vegetation on a particular range site. The more closely the existing community resembles the climax vegetation, the better the range condition.

Four range condition classes are used to indicate the degree of departure from the potential, or climax, vegetation brought about by grazing or other uses. The classes show the present condition of the native vegetation on a range site in relation to the native vegetation that could grow there. A range is in excellent condition if 76 to 100 percent of the vegetation is of the same kind as that in the climax stand, in good condition if the percentage is 51 to 75, in fair condition if the percentage is 26 to 50, and in poor condition if the percentage is 25 or less.

Potential forage production depends on the range site. Current forage production depends on the range condition and the moisture available to plants during their growing season.

A primary objective of good range management is to keep range in excellent or good condition, thus conserving water, improving yields, and protecting the soil. The main management concern is recognizing important changes that occur in the kind of cover on a range site. These changes take place gradually and can be misinterpreted or overlooked. Plant growth that occurs because of heavy rainfall can lead to the conclusion that the range is in good condition when the plant community actually has a large percentage of weeds and the long-term trend is toward lower production. On the other hand, some rangeland that has been closely grazed for short periods under careful supervision may have a degraded appearance that temporarily conceals its quality and ability to recover.

If range is subject to years of prolonged overuse, it loses the sources of seeds of desirable vegetation. Under these conditions, the vegetation must be reestablished before management can be effective. The condition of the range can be improved by controlling brush, range seeding, fencing, developing water sources, or applying other mechanical treatment to revitalize stands of native plants. Thereafter, deferred grazing, proper grazing use, and a planned grazing system can help to maintain or improve the range.

Good management results in the optimum production of vegetation, conservation of water, and control of erosion. Sometimes, however, a range condition somewhat below the potential meets grazing needs, provides wildlife habitat, and conserves soil and water resources.

Table 7 shows, for some soils, the range site and the potential annual production of vegetation in favorable, average, and unfavorable years. Only those soils that are suited to rangeland are listed.

*Potential annual production* is the amount of vegetation that can be expected to grow annually on well managed rangeland that is in excellent condition. It includes the current grasses and forbs as well as current year's growth of leaves, twigs, and fruits of woody plants, but does not include the increase in stem diameter of trees and shrubs. It is expressed in pounds per acre of air-dry vegetation for favorable, average, and unfavorable years. In a favorable year, the amount and distribution of precipitation and the temperatures make growing conditions substantially better than average. In an unfavorable year, growing conditions are well below average, generally because of low available soil moisture.

Three range sites have been identified in Liberty County. They are Blackland, Loamy Prairie, and Lowland.

**Blackland range site.** This range site consists of deep, clayey soils that are nearly level to gently sloping. The Beaumont, Bernard, Lake Charles, and Vamont soils in map units Ba, Be, Bm, LaA, LaC, VaA, and VaB are in this site.

The potential vegetation is tall grasses, such as indiagrass, switchgrass, little bluestem, big bluestem, and eastern gamagrass. In most places these plants make up about 70 to 75 percent of the forage. The site also has small amounts of Florida paspalum, longtom, brownseed paspalum, Scribner panicum, and cordgrasses. Broadleaf forbs include button snakeroot, Maximilian sunflower, and several kinds of herbaceous legumes. If overgrazing continues, annual weeds, annual grasses, waxmyrtle, rattlebox, carpetgrass, and bermudagrass invade this site.

If this site is in excellent condition, the average annual yield per acre of air-dry herbage ranges from 9,500 pounds in wet years to 2,500 pounds in dry years.

**Loamy Prairie range site.** This range site consists of deep, nearly level, loamy soils. The Katy, Kemah, Mocreay, Morey, and Yeaton soils in map units Kg, Kh, Km, My, and Bm are in this site. Mounds occur in many of these map units, and water ponds in the low areas for long periods. This site is subject to uneven grazing because livestock graze on the mounds when the low areas are wet.

The potential vegetation is little bluestem, indiagrass, switchgrass, brownseed paspalum, and panicum. These plants make up about 70 to 75 percent of the forage. If overgrazed, brownseed paspalum and panicum increase in abundance. If overgrazing continues, carpetgrass, waxmyrtle, annual weeds, and rattlebox dominate the site.

If this site is in excellent condition, the average annual yield per acre of air-dry herbage ranges from 9,000 pounds in wet years to 2,000 pounds in dry years.

**Lowland range site.** This site consists of nearly level, deep clay or silty clay soils. Some soils are in depressions and are ponded. The Aris, Beaumont, Vamont, and Verland soils in map units Ar, As, Km, Bd, Vd, and Ve are in this range site.

The potential vegetation is prairie grasses and grasslike plants. Maidencane is the dominant grass. Sugarcane plume grass, spike sedge, flat sedge, and smartweed are abundant. These plants make up 65 to 70 percent of the forage. If heavily grazed, other perennial grasslike plants, sedges, and rushes increase in abundance. If overgrazing continues, Chinese tallow trees, low-quality sedges, rushes, and cattails dominate the site.

If this site is in excellent condition, the average annual yield per acre of air-dry herbage ranges from 8,000 pounds in wet years to 2,500 pounds in dry years.

## Woodland Management and Productivity

Raymond Stoner, forester, Natural Resources Conservation Service, helped prepare this section.

Soils vary in their ability to produce trees. Available water capacity and depth of the root zone have major effects on tree growth. Fertility and texture also influence tree growth. Elevation, aspect, and climate determine the kinds of trees that can grow on a site.

Liberty County has about 352,000 acres of woodland, including large areas of hardwoods on bottomland and mixed pine and hardwoods on uplands (fig. 4). The woodland areas are used for producing commercial wood products, for the study of wildlife, for recreational activities, and for hunting.

This soil survey can be used by woodland managers planning ways to increase the productivity of forest land. Some soils respond better to applications of fertilizer than others, and some are more susceptible to landslides and erosion after roads are built and timber is harvested. Some soils require special reforestation efforts. In the section "Detailed Soil Map Units," the description of each map unit in the survey area suitable for timber includes information about productivity, limitations in harvesting timber, and management concerns in producing timber. Table 8 summarizes forestry information and rates the soils for a number of factors to be considered in management. *Slight*, *moderate*, and *severe* are used to indicate the degree of the major soil limitations to be considered in forest management.

Table 8 lists the *ordination symbol* for each soil. The first part of the ordination symbol, a number, indicates the potential productivity of a soil for the indicator species based on its site index. The larger the number, the greater the potential productivity.

The second part of the ordination symbol, a letter, indicates the major kind of soil limitation affecting use and management. The letter *R* indicates a soil that has a significant limitation because of steepness of slope. The letter *X* indicates that a soil has restrictions because of stones or rocks on the surface. The letter *W* indicates a soil in which excessive water, either seasonal or year-round, causes a significant limitation. The letter *T* indicates a soil that has, within the root zone, excessive alkalinity or acidity, sodium salts, or other toxic substances that limit the development of desirable trees. The letter *D* indicates a soil that has a limitation because of a restricted rooting depth, such as a shallow soil that is underlain by hard bedrock, a hardpan, or other layers that restrict roots. The letter *C* indicates a soil that has a limitation because of the kind or amount of clay in the upper part of the profile. The letter *S* indicates a sandy soil. The letter *F* indicates a soil that has a large amount of coarse fragments. The letter *A* indicates a soil having no significant limitations that affect forest use and management. If a soil has more than one limitation, the priority is as follows: *R*, *X*, *W*, *T*, *D*, *C*, *S*, and *F*.

Ratings of the *erosion hazard* indicate the probability that damage may occur if site preparation or harvesting activities expose the soil. The risk is *slight* if no particular preventive measures are needed under ordinary conditions; *moderate* if erosion-control measures are needed for particular silvicultural activities; and *severe* if special precautions are needed to control erosion for most silvicultural activities. Ratings of moderate or severe indicate the need for construction of higher standard roads, additional maintenance of roads, additional care in planning harvesting and reforestation activities, or the use of special equipment.

Ratings of *equipment limitation* indicate limits on the use of forest management equipment, year-round or seasonal, because of such soil characteristics as slope, wetness, stoniness, and susceptibility of the surface layer to compaction. As slope gradient and length increase, it becomes more difficult to use wheeled equipment. On the steeper slopes, tracked equipment is needed. On the steepest slopes, even tracked equipment cannot be operated and more sophisticated systems are needed. The rating is *slight* if equipment use is restricted by wetness for less than 2 months and if special equipment is not needed. The rating is *moderate* if slopes are so steep that wheeled equipment cannot be operated safely across the slope, if wetness



**Figure 4.—Loblolly pine in an area of Vamont silty clay, 0 to 1 percent slopes. The production of timber is the major industry in the northern part of Liberty County.**

restricts equipment use from 2 to 6 months per year, if stoniness restricts the use of ground-based equipment, or if special equipment is needed to prevent or minimize compaction. The rating is *severe* if slopes are so steep that tracked equipment cannot be operated safely across the slope, if wetness restricts equipment use for more than 6 months per year, if stoniness restricts the use of ground-based equipment, or if special equipment is needed to prevent or minimize compaction. Ratings of moderate or severe indicate a need to choose the best suited equipment and to carefully plan the timing of harvesting and other management activities.

Ratings of *seedling mortality* refer to the probability of the death of naturally occurring or properly planted seedlings of good stock in periods of normal rainfall, as influenced by kinds of soil or topographic features. Seedling mortality is caused primarily by too much water or too little water. The factors used in rating a soil for seedling mortality are texture of the surface layer, depth to a seasonal high water table and the length of the period when the water table is high, rock fragments in the surface layer, rooting depth, and the aspect of the slope. The mortality rate generally is highest on soils that have a sandy or clayey surface layer. The risk

is *slight* if, after site preparation, expected mortality is less than 25 percent; *moderate* if expected mortality is between 25 and 50 percent; and *severe* if expected mortality exceeds 50 percent. Ratings of moderate or severe indicate that it may be necessary to use containerized or larger than usual planting stock or to make special site preparations, such as bedding, furrowing, installing a surface drainage system, and providing artificial shade for seedlings. Reinforcement planting is often needed if the risk is moderate or severe.

Ratings of *windthrow hazard* indicate the likelihood that trees will be uprooted by the wind. A restricted rooting depth is the main reason for windthrow. The rooting depth can be restricted by a high water table, a fragipan, or bedrock or by a combination of such factors as wetness, texture, structure, and depth. The risk is *slight* if strong winds cause trees to break but do not uproot them; *moderate* if strong winds cause an occasional tree to be blown over and many trees to break; and *severe* if moderate or strong winds commonly blow trees over. Ratings of moderate or severe indicate that care is needed in thinning or that the stand should not be thinned at all. Special equipment may be needed to prevent damage to shallow root systems in partial cutting operations. A plan for the periodic removal of windthrown trees and the maintenance of a road and trail system may be needed.

Ratings of *plant competition* indicate the likelihood of the growth or invasion of undesirable plants. Plant competition is more severe on the more productive soils, on poorly drained soils, and on soils having a restricted root zone that holds moisture. The risk is *slight* if competition from undesirable plants hinders adequate natural or artificial reforestation but does not necessitate intensive site preparation and maintenance. The risk is *moderate* if competition from undesirable plants hinders natural or artificial reforestation to the extent that some type of site preparation and maintenance are needed. The risk is *severe* if competition from undesirable plants prevents adequate natural or artificial reforestation unless the site is intensively prepared and maintained. A moderate or severe rating indicates the need for site preparation to ensure the development of an adequately stocked stand. Managers must plan site preparation measures to ensure reforestation without delays.

The *potential productivity of common trees* on a soil is expressed as a *site index* and a *volume* number. Generally, only two or three tree species dominate. The first tree listed for each soil is the indicator species for that soil. An indicator species is a tree that is common

in the area and that is generally the most productive on a given soil.

The *site index* is determined by taking height measurements and determining the age of selected trees within stands of a given species. This index is the average height, in feet, that the trees attain in a specified number of years. For cottonwood this height is attained in 30 years and for all other species, 50 years. This index applies to fully stocked, even-aged, unmanaged stands.

The *volume* is the yield likely to be produced by the indicator species in fully stocked natural stands, expressed in board feet (Doyle rule) per acre per year over a 50-year period. Because this volume is based on trees in natural stands that have had no intermediate cutting management, the listed yields can be significantly increased by applying sound forestry practices, such as thinning.

*Trees to plant* are those that are used for reforestation or, under suitable conditions, natural regeneration. They are suited to the soils and can produce a commercial wood crop. The desired product, topographic position (such as a low, wet area), and personal preference are three factors among many that can influence the choice of trees for use in reforestation.

## Woodland Understory Vegetation

Wilbur E. Bohmfalk, agronomist, and Ray Stoner, forester, Natural Resources Conservation Service, helped to prepare this section.

Understory vegetation includes herbaceous plants and the leaves, twigs, and fruit of woody plants that are as tall as 4.5 feet. A forest stand that has a closed canopy of 75 percent or more limits the amount of forage available for a profitable livestock operation. A closed canopy also limits use by big game animals because of the lack of browse plants. Woodland management practices, such as proper harvesting, thinning, and prescribed burning, are needed to keep the canopy and midstory open. An overstory canopy of 36 to 55 percent provides good timber growth and understory forage development.

The average annual yield per acre of air-dry herbage is about 1,500 pounds. In some areas yields can exceed 3,000 pounds.

In Liberty County, hunting leases are worth several times more per acre than grazing leases. Livestock and deer, however, compete for many of the same browse plants. Good livestock grazing management practices can minimize competition for these high-value browse plants.

The quality of the understory vegetation depends on

good management of the trees in the overstory. Several practices can help landusers achieve the high levels of forage production consistent with good forest management. The practices are described in the following paragraphs.

Proper woodland grazing or proper grazing use is grazing at an intensity that maintains or improves the quantity and quality of desirable plants. It is generally thought to be grazing of no more than half, by weight, of the annual growth of the key forage plants in preferred grazing areas. Proper grazing use increases the vigor and reproduction capacity of the key forage plants, conserves soil and water, improves the condition of the vegetation, and increases forage production.

Deferred grazing consists of postponing grazing or resting grazing land for a prescribed period. The rest period promotes the growth of natural vegetation by permitting the vigor of the forage to increase and by permitting desirable plants to seed. Deferred grazing provides feed reserves for fall.

Planned grazing systems are systems in which two or more grazing units are rested in a planned sequence throughout the year or during the growing season of the key forage plants. These systems improve the production of desirable forage plants.

Prescribed burning can control undesirable vegetation, increase the quantity of the more desirable plants, and reduce the hazard of wildfire.

## Recreation

In table 9, the soils of the survey area are rated according to the limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewer lines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation are also important. Soils subject to flooding are limited for recreational uses by the duration and intensity of flooding and the season when flooding occurs. In planning recreational facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

In table 9, the degree of soil limitation is expressed as slight, moderate, or severe. *Slight* means that soil properties are generally favorable and that limitations

are minor and easily overcome. *Moderate* means that limitations can be overcome or alleviated by planning, design, or special maintenance. *Severe* means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or by a combination of these measures.

The information in table 9 can be supplemented by other information in this survey, for example, interpretations for septic tank absorption fields in table 12 and interpretations for dwellings without basements and for local roads and streets in table 11.

*Camp areas* require site preparation such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils have gentle slopes and are not wet or subject to flooding during the period of use. The surface has few or no stones or boulders, absorbs rainfall readily but remains firm, and is not dusty when dry. Strong slopes and stones or boulders can greatly increase the cost of constructing campsites.

*Picnic areas* are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for picnic areas are firm when wet, are not dusty when dry, are not subject to flooding during the period of use, and do not have slopes, stones, or boulders that 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 and boulders, is firm after rains, and is not dusty when dry. If grading is needed, the depth of the soil over bedrock or a hardpan should be considered.

*Paths and trails* for hiking and horseback riding should require little or no cutting and filling. The best soils are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding more than once a year during the period of use. They have moderate slopes and few or no stones or boulders on the surface.

*Golf fairways* are subject to heavy foot traffic and some light vehicular traffic. Cutting or filling may be required. The best soils for use as golf fairways are firm when wet, are not dusty when dry, and are not subject to prolonged flooding during the period of use. They have moderate slopes and no stones or boulders on the surface. The suitability of the soil for tees or greens is not considered in rating the soils.

## Wildlife Habitat

Mike Zeaman, biologist, Natural Resources Conservation Service, helped prepare this section.

Soils affect the kind and amount of vegetation that is available to wildlife as food and cover. They also affect the construction of water impoundments. The kind and abundance of wildlife depend largely on the amount and distribution of food, cover, and water. Wildlife habitat can be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by promoting the natural establishment of desirable plants.

Wildlife habitat in Liberty County includes areas of mixed pine and hardwoods, areas of irrigated cropland and grassland, and the area along the flood plain of the Trinity River. Each of these areas supports a variety of plants and wildlife. A good diversity of species occurs in the areas where different habitat types merge.

Loblolly pines are the dominant trees in the flatwoods of the northern part of the county. Understory vegetation includes yaupon, American beautyberry, greenbriar, rattan, and longleaf uniola. The primary game species are whitetail deer and squirrel.

The soils of the coast prairie in the southern part of the county are primarily used for cropland and pasture. Rice is the major cultivated crop. The game species include ducks, geese, mourning dove, rabbits, and bobwhite quail. A small number of pheasant have been introduced into the area. This is a key wintering area for waterfowl of the central flyway because of the large fields of irrigated rice. Waterfowl species include mallard ducks, pintail ducks, snow geese, and white-fronted geese.

The soils of the Trinity River flood plain support a variety of oaks, blackgum, ash, and cypress. Understory plants include hornbeam, hawthorn, arrowwood, yaupon, dwarf palmetto, switchcane, and savannah panicum. The important game species are deer and squirrel. Oxbow lakes, buttonbush swamps, and cypress swamps are along the Trinity River and provide valuable waterfowl habitat. The periodically flooded areas of hardwoods serve as primary feeding grounds for wood ducks and mallard ducks during years when mast is abundant. Feral hogs have become plentiful in this area. Wetland areas support a variety of nongame species, such as water snakes, frogs, turtles, fish, herons, and egrets. Common furbearers include raccoon, mink, otter, bobcat, nutria, beaver, fox, and skunk.

Approximately 500 ponds in the county support many fresh water species of fish, including largemouth bass, channel catfish, various sunfishes, crappie, and minnows.

The potential for aquaculture is high because of the number of soils that can provide a suitable site, a favorable growing season, and a high average rainfall amount. Species suitable for aquaculture include catfish, baitfish, and largemouth bass.

Because of the diverse climate, water, and soils, all habitats support many nongame species, including raptors, songbirds, and small mammals.

Waterfowl are the primary game species managed for recreation in the county. Puddle ducks feed on the seeds of rice and native plants in slightly flooded areas. Geese feed on winter grasses, rice, soybeans, and roots and tubers.

The habitat for mourning dove can be improved by planting grain on upland soils. Quail need herbaceous plants that have low brushy cover, such as ragweed and croton. Leaving areas of cover along fencerows and disking strips next to areas of cover can improve the habitat for quail. Deer browse on woodland shrubs and herbaceous plants in the open areas. The habitat for deer can be improved by practices that include management of livestock grazing, prescribed burning to improve the quality of browse plants, and renovation of pastures with clover. Maintaining small areas of hardwoods in pine forests improves the habitat for squirrels.

In table 10, the soils in the survey area are rated according to their potential for providing habitat for various kinds of wildlife. This information can be used in planning parks, wildlife refuges, nature study areas, and other developments for wildlife; in selecting soils that are suitable for establishing, improving, or maintaining specific elements of wildlife habitat; and in determining the intensity of management needed for each element of the habitat.

The potential of the soil is rated good, fair, poor, or very poor. A rating of *good* indicates that the element or kind of habitat is easily established, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected. A rating of *fair* indicates that the element or kind of habitat can be established, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of *poor* indicates that limitations are severe for the designated element or kind of habitat. Habitat can be created, improved, or maintained in most places, but management is difficult and must be intensive. A rating of *very poor* indicates that restrictions for the element or kind of habitat are very severe and that unsatisfactory results can be expected. Creating, improving, or maintaining habitat is impractical or impossible.

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

*Grain and seed crops* are domestic grains and seed-producing herbaceous plants. Soil properties and features 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 flooding. Soil temperature and soil moisture are also considerations. Examples of grain and seed crops are rice, wheat, and soybeans.

*Grasses and legumes* are domestic perennial grasses and herbaceous legumes. Soil properties and features 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, flooding, and slope. Soil temperature and soil moisture are also considerations. Examples of grasses and legumes are bermudagrass, bahiagrass, clover, and vetch.

*Wild herbaceous plants* are native or naturally established grasses and forbs, including weeds. Soil properties and features 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 flooding. Soil temperature and soil moisture are also considerations. Examples of wild herbaceous plants are croton, goldenrod, beggarweed, ragweed, and paspalums.

*Hardwood trees* and woody understory produce nuts or other fruit, buds, catkins, twigs, bark, and foliage. Soil properties and features that affect the growth of hardwood trees and shrubs are depth of the root zone, available water capacity, and wetness. Examples of these plants are oak, sweetgum, hawthorn, dogwood, and hickory. Examples of fruit-producing shrubs that are suitable for planting on soils rated *good* are blackberry, plum, and crabapple.

*Coniferous plants* furnish browse and seeds. Soil properties and features that affect the growth of coniferous trees, shrubs, and ground cover are depth of the root zone, available water capacity, and wetness. Examples of coniferous plants are pine, cedar, and baldcypress.

*Wetland plants* are annual and perennial wild herbaceous plants that grow on moist or wet sites. Submerged or floating aquatic plants are excluded. Soil properties and features affecting wetland plants are texture of the surface layer, wetness, reaction, salinity, slope, and surface stoniness. Examples of wetland plants are smartweed, wild millet, wildrice, rushes, sedges, and reeds.

*Shallow water areas* have an average depth of less than 5 feet. Some are naturally wet areas. Others are created by dams, levees, or other water control structures. Soil properties and features affecting shallow water areas are depth to bedrock, wetness, surface

stoniness, slope, and permeability. Examples of shallow water areas are marshes, waterfowl feeding areas, and ponds.

The habitat for various kinds of wildlife is described in the following paragraphs.

*Habitat for openland wildlife* consists of cropland, pasture, meadows, and areas that are overgrown with grasses, herbs, shrubs, and vines. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. Wildlife attracted to these areas include bobwhite quail, pheasant, meadowlark, field sparrow, cottontail, and red fox.

*Habitat for woodland wildlife* consists of areas of deciduous plants or coniferous plants or both and associated grasses, legumes, and wild herbaceous plants. Wildlife attracted to these areas include wild turkey, thrushes, woodpeckers, squirrels, gray fox, raccoon, and deer.

*Habitat for wetland wildlife* consists of open, marshy or swampy shallow water areas. Some of the wildlife attracted to such areas are ducks, geese, herons, shore birds, muskrat, mink, and beaver.

## Engineering

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. Ratings are given for building site development, sanitary facilities, construction materials, and water management. The ratings are based on observed performance of the soils and on the estimated data and test data in the "Soil Properties" section.

*Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 or 6 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.*

*The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.*

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations should be considered in planning, in site selection, and in design.

Soil properties, site features, and observed

performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 or 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kinds of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to evaluate the potential of areas for residential, commercial, industrial, and recreational uses; make preliminary estimates of construction conditions; evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; plan detailed onsite investigations of soils and geology; locate potential sources of gravel, sand, earthfill, and topsoil; plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey, can be used to make additional interpretations.

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

### **Building Site Development**

Table 11 shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required. Special feasibility studies

may be required where the soil limitations are severe.

*Shallow excavations* are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves, utility lines, open ditches, and other purposes. The ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by the depth to bedrock, a cemented pan, or a very firm, dense layer; stone content; soil texture; and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and depth to the water table.

*Dwellings and small commercial buildings* are structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for small commercial buildings without basements, for dwellings with basements, and for dwellings without basements. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, shrinking and swelling, and organic layers can cause the movement of footings. Depth to a high water table, depth to bedrock or to a cemented pan, large stones, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 or 6 feet are not considered.

*Local roads and streets* have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material; a base of gravel, crushed rock, or stabilized soil material; and a flexible or rigid surface. Cuts and fills are generally limited to less than 6 feet. The ratings are based on soil properties, site features, and observed performance of the soils. Depth to bedrock or to a cemented pan, depth to a high water table, flooding, large stones, and slope affect the ease of excavating and grading. Soil strength (as inferred from the engineering classification of the soil), shrink-swell potential, frost-action potential, and depth to a high water table affect the traffic-supporting capacity.

*Lawns and landscaping* require soils on which turf and ornamental trees and shrubs can be established and maintained. The ratings are based on soil properties, site features, and observed performance of the soils. Soil reaction, depth to a high water table, depth to bedrock or to a cemented pan, the available water capacity in the upper 40 inches, and the content of salts, sodium, and sulfidic materials affect plant growth. Flooding, wetness, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer affect trafficability after vegetation is established.

## Sanitary Facilities

Table 12 shows the degree and the kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required.

Table 12 also shows the suitability of the soils for use as daily cover for landfill. A rating of *good* indicates that soil properties and site features are favorable for the use and that good performance and low maintenance can be expected; *fair* indicates that soil properties and site features are moderately favorable for the use and one or more soil properties or site features make the soil less desirable than the soils rated good; and *poor* indicates that one or more soil properties or site features are unfavorable for the use and overcoming the unfavorable properties requires special design, extra maintenance, or costly alteration.

*Septic tank absorption fields* are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 72 inches is evaluated. The ratings are based on soil properties, site features, and observed performance of the soils. Permeability, depth to a high water table, depth to bedrock or to a cemented pan, and flooding affect absorption of the effluent. Large stones and bedrock or a cemented pan interfere with installation.

Unsatisfactory performance of septic tank absorption fields, including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, can affect public health. Ground water can be polluted if highly permeable sand and gravel or fractured bedrock is less than 4 feet below the base of the absorption field, if slope is excessive, or if the water table is near the surface. There must be unsaturated soil material beneath the absorption field to filter the effluent effectively. Many local ordinances require that this material be of a certain thickness.

*Sewage lagoons* are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Lagoons generally are designed to hold

the 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.

Table 12 gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. The ratings are based on soil properties, site features, and observed performance of the soils. Considered in the ratings are slope, permeability, depth to a high water table, depth to bedrock or to a cemented pan, flooding, large stones, and content of organic matter.

Excessive seepage resulting from rapid permeability in the soil or a water table that is high enough to raise the level of sewage in the lagoon causes a lagoon to function unsatisfactorily. Pollution results if seepage is excessive or if floodwater overtops the lagoon. A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope, bedrock, and cemented pans can cause construction problems, and large stones can hinder compaction of the lagoon floor.

*Sanitary landfills* are areas where solid waste is disposed of by burying it in soil. There are two types of landfill—trench and area. In a trench landfill, the waste is placed in a trench. It is spread, compacted, and covered daily with a thin layer of soil excavated at the site. In an area landfill, the waste is placed in successive layers on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil from a source away from the site.

Both types of landfill must be able to bear heavy vehicular traffic. Both types involve a risk of ground-water pollution. Ease of excavation and revegetation should be considered.

The ratings in table 12 are based on soil properties, site features, and observed performance of the soils. Permeability, depth to bedrock or to a cemented pan, depth to a water table, slope, and flooding affect both types of landfill. Texture, stones and boulders, highly organic layers, soil reaction, and content of salts and sodium affect trench landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

*Daily cover for landfill* is the soil material that is used to cover compacted solid waste in an area sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste.

Soil texture, wetness, coarse fragments, and slope affect the ease of removing and spreading the material during wet and dry periods. Loamy or silty soils that are

free of large stones or excess gravel are the best cover for a landfill. Clayey soils are sticky or cloddy and are difficult to spread; sandy soils are subject to wind erosion.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock, a cemented pan, or the water table to permit revegetation. The soil material used as the final cover for a landfill should be suitable for plants. The surface layer generally has the best workability, more organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

### Construction Materials

Table 13 gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated *good*, *fair*, or *poor* as a source of roadfill and topsoil. They are rated as a *probable* or *improbable* source of sand and gravel. The ratings are based on soil properties and site features that affect the removal of the soil and its use as construction material. Normal compaction, minor processing, and other standard construction practices are assumed. Each soil is evaluated to a depth of 5 or 6 feet.

*Roadfill* is soil material that is excavated in one place and used in road embankments in another place. In this table, the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the soil material below the surface layer to a depth of 5 or 6 feet. It is assumed that soil layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The table showing engineering index properties provides detailed information about each soil layer. This information can help to determine the suitability of each layer for use as roadfill. The performance of soil after it is stabilized with lime or cement is not considered in the ratings.

The ratings are based on soil properties, site features, and observed performance of the soils. The thickness of suitable material is a major consideration. The ease of excavation is affected by large stones, a high water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the engineering classification of the soil) and shrink-swell potential.

Soils rated *good* contain significant amounts of sand or gravel or both. They have at least 5 feet of suitable material, a low shrink-swell potential, few cobbles and stones, and slopes of 15 percent or less. Depth to the water table is more than 3 feet. Soils rated *fair* are more

than 35 percent silt- and clay-sized particles and have a plasticity index of less than 10. They have a moderate shrink-swell potential, slopes of 15 to 25 percent, or many stones. Depth to the water table is 1 to 3 feet. Soils rated *poor* have a plasticity index of more than 10, a high shrink-swell potential, many stones, or slopes of more than 25 percent. They are wet and have a water table at a depth of less than 1 foot. They may have layers of suitable material, but the material is less than 3 feet thick.

*Sand* and *gravel* are natural aggregates suitable for commercial use with a minimum of processing. They are used in many kinds of construction. Specifications for each use vary widely. In table 13, only the probability of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material.

The properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the engineering classification of the soil), the thickness of suitable material, and the content of rock fragments. Kinds of rock, acidity, and stratification are given in the soil series descriptions. Gradation of grain sizes is given in the table on engineering index properties.

A soil rated as a probable source has a layer of clean sand or gravel or a layer of sand or gravel that is up to 12 percent silty fines. This material must be at least 3 feet thick and less than 50 percent, by weight, large stones. All other soils are rated as an improbable source. Coarse fragments of soft bedrock, such as shale and siltstone, are not considered to be sand and gravel.

*Topsoil* is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area.

Plant growth is affected by toxic material and by such properties as soil reaction, available water capacity, and fertility. The ease of excavating, loading, and spreading is affected by rock fragments, slope, a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, a water table, rock fragments, bedrock, and toxic material.

Soils rated *good* have friable, loamy material to a depth of at least 40 inches. They are free of stones and cobbles, have little or no gravel, and have slopes of less than 8 percent. They are low in content of soluble salts, are naturally fertile or respond well to fertilizer, and are not so wet that excavation is difficult.

Soils rated *fair* are sandy soils, loamy soils that have a relatively high content of clay, soils that have only 20

to 40 inches of suitable material, soils that have an appreciable amount of gravel, stones, or soluble salts, or soils that have slopes of 8 to 15 percent. The soils are not so wet that excavation is difficult.

Soils rated *poor* are very sandy or clayey, have less than 20 inches of suitable material, have a large amount of gravel, stones, or soluble salts, have slopes of more than 15 percent, or have a seasonal high water table at or near the surface.

The surface layer of most soils is generally preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and releases a variety of plant nutrients as it decomposes.

### Water Management

Table 14 gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas; embankments, dikes, and levees; and aquifer-fed excavated ponds. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and are easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increase in construction costs, and possibly increased maintenance are required.

This table also gives the restrictive features that affect each soil for drainage, irrigation, terraces and diversions, and grassed waterways.

*Pond reservoir areas* hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability of the soil and the depth to fractured bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area.

*Embankments, dikes, and levees* are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. In this table, the soils are rated as a source of material for embankment fill. The ratings apply to the soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

The ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a depth greater than the height of the embankment can affect performance and safety of the embankment.

Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of stones or boulders, organic matter, or salts or sodium. A high water table affects the amount of usable material. It also affects trafficability.

*Aquifer-fed excavated ponds* are pits or dugouts that extend to a ground-water aquifer or to a depth below a permanent water table. Excluded are ponds that are fed only by surface runoff and embankment ponds that impound water 3 feet or more above the original surface. Excavated ponds are affected by depth to a permanent water table, permeability of the aquifer, and the salinity of the soil. Depth to bedrock and the content of large stones affect the ease of excavation.

*Drainage* is the removal of excess surface and subsurface water from the soil. How easily and effectively the soil is drained depends on the depth to bedrock, to a cemented pan, or to other layers that affect the rate of water movement; permeability; depth to a high water table or depth of standing water if the soil is subject to ponding; slope; susceptibility to flooding; subsidence of organic layers; and the potential for frost action. Excavating and grading and the stability of ditchbanks are affected by depth to bedrock or to a cemented pan, large stones, slope, and the hazard of cutbanks caving. The productivity of the soil after drainage is adversely affected by extreme acidity or by toxic substances in the root zone, such as salts, sodium, and sulfur. Availability of drainage outlets is not considered in the ratings.

*Irrigation* is the controlled application of water to supplement rainfall and support plant growth. The design and management of an irrigation system are affected by depth to the water table, the need for drainage, flooding, available water capacity, intake rate, permeability, erosion hazard, and slope. The construction of a system is affected by large stones and depth to bedrock or to a cemented pan. The performance of a system is affected by the depth of the root zone, the amount of salts or sodium, and soil reaction.

*Terraces and diversions* are embankments or a combination of channels and ridges constructed across a slope to control erosion and conserve moisture by intercepting runoff. Slope, wetness, large stones, and depth to bedrock or to a cemented pan affect the construction of terraces and diversions. A restricted rooting depth, a severe hazard of wind erosion or water erosion, an excessively coarse texture, and restricted permeability adversely affect maintenance.



# Soil Properties

---

Data relating to soil properties are collected during the course of the soil survey. The data and the estimates of soil and water features, listed in tables, are explained on the following pages.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine grain-size distribution, plasticity, and compaction characteristics. These results are reported in table 21.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help to characterize key soils.

The estimates of soil properties shown in the tables include the range of grain-size distribution and Atterberg limits, the engineering classification, and the physical and chemical properties of the major layers of each soil. Pertinent soil and water features also are given.

## Engineering Index Properties

Table 15 gives estimates of the engineering classification and of the range of index properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 or 6 feet.

*Depth* to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given for each soil series under the heading "Soil Series and Their Morphology."

*Texture* is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. "Loam," for example, is soil that is 7 to 27

percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is as much as 15 percent, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the Glossary.

*Classification* of the soils is determined according to the Unified soil classification system (3) and the system adopted by the American Association of State Highway and Transportation Officials (2).

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as PT. Soils exhibiting engineering properties of two groups can have a dual classification, for example, SP-SM.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups 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 (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20, or higher, for the poorest. The AASHTO classification for soils tested, with group index numbers in parentheses, is given in table 21.

*Percentage (of soil particles) passing designated sieves* is the percentage of the soil fraction less than 3 inches in diameter based on an oven-dry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard

Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

*Liquid limit and plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination.

## Physical and Chemical Properties

Table 16 shows estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

*Clay* as a soil separate, or component, consists of mineral soil particles that are less than 0.002 millimeter in diameter. In this table, the estimated clay content of each major soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The amount and kind of clay greatly affect the fertility and physical condition of the soil. They determine the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, permeability, plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earthmoving operations.

*Moist bulk density* is the weight of soil (oven-dry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at  $\frac{1}{2}$ -bar moisture tension. Weight is determined after drying the soil at 105 degrees C. In this table, the estimated moist bulk density of each major soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. A bulk density of more than 1.6 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

*Permeability* refers to the ability of a soil to transmit water or air. The estimates indicate the rate of movement of water through the soil when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems and septic tank absorption fields.

*Available water capacity* refers to the quantity of water that the soil is capable of storing for use by

plants. The capacity for water storage in each major soil layer is stated in inches of water per inch of soil. The capacity varies, depending on soil properties that affect the retention of water and the depth of the root zone. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

*Soil reaction* is a measure of acidity or alkalinity and is expressed as a range in pH values. The range in pH of each major horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

*Salinity* is a measure of soluble salts in the soil at saturation. It is expressed as the electrical conductivity of the saturation extract, in millimhos per centimeter at 25 degrees C. Estimates are based on field and laboratory measurements at representative sites of nonirrigated soils. The salinity of irrigated soils is affected by the quality of the irrigation water and by the frequency of water application. Hence, the salinity of soils in individual fields can differ greatly from the value given in the table. Salinity affects the suitability of a soil for crop production, the stability of soil if used as construction material, and the potential of the soil to corrode metal and concrete.

*Shrink-swell potential* is the potential for volume change in a soil with a loss or gain in moisture. Volume change occurs mainly because of the interaction of clay minerals with water and varies with the amount and type of clay minerals in the soil. The size of the load on the soil and the magnitude of the change in soil moisture content influence the amount of swelling of soils in place. Laboratory measurements of swelling of undisturbed clods were made for many soils. For others, swelling was estimated on the basis of the kind and amount of clay minerals in the soil and on measurements of similar soils.

If the shrink-swell potential is rated moderate to very high, shrinking and swelling can cause damage to buildings, roads, and other structures. Special design is often needed.

Shrink-swell potential classes are based on the change in length of an unconfined clod as moisture content is increased from air-dry to field capacity. The classes are *low*, a change of less than 3 percent; *moderate*, 3 to 6 percent; and *high*, more than 6

percent. *Very high*, more than 9 percent, is sometimes used.

*Erosion factor K* indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet and rill erosion. Losses are expressed in tons per acre per year. These estimates are based primarily on percentage of silt, sand, and organic matter (up to 4 percent) and on soil structure and permeability. Values of K range from 0.02 to 0.69. The higher the value, the more susceptible the soil is to sheet and rill erosion by water.

*Erosion factor T* is an estimate of the maximum average annual rate of soil erosion by wind or water that can occur over a sustained period without affecting crop productivity. The rate is expressed in tons per acre per year.

*Organic matter* is the plant and animal residue in the soil at various stages of decomposition. In table 16, the estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of organic matter in a soil can be maintained or increased by returning crop residue to the soil. Organic matter affects the available water capacity, infiltration rate, and tilth. It is a source of nitrogen and other nutrients for crops.

## Soil and Water Features

Table 17 gives estimates of various soil and water features. The estimates are used in land use planning that involves engineering considerations.

*Hydrologic soil groups* are used to estimate runoff from precipitation. Soils are assigned to one of four groups. They are grouped according to the infiltration of water when the soils are thoroughly wet and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep or very deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep to very deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or

soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to two hydrologic groups in table 17, the first letter is for drained areas and the second is for undrained areas.

*Flooding*, the temporary covering of the soil surface by flowing water, is caused by overflowing streams, by runoff from adjacent slopes, or by inflow from high tides. Shallow water standing or flowing for short periods after rainfall or snowmelt is not considered flooding. Standing water in swamps and marshes or in a closed depression is considered ponding.

Table 17 gives the frequency and duration of flooding and the time of year when flooding is most likely.

Frequency, duration, and probable dates of occurrence are estimated. Frequency generally is expressed as *none*, *rare*, *occasional*, or *frequent*. *None* means that flooding is not probable. *Rare* means that flooding is unlikely but possible under unusual weather conditions (the chance of flooding is nearly 0 percent to 5 percent in any year). *Occasional* means that flooding occurs infrequently under normal weather conditions (the chance of flooding is 5 to 50 percent in any year).

*Frequent* means that flooding occurs often under normal weather conditions (the chance of flooding is more than 50 percent in any year). *Common* is used when the occasional and frequent classes are grouped for certain purposes. Duration is expressed as *very brief* (less than 2 days), *brief* (2 to 7 days), *long* (7 days to 1 month), and *very long* (more than 1 month). The time of year that floods are most likely to occur is expressed in months. About two-thirds to three-fourths of all flooding occurs during the stated period.

The information on flooding is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and little or no horizon development.

Also considered is local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

*High water table* (seasonal) is the highest level of a

saturated zone in the soil in most years. The estimates are based mainly on the evidence of a saturated zone, namely grayish colors or mottles in the soil. Indicated in table 17 are the depth to the seasonal high water table; the kind of water table, that is, *perched or apparent*; and the months of the year that the water table commonly is highest. A water table that is seasonally high for less than 1 month is not indicated in table 17.

An *apparent* water table is a thick zone of free water in the soil. It is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil. A *perched* water table is water standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

Two numbers in the column showing depth to the water table indicate the normal range in depth to a saturated zone. Depth is given to the nearest half foot. The first numeral in the range indicates the highest water level. A plus sign preceding the range in depth indicates that the water table is above the surface of the soil. "More than 6.0" indicates that the water table is below a depth of 6 feet or that it is within a depth of 6 feet for less than a month.

*Risk of corrosion* pertains to potential soil-induced electrochemical or chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors results in a severe hazard of corrosion. The steel in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than steel in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low*, *moderate*, or *high*, is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion is also expressed as *low*, *moderate*, or *high*. It is based on soil texture, acidity, and the amount of sulfates in the saturation extract.

### Physical, Chemical, and Mineralogical Analyses of Selected Soils

The results of physical analysis of several typical pedons in the survey area are given in table 18, the

results of chemical analysis in table 19, and the results of mineralogical analysis in table 20. The data are for soils sampled at carefully selected sites. Unless otherwise indicated, the pedons are typical of the series and are described in the section "Soil Series and Their Morphology." Soil samples were analyzed by the Soil Characterization Laboratory, Texas Agricultural Experiment Station, College Station, Texas.

Most determinations, except those for grain-size analysis and bulk density, were made on soil material smaller than 2 millimeters in diameter. Measurements reported as percent or quantity of unit weight were calculated on an oven-dry basis. The methods used in obtaining the data are indicated in the list that follows. The codes in parentheses refer to published methods (13).

*Sand*—(0.05-2.0 mm fraction) weight percentages of material less than 2 mm (3A1).

*Silt*—(0.002-0.05 mm fraction) pipette extraction, weight percentages of all material less than 2 mm (3A1).

*Clay*—(fraction less than 0.002 mm) pipette extraction, weight percentages of material less than 2 mm (3A1).

*Water retained*—pressure extraction, percentage of oven-dry weight of less than 2 mm material;  $\frac{1}{3}$  or  $\frac{1}{10}$  bar (4B1), 15 bars (4B2).

*Linear extensibility*—change in clod dimension based on whole soil material (4D).

*Organic carbon*—wet combustion. Walkley-Black modified acid-dichromate, ferric sulfate titration (6A1c).

*Extractable cations*—ammonium acetate pH 7.0, atomic absorption; calcium (6N2e), magnesium (6D2d), sodium (6P2b), potassium (6Q2b).

*Base saturation*—ammonium acetate, pH 7.0 (5C1).

*Reaction (pH)*—1:1 water dilution (8C1f).

*Clay mineralogy* (7A2i).

### Engineering Index Test Data

Table 21 shows laboratory test data for several pedons sampled at carefully selected sites in the survey area. The pedons are typical of the series and are described in the section "Soil Series and Their Morphology." The soil samples were tested by the Texas Department of Highways and Public Transportation.

The testing methods generally are those of the American Association of State Highway and Transportation Officials (AASHTO) or the American Society for Testing and Materials (ASTM).

The tests and methods are AASHTO classification—M 145 (AASHTO), D 3282 (ASTM); Unified

classification—D 2487 (ASTM); Mechanical analysis—T 88 (AASHTO), D 422 (ASTM), D 2217 (ASTM); Liquid limit—T 89 (AASHTO), D 4318 (ASTM); Plasticity

index—T 90 (AASHTO), D 4318 (ASTM); and Shrinkage—T 92 (AASHTO), D 427 (ASTM).



# Classification of the Soils

---

The system of soil classification used by the National Cooperative Soil Survey has six categories (12). Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or on laboratory measurements. Table 22 shows the classification of the soils in the survey area. The categories are defined in the following paragraphs.

**ORDER.** Eleven soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in *sol*. An example is Entisol.

**SUBORDER.** Each order is divided into suborders, primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Aquent (*Aqu*, meaning water, plus *ent*, from Entisol).

**GREAT GROUP.** Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Fluvaquents (*Fluv*, meaning flood plain sediments, plus *aquent*, the suborder of the Entisols that has an aquic moisture regime).

**SUBGROUP.** Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Typic* identifies the subgroup that typifies the great group. An example is Typic Fluvaquents.

**FAMILY.** Families are established within a subgroup

on the basis of physical and chemical properties and other characteristics that affect management. Generally, the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineral content, temperature regime, depth of the root zone, consistence, moisture equivalent, slope, and permanent cracks. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is fine-loamy, siliceous, nonacid, thermic Typic Fluvaquents.

**SERIES.** The series consists of soils that have similar horizons in their profile. The horizons are similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile. There can be some variation in the texture of the surface layer or of the underlying material within a series.

## Soil Series and Their Morphology

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

Characteristics of the soil and the material in which it formed are identified for each series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the "Soil Survey Manual" (15). Many of the technical terms used in the descriptions are defined in "Soil Taxonomy" (12). Unless otherwise stated, colors in the descriptions are for moist soil. Following the pedon description is the range of important characteristics of the soils in the series.

The map units of each soil series are described in the section "Detailed Soil Map Units."

### Alaga Series

The Alaga series consists of very deep, very gently sloping, somewhat excessively drained, rapidly permeable soils. These soils formed in thick sandy

sediments on stream terraces. Slopes range from 1 to 3 percent.

Typical pedon of Alaga fine sand, 1 to 3 percent slopes; from the intersection of Farm Road 787 and Texas Highway 146 in Rye, 3 miles west on Farm Road 787 and 100 feet south in a forest:

A—0 to 8 inches; brown (10YR 5/3) fine sand; single grained; loose, very friable, nonsticky, nonplastic; moderately acid; clear smooth boundary.

C1—8 to 40 inches; dark yellowish brown (10YR 4/4) loamy sand; single grained; loose, very friable, nonsticky, nonplastic; strongly acid; clear smooth boundary.

C2—40 to 60 inches; light yellowish brown (10YR 6/4) loamy sand; single grained; loose, very friable, nonsticky, nonplastic; slightly acid.

The combined thickness of the A and C horizons is more than 80 inches. Reaction ranges from very strongly acid to slightly acid throughout the profile.

The A horizon ranges from 3 to 20 inches in thickness. It is very dark grayish brown, dark brown, dark yellowish brown, or brown.

The C horizon is yellowish brown, light yellowish brown, brownish yellow, very pale brown, brown, strong brown, or dark yellowish brown. It is loamy sand, loamy fine sand, fine sand, or sand.

The Alaga soil is outside the range defined for the series because reaction is slightly less acid below a depth of 40 inches. This difference, however, does not affect the use and management of the soils.

### Aldine Series

The Aldine series consists of very deep, nearly level and very gently sloping, somewhat poorly drained, very slowly permeable soils. These soils formed in clayey marine sediments. Slopes range from 0 to 2 percent.

Typical pedon of Aldine silt loam, 0 to 2 percent slopes; from the intersection of Texas Highway 105 and Texas Highway 146 in Moss Hill, 3.0 miles east on Texas Highway 105, about 6.4 miles north on Strahan Road, and 100 feet east in a pasture:

A—0 to 4 inches; dark grayish brown (10YR 4/2) silt loam; few medium distinct brownish yellow (10YR 6/6) mottles; weak fine and medium subangular blocky structure; soft, very friable, slightly sticky, nonplastic; common fine, medium, and coarse roots; few fine pores; common small bodies of clean silt grains; few antcasts and wormcasts; strongly acid; abrupt wavy boundary.

E—4 to 17 inches; brown (10YR 5/3) silt loam; few fine faint brownish yellow (10YR 6/6) mottles; weak fine

subangular blocky structure; soft, very friable, slightly sticky, nonplastic; common fine, medium, and coarse roots; few very fine pores; few antcasts and wormcasts; strongly acid; clear irregular boundary.

Bt/E—17 to 25 inches; yellowish brown (10YR 5/6) loam; common medium faint brownish yellow (10YR 6/6) and strong brown (7.5YR 5/6) mottles; weak fine and medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; common tongues and pockets of light brownish gray silt loam (E); common fine and medium roots; many fine and very fine pores; few thin clay films on faces of peds; slightly acid; clear irregular boundary.

Btg1—25 to 31 inches; grayish brown (10YR 5/2) clay; many medium distinct yellowish brown (10YR 5/6) and many medium prominent red (2.5YR 4/8) mottles; moderate medium subangular blocky structure; very hard, firm, sticky, plastic; common fine and few medium roots; many fine and very fine pores; few streaks and pockets of silt loam; few thin clay films on faces of peds; strongly acid; clear wavy boundary.

Btg2—31 to 37 inches; gray (10YR 6/1) clay; many fine and medium distinct yellowish brown (10YR 5/6) and many medium and coarse prominent red (2.5YR 4/6 and 4/8) mottles; moderate medium subangular blocky structure parting to moderate fine subangular blocky; extremely hard, extremely firm, very sticky, very plastic; few fine roots; few very fine pores; few thin clay films on faces of peds; few fine black concretions; very strongly acid; clear wavy boundary.

Btg3—37 to 50 inches; gray (10YR 6/1) clay; few medium prominent red (2.5YR 4/8), common fine distinct yellowish brown (10YR 5/6), and many medium and coarse prominent red (10R 4/8) mottles; moderate medium subangular blocky structure parting to moderate fine blocky; extremely hard, extremely firm, very sticky, very plastic; few fine roots; few very fine pores; few thin clay films on faces of peds; very strongly acid; clear wavy boundary.

Btg4—50 to 55 inches; gray (10YR 6/1) clay; common medium prominent red (10R 4/8 and 2.5YR 4/8) and common fine distinct yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure parting to moderate fine blocky; extremely hard, very firm, very sticky, very plastic; few fine roots; few very fine pores; few thin clay films on faces of peds; very strongly acid; clear wavy boundary.

Btg5—55 to 60 inches; gray (10YR 6/1) clay; common medium prominent weak red (10R 5/4) and red

(2.5YR 4/6) and common fine distinct brownish yellow (10YR 6/6 and 6/8) mottles; moderate medium subangular blocky structure parting to moderate fine blocky; extremely hard, very firm, very sticky, very plastic; few very fine pores; few thin clay films on faces of pedis; strongly acid.

The thickness of the solum ranges from 60 to more than 70 inches. Reaction ranges from very strongly acid to slightly acid.

The A horizon is very dark grayish brown, dark brown, dark grayish brown, grayish brown, or brown. It is fine sandy loam or silt loam.

The E horizon is grayish brown, brown, yellowish brown, light brownish gray, pale brown, or light yellowish brown. It is fine sandy loam or silt loam.

The Bt/E horizon has colors in shades of brown or yellow in the Bt part and is grayish brown, light gray, or light brownish gray in the E part. It has few or common mottles in shades of yellow or brown.

The Btg horizon is gray, grayish brown, or light brownish gray. It has few to many mottles in shades of yellow, brown, and red. It is clay or silty clay.

## Anahuac Series

The Anahuac series consists of very deep, nearly level and very gently sloping, somewhat poorly drained, very slowly permeable soils. These soils formed in thick beds of unconsolidated coastal marine sediments. Slopes range from 0 to 2 percent.

Typical pedon of Anahuac silt loam, in an area of Anahuac-Aris complex; from the intersection of Texas Highway 146 and Texas Highway 105 in Moss Hill, 3 miles east on Texas Highway 105 and 150 feet northeast on a mound in a pasture:

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) silt loam; weak fine subangular blocky structure; soft, very friable, slightly sticky, nonplastic; common fine and medium roots; moderately acid; clear smooth boundary.

A—8 to 16 inches; dark brown (10YR 3/3) silt loam; weak fine subangular blocky structure; soft, very friable, slightly sticky, nonplastic; common fine and medium roots; many fine and few medium pores; few brown (10YR 5/3) wormcasts; few clean sand grains on the interior of the pedis; strongly acid; clear smooth boundary.

E1—16 to 26 inches; brown (10YR 5/3) silt loam; common medium distinct dark yellowish brown (10YR 4/6), few coarse faint yellowish brown (10YR 5/4), and common fine and medium faint grayish brown (10YR 5/2) mottles; weak fine and medium subangular blocky structure; soft, very friable,

slightly sticky, nonplastic; common medium roots; few very dark grayish brown (10YR 3/2) krotovinas; many fine and medium pores; strongly acid; clear wavy boundary.

E2—26 to 33 inches; brown (10YR 5/3) silt loam; common fine distinct yellowish brown (10YR 5/6), common medium distinct yellowish brown (10YR 5/8), and common fine and medium faint grayish brown (10YR 5/2) mottles; weak fine subangular blocky structure; soft, very friable, slightly sticky, nonplastic; common medium roots; many fine and few medium and coarse pores; strongly acid; gradual wavy boundary.

E3—33 to 37 inches; brown (10YR 5/3) loam; many medium distinct yellowish brown (10YR 5/8) and few fine prominent red (2.5YR 4/8) mottles; weak fine subangular blocky structure; hard, firm, sticky, plastic; common fine roots; many fine pores and few medium pores; few black concretions; strongly acid; clear smooth boundary.

Btg1—37 to 49 inches; light brownish gray (10YR 6/2) clay; many medium prominent red (2.5YR 4/6) mottles; moderate coarse prismatic structure parting to strong fine blocky; very hard, very firm, very sticky, very plastic; few medium roots; few fine and medium pores; continuous grayish brown clay films on faces of pedis; few strong brown coatings along root channels; common black concretions; few medium pressure faces; very strongly acid; gradual smooth boundary.

Btg2—49 to 62 inches; light brownish gray (10YR 6/2) clay; common coarse prominent red (2.5YR 4/6), common medium prominent red (10R 4/6), and common medium distinct yellowish brown (10YR 5/6) mottles; moderate coarse prismatic structure parting to strong fine blocky; very hard, very firm, very sticky, very plastic; few medium roots; few fine vesicular pores; many medium continuous grayish brown (10YR 5/2) clay films on faces of pedis; strongly acid; clear wavy boundary.

Btg3—62 to 70 inches; light gray (10YR 6/1) clay; common medium prominent red (2.5YR 4/6), few medium prominent red (10R 4/6), and common fine and medium distinct yellowish brown (10YR 5/6) mottles; moderate coarse prismatic structure parting to moderate medium blocky; very hard, very firm, slightly sticky, very plastic; few medium roots; few fine pores; few thin clay films on the faces of prisms; few pressure faces; few slickensides; strongly acid; clear wavy boundary.

Btg4—70 to 80 inches; light gray (10YR 6/1) clay; many coarse prominent red (10R 4/6), common coarse distinct dark yellowish brown (10YR 4/6), and many fine and medium prominent strong brown (7.5YR

4/6) mottles; moderate coarse prismatic structure parting to moderate medium blocky; very hard, very firm, slightly sticky, very plastic; few fine and medium pores; few thin clay films on faces of prisms; few slickensides; moderately acid.

The solum is more than 80 inches thick. Base saturation ranges from 35 to 49 percent in the E horizon and the upper part of the Bt horizon. Mottles at a depth of 10 to 30 inches have low chroma because of wetness.

The combined thickness of the A and E horizons ranges from 18 to 34 inches. These horizons are strongly acid to slightly acid. The A horizon is very dark grayish brown, dark brown, or very dark gray. The E horizon is brown, pale brown, dark yellowish brown, yellowish brown, or light yellowish brown. It has few or common mottles in shades of brown or red. It is very fine sandy loam, loam, or silt loam.

The Btg horizon is dark grayish brown, grayish brown, light brownish gray, or light gray. It has few to many mottles in shades of red, yellow, and brown. It is clay or silty clay. The content of clay in the control section ranges from 40 to 50 percent. Reaction ranges from very strongly acid to moderately acid.

## Aris Series

The Aris series consists of very deep, nearly level, somewhat poorly drained and poorly drained, very slowly permeable soils. These soils formed in thick beds of unconsolidated coastal plain sediments. Slopes are 0 to 1 percent.

Typical pedon of Aris silt loam; from the intersection of Texas Highway 105 and Texas Highway 146 in Moss Hill, 3.8 miles east on Texas Highway 105, about 0.8 mile south on a dirt road, and 50 feet east in a wooded area:

A—0 to 3 inches; dark gray (10YR 4/1) silt loam; weak fine and medium subangular blocky structure; slightly hard, very friable, sticky, slightly plastic; common fine, medium, and coarse roots; few fine and very fine pores; strongly acid; clear smooth boundary.

E—3 to 5 inches; grayish brown (10YR 5/2) silt loam; common fine faint yellowish brown (10YR 5/6) and gray (10YR 6/1) mottles; weak fine and medium subangular blocky structure; slightly hard, very friable, sticky, slightly plastic; common fine, medium, and coarse roots; few very fine pores; very strongly acid; clear wavy boundary.

Btg/E1—5 to 18 inches; dark gray (10YR 4/1) silty clay loam; common fine distinct yellowish brown (10YR

5/6) mottles; moderate medium subangular blocky structure; hard, firm, sticky, plastic; common fine, medium, and coarse roots; few very fine pores; about 20 percent tongues and streaks of grayish brown (10YR 5/2) silt loam (E); very strongly acid; clear irregular boundary.

Btg/E2—18 to 29 inches; dark gray (10YR 4/1) clay loam; common fine and medium distinct yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; extremely hard, firm, very sticky, very plastic; common fine and medium roots; few fine and very fine pores; few thin clay films on faces of peds; about 15 percent tongues and pockets of grayish brown (10YR 5/2) silt loam (E); very strongly acid; clear irregular boundary.

Btg1—29 to 38 inches; dark gray (10YR 4/1) clay; common fine distinct yellowish brown (10YR 5/6) and many fine and medium prominent red (2.5YR 4/8) mottles; moderate medium subangular blocky structure; extremely hard, very firm, very sticky, very plastic; few fine and medium roots; common very fine pores; many yellowish brown root stains; few thin clay films on faces of peds; few small bodies of silt loam; few crawfish krotovinas; strongly acid; clear irregular boundary.

Btg2—38 to 60 inches; gray (10YR 6/1) clay; few fine prominent red (2.5YR 4/8) and common fine and medium distinct yellowish brown (10YR 5/6) mottles; moderate fine and medium subangular blocky structure; extremely hard, very firm, very sticky, very plastic; few fine pores; few thin clay films on faces of peds; few crawfish krotovinas; strongly acid.

The thickness of the solum ranges from 60 to more than 70 inches.

The A horizon is very dark gray, very dark grayish brown, dark gray, gray, or light brownish gray. It is silt loam or loam. Reaction ranges from very strongly acid to moderately acid.

The E horizon is light gray, light brownish gray, grayish brown, or dark grayish brown. The number of mottles in shades of brown and yellow ranges from none to common. This horizon is silt loam, very fine sandy loam, or loam. Reaction ranges from very strongly acid to moderately acid.

The Btg/E horizon is dark gray or gray. It has few or common mottles in shades of gray, brown, and yellow. The Btg part is silty clay loam or clay loam. The E part is grayish brown silt loam. Reaction ranges from very strongly acid to moderately acid.

The Btg horizon is dark gray in the upper part and gray or light brownish gray in the lower part. It has few

or common mottles in shades of brown, red, or gray. It is clay or clay loam. Reaction ranges from strongly acid to neutral.

### Beaumont Series

The Beaumont series consists of very deep, nearly level, poorly drained, very slowly permeable soils. These soils formed in thick beds of clayey marine sediments. Slopes are less than 1 percent.

Typical pedon of Beaumont clay; from the intersection of Texas Highway 61 and Farm Road 1410 about 6.0 miles south of Devers, 5.5 miles east on Farm Road 1410, about 1.0 mile east and north on a gravel road, and 50 feet west in a pasture:

Ap—0 to 10 inches; dark gray (10YR 4/1) clay; weak coarse blocky structure; extremely hard, very firm, very sticky, very plastic; common fine, medium, and few coarse roots; many fine and medium pores; common red and yellowish red stains along root channels; few pressure faces; moderately acid; clear wavy boundary.

A—10 to 28 inches; dark gray (10YR 4/1) clay; common fine and medium distinct strong brown (7.5YR 5/8) mottles; weak coarse angular blocky structure; extremely hard, very firm, very sticky, very plastic; common pressure faces; strongly acid; gradual wavy boundary.

Bssg1—28 to 39 inches; dark gray (10YR 4/1) clay; common fine and medium distinct strong brown (7.5YR 5/8) and few fine prominent red (2.5YR 5/8) mottles; weak coarse angular blocky structure; extremely hard, very firm, very sticky, very plastic; common pressure faces; common intersecting slickensides; strongly acid; clear wavy boundary.

Bssg2—39 to 60 inches; gray (10YR 6/1) clay; many coarse distinct strong brown (7.5YR 5/8) and common medium prominent red (10R 4/8) mottles; weak medium blocky structure; extremely hard, very firm, very sticky, very plastic; many pressure faces; many intersecting slickensides; very strongly acid.

The thickness of the solum ranges from 60 to more than 80 inches. The content of clay in the 10- to 40-inch control section ranges from 45 to 60 percent.

Intersecting slickensides and pressure faces occur at a depth of 10 to 80 inches. During dry periods cracks 1 inch to 3 inches wide extend from the surface to a depth of more than 30 inches. These cracks remain open less than 90 cumulative days. Undisturbed areas have gilgai microrelief. The center of microknolls is 6 to 12 feet from the center of the microdepressions.

The A horizon ranges from 6 to 30 inches in thickness. It is very dark gray, dark gray, or gray. It has

few or common mottles in shades of brown and yellow. In areas where the color is very dark gray, the horizon is less than 12 inches thick in more than 60 percent of the pedon. Reaction is strongly acid or moderately acid.

The Bssg horizon is dark gray or gray. It has common or many mottles in shades of red, yellow, and brown. It is clay or silty clay. Reaction is very strongly acid or strongly acid. In some pedons, the reaction ranges to slightly alkaline and the lower part of the horizon has a few pitted concretions of calcium carbonate.

### Bernard Series

The Bernard series consists of very deep, nearly level, somewhat poorly drained, very slowly permeable soils. These soils formed in thick beds of alkaline, clayey marine sediments. Slopes are 0 to 1 percent.

Typical pedon of Bernard clay loam; from the intersection of U.S. Highway 90 and Texas Highway 146 in Dayton, 5.8 miles southwest on U.S. Highway 90 to a county road, 2.0 miles north on a county road, and 50 feet east in an area of cropland:

Ap—0 to 6 inches; very dark gray (10YR 3/1) clay loam; weak fine and medium subangular blocky structure; hard, firm, sticky, slightly plastic; many fine and common medium roots; common fine pores; slightly acid; clear smooth boundary.

Btg1—6 to 27 inches; very dark gray (10YR 3/1) clay; few fine prominent yellowish red (5YR 4/6) mottles; weak medium subangular blocky structure parting to moderate fine subangular blocky; extremely hard, extremely firm, very sticky, very plastic; common fine and few medium roots; common very fine pores; common thin clay films on faces of peds; neutral; clear wavy boundary.

Btg2—27 to 49 inches; very dark gray (10YR 3/1) clay; few fine prominent yellowish red (5YR 4/6) and common fine distinct dark yellowish brown (10YR 4/4) mottles; moderate fine and medium subangular blocky structure; extremely hard, extremely firm, very sticky, very plastic; few fine roots; common very fine pores; common thin clay films on faces of peds; slightly alkaline; gradual wavy boundary.

Btg3—49 to 57 inches; dark gray (10YR 4/1) clay; few fine prominent yellowish red (5YR 4/6) and common fine and medium distinct olive brown (2.5Y 4/4) mottles; weak medium subangular blocky structure parting to moderate fine blocky; extremely hard, extremely firm, very sticky, very plastic; common small slickensides; few thin clay films on faces of peds; moderately alkaline; gradual wavy boundary.

Bck—57 to 72 inches; grayish brown (2.5Y 5/2) clay; common fine faint light olive brown (2.5Y 5/6) and

common medium and coarse distinct dark gray (10YR 4/1) mottles; weak fine and medium subangular blocky structure; extremely hard, extremely firm, very sticky, very plastic; common very fine pores; common fine and medium concretions of calcium carbonate; few fine black concretions; few small slickensides; moderately alkaline.

The thickness of the solum ranges from 60 to more than 80 inches. The content of clay in the control section ranges from 35 to 55 percent.

The A horizon is black or very dark gray. Most pedons have root stains in shades of brown. Reaction ranges from moderately acid to neutral.

The Btg horizon is black, very dark gray, dark gray, gray, dark grayish brown, very dark grayish brown, or very dark brown. It has few or common mottles in shades of brown and yellow. It has few round black concretions in some pedons. Reaction ranges from moderately acid to moderately alkaline.

The BCk horizon is grayish brown or brown. It has no mottles or has mottles in shades of yellow, gray, or brown. It has few or common concretions of calcium carbonate. Reaction is slightly alkaline or moderately alkaline.

## Bienville Series

The Bienville series consists of very deep, nearly level and very gently sloping, somewhat excessively drained, moderately rapidly permeable soils. These soils formed in sandy alluvium on stream terraces. Slopes range from 0 to 3 percent.

Typical pedon of Bienville loamy fine sand, 0 to 2 percent slopes; from the intersection of Farm Road 2518 and Texas Highway 105 in Tarkington, 0.3 mile north on Farm road 2518, about 3.2 miles east on Davis Hill Road, 3.5 miles north on Palmer Lake Road, and 100 feet west in a forest:

A—0 to 5 inches; dark grayish brown (10YR 4/2) loamy fine sand; weak fine granular structure; loose, very friable, nonsticky, nonplastic; common fine, medium, and coarse roots; few fine pores; strongly acid; clear smooth boundary.

E—5 to 24 inches; yellowish brown (10YR 5/4) loamy fine sand; weak fine granular structure; loose, very friable, nonsticky, nonplastic; common fine and medium and few coarse roots; strongly acid; gradual smooth boundary.

E/B—24 to 40 inches; dark yellowish brown (10YR 4/4) loamy fine sand (E); common medium distinct bodies of strong brown (7.5YR 5/6) coarse sand

grains (B); weak fine granular structure; loose, very friable, nonsticky, nonplastic; few fine and medium roots; few fine pores; moderately acid; gradual smooth boundary.

Bt1—40 to 72 inches; yellowish brown (10YR 5/4) loamy fine sand; common medium faint dark yellowish brown (10YR 4/4) mottles; weak fine granular structure; loose, very friable, nonsticky, nonplastic; few clean sand grains; few thin dark brown (7.5YR 4/4) lamellae of fine sandy loam; few thin clay films bridging sand grains; few fine roots; few fine pores; moderately acid; gradual smooth boundary.

Bt2—72 to 80 inches; yellowish brown (10YR 5/4) loamy fine sand; common medium faint dark yellowish brown (10YR 4/4) mottles; weak fine granular structure; loose, very friable, nonsticky, nonplastic; few dark brown (7.5YR 4/4) lamellae of fine sandy loam; few clean sand grains; few thin clay films bridging sand grains; few fine pores; moderately acid.

The thickness of the solum ranges from 60 to more than 80 inches. The depth to lamellae ranges from 30 to 60 inches.

The combined thickness of the A and E horizons ranges from 5 to 28 inches. The A horizon is dark grayish brown, grayish brown, dark yellowish brown, yellowish brown, dark brown, or brown. Reaction ranges from strongly acid to slightly acid.

The E and E/B horizons are brown, yellowish brown, or dark yellowish brown. They are loamy fine sand or fine sand. The B part of the E/B horizon is strong brown or yellowish red lamellae or bodies of fine sandy loam and coarse sand grains. Reaction is strongly acid or moderately acid.

The Bt horizon is strong brown, dark yellowish brown, yellowish brown, yellowish red, or reddish brown. It is loamy fine sand that has lamellae and bodies of fine sandy loam. Reaction ranges from very strongly acid to moderately acid.

## Boykin Series

The Boykin series consists of very deep, very gently sloping, well drained, moderately permeable soils (fig. 5). These soils formed in sandy and loamy coastal plain sediments. Slopes range from 1 to 3 percent.

Typical pedon of Boykin loamy fine sand, 1 to 3 percent slopes; from the intersection of Farm Road 787 and Texas Highway 146 in Rye, 2.0 miles east on Farm Road 787, about 0.3 mile north on a county road, 1.5 miles southeast on a private road, and 100 feet south in a forest:

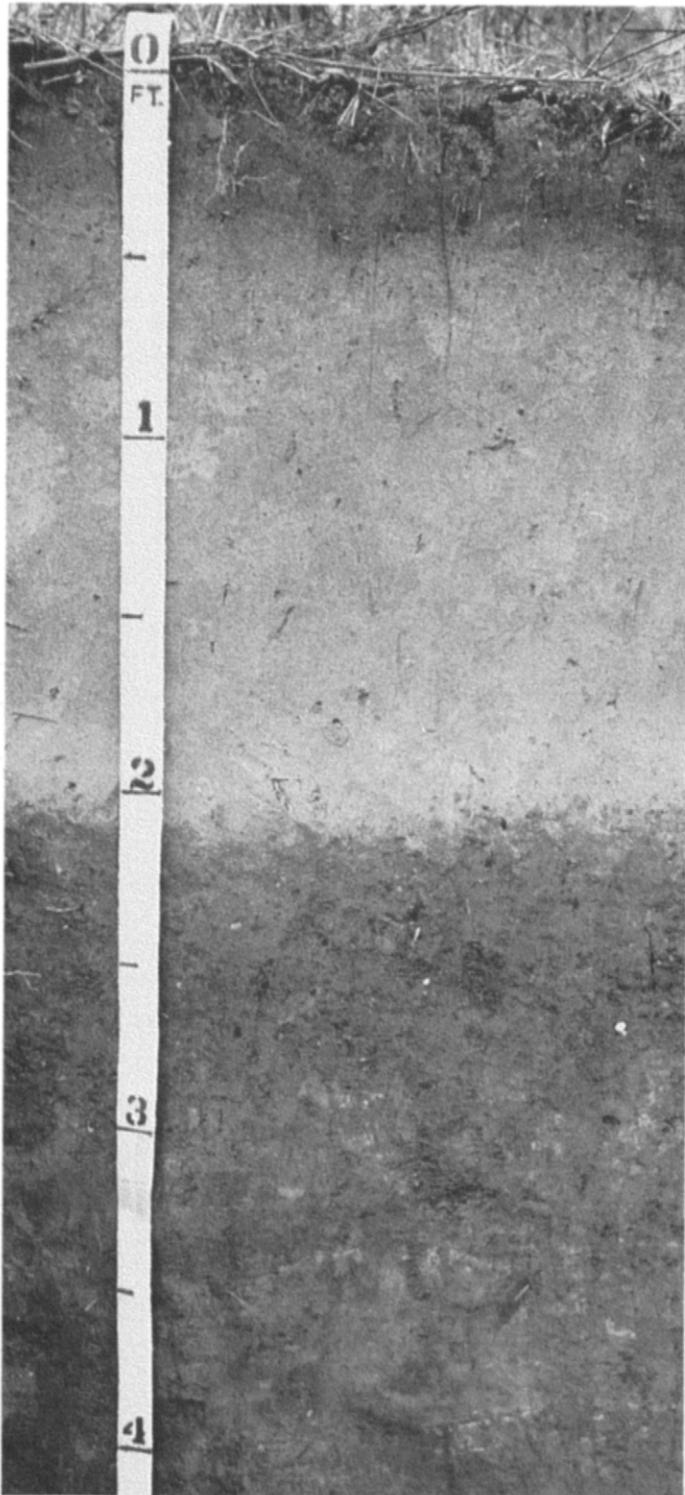


Figure 5.—Profile of Boykin loamy fine sand, 1 to 3 percent slopes.

A—0 to 7 inches; dark brown (10YR 4/3) loamy fine sand; few fine distinct brownish yellow (10YR 6/8)

mottles; weak fine granular structure; loose, very friable, slightly sticky, nonplastic; few fine, medium, and coarse roots; few fine black masses and concretions; very strongly acid; clear smooth boundary.

E—7 to 22 inches; yellowish brown (10YR 5/4) loamy fine sand; weak fine subangular blocky structure; loose, very friable, slightly sticky, nonplastic; few medium roots; moderately acid; clear smooth boundary.

Bt1—22 to 26 inches; red (2.5YR 4/6) sandy clay loam; few fine distinct brownish yellow (10YR 6/8) mottles; moderate medium subangular blocky structure; hard, firm, very sticky, plastic; many thin clay films on faces of peds; few fine, medium, and coarse roots; few fine and medium pores; very strongly acid; gradual diffuse boundary.

Bt2—26 to 48 inches; red (2.5YR 4/6) sandy clay loam; moderate medium subangular blocky structure; hard, firm, very sticky, plastic; few fine and medium roots; few fine and medium pores; many thin clay films on faces of peds; very strongly acid; gradual diffuse boundary.

Bt3—48 to 60 inches; red (2.5YR 4/6) sandy clay loam; moderate medium subangular blocky structure; hard, firm, very sticky, plastic; few fine and medium roots; few fine and medium pores; many thin clay films on faces of peds; very strongly acid.

The thickness of the solum ranges from 60 to more than 80 inches.

The combined thickness of the A and E horizons ranges from 20 to 40 inches. These horizons are very strongly acid to slightly acid. The A horizon is dark grayish brown, dark brown, grayish brown, brown, or yellowish brown. The E horizon is brown, light brown, yellowish brown, pale brown, or dark yellowish brown.

The Bt horizon is red or yellowish red. The number of mottles in shades of red, brown, and yellows ranges from none to common. This horizon is sandy clay loam or fine sandy loam. Reaction ranges from very strongly acid to moderately acid.

### Choates Series

The Choates series consists of very deep, very gently sloping, somewhat poorly drained, moderately slowly permeable soils. These soils formed in thick beds of sandy and loamy coastal plain sediments. Slopes range from 1 to 3 percent.

Typical pedon of Choates loamy fine sand, 1 to 3 percent slopes; from the intersection of Texas Highway 146 and Farm Road 787 in Rye, 2.0 miles east on Farm Road 787, about 2.0 miles north on a county road, and 0.3 mile east and 100 feet south in a forest:

- A—0 to 4 inches; grayish brown (10YR 5/2) loamy fine sand; single grained; loose, nonsticky, nonplastic; common fine, medium, and coarse roots; slightly acid; clear wavy boundary.
- E—4 to 29 inches; very pale brown (10YR 7/4) loamy fine sand; single grained; loose, nonsticky, nonplastic; common fine, medium, and coarse roots; few coarse black concretions; slightly acid; clear wavy boundary.
- Bt—29 to 36 inches; brownish yellow (10YR 6/6) sandy clay loam; few fine faint light brownish gray (10YR 6/2) mottles; weak medium subangular blocky structure; slightly hard, friable, sticky, slightly plastic; few fine and medium roots; few small bodies of clean sand grains; about 3 percent plinthite; few black concretions; many fine and medium pores; strongly acid; gradual wavy boundary.
- Btv—36 to 50 inches; brownish yellow (10YR 6/6) sandy clay loam; common medium faint light brownish gray (10YR 6/2), many coarse faint yellowish brown (10YR 5/8), and many medium prominent red (2.5YR 4/8) mottles; moderate fine and medium subangular blocky structure; hard, firm, sticky, plastic; few fine roots; many fine and medium pores; about 10 percent plinthite; few patchy clay films on faces of peds; very strongly acid; clear wavy boundary.
- B't—50 to 60 inches; mottled light gray (10YR 7/2), reddish yellow (7.5YR 6/8), and red (2.5YR 4/8) sandy clay loam; weak medium subangular blocky structure; hard, firm, sticky, slightly plastic; about 2 percent plinthite; common streaks of loamy fine sand; very strongly acid.

The thickness of the solum ranges from 60 to more than 80 inches. The depth to a horizon that has 5 to 10 percent plinthite ranges from 30 to 60 inches.

The combined thickness of the A and E horizons ranges from 20 to 40 inches. These horizons are strongly acid to slightly acid. The A horizon is dark brown, brown, dark grayish brown, or grayish brown. The E horizon is brown, light brown, pinkish gray, pink, light gray, light brownish gray, grayish brown, yellowish brown, light yellowish brown, pale brown, or very pale brown. The number of mottles in shades of gray or brown ranges from none to common.

The Bt horizon is dark yellowish brown, yellowish brown, brownish yellow, strong brown, reddish yellow, reddish brown, or yellowish red, or it is mottled in these colors and in shades of gray. Reaction ranges from extremely acid to strongly acid. The content of plinthite ranges from 3 to 10 percent but is more than 5 percent in some subhorizons of the Bt horizon.

## Dallardsville Series

The Dallardsville series consists of very deep, nearly level and very gently sloping, somewhat poorly drained, moderately slowly permeable soils. These soils formed in thick beds of unconsolidated, loamy marine sediments. Slopes range from 0 to 3 percent.

Typical pedon of Dallardsville fine sandy loam, 1 to 3 percent slopes; from the intersection of Farm Road 2518 and Texas Highway 105, about 0.3 miles north on Farm Road 2518, about 3.2 miles past Davis Hill Road, 2.5 miles north on Palmer Lace Road, and 50 feet west in a forest:

- A—0 to 3 inches; brown (10YR 4/3) fine sandy loam; weak fine subangular blocky structure parting to weak fine granular; loose, very friable, slightly sticky, nonplastic; many fine, medium, and coarse roots; many fine and medium pores; strongly acid; clear smooth boundary.
- E—3 to 8 inches; yellowish brown (10YR 5/4) fine sandy loam; few fine and medium faint yellowish brown (10YR 5/6) mottles; weak fine subangular blocky structure parting to weak fine granular; soft, very friable, slightly sticky, nonplastic; common fine, medium, and coarse roots; many fine and medium pores; strongly acid; clear smooth boundary.
- E/B—8 to 20 inches; yellowish brown (10YR 5/4) fine sandy loam (E); many fine and medium faint dark yellowish brown (10YR 4/4) mottles (B); weak fine subangular blocky structure; soft, very friable, slightly sticky, nonplastic; few fine and medium roots; common fine and medium pores; strongly acid; gradual diffuse boundary.
- Bt/E1—20 to 30 inches; brownish yellow (10YR 6/6) fine sandy loam; common medium distinct yellowish red (5YR 4/6) and fine and medium distinct light gray (10YR 7/2) mottles (E); weak fine and medium subangular blocky structure; soft, very friable, slightly sticky, nonplastic; few fine and medium pores; few patchy clay films on faces of peds; common small bodies of clean sand (E); strongly acid; gradual diffuse boundary.
- Bt/E2—30 to 60 inches; brownish yellow (10YR 6/6) fine sandy loam; many medium and coarse distinct light gray (10YR 7/2) and few fine distinct yellowish red (5YR 5/8) mottles (E); weak fine and medium subangular blocky structure parting to weak fine granular; soft, very friable, slightly sticky, nonplastic; common vesicular pores; few patchy clay films on faces of peds; common brown brittle bodies; many streaks of clean sand (E); strongly acid.

The thickness of the solum ranges from 60 to more than 80 inches. Mottles at a depth of 10 to 30 inches

are gray because of wetness. Reaction is strongly acid or very strongly acid.

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

The E horizon is brown, yellowish brown, pale brown, light yellowish brown, or very pale brown. It is fine sandy loam, very fine sandy loam, or loamy very fine sand.

The E/B horizon is pale brown, light yellowish brown, or yellowish brown. It has few or common mottles in shades of red, yellow, brown, and gray. It is fine sandy loam, loam, or very fine sandy loam. Some pedons have a B/E or B horizon that has colors and textures similar to those of the E/B horizon.

Some pedons have a Bt horizon. This horizon and the Bt/E horizon are gray, grayish brown, yellowish brown, light brownish gray, pale brown, light yellowish brown, or brownish yellow. They have few or common mottles in these colors and in shades of red. They are loam or fine sandy loam. The content of plinthite is less than 5 percent.

The Dallardsville soil is outside the range defined for the series because reaction is slightly higher throughout the subsoil and because the lower part of the subsoil is less clayey and somewhat more permeable.

## Doucette Series

The Doucette series consists of very deep, very gently sloping, well drained, moderately permeable soils. These soils formed in sandy and loamy coastal plain sediments. Slopes range from 1 to 3 percent.

Typical pedon of Doucette loamy fine sand, 1 to 3 percent slopes; from the intersection of Farm Road 2518 and Texas Highway 105 near Tarkington, 0.3 mile north on Farm Road 2518, about 3.2 miles east on Davis Hill Road, 3.0 miles north on Palmer Lake Road, 0.25 mile west on Hunting Club Road, and 100 feet north in a wooded area:

A—0 to 3 inches; dark grayish brown (10YR 4/2) loamy fine sand; weak fine granular structure; soft, very friable, slightly sticky, nonplastic; common fine, medium, and coarse roots; many fine and common medium pores; moderately acid; clear smooth boundary.

E1—3 to 10 inches; yellowish brown (10YR 5/4) loamy fine sand; weak fine granular structure; soft, very friable, slightly sticky, nonplastic; common fine and medium roots; many fine and medium pores; few small bodies of dark grayish brown loamy fine sand along root channels; moderately acid; gradual smooth boundary.

E2—10 to 28 inches; light yellowish brown (10YR 6/4) loamy fine sand; weak fine granular structure; soft,

very friable, slightly sticky, nonplastic; common fine and medium roots; common fine and medium pores; few small bodies of yellowish brown loamy fine sand in the lower part; moderately acid; clear smooth boundary.

Bt—28 to 37 inches; strong brown (7.5YR 5/8) sandy clay loam; common medium and coarse faint yellowish red (5YR 5/8) mottles; moderate medium subangular blocky structure; very hard, firm, sticky, slightly plastic; few fine and medium roots; many fine and medium pores; very strongly acid; clear smooth boundary.

Btv—37 to 45 inches; strong brown (7.5YR 5/8) sandy clay loam; common medium and coarse faint yellowish red (5YR 5/8) and many medium and coarse distinct red (2.5YR 4/8) mottles; moderate medium subangular blocky structure; very hard, firm, sticky, plastic; few fine and medium roots; many fine and medium pores; about 8 percent plinthite; very strongly acid; clear smooth boundary.

B't1—45 to 52 inches; strong brown (7.5YR 5/8) sandy clay loam; common medium and coarse distinct red (2.5YR 4/8) and common fine and medium distinct light brownish gray (10YR 6/2) mottles; moderate medium subangular blocky structure; very hard, firm, sticky, plastic; few fine roots; many fine and medium pores; about 3 percent plinthite; very strongly acid; clear smooth boundary.

B't2—52 to 60 inches; strong brown (7.5YR 5/8) sandy clay loam; common fine and medium faint yellowish red (5YR 5/8) and common fine and medium distinct light brownish gray (10YR 6/2) mottles; weak fine subangular blocky structure parting to weak medium granular; slightly hard, friable, sticky, slightly plastic; many fine and medium pores; very strongly acid.

The thickness of the solum ranges from 60 to more than 80 inches. The depth to a horizon that has more than 5 percent plinthite ranges from 30 to 60 inches.

The combined thickness of the A and E horizons ranges from 20 to 40. These horizons are strongly acid or moderately acid. The A horizon is dark grayish brown, dark brown, brown, grayish brown, pale brown, light yellowish brown, or yellowish brown. The E horizon is brown, yellowish brown, pale brown, light yellowish brown, or brownish yellow. It is loamy sand, loamy fine sand, or fine sand.

The Bt and Btv horizons are light yellowish brown, brownish yellow, yellowish brown, brown, strong brown, light brown, or reddish yellow. They have few to many mottles in shades of red, yellow, and gray. Mottles that have chroma of 2 or less occur at a depth of 40 to 60 inches. Reaction is very strongly acid or strongly acid.

The content of plinthite ranges from 5 to 10 percent in the Btv horizon and is less than 5 percent in the Bt horizon.

## Dylan Series

The Dylan series consists of very deep, gently sloping to moderately sloping, somewhat poorly drained, very slowly permeable soils. These soils formed in thick, alkaline, clayey marine sediments. Slopes range from 3 to 6 percent.

Typical pedon of Dylan clay, 3 to 6 percent slopes; from the intersection of Texas Highway 321 and Farm Road 1008 in Dayton, 6.3 miles north on Farm Road 1008, about 0.9 mile northwest in the Winter Valley subdivision, 0.1 mile north on Ski Run Road, and 50 feet west in a forest:

A—0 to 4 inches; dark grayish brown (10YR 4/2) clay; few medium faint brown (10YR 5/3) mottles; moderate fine and medium subangular blocky structure; very hard, very firm, sticky, plastic; many fine and medium and few coarse roots; many fine and very fine pores; many wormcasts; few fine black concretions; few small pieces of charcoal; 1-inch thick layer of about 20 percent decomposed pine and hardwood litter; slightly alkaline; clear wavy boundary.

Bw1—4 to 14 inches; brownish yellow (10YR 6/6) clay; few medium and coarse distinct grayish brown (10YR 5/2), common fine distinct reddish yellow (7.5YR 6/6), and common fine prominent red (2.5YR 5/8) mottles; moderate fine subangular blocky structure; extremely hard, extremely firm, very sticky, very plastic; common fine and medium and few coarse roots; many fine and very fine pores; grayish brown (10YR 5/2) mottles in root channels; common dark brown root stains; vertical cracks filled with dark grayish brown surface material; few small pressure faces; neutral; clear wavy boundary.

Bw2—14 to 16 inches; yellowish brown (10YR 5/4) clay; few fine faint yellowish brown (10YR 5/6) mottles; moderate fine subangular blocky structure; extremely hard, extremely firm, very sticky, very plastic; common fine roots; many very fine pores; many dark brown root stains; many fine black concretions; common pressure faces; few intersecting slickensides; few vertical cracks filled with dark grayish brown surface material; slightly alkaline; clear wavy boundary.

Bssk1—16 to 26 inches; yellowish brown (10YR 5/6) clay; common fine faint strong brown (7.5YR 5/8) and common fine distinct light brownish gray (10YR 6/2) mottles; moderate medium and coarse

subangular blocky structure; extremely hard, extremely firm, very sticky, very plastic; common fine and few coarse roots; common very fine pores; common pressure faces; common intersecting slickensides; about 12 percent fine pitted concretions of calcium carbonate; common fine black concretions; slightly alkaline; gradual wavy boundary.

Bssk2—26 to 38 inches; brownish yellow (10YR 6/6) clay; many fine faint strong brown (7.5YR 5/8) and common fine and medium distinct light brownish gray (10YR 6/2) mottles; weak coarse subangular blocky structure; extremely hard, extremely firm, very sticky, very plastic; few fine roots; common very fine pores; common pressure faces; common intersecting slickensides; few dark brown root stains; common fine black concretions; about 15 percent concretions and threads of calcium carbonate; slightly calcareous matrix; moderately alkaline; clear wavy boundary.

Bssk3—38 to 52 inches; yellowish brown (10YR 5/6) clay; common coarse distinct light olive gray (5Y 6/2) and many fine faint yellowish brown (10YR 5/8) mottles; moderate medium subangular blocky structure; extremely hard, extremely firm, very sticky, very plastic; few fine roots; common very fine pores; common dark brown root stains; many large intersecting slickensides; common fine black concretions; about 5 percent pitted concretions and threads of calcium carbonate; calcareous; moderately alkaline; clear wavy boundary.

Bssk4—52 to 60 inches; strong brown (7.5YR 5/6) clay; few coarse distinct light brownish gray (10YR 6/2) and many fine and medium distinct light olive gray (5Y 6/2) mottles; strong fine angular and subangular blocky structure; extremely hard, extremely firm, very sticky, very plastic; few fine roots; few dark brown root stains; common large intersecting slickensides; few fine black concretions; about 3 percent concretions and soft masses of calcium carbonate; calcareous; moderately alkaline.

The thickness of the solum ranges from 60 to more than 80 inches. The depth to horizons that have accumulations of calcium carbonate ranges from 4 to 33 inches. The depth to intersecting slickensides ranges from 10 to 32 inches. Undisturbed areas have gilgai microrelief. The microknolls are about 4 inches higher than the microdepressions. Microknolls and microdepressions occur every 4 to 12 feet. The soil is clay throughout the profile. The content of clay in the control section is 60 to 80 percent. Reaction is neutral or moderately alkaline.

The A horizon is very dark gray, very dark grayish

brown, dark brown, dark gray, dark grayish brown, brown, gray, or grayish brown.

The Bw and Bssk horizons are dark brown, dark yellowish brown, grayish brown, brown, yellowish brown, brownish yellow, light yellowish brown, pale brown, very pale brown, yellow, olive brown, light olive brown, olive yellow, olive gray, olive, or pale olive. They have few to many mottles in shades of red, gray, brown, yellow, and olive. The content of pitted concretions and soft masses of calcium carbonate ranges from 0 to 15 percent in the Bw horizon and from 5 to 20 percent in the Bssk horizon.

### Estes Series

The Estes series consists of very deep, nearly level, poorly drained, very slowly permeable soils. These soils formed in clayey alluvium, mainly along the flood plain of Batiste Creek. Slopes are 0 to 1 percent.

Typical pedon of Estes clay, frequently flooded; from the intersection of U.S. Highway 90 and a county road in Devers, 6 miles north on a county road and 100 feet south in a forest:

A1—0 to 4 inches; dark grayish brown (10YR 4/2) clay; moderate medium and coarse subangular blocky and blocky structure; extremely hard, very firm, very sticky, very plastic; common fine, medium, and coarse roots; many fine, medium, and coarse pores; many dark yellowish brown root stains; common pressure faces; strongly acid; clear smooth boundary.

A2—4 to 8 inches; grayish brown (10YR 5/2) clay; many fine prominent yellowish red (5YR 5/6) and common medium distinct strong brown (7.5YR 5/8) mottles; moderate medium and coarse subangular blocky and blocky structure; extremely hard, very firm, very sticky, very plastic; common fine, medium, and coarse roots; many fine, medium, and coarse pores; many dark yellowish brown root stains; common pressure faces; very strongly acid; clear smooth boundary.

Bg—8 to 34 inches; light brownish gray (10YR 6/2) clay; many fine and medium faint brownish yellow (10YR 6/8) and many fine and medium prominent yellowish red (5YR 5/8) mottles; weak medium subangular blocky structure; extremely hard, very firm, very sticky, very plastic; common fine, medium, and coarse roots; common fine, medium, and coarse pores; many pressure faces; few medium black masses; few silt coatings on faces of peds; very strongly acid; gradual wavy boundary.

Bssg—34 to 60 inches; light brownish gray (10YR 6/2) clay; many medium and coarse distinct strong brown (7.5YR 5/8), common fine prominent red

(2.5YR 5/8), and few medium faint yellow (10YR 7/8) mottles; weak medium subangular blocky structure; extremely hard, very firm, very sticky, very plastic; few fine and medium roots; few fine and medium pores; common silt coatings on faces of peds; common slickensides; few pressure faces; few fine black masses; very strongly acid.

The solum is more than 80 inches thick. Reaction is very strongly acid or strongly acid. The content of clay in the 10- to 40-inch control section ranges from 35 to 50 percent.

The A horizon is very dark grayish brown, dark grayish brown, grayish brown, or gray. The number of mottles in shades of yellow and brown ranges from none to common.

The Bg horizon is dark gray, gray, light gray, dark grayish brown, grayish brown, and light brownish gray. It has few to many mottles in shades of yellow and brown. It has few crawfish krotovinas and dark concretions or masses in most pedons.

The Estes soil is a taxadjunct to the series because it is slightly wetter than is typical for the series.

### Fausse Series

The Fausse series consists of very deep, nearly level, very poorly drained, very slowly permeable soils. These soils formed in clayey alluvium. Slopes are 0 to 1 percent.

Typical pedon of Fausse clay, frequently flooded; from the intersection of Texas Highway 146 and Farm Road 787 in Rye, 4.3 miles west on Farm Road 787, about 0.1 mile south on a gravel road, and 200 feet east in a swamp:

A—0 to 5 inches; dark grayish brown (10YR 4/2) clay; weak fine and medium subangular blocky structure; very hard, very firm, very sticky, very plastic; common fine and medium and few coarse roots; many fine and medium pores; many fine and medium dark brown root stains; ½-inch thick layer of undecomposed and partially decomposed litter of cypress and hardwood leaves on surface; slightly acid; clear smooth boundary.

Bg1—5 to 15 inches; dark gray (N 4/0) clay; weak medium subangular blocky structure; extremely hard, extremely firm, very sticky, very plastic; common fine and medium roots; many fine and medium pores; many fine and medium dark brown root stains; neutral; clear smooth boundary.

Bg2—15 to 32 inches; dark gray (N 4/0) clay; common fine prominent dark reddish brown (5YR 3/3) mottles; moderate fine and medium subangular blocky structure; extremely hard, extremely firm,

very sticky, very plastic; common fine roots; many fine pores; common small pressure faces; many fine and medium dark brown root stains; slightly alkaline; gradual wavy boundary.

Cg—32 to 60 inches; dark gray (N 4/0) clay; common fine and medium distinct grayish brown (10YR 5/2) mottles; weak fine subangular blocky structure; extremely hard, extremely firm, very sticky, very plastic; few fine roots; few fine pores; few fine pitted concretions of calcium carbonate; many fine pressure faces; common fine and medium dark brown root stains; slightly alkaline.

The thickness of the solum ranges from 30 to 50 inches. The soil is continuously saturated below a depth of 24 inches in most years. The content of clay in the 10- to 40-inch control section is 60 to 80 percent.

The A horizon is dark gray, gray, very dark gray, dark grayish brown, or very dark grayish brown. Reaction ranges from moderately acid to neutral.

The Bg horizon is dark gray or gray. The number of mottles in shades of brown ranges from none to common. Reaction is neutral or moderately alkaline. Some pedons have few concretions of calcium carbonate.

The Cg horizon, if it occurs, is dark gray. The number of mottles in shades of brown ranges from none to few. This horizon is clay, silty clay, or silty clay loam. Reaction is neutral or moderately alkaline.

## Guyton Series

The Guyton series consists of very deep, nearly level, poorly drained and very poorly drained, slowly permeable soils. These soils formed in thick beds of unconsolidated coastal plain sediments. Slopes are 0 to 1 percent.

Typical pedon of Guyton silt loam; from the intersection of Farm Road 2518 and Texas Highway 105 near Tarkington, 0.3 mile north on Farm Road 2518, about 3.2 miles east on Davis Hill Road, 1.0 mile north on a county road, and 200 feet west in a forest:

A—0 to 3 inches; pale brown (10YR 6/3) silt loam; weak medium subangular blocky structure; soft, very friable, sticky, nonplastic; common fine and medium and few coarse roots; few fine faint yellow root stains; many fine, medium, and coarse pores; few partially decomposed leaves; common wormcasts; strongly acid; clear smooth boundary.

Eg1—3 to 16 inches; light brownish gray (10YR 6/2) silt loam; common medium and coarse distinct strong brown (7.5YR 5/8) mottles; weak medium subangular blocky structure; soft, very friable, sticky, nonplastic; common fine, medium, and few

coarse roots; many fine, medium, and coarse pores; common wormcasts; very strongly acid; gradual smooth boundary.

Eg2—16 to 23 inches; light brownish gray (2.5Y 6/2) silt loam; many medium and coarse distinct strong brown (7.5YR 5/8) mottles; weak medium subangular blocky structure; soft, very friable, sticky, nonplastic; few fine and common medium and coarse roots; many fine, medium, and coarse pores; very strongly acid; clear irregular boundary.

Btg/E1—23 to 33 inches; light brownish gray (10YR 6/2) silty clay loam; many medium and coarse faint yellowish brown (10YR 5/8) mottles; weak medium subangular blocky structure; hard, firm, sticky, slightly plastic; few fine roots; many fine, medium, and coarse pores; about 15 percent tongues of light brownish gray silt loam (E); few patchy clay films on faces of peds; very strongly acid; gradual smooth boundary.

Btg/E2—33 to 45 inches; light brownish gray (10YR 6/2) silty clay loam; many medium and coarse faint yellowish brown (10YR 5/4 and 5/8) mottles; weak medium subangular blocky structure; hard, firm, sticky, slightly plastic; few fine roots; many fine, medium, and coarse pores; about 10 percent tongues of light brownish gray silt loam (E); few patchy clay films on faces of peds; very strongly acid; gradual smooth boundary.

Btg/E3—45 to 72 inches; light brownish gray (10YR 6/2) silty clay loam; many medium and coarse faint yellowish brown (10YR 5/4) mottles; moderate medium subangular blocky structure; hard, firm, sticky, plastic; few fine roots; many fine and medium pores; about 5 percent tongues of light brownish gray silt loam (E); very strongly acid.

The thickness of the solum ranges from 60 to about 80 inches. Reaction ranges from extremely acid to moderately acid.

The A horizon is grayish brown, brown, light brownish gray, or pale brown. The number of mottles in shades of yellow ranges from none to few.

The Eg horizon is white, light gray, gray, light brownish gray, or grayish brown. It is silt loam, loam, or very fine sandy loam. It has few to many mottles in shades of brown.

The Btg/E horizon is gray, grayish brown, or light brownish gray. It has few to many mottles in shades of brown. It is silt loam, silty clay loam, or clay loam. The E material makes up 15 to 20 percent of the horizon.

## Hatliff Series

The Hatliff series consists of very deep, nearly level, moderately well drained, moderately rapidly permeable

soils. These soils formed in deep loamy and sandy alluvial sediments. Slopes are 0 to 1 percent.

Typical pedon of Hatliff clay loam, occasionally flooded; from the intersection of U.S. Highway 59 and Texas Highway 105 southwest of Cleveland, 0.7 mile west on Texas Highway 105 and 300 feet south in a forest:

- A—0 to 3 inches; very dark grayish brown (10YR 3/2) clay loam; moderate fine and medium subangular blocky structure; hard, firm, sticky, plastic; common fine and medium roots; common wormcasts; common dark yellowish brown root stains; few small bodies of clean sand; neutral; clear wavy boundary.
- C1—3 to 6 inches; yellowish brown (10YR 5/4) loam; weak fine and medium subangular blocky structure; hard, firm, sticky, plastic; common fine and medium roots; common fine and medium pores; few fine bodies of clean sand; common wormcasts; slightly acid; clear wavy boundary.
- C2—6 to 17 inches; dark yellowish brown (10YR 4/4) loam; few medium and coarse faint gray (10YR 5/1) mottles; weak fine and medium subangular blocky structure; hard, firm, sticky, plastic; common fine and medium and few coarse roots; common fine and medium pores; few wormcasts; few fine bodies of clean sand; slightly acid; clear wavy boundary.
- C3—17 to 37 inches; yellowish brown (10YR 5/4) loamy fine sand; single grained; loose; few fine and medium roots; slightly acid; gradual diffuse boundary.
- C4—37 to 56 inches; yellowish brown (10YR 5/4) loam; weak fine subangular blocky structure parting to weak fine granular; soft, very friable, sticky, slightly plastic; few fine and medium roots; slightly acid; clear wavy boundary.
- C5—56 to 60 inches; light yellowish brown (10YR 6/4) loamy fine sand; single grained; loose; few fine roots; slightly acid.

Reaction is slightly acid or neutral. Mottles that have chroma of 2 or less occur within a depth of 20 inches.

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

The C horizon is dark grayish brown, dark brown, dark yellowish brown, grayish brown, brown, yellowish brown, light brownish gray, pale brown, or light yellowish brown. It has no mottles or has mottles in shades of gray, brown, and yellow. It is loam, sandy loam, loamy fine sand, loamy sand, fine sandy loam, or sand. The content of clay in the 10- to 40-inch control section ranges from 8 to 18 percent. Some pedons have few fine black concretions.

## Hockley Series

The Hockley series consists of very deep, nearly level, moderately well drained, moderately slowly permeable soils. These soils formed in thick beds of unconsolidated coastal plain sediments. Slopes are 0 to 1 percent.

Typical pedon of Hockley fine sandy loam; from the intersection of Farm Road 2090 and Farm Road 1010 in Plum Grove, 1.1 miles west on Farm Road 2090, about 0.6 mile northeast on a county road, 1.4 miles northwest in a subdivision to the property line, and 80 feet northwest in a forest:

- A—0 to 3 inches; dark grayish brown (10YR 4/2) fine sandy loam; weak fine subangular blocky structure; soft, very friable, slightly sticky, nonplastic; common fine and medium and few coarse roots; few very fine pores; strongly acid; abrupt smooth boundary.
- E1—3 to 14 inches; brown (10YR 5/3) fine sandy loam; weak fine and medium subangular blocky structure; soft, very friable, slightly sticky, nonplastic; common fine and medium roots; few very fine pores; strongly acid; clear smooth boundary.
- E2—14 to 23 inches; pale brown (10YR 6/3) fine sandy loam; weak fine subangular blocky structure; soft, very friable, slightly sticky, nonplastic; common fine and few medium and coarse roots; few very fine pores; few round pebbles; moderately acid; clear wavy boundary.
- Bt—23 to 42 inches; yellowish brown (10YR 5/4) sandy clay loam; common medium and coarse faint yellowish brown (10YR 5/8) and few fine faint brown (10YR 5/3) mottles; weak medium subangular blocky structure; hard, firm, sticky, slightly plastic; few fine roots; many fine and few medium pores; few fragments of medium gravel; few patchy clay films on faces of peds; strongly acid; clear wavy boundary.
- Btv—42 to 72 inches; light yellowish brown (10YR 6/4) sandy clay loam; common fine distinct grayish brown (10YR 5/2), many medium prominent red (2.5YR 4/8), and many medium and coarse distinct yellowish brown (10YR 5/8) mottles; moderate fine and medium subangular blocky structure; very hard, firm, sticky, plastic; common very fine pores; few patchy clay films on faces of peds; about 10 percent plinthite; strongly acid.

The thickness of the solum ranges from 70 to more than 80 inches. The depth to horizons that have more than 5 percent plinthite ranges from 30 to 60 inches.

The A horizon is brown, dark grayish brown, or grayish brown. Reaction ranges from strongly acid to slightly acid.

The E horizon is brown or pale brown. Reaction ranges from strongly acid to slightly acid.

The Bt and Btv horizons are yellowish brown, light yellowish brown, brownish yellow, very pale brown, or yellow. They have mottles in shades of yellow, red, and brown. In some pedons the lower part of the Bt horizon is reticulately mottled in shades of red, gray, brown, and yellow. The Bt and Btv horizons are loam, clay loam, or sandy clay loam. The content of clay in the control section ranges from 18 to 35 percent. Reaction ranges from strongly acid to slightly acid. The content of plinthite in the Btv horizons ranges from 5 to 15 percent.

### Kaman Series

The Kaman series consists of very deep, nearly level, poorly drained, very slowly permeable soils. These soils formed in clayey alluvium. Slopes are 0 to 1 percent.

Typical pedon of Kaman clay, frequently flooded; from the intersection of Texas Highway 146 and Farm Road 162 in Moss Hill, 10.0 miles north on Texas Highway 146 to Doctor's Road in Clark, 1.7 miles west and south on Doctor's Road, and 100 feet east in a pasture:

- A1—0 to 5 inches; black (10YR 2/1) clay; weak fine and medium subangular blocky structure; extremely hard, extremely firm, very sticky, very plastic; common fine and medium roots; many fine and medium pores; slightly acid; clear wavy boundary.
- A2—5 to 24 inches; very dark gray (10YR 3/1) clay; weak medium subangular blocky structure; extremely hard, extremely firm, very sticky, very plastic; common fine roots; few fine and medium pores; slightly acid; clear smooth boundary.
- Bg—24 to 32 inches; dark gray (10YR 4/1) clay; weak medium and coarse subangular blocky structure; extremely hard, extremely firm, very sticky, very plastic; few fine and medium roots; many fine and common medium pores; clean sand grains on faces of some peds; many fine and medium dark yellowish brown root stains; few shiny pressure faces; slightly acid; gradual wavy boundary.
- Bssg1—32 to 40 inches; dark gray (10YR 4/1) clay; common medium and coarse distinct brown (7.5YR 4/4) mottles; weak medium and coarse subangular blocky structure; extremely hard, extremely firm, very sticky, very plastic; few fine and medium roots; common fine and medium pores; common shiny pressure faces; common dark yellowish brown root stains; few intersecting slickensides; neutral; gradual wavy boundary.
- Bssg2—40 to 60 inches; dark gray (10YR 4/1) clay;

many medium and coarse distinct brown (7.5YR 4/4) mottles; weak coarse subangular blocky structure; extremely hard, extremely firm, very sticky, very plastic; few fine roots; common fine pores; many intersecting slickensides; clean sand grains on faces of some peds; few dark yellowish brown root stains; few fine concretions of calcium carbonate; neutral.

The thickness of the solum ranges from 60 to more than 80 inches. During most years cracks more than 0.4 inch wide extend from the surface to a depth of more than 20 inches in some seasons. Pressure faces and slickensides occur below a depth of 10 inches. The content of clay in the 10- to 40-inch control section ranges from 45 to 60 percent.

The thickness of the A horizon ranges from 20 to 40 inches. It is very dark gray or black. The number of mottles in shades of brown ranges from none to common. Reaction ranges from moderately acid to slightly alkaline.

The Bg and Bssg horizons are dark gray or gray. The number of mottles in shades of brown ranges from none to many. These horizons are clay or silty clay. Reaction ranges from moderately acid to moderately alkaline. Some pedons have seams and pitted concretions of calcium carbonate below a depth of 30 inches.

### Katy Series

The Katy series consists of very deep, nearly level, moderately well drained, slowly permeable soils. These soils formed in loamy marine sediments. Slopes are 0 to 1 percent.

Typical pedon of Katy fine sandy loam; from the intersection of U.S. Highway 90 and Texas Highway 61 in Devers, 0.8 mile east on U.S. Highway 90, about 3.4 miles south and east on a county road (Willie Lane), 1.5 miles south on a county road, and 100 feet east in a pasture:

- A1—0 to 3 inches; dark grayish brown (10YR 4/2) fine sandy loam; weak fine subangular blocky structure; soft, very friable, slightly sticky, nonplastic; common fine, medium, and coarse roots; few fine pores; moderately acid; clear smooth boundary.
- A2—3 to 12 inches; dark brown (10YR 4/3) fine sandy loam; weak fine subangular blocky structure; soft, very friable, slightly sticky, nonplastic; common fine, medium, and coarse roots; few fine and medium pores; moderately acid; clear smooth boundary.
- E—12 to 23 inches; brown (10YR 5/3) fine sandy loam; few fine faint yellowish brown (10YR 5/6) mottles; weak fine subangular blocky structure; soft, very friable, slightly sticky, nonplastic; few fine, medium,

and coarse roots; few medium pores; moderately acid; clear smooth boundary.

Bt1—23 to 29 inches; yellowish brown (10YR 5/4) clay loam; common fine and medium prominent red (2.5YR 4/8) mottles; many grayish brown (10YR 5/2) coatings on faces of peds; moderate medium subangular blocky structure; hard, firm, sticky, slightly plastic; few fine roots; few fine and medium pores; few thin clay films on faces of peds; moderately acid; clear smooth boundary.

Bt2—29 to 35 inches; grayish brown (10YR 5/2) clay loam; few fine and medium distinct yellowish brown (10YR 5/6 and 5/4) and common fine and medium prominent red (2.5YR 4/6 and 4/8) mottles; moderate medium subangular blocky structure; hard, firm, sticky, slightly plastic; few medium pores; few thin clay films on faces of peds; strongly acid; clear smooth boundary.

Bt3—35 to 52 inches; grayish brown (10YR 5/2) clay loam; many medium and coarse prominent red (2.5YR 4/6 and 4/8) and common coarse faint yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; hard, firm, sticky, slightly plastic; about 3 percent plinthite; few medium pores; few thin clay films on faces of peds; strongly acid; clear smooth boundary.

Bt4—52 to 60 inches; mottled red (2.5YR 4/6 and 4/8), light brownish gray (10YR 6/2), and yellowish brown (10YR 5/4 and 5/6) clay loam; weak medium subangular blocky structure; hard, firm, sticky, slightly plastic; few medium pores; few thin clay films on faces of peds; strongly acid.

The solum is more than 80 inches thick.

The A horizon is dark grayish brown or dark brown.

Reaction is moderately acid or slightly acid.

The E horizon is brown or yellowish brown. It has no mottles or has few mottles in shades of brown. Reaction is moderately acid or slightly acid.

The Bt horizon is yellowish brown, grayish brown, or light brownish gray. It has few or common mottles in shades of red, brown, and gray. It is sandy clay loam or clay loam. Reaction ranges from strongly acid to neutral.

## Kemah Series

The Kemah series consists of very deep, nearly level, somewhat poorly drained, very slowly permeable soils. These soils formed in thick beds of unconsolidated coastal marine sediments. Slopes are 0 to 1 percent.

Typical pedon of Kemah silt loam; from the intersection of Farm Road 160 and U.S. Highway 90 in Ames, 2.0 miles south and east on Farm Road 160,

about 1.1 miles south on a gravel road, and 100 feet east in a pasture:

A—0 to 8 inches; dark grayish brown (10YR 4/2) silt loam; weak medium and coarse subangular blocky structure; soft, very friable, slightly sticky, slightly plastic; common fine and medium roots; common fine and very fine pores; many antcasts and wormcasts; common fine strong brown root stains; strongly acid; clear wavy boundary.

E—8 to 18 inches; grayish brown (10YR 5/2) silt loam; few fine distinct strong brown (7.5YR 5/8) and common fine and medium distinct yellowish brown (10YR 5/6) mottles; weak medium and coarse subangular blocky structure; soft, very friable, slightly sticky, nonplastic; common fine and medium roots; few very fine pores; few wormcasts; common fine strong brown root stains; strongly acid; abrupt smooth boundary.

Btg1—18 to 34 inches; dark gray (10YR 4/1) clay; few fine distinct yellowish brown (10YR 5/6) and common fine and many medium prominent red (2.5YR 4/8) mottles; moderate fine and medium subangular blocky structure; very hard, very firm, very sticky, very plastic; common fine roots; few very fine pores; few patchy clay films on faces of peds; strongly acid; clear wavy boundary.

Btg2—34 to 42 inches; dark gray (10YR 4/1) clay; many medium and coarse distinct yellowish brown (10YR 5/6), common fine faint gray (10YR 6/1), and few fine prominent red (2.5YR 4/8) mottles; moderate fine and medium subangular blocky structure; very hard, very firm, very sticky, very plastic; few very fine pores; few fine roots; few patchy clay films on faces of peds; strongly acid; clear wavy boundary.

Btg3—42 to 52 inches; gray (10YR 5/1) clay; common medium prominent red (2.5YR 4/8) and many fine and medium distinct yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; very hard, very firm, very sticky, very plastic; few very fine pores; few patchy clay films on faces of peds; strongly acid; clear wavy boundary.

Btg4—52 to 60 inches; gray (10YR 6/1) clay; many medium and coarse distinct yellowish brown (10YR 5/6 and 5/8) mottles; moderate medium subangular blocky structure; very hard, very firm, very sticky, very plastic; few fine brown concretions; few very fine pores; few patchy clay films on faces of peds; strongly acid.

The solum is more than 60 inches thick.

The A horizon is very dark grayish brown, very dark gray, dark gray, dark grayish brown, gray, or grayish brown. The number of root stains in shades of brown

ranges from none to common. Reaction ranges from strongly acid to neutral.

The E horizon is gray, grayish brown, light brownish gray, or light gray. It has few to many mottles in shades of brown and yellow. Reaction ranges from strongly acid to slightly acid.

The Btg horizon is dark gray, dark grayish brown, gray, light brownish gray, or dark grayish brown. It has few to many mottles in shades of yellow, brown, red, and gray. It is clay or clay loam. The content of clay in the control section ranges from 35 to 50 percent. Reaction ranges from strongly acid to slightly alkaline.

### Kenefick Series

The Kenefick series consists of very deep, nearly level and very gently sloping, well drained, moderately permeable soils. These soils formed in sandy and loamy alluvial sediments. Slopes range from 0 to 3 percent.

Typical pedon of Kenefick fine sandy loam; from the intersection of Farm Road 2518 and Texas Highway 105 near Tarkington, 0.2 mile north on Farm Road 2518, about 3.2 miles east on Davis Hill Road, 2.0 miles north on Palmer Lake Road, 0.2 mile west and north on a private woodland trail, and 50 feet east in a forest:

A—0 to 4 inches; brown (10YR 4/3) fine sandy loam; weak fine and medium subangular blocky structure parting to weak fine granular; soft, very friable, slightly sticky, nonplastic; common fine, medium, and few coarse roots; common fine and very fine pores; common wormcasts; very strongly acid; clear smooth boundary.

E—4 to 9 inches; yellowish brown (10YR 5/4) fine sandy loam; weak fine and medium subangular blocky structure parting to weak fine granular; soft, very friable, slightly sticky, nonplastic; common fine, medium, and few coarse roots; many fine and very fine pores; common wormcasts; moderately acid; gradual wavy boundary.

EB—9 to 18 inches; strong brown (7.5YR 5/6) fine sandy loam; weak medium and coarse subangular blocky structure parting to weak fine granular; soft, very friable, slightly sticky, nonplastic; few fine, medium, and coarse roots; many fine and very fine pores; common wormcasts; moderately acid; abrupt smooth boundary.

Bt1—18 to 52 inches; red (2.5YR 4/8) sandy clay loam; few fine distinct brownish yellow (10YR 6/6) mottles in the lower part; weak medium and coarse subangular blocky structure; hard, very firm, sticky, plastic; few fine, medium, and coarse roots; common fine and very fine pores; common thin

patchy clay films on faces of pedis; few small pockets of light yellowish brown (10YR 6/4) clean sand in the lower part; few fine black concretions; very strongly acid; clear smooth boundary.

Bt2—52 to 65 inches; red (2.5YR 5/6) fine sandy loam; few fine distinct brownish yellow (10YR 6/6) mottles; weak fine and medium subangular blocky structure; slightly hard, friable, sticky, slightly plastic; few fine roots; common fine and very fine pores; common fine black concretions; few fine pebbles; few thin patchy clay films on faces of pedis; very strongly acid; abrupt smooth boundary.

C—65 to 80 inches; red (2.5YR 5/6), reddish yellow (5YR 6/6), yellowish brown (10YR 5/6), and very pale brown (10YR 7/4) stratified loamy fine sand and fine sandy loam; strata are less than 1 inch to 4 inches in thickness; massive; slightly hard, very friable; few streaks of clean sand grains; very strongly acid.

The thickness of the solum ranges from 40 to 70 inches. The average content of clay ranges from 20 to 34 percent in the control section and is 14 percent or less within a depth of 60 inches.

The A horizon is brown, dark brown, or dark yellowish brown. Reaction ranges from very strongly acid to slightly acid.

The E and EB horizons are yellowish brown, dark yellowish brown, dark brown, brown, or strong brown. Reaction ranges from strongly acid to slightly acid.

The upper part of the Bt horizon is reddish brown, yellowish red, light reddish brown, reddish yellow, light red, or red. The number of mottles in shades of red, yellow, and brown ranges from none to common. Texture is clay loam or sandy clay loam. Reaction ranges from very strongly acid to moderately acid. Some pedons have few or common fine black concretions.

The lower part of the Bt horizon is reddish brown, yellowish red, light reddish brown, reddish yellow, light red, red, or strong brown. The number of mottles in shades of red, yellow, brown, and gray ranges from none to common. Texture is sandy clay loam or fine sandy loam. Reaction ranges from very strongly acid to moderately acid. Most pedons have fine pebbles and small pockets of clean sand grains. The content of plinthis is less than 5 percent in some pedons. Some pedons have few or common black concretions.

Some pedons have a BC horizon. This horizon is strong brown, yellowish red, dark yellowish brown, or yellowish brown. The number of mottles in shades of red, yellow, and brown ranges from none to common. This horizon is fine sandy loam or sandy loam. Reaction is very strongly acid or strongly acid.

The C horizon is brown, yellowish brown, pale brown, light yellowish brown, brownish yellow, very pale brown, yellow, strong brown, light brown, reddish yellow, or pink. The number of mottles in shades of red, yellow, brown, and gray ranges from none to common. This horizon is fine sandy loam, loamy fine sand, or sand, or it has strata of two or more of these textures. Some pedons have thin strata of clay loam, sandy clay loam, and loam in the sandy matrix. Reaction is very strongly acid or strongly acid. Some pedons have fine gravel.

### Kirbyville Series

The Kirbyville series consists of very deep, nearly level, somewhat poorly drained, moderately permeable soils. These soils formed in thick beds of unconsolidated, loamy coastal plain sediments. Slopes are 0 to 1 percent.

Typical pedon of Kirbyville fine sandy loam; from the intersection of Texas Highway 321 and Doc Howard Road about 5.0 miles east of Cleveland, 0.5 mile north on Doc Howard Road and 25 feet east in a forest:

A—0 to 4 inches; dark grayish brown (10YR 4/2) fine sandy loam; weak fine subangular blocky structure; soft, very friable, slightly sticky, nonplastic; common fine and coarse roots; common fine pores; strongly acid; clear smooth boundary.

E—4 to 15 inches; very pale brown (10YR 7/4) fine sandy loam; few fine faint brownish yellow (10YR 6/6) mottles; soft, very friable, slightly sticky, nonplastic; common medium and coarse roots; many fine pores; strongly acid; gradual irregular boundary.

Bt/E1—15 to 30 inches; yellowish brown (10YR 5/4) clay loam; common medium distinct yellow (10YR 7/8) and few fine distinct light gray (10YR 7/2) and reddish yellow (7.5YR 6/8) mottles; moderate medium subangular blocky structure; very hard, firm, sticky, slightly plastic; few streaks and pockets of clean sand grains (E); few medium and coarse roots; many fine pores; few thin clay films on faces of peds; very strongly acid; gradual irregular boundary.

Bt/E2—30 to 45 inches; yellowish brown (10YR 5/4) clay loam; common medium distinct brownish yellow (10YR 6/8), few medium faint light brownish gray (10YR 6/2), and few fine distinct yellowish red (5YR 5/8) mottles; moderate medium subangular blocky structure; very hard, firm, sticky, plastic; few streaks and pockets of clean sand grains (E); few coarse roots; many fine pores; common thin clay films on faces of peds; very strongly acid; clear irregular boundary.

Btv/E1—45 to 57 inches; brownish yellow (10YR 6/6)

clay loam; few medium prominent red (2.5YR 4/8) and many medium distinct light brownish gray (10YR 6/2) and yellowish red (5YR 5/8) mottles; moderate medium subangular blocky structure; very hard, firm, sticky, plastic; few streaks and pockets of clean sand grains (E); few fine roots; common thin clay films on faces of peds; few round black concretions; about 6 percent plinthite; very strongly acid; clear irregular boundary.

Btv/E2—57 to 70 inches; light brownish gray (10YR 6/2) clay loam; common medium distinct yellowish brown (10YR 5/8) and common medium prominent red (2.5YR 4/6) mottles; moderate medium subangular blocky structure; very hard, very firm, sticky, plastic; streaks and pockets of clean sand grains (E); many thin clay films on faces of peds; about 15 percent plinthite; few round black concretions; very strongly acid; gradual irregular boundary.

Bt/E'—70 to 80 inches; light brownish gray (10YR 6/2) clay loam; many medium distinct brownish yellow (10YR 6/8) and few fine prominent red (2.5YR 4/6) mottles; moderate medium subangular blocky structure; very hard, very firm, sticky, plastic; many very fine pores; few patchy clay films on faces of peds; few streaks and pockets of clean sand grains (E); about 3 percent plinthite; few round black concretions; very strongly acid.

The thickness of the solum ranges from 60 to more than 80 inches. The depth to horizons that have more than 5 percent plinthite ranges from 24 to 60 inches. Most pedons have few or common black concretions.

The A horizon is dark grayish brown, dark brown, brown, pale brown, light brownish gray, or grayish brown. Reaction ranges from very strongly acid to moderately acid.

The E horizon is pale brown, light yellowish brown, very pale brown, or yellow. It has mottles in shades of brown, yellow, and gray. Reaction ranges from very strongly acid to moderately acid.

The Bt/E and Btv/E horizons are light yellowish brown, brownish yellow, yellowish brown, light brownish gray, reddish yellow, or strong brown. They have mottles in shades of red, brown, yellow, and gray. They are sandy clay loam, clay loam, or loam. Reaction is strongly acid or very strongly acid. The E material makes up 5 to 15 percent of the horizon. The content of plinthite ranges from 5 to 15 percent. Plinthite commonly occurs below a depth of 30 inches.

### Lake Charles Series

The Lake Charles series consists of very deep, nearly level to gently sloping, somewhat poorly drained, very slowly permeable soils. These soils formed in thick

beds of alkaline, clayey marine sediments. Slopes range from 0 to 5 percent.

Typical pedon of Lake Charles clay, 0 to 1 percent slopes; from the intersection of U.S. Highway 90 and Texas Highway 146 in Dayton, 7.0 miles south on Texas Highway 146, about 2.8 miles south and east on a private field road, and 150 feet south in an area of cropland:

**Ap**—0 to 6 inches; very dark gray (10YR 3/1) clay; common fine distinct dark brown (7.5YR 4/4) root stains; moderate coarse blocky structure; extremely hard, very firm, very sticky, very plastic; common fine and medium roots; few fine pores; moderately acid; gradual diffuse boundary.

**Bw**—6 to 18 inches; very dark gray (10YR 3/1) clay; few fine distinct brownish yellow (10YR 6/6) and few medium distinct dark brown (7.5YR 4/4) mottles and root stains; weak medium and coarse prismatic structure parting to weak medium subangular blocky; extremely hard, very firm, very sticky, very plastic; common pressure faces; few fine pores; neutral; gradual diffuse boundary.

**Bss1**—18 to 36 inches; very dark gray (10YR 3/1) clay; few fine distinct yellowish red (5YR 5/8), common fine distinct yellowish brown (10YR 5/8) and light yellowish brown (2.5Y 6/4), and common medium faint dark grayish brown (2.5Y 4/2) mottles; weak medium subangular blocky structure; extremely hard, very firm, very sticky, very plastic; common intersecting slickensides; many pressure faces; slightly alkaline; clear wavy boundary.

**Bss2**—36 to 46 inches; gray (10YR 5/1) clay; many coarse faint grayish brown (2.5YR 5/2) and common fine distinct olive yellow (2.5Y 6/6) mottles; weak fine subangular blocky structure; extremely hard, very firm, very sticky, very plastic; common bodies of very dark gray clay; common intersecting slickensides; many pressure faces; few fine pores; few fine black concretions; slightly alkaline; gradual diffuse boundary.

**Bss3**—46 to 60 inches; gray (10YR 5/1) clay; many coarse faint grayish brown (2.5YR 5/2) and common fine distinct olive yellow (2.5Y 6/6) mottles; weak fine subangular blocky structure; extremely hard, very firm, very sticky, very plastic; few bodies of very dark gray clay; common intersecting slickensides; many pressure faces; few pitted concretions of calcium carbonate; slightly alkaline.

The thickness of the solum ranges from 60 to more than 80 inches. The content of clay in the 10- to 40-inch control section is 45 to 60 percent. Intersecting slickensides and pressure faces begin at a depth of 10

to 30 inches. Cracks 1 inch to 2 inches wide extend from the surface to a depth of more than 30 inches. These cracks remain open less than 90 cumulative days in most years. Undisturbed areas have gilgai microrelief. The microknolls are 6 to 12 inches higher than the microdepressions. The distance from the center of the microknolls to the center of the microdepressions is 3 to 12 feet.

The A horizon ranges from 10 to 35 inches in thickness. It is black or very dark gray. The number of mottles in shades of brown and yellow ranges from none to common. Reaction ranges from moderately acid to slightly alkaline.

The Bg horizons are very dark gray, dark gray, or gray. The number of mottles in shades of brown, yellow, and red ranges from none to common. Reaction is neutral or moderately alkaline. The number of pitted concretions of calcium carbonate ranges from none to common. Most pedons have few or common round black concretions.

## Landman Series

The Landman series consists of very deep, nearly level and very gently sloping, moderately well drained, moderately slowly permeable soils. These soils formed in sandy and loamy alluvium. Slopes range from 0 to 2 percent.

Typical pedon of Landman loamy fine sand, 0 to 2 percent slopes; from the intersection of U.S. Highway 59 and Farm Road 2025 in Cleveland, 0.5 mile north on Farm Road 2025, about 1.6 miles west on a county road, 0.6 mile north on a private road, and 150 feet northwest in a forest:

**A**—0 to 3 inches; brown (10YR 5/3) loamy fine sand; weak fine granular structure; loose, very friable, nonsticky, nonplastic; common fine, medium, and coarse roots; many fine pores; few dark brown root stains; strongly acid; clear wavy boundary.

**E1**—3 to 32 inches; light yellowish brown (10YR 6/4) loamy fine sand; few fine faint yellowish brown (10YR 6/6) mottles; weak medium subangular blocky structure parting to weak fine granular; loose, very friable, nonsticky, nonplastic; common fine and medium roots; strongly acid; clear wavy boundary.

**E2**—32 to 38 inches; very pale brown (10YR 7/4) loamy fine sand; common fine faint yellowish brown (10YR 6/6) mottles; weak medium subangular blocky structure parting to weak fine granular; loose, very friable, nonsticky, nonplastic; common fine and medium roots; many fine and medium pores; moderately acid; clear wavy boundary.

E3—38 to 52 inches; very pale brown (10YR 7/4) loamy fine sand; many fine faint yellowish brown (10YR 6/6) mottles; weak medium subangular blocky structure parting to weak fine granular; loose, very friable, nonsticky, nonplastic; few fine roots; common fine and medium pores; strongly acid; clear wavy boundary.

Bt1—52 to 60 inches; light gray (10YR 7/2) sandy clay loam; many fine prominent red (2.5YR 4/8) and many medium and coarse faint brownish yellow (10YR 6/8) mottles; weak medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; very strongly acid; clear wavy boundary.

Bt2—60 to 72 inches; mottled light gray (10YR 7/2), brownish yellow (10YR 6/6), yellowish red (5YR 5/8), and red (2.5YR 4/8) sandy clay loam; weak medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; very strongly acid.

The solum is more than 80 inches thick.

The combined thickness of the A and E horizons ranges from 40 to 52 inches. These horizons are strongly acid to slightly acid. The A horizon is dark grayish brown, dark brown, grayish brown, brown, or light brownish gray. The E horizon is light gray, light brownish gray, pale brown, very pale brown, light yellowish brown, or yellowish brown. It has mottles in shades of yellow or brown. It is fine sand or loamy fine sand.

The Bt horizon is gray, grayish brown, light gray, or light brownish gray. It has few to many mottles in shades of red and yellow. It is sandy clay loam or fine sandy loam. Reaction ranges from very strongly acid to moderately acid.

## Mantachie Series

The Mantachie series consists of very deep, nearly level, somewhat poorly drained, moderately permeable soils. These soils formed in loamy alluvium. Slopes are 0 to 1 percent.

Typical pedon of Mantachie loam, frequently flooded; from the intersection of Farm Road 223 and Farm Road 787 in Dolen, 1.8 miles east on Farm Road 787, about 3.5 miles east and south on a county road, and 100 feet east in a pasture:

A—0 to 5 inches; very dark grayish brown (10YR 3/2) loam; moderate fine and medium subangular blocky structure; soft, very friable, slightly sticky, slightly plastic; common fine, medium, and coarse roots; common fine and few medium pores; strongly acid; clear wavy boundary.

Bw1—5 to 13 inches; grayish brown (10YR 5/2) loam; common fine and medium faint dark grayish brown (10YR 4/3) and common fine and medium distinct yellowish brown (10YR 5/6) mottles; weak fine subangular blocky structure; soft, very friable, slightly sticky, nonplastic; many fine and few medium pores; common medium and fine roots; few wormcasts; strongly acid; clear wavy boundary.

Bw2—13 to 18 inches; brown (10YR 5/3) loam; many fine and medium faint grayish brown (10YR 5/2) and common fine distinct yellowish brown (10YR 5/6) mottles; weak fine and medium subangular blocky structure; soft, very friable, slightly sticky, slightly plastic; common fine and medium roots; many fine and very fine pores; strongly acid; clear wavy boundary.

Bg1—18 to 32 inches; grayish brown (10YR 5/2) loam; many fine and medium distinct yellowish brown (10YR 5/6) and common medium faint brown (10YR 5/3) mottles; weak fine and medium blocky structure; soft, very friable, slightly sticky, nonplastic; few medium bodies of clean sand; few fine roots; few fine pores; very strongly acid; clear wavy boundary.

Bg2—32 to 42 inches; grayish brown (10YR 5/2) sandy clay loam; common medium faint and distinct yellowish brown (10YR 5/4 and 5/6) mottles; weak fine and medium subangular blocky structure; hard, firm, sticky, plastic; few fine roots; many fine pores; very strongly acid; gradual wavy boundary.

Bg3—42 to 60 inches; gray (10YR 5/1) sandy clay loam; many medium and coarse distinct dark yellowish brown (10YR 4/4) mottles; weak fine and medium subangular blocky structure; hard, firm, sticky, plastic; many very fine pores; few fine black concretions; very strongly acid.

The thickness of the solum ranges from 30 to 65 inches. The content of clay in the 10- to 40-inch control section ranges from 18 to 35 percent. Reaction is strongly acid or very strongly acid throughout the profile.

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

The Bw horizon is dark grayish brown, dark brown, grayish brown, brown, or yellowish brown. The number of mottles in shades of yellow and brown ranges from none to common. This horizon is clay loam, loam, or sandy clay loam.

The Bg horizon is gray, grayish brown, light gray, or light brownish gray. It has few to many mottles in shades of yellow, brown, and gray. It is loam, clay loam, or sandy clay loam.



Figure 6.—Profile of Mocarey loam in an area of the Mocarey-Yeaton complex.

## Mocarey Series

The Mocarey series consists of very deep, nearly level, somewhat poorly drained, slowly permeable soils (fig. 6). These soils formed in thick beds of clayey coastal plain sediments enriched with calcium carbonate. Slopes are 0 to 1 percent.

Typical pedon of Mocarey loam, in an area of Mocarey-Yeaton complex; from the intersection of U.S. Highway 90 and Texas Highway 146 in Dayton, 5.5 miles south on Texas Highway 146 and 300 feet west in an area of cropland:

Ap—0 to 8 inches; very dark gray (10YR 3/1) loam; weak fine and medium subangular blocky structure; hard, firm, slightly sticky, slightly plastic; common fine and medium and few coarse roots; few fine and medium pores; few wormcasts; neutral; clear wavy boundary.

A—8 to 12 inches; very dark gray (10YR 3/1) loam;

moderate fine and medium subangular blocky structure; hard, firm, sticky, plastic; few fine and medium roots; many fine and few medium pores; few fine round black concretions; moderately alkaline; gradual wavy boundary.

Bw—12 to 18 inches; dark gray (10YR 4/1) loam; weak fine and medium subangular blocky structure; hard, firm, slightly sticky, slightly plastic; few wormcasts; few fine round black bodies; few fine and medium roots; many fine and few medium pores; few fine concretions of calcium carbonate; moderately alkaline; gradual smooth boundary.

Bk1—18 to 24 inches; gray (10YR 5/1) loam; weak fine subangular blocky structure; hard, firm, slightly sticky, slightly plastic; few bodies of dark gray (10YR 4/1) material; few wormcasts; about 12 percent, by volume, visible fine, medium, and coarse concretions of calcium carbonate; few fine and medium roots; many fine and few medium pores; moderately alkaline; clear smooth boundary.

Bk2—24 to 37 inches; gray (10YR 5/1) clay loam; common medium and coarse distinct brownish yellow (10YR 6/6) mottles; moderate medium prismatic structure parting to weak fine subangular blocky; hard, firm, slightly sticky, slightly plastic; few fine roots; many fine and medium pores; few bodies of light brownish gray (10YR 6/2) material; about 15 to 20 percent coated concretions of calcium carbonate; few threads of soft, powdery lime; moderately alkaline; clear smooth boundary.

Bk3—37 to 44 inches; gray (10YR 6/1) clay loam; common medium and coarse distinct brownish yellow (10YR 6/6) mottles; moderate medium prismatic structure parting to weak fine subangular blocky; hard, firm, slightly sticky, slightly plastic; few fine roots; many fine and few medium pores; few coatings of dark gray (10YR 4/1) material on faces of peds; about 8 percent fine and medium concretions of calcium carbonate; moderately alkaline; clear wavy boundary.

Bk4—44 to 66 inches; gray (10YR 5/1 and 6/1) clay loam; common medium and coarse distinct brownish yellow (10YR 6/6 and 6/8) mottles; moderate medium prismatic structure parting to weak fine and medium subangular blocky; very hard, firm, slightly sticky, slightly plastic; few coatings of dark gray (10YR 5/1) material on faces of peds; few fine roots; many fine and few medium pores; few coarse and common fine and medium concretions of calcium carbonate; few wormcasts; few fine black concretions; moderately alkaline; gradual wavy boundary.

Bk5—66 to 80 inches; light gray (10YR 7/1) clay loam;

common medium distinct brownish yellow (10YR 6/6 and 6/8) mottles; moderate coarse prismatic structure parting to moderate medium subangular blocky; very hard, firm, slightly sticky, slightly plastic; few gray (10YR 6/1) clay coatings on faces of peds; many fine and few medium pores; few fine black concretions; few coarse concretions of calcium carbonate; common fine pockets of calcium carbonate on the faces of prisms; moderately alkaline.

The thickness of the solum ranges from 36 to more than 60 inches. The depth to horizons with secondary carbonates ranges from 17 to 30 inches.

The A horizon is black, very dark gray, very dark brown, very dark grayish brown, or dark brown. Reaction ranges from slightly acid to moderately alkaline.

The Bw horizon is dark gray, gray, light gray, grayish brown, light brownish gray, or light gray. Some pedons have mottles in shades of brown, yellow, and gray. This horizon is silty clay loam, clay loam, or loam. The number of concretions of calcium carbonate ranges from none to few. Reaction is slightly alkaline or moderately alkaline.

The Bk horizon is dark gray, gray, light gray, dark grayish brown, grayish brown, light brownish gray, brown, pale brown, or very pale brown. The number of mottles in shades of brown ranges from none to common. This horizon is silty clay loam, clay loam, or loam. The content of concretions and soft masses of calcium carbonate ranges from 3 to 25 percent.

The Mocarey soil is a taxadjunct to the series because it has a control section that is fine silty. This difference, however, does not affect the use and management of the soil.

## Morey Series

The Morey series consists of very deep, nearly level, poorly drained, slowly permeable soils. These soils formed in silty alluvium. Slopes are 0 to 1 percent.

Typical pedon of Morey silt loam, in an area of Bernard-Morey complex; from the intersection of Texas Highway 146 and U.S. Highway 90 in Dayton, 8.5 miles south on Texas Highway 146 and 450 feet east in an area of cropland:

Ap—0 to 8 inches; very dark gray (10YR 3/1) silt loam; weak fine subangular blocky structure parting to weak fine granular; hard, friable, sticky, nonplastic; common fine and medium and few coarse roots; few fine and medium pores; few wormcasts; neutral; clear wavy boundary.

Btg1—8 to 14 inches; dark gray (10YR 4/1) silt loam;

few fine and medium distinct strong brown (7.5YR 5/6) mottles; weak fine subangular blocky structure; very hard, firm, sticky, slightly plastic; common fine and few medium and coarse roots; few fine and medium pores; few wormcasts; few white bodies of silt; slightly alkaline; clear smooth boundary.

Btg2—14 to 23 inches; grayish brown (10YR 5/2) silty clay loam; few fine and medium faint yellowish brown (10YR 5/6) mottles; moderate fine blocky and subangular blocky structure; extremely hard, very firm, sticky, plastic; few fine roots; common fine pores; few small bodies of silty clay loam; moderately alkaline; clear smooth boundary.

Btg3—23 to 34 inches; grayish brown (2.5Y 5/2) silty clay; common fine and medium faint light olive brown (2.5Y 5/4) and few fine faint yellowish brown (10YR 5/6) mottles; moderate fine blocky and subangular blocky structure; extremely hard, very firm, sticky, plastic; few fine pores; few dark brown masses; few pitted concretions of calcium carbonate in the lower part; moderately alkaline; clear smooth boundary.

Btg4—34 to 54 inches; grayish brown (2.5Y 5/2) silty clay; many fine and medium faint light olive brown (2.5Y 5/4) mottles; weak fine subangular blocky structure; extremely hard, very firm, sticky, plastic; few round black concretions; few pitted concretions of calcium carbonate; few dark brown masses and streaks; few shiny pressure faces; moderately alkaline; gradual smooth boundary.

Btg5—54 to 60 inches; grayish brown (2.5Y 5/2) silty clay; many fine and medium faint light olive brown (2.5Y 5/4) and few fine distinct yellowish brown (10YR 5/6) mottles; weak fine subangular blocky structure; extremely hard, very firm, sticky, plastic; few round black concretions; few pitted concretions of calcium carbonate; few dark brown masses; few shiny pressure faces; moderately alkaline.

The thickness of the solum ranges from 60 to more than 80 inches. The mollic epipedon is slightly less than 10 inches thick.

The A horizon is very dark gray or very dark grayish brown. Reaction ranges from moderately acid to neutral.

The Btg horizon is dark gray or grayish brown. It has few to many mottles in shades of brown. It is silt loam and silty clay loam in the upper part and silty clay in the lower part. The number of pitted concretions of calcium carbonate ranges from none to few. Reaction ranges from moderately acid to slightly alkaline in the upper part and from moderately acid to moderately alkaline in the lower part.

The Morey soil is a taxadjunct to the series because

the mollic epipedon is slightly less than 10 inches thick as a result of cultivating and land leveling. This difference, however, does not affect the use and management of the soil.

### Otanya Series

The Otanya series consists of very deep, very gently sloping, moderately well drained, moderately slowly permeable soils. These soils formed in thick beds of unconsolidated, loamy coastal plain sediments. Slopes range from 1 to 3 percent.

Typical pedon of Otanya fine sandy loam, 1 to 3 percent slopes; from the intersection of U.S. Highway 59 and Texas Highway 321 in Cleveland, 5.0 miles east on Texas Highway 321, about 0.7 mile north on a county road (Doc Howard Road), and 20 feet west in a forest:

- A—0 to 4 inches; dark brown (10YR 4/3) fine sandy loam; few fine and medium faint brown (10YR 5/3) and dark grayish brown (10YR 4/2) mottles; weak fine and medium subangular blocky structure; soft, very friable, slightly sticky, nonplastic; many fine, medium, and coarse roots; many fine and medium pores; slightly acid; clear wavy boundary.
- E—4 to 12 inches; light yellowish brown (10YR 6/4) fine sandy loam; weak fine and medium subangular blocky structure; soft, very friable, slightly sticky, nonplastic; many fine, medium, and coarse roots; many fine and medium pores; slightly acid; clear wavy boundary.
- Bt1—12 to 27 inches; brownish yellow (10YR 6/8) sandy clay loam; few fine and medium prominent red (2.5YR 4/6) mottles; moderate medium subangular blocky structure; very hard, firm, sticky, slightly plastic; few fine and medium roots; few fine pores; few round ironstone pebbles; few thin clay films on faces of peds; strongly acid; gradual smooth boundary.
- Bt2—27 to 48 inches; brownish yellow (10YR 6/8) sandy clay loam; common medium and coarse prominent red (2.5YR 4/8) mottles; moderate medium subangular blocky structure; very hard, firm, sticky, plastic; few clay films on faces of peds; about 4 percent plinthite; very strongly acid; gradual smooth boundary.
- Btv1—48 to 60 inches; brownish yellow (10YR 6/8) sandy clay loam; few medium and coarse prominent red (2.5YR 4/8) mottles; moderate fine and medium subangular blocky structure; very hard, firm, sticky, plastic; few clay films on faces of peds; about 7 percent plinthite; very strongly acid; clear smooth boundary.
- Btv2—60 to 68 inches; reddish yellow (7.5YR 6/6) and

brownish yellow (10YR 6/6) sandy clay loam; common medium and coarse distinct yellowish red (5YR 5/6) and few medium distinct light brownish gray (10YR 6/2) mottles; moderate medium subangular blocky structure; very hard, firm, sticky, plastic; few clay films on faces of peds; about 5 percent plinthite; very strongly acid; gradual smooth boundary.

Btv3—68 to 80 inches; reddish yellow (7.5YR 6/6) and brownish yellow (10YR 6/6) sandy clay loam; common medium and coarse distinct yellowish red (5YR 5/6) and common medium and coarse prominent red (2.5YR 4/6) mottles; moderate medium subangular blocky structure; very hard, firm, sticky, plastic; few clay films on faces of peds; tongues of light gray and light brownish gray silt loam and very fine sandy loam; about 5 percent plinthite; very strongly acid.

The thickness of the solum ranges from 60 to more than 80 inches. The depth to a horizon that has more than 5 percent plinthite ranges from 24 to 60 inches. Most pedons have few or common black concretions and fragments of gravel.

The combined thickness of the A and E horizons ranges from 7 to 20 inches. These horizons are very strongly acid to slightly acid. The A horizon is very dark gray, dark gray, gray, very dark grayish brown, dark grayish brown, grayish brown, light brownish gray, dark brown, brown, or pale brown. The E horizon is dark grayish brown, grayish brown, light brownish gray, light gray, brown, pale brown, very pale brown, dark yellowish brown, yellowish brown, light yellowish brown, olive brown, or light olive brown. It has mottles in shades of brown and yellow. It is fine sandy loam or very fine sandy loam.

The Bt and Btv horizons are fine sandy loam, clay loam, or sandy clay loam. They are brown, light brown, strong brown, reddish yellow, yellowish brown, light yellowish brown, very pale brown, or brownish yellow. They have no mottles or have few or common mottles in shades of brown and red. Gray mottles are below a depth of 30 inches. Reaction is very strongly acid or strongly acid.

### Owentown Series

The Owentown series consists of very deep, nearly level, moderately well drained, moderately permeable soils. These soils formed in loamy alluvium. Slopes are 0 to 1 percent.

Typical pedon of Owentown fine sandy loam, occasionally flooded; from the intersection of Texas Highway 105 and Farm Road 2518 about 8.0 miles east of Cleveland, 0.5 mile south on Farm Road 2518, about

2.0 miles east on a county road, 1.5 miles south on a county road, and 0.5 mile east in a pasture:

- A—0 to 4 inches; brown (10YR 4/3) fine sandy loam; weak fine subangular blocky structure; soft, very friable, slightly sticky, nonplastic; common fine and medium roots; many fine and common medium pores; strongly acid; clear wavy boundary.
- Bw1—4 to 20 inches; yellowish brown (10YR 5/4) fine sandy loam; moderate fine and medium subangular blocky structure; soft, very friable, slightly sticky, nonplastic; common fine and medium roots; many fine pores; strongly acid; clear smooth boundary.
- Bw2—20 to 28 inches; yellowish brown (10YR 5/4) fine sandy loam; weak medium platy and weak fine and medium subangular blocky structure; soft, very friable, slightly sticky, nonplastic; common fine and medium roots; many fine pores; strongly acid; clear smooth boundary.
- BC1—28 to 36 inches; yellowish brown (10YR 5/4) loamy fine sand; common medium faint light brownish gray (10YR 6/2) and few medium faint yellowish brown (10YR 5/6) mottles; single grained; loose, nonsticky, nonplastic; common medium roots; many fine and very fine and common medium pores; common bodies of clean sand; strongly acid; clear smooth boundary.
- BC2—36 to 60 inches; brown (10YR 5/3) loamy fine sand; common medium and coarse faint yellowish brown (10YR 5/6) and common medium faint light brownish gray (10YR 6/2) mottles; single grained; loose, nonsticky, nonplastic; few fine roots; many fine and medium and few coarse pores; common bodies of clean sand; strongly acid.

The thickness of the solum ranges from 60 to more than 80 inches. The content of clay in the 10- to 40-inch control section ranges from 8 to 17 percent. Reaction is strongly acid or moderately acid.

The A horizon is dark brown, brown, light brown, very dark grayish brown, dark grayish brown, grayish brown, dark yellowish brown, yellowish brown, or brown.

The Bw horizon is brown, yellowish brown, light brown, strong brown, or reddish yellow. It has few or common mottles in shades of brown, yellow, and gray. Gray mottles are at a depth of 24 to 40 inches. This horizon is fine sandy loam, loamy fine sand, or loam.

The BC horizon is brown, yellowish brown, light brown, strong brown, or reddish yellow. It has few or common mottles in shades of brown, yellow, and gray. It is loamy fine sand or fine sandy loam.

The Owentown soil is outside the range defined for the series because areas of this soil receive 30 to 42 inches of rainfall.

## Pluck Series

The Pluck series consists of very deep, nearly level, poorly drained, moderately permeable soils. These soils formed in loamy alluvium. Slopes are 0 to 1 percent.

Typical pedon of Pluck fine sandy loam, frequently flooded; from the intersection of Farm Road 2797 and Farm Road 1008 in Kenefick, 2.0 miles east on Farm Road 2797, about 0.3 mile south and 0.5 mile east on a private dirt road, and 150 feet north in a pasture:

- A1—0 to 3 inches; dark grayish brown (10YR 4/2) fine sandy loam; few fine faint dark gray (10YR 4/1) and common fine faint yellowish brown (10YR 5/6) mottles; weak fine subangular blocky structure; soft, friable, slightly sticky, nonplastic; few fine, medium, and coarse roots; very fine pores; moderately acid; abrupt smooth boundary.
- A2—3 to 12 inches; dark grayish brown (10YR 4/2) silty clay loam; common fine distinct yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; hard, firm, sticky, plastic; few fine, medium, and coarse roots; common fine pores; few thin lenses of silt; neutral; clear smooth boundary.
- Bg1—12 to 35 inches; dark gray (10YR 4/1) clay loam; common medium distinct yellowish brown (10YR 5/6) and common medium faint gray (10YR 5/1) mottles; moderate medium subangular blocky structure; hard, firm, sticky, plastic; few thin layers of silt; common fine, medium, and coarse roots; common fine and very fine pores; common dark yellowish brown root stains; slightly alkaline; abrupt smooth boundary.
- Bg2—35 to 48 inches; dark gray (10YR 4/1) clay loam; common fine distinct yellowish brown (10YR 5/6) and many medium faint dark grayish brown (10YR 4/2) mottles; moderate medium subangular blocky structure; very hard, firm, very sticky, plastic; few fine roots; few fine pores; few bodies of clean silt; slightly alkaline; abrupt smooth boundary.
- Bg3—48 to 60 inches; dark gray (10YR 4/1) clay loam; common fine distinct yellowish brown (10YR 5/6) and many fine faint dark brown (10YR 4/3) mottles; moderate medium subangular blocky structure; extremely hard, firm, very sticky, very plastic; common fine pores; common fine fragments of charcoal; slightly alkaline.

The thickness of the solum ranges from 60 to more than 80 inches.

The A horizon is very dark gray, dark gray, very dark grayish brown, dark grayish brown, grayish brown, dark brown, or brown. The number of mottles in shades of gray and brown ranges from none to common. Reaction ranges from moderately acid to neutral.

The Bg horizon is dark gray, gray, grayish brown, or light brownish gray. The number of mottles in shades of yellow, brown, and gray ranges from none to many. This horizon is fine sandy loam, loam, or clay loam. Reaction ranges from moderately acid to slightly alkaline. Typically, the soil becomes more clayey with increasing depth.

### Segno Series

The Segno series consists of very deep, nearly level, moderately well drained, moderately slowly permeable soils on uplands. These soils formed in coastal plain sediments. Slopes are 0 to 1 percent.

Typical pedon of Segno fine sandy loam; from the intersection of U.S. Highway 59 and Texas Highway 105 in Cleveland, 5.0 miles west on Texas Highway 105, about 1.2 miles south on a county road (Fostoria Road), and 300 feet east in a forest:

A—0 to 3 inches; brown (10YR 4/3) fine sandy loam; weak medium subangular blocky structure parting to weak fine granular; soft, very friable, slightly sticky, nonplastic; few and common fine, medium, and coarse roots; many fine and medium pores; few wormcasts; strongly acid; clear smooth boundary.

E—3 to 17 inches; very pale brown (10YR 7/4) fine sandy loam; weak medium subangular blocky structure parting to weak fine granular; soft, very friable, slightly sticky, nonplastic; common fine, medium, and coarse roots; many fine and medium pores; few wormcasts; slightly acid; clear smooth boundary.

Bt—17 to 33 inches; yellowish brown (10YR 5/8) sandy clay loam; few fine distinct yellowish red (5YR 5/8) and common medium and coarse faint strong brown (7.5YR 5/8) mottles; moderate fine and medium subangular blocky structure; hard, firm, sticky, plastic; common fine and medium and few coarse roots; common fine and medium pores; few fine bodies of clean sand; few wormcasts; moderately acid; gradual smooth boundary.

Btv1—33 to 44 inches; yellowish brown (10YR 5/8) sandy clay loam; common fine and medium faint light gray (10YR 7/2), common fine distinct yellowish red (5YR 5/8), and few fine prominent red (2.5YR 4/8) mottles; moderate fine and medium subangular blocky structure; hard, firm, sticky, plastic; few fine and medium roots; many fine and medium pores; few fine dark concretions; few fine pebbles; few brittle bodies; about 8 percent plinthite; moderately acid; gradual wavy boundary.

Btv2—44 to 60 inches; yellowish brown (10YR 5/8) sandy clay loam; common fine and medium faint light gray (10YR 7/2), common medium and coarse

distinct yellowish red (5YR 5/8), and common fine and medium prominent red (2.5YR 4/8) mottles; moderate fine and medium subangular blocky structure; hard, firm, sticky, plastic; few fine roots; many fine pores; common fine pebbles; common brittle bodies; about 7 percent plinthite; moderately acid.

The thickness of the solum ranges from 60 to more than 80 inches. The content of plinthite is more than 5 percent at a depth of 30 to 50 inches. Base saturation ranges from 35 to 50 percent at a depth of about 50 inches.

The combined thickness of the A and E horizons ranges from 6 to 20 inches. These horizons are strongly acid to slightly acid. The A horizon is dark gray, gray, very dark grayish brown, dark grayish brown, grayish brown, dark brown, brown, or pale brown. The E horizon is grayish brown, light brownish gray, very pale brown, or yellowish brown.

The Bt and Btv horizons are yellowish brown or strong brown. They have few to many mottles in shades of red, gray, brown, and yellow. They are sandy clay loam, clay loam, or fine sandy loam. The content of clay in the upper 20 inches of the argillic horizon ranges from 18 to 35 percent. Reaction ranges from very strongly acid to moderately acid. Some pedons have few or common brittle bodies and pebbles. The content of pebbles is less than 15 percent. The content of plinthite ranges from 5 to 10 percent in the Btv horizon.

### Sorter Series

The Sorter series consists of very deep, nearly level, poorly drained, slowly permeable soils. These soils formed in loamy marine sediments. Slopes are 0 to 1 percent.

Typical pedon of Sorter loam; from the intersection of Texas Highway 105 and Farm Road 2518 near Tarkington, 2.1 miles west on Texas Highway 105, 1.4 miles north on a county road (Goat Road), and 75 feet west in a forest:

A—0 to 3 inches; light brownish gray (10YR 6/2) loam; weak fine subangular blocky and granular structure; soft, very friable, slightly sticky, nonplastic; common fine and medium roots; common fine and medium pores; many wormcasts; slightly acid; clear smooth boundary.

E—3 to 18 inches; light gray (10YR 7/2) loam; few fine faint brownish yellow (10YR 6/6) mottles; moderate fine and medium subangular blocky and moderate fine granular structure; slightly hard, very friable, slightly sticky, nonplastic; few fine roots; common fine pores; strongly acid; clear smooth boundary.

Btg1—18 to 42 inches; light gray (10YR 7/2) loam; few fine and medium faint brownish yellow (10YR 6/6) mottles; weak fine subangular blocky structure; slightly hard, friable, sticky, slightly plastic; few fine roots; common fine pores; common crawfish krotovinas; few thin clay films in pores; slightly acid; clear smooth boundary.

Btg2—42 to 48 inches; light brownish gray (10YR 6/2) loam; many medium and coarse faint brownish yellow (10YR 6/8) mottles; moderate medium subangular blocky structure; slightly hard, friable, sticky, slightly plastic; few fine roots; common fine pores; few crawfish krotovinas; few thin clay films in pores; slightly acid; clear smooth boundary.

Btg3—48 to 72 inches; light brownish gray (10YR 6/2) loam; few coarse distinct yellowish red (5YR 5/8) and common medium faint brownish yellow (10YR 6/8) mottles; moderate medium subangular blocky structure; slightly hard, friable, sticky, slightly plastic; common fine pores; common bodies of clean sand; few crawfish krotovinas; few thin clay films in pores; slightly acid.

The thickness of the solum ranges from 60 to more than 80 inches.

The A horizon is gray, dark grayish brown, grayish brown, or light brownish gray. It has no mottles or has mottles in shades of brown. Reaction ranges from very strongly acid to slightly acid.

The E horizon is gray, light gray, grayish brown, or light brownish gray. The number of mottles in shades of yellow ranges from none to few. This horizon is loam or silt loam. Reaction ranges from very strongly acid to slightly acid.

The Btg horizon is gray, light gray, grayish brown, or light brownish gray. It has few to many mottles in shades of yellow, brown, and red. It is loam or silt loam. Reaction ranges from very strongly acid to slightly acid.

Some pedons have a Cg horizon. This horizon is gray, light gray, grayish brown, or light brownish gray. It has few to many mottles in shades of yellow, brown, and red. It is fine sandy loam, loam, or silt loam. Reaction ranges from very strongly acid to moderately acid.

## Splendora Series

The Splendora series consists of very deep, nearly level, somewhat poorly drained, slowly permeable soils. These soils formed in thick beds of unconsolidated coastal plain sediments. Slopes are 0 to 1 percent.

Typical pedon of Splendora fine sandy loam; from the intersection of U.S. Highway 59 and Texas Highway 105 in Cleveland, 5.0 miles west on Texas Highway 105, about 0.9 mile south on a county road (Fostoria

Road), 500 feet east on a private road, and 50 feet north in a forest:

A—0 to 6 inches; dark grayish brown (10YR 4/2) fine sandy loam; weak fine subangular blocky structure parting to weak fine granular; soft, very friable, slightly sticky, nonplastic; common fine and medium roots; many fine and medium pores; few wormcasts; common dark brown root stains; strongly acid; clear smooth boundary.

E—6 to 18 inches; very pale brown (10YR 7/3) fine sandy loam; common fine and medium faint yellowish brown (10YR 5/8) and brownish yellow (10YR 6/6) mottles; weak fine subangular blocky structure parting to weak fine granular; soft, very friable, slightly sticky, nonplastic; few very fine pores; common fine, medium, and coarse roots; few antcasts and wormcasts; strongly acid; clear irregular boundary.

Bt/E1—18 to 31 inches; brownish yellow (10YR 6/6) sandy clay loam; many fine and medium faint light gray (10YR 7/2) and yellow (10YR 7/6) mottles; weak fine and medium subangular blocky structure; hard, firm, sticky, slightly plastic; few fine and medium and common coarse roots; many fine and medium pores; few thin clay films on faces of peds; about 20 percent tongues and pockets of very pale brown fine sandy loam (E); about 2 percent plinthite; very strongly acid; gradual wavy boundary.

Btx/E2—31 to 42 inches; light yellowish brown (10YR 6/4) sandy clay loam; many medium and coarse faint light gray (10YR 7/2), many medium and coarse distinct yellowish red (5YR 5/8), and common fine and medium faint yellow (10YR 7/8) mottles; weak fine and medium subangular blocky structure; hard, firm, sticky, slightly plastic; few fine roots; many fine and medium pores; about 20 percent tongues and pockets of very pale brown fine sandy loam (E); about 3 percent plinthite; few thin clay films on faces of peds; about 25 percent of the interior of the peds is brittle; very strongly acid; gradual wavy boundary.

Btx/E3—42 to 51 inches; brownish yellow (10YR 6/6) sandy clay loam; many medium and coarse faint light gray (10YR 7/2) and brownish yellow (10YR 6/8) and common medium and coarse distinct yellowish red (5YR 5/8) mottles; weak fine and medium subangular blocky structure; hard, firm, sticky, slightly plastic; few fine roots; common fine and medium pores; about 20 percent tongues and pockets of very pale brown fine sandy loam (E); about 2 percent plinthite; about 40 percent of the interior of the peds is brittle; few thin clay films on

faces of peds; very strongly acid; gradual wavy boundary.

Btx/E4—51 to 60 inches; brownish yellow (10YR 6/6) sandy clay loam; many medium and coarse faint light gray (10YR 7/2) and brownish yellow (10YR 6/8) and common medium and coarse distinct yellowish red (5YR 5/8) mottles; weak fine subangular blocky structure; slightly hard, sticky, slightly plastic; about 20 percent tongues and pockets of very pale brown fine sandy loam (E); about 5 percent plinthite; about 25 percent of the horizon is brittle; few thin clay films on faces of peds; very strongly acid.

The thickness of the solum ranges from 60 to more than 80 inches. The depth to a horizon that is brittle in more than 25 percent of the matrix ranges from 20 to 40 inches. Crawfish krotovinas occur throughout the solum.

The A horizon is very dark gray, dark gray, gray, very dark grayish brown, dark grayish brown, or grayish brown. Reaction is strongly acid or moderately acid.

The E horizon is gray, grayish brown, light brownish gray, light gray, brown, pale brown, and very pale brown. It has mottles in shades of yellow and brown. Reaction is strongly acid or moderately acid.

The Bt/E horizon is brown, strong brown, light brown, reddish yellow, dark yellowish brown, yellowish brown, light yellowish brown, and brownish yellow. It has mottles in shades of red, brown, gray, and yellow. It is clay loam, sandy clay loam, or loam. Reaction is very strongly acid or strongly acid. The content of iron concretions and plinthite in some pedons is as much as 5 percent.

## Spurger Series

The Spurger series consists of very deep, nearly level and very gently sloping, moderately well drained, slowly permeable soils. These soils formed in clayey alluvial sediments. Slopes range from 0 to 2 percent.

Typical pedon of Spurger fine sandy loam, 0 to 2 percent slopes; from the intersection of U.S. Highway 59 and Texas Highway 105 in Cleveland, 1.0 mile west on Texas Highway 105, about 0.3 mile north on Farm Road 1725, and 300 feet east in a forest:

A—0 to 3 inches; dark brown (10YR 3/3) fine sandy loam; weak fine subangular blocky and granular structure; soft, very friable, slightly sticky, slightly plastic; common fine, medium, and coarse roots; many fine and medium pores; common wormcasts; common fine bodies of clean sand; few fine dark concretions; slightly acid; clear wavy boundary.

E—3 to 12 inches; brown (10YR 4/3) fine sandy loam; common fine faint reddish yellow (7.5 6/6) mottles; weak fine subangular blocky and granular structure; soft, very friable, slightly sticky, nonplastic; common fine and medium and few coarse roots; common fine and medium and few coarse pores; common wormcasts; slightly acid; clear wavy boundary.

Bt1—12 to 19 inches; yellowish red (5YR 4/6) clay; few fine distinct light brownish gray (10YR 6/2), common fine distinct brownish yellow (10YR 6/6), and common fine faint red (2.5YR 5/6) mottles; moderate fine and medium subangular blocky structure; very hard, firm, sticky, plastic; common fine and medium roots; common fine and medium pores; many pressure faces; few fine bodies of clean sand; common wormcasts; common clay films on faces of peds; moderately acid; clear wavy boundary.

Bt2—19 to 24 inches; yellowish red (5YR 5/8) clay; common fine distinct light brownish gray (10YR 6/2) and common fine faint red (2.5YR 4/8) mottles; moderate fine and medium subangular blocky structure; very hard, firm, sticky, plastic; common fine roots; common fine pores; many pressure faces; common clay films on faces of peds; few fine bodies of clean sand; strongly acid; clear wavy boundary.

Bt3—24 to 35 inches; yellowish red (5YR 5/8) clay loam; many medium and coarse distinct pale brown (10YR 6/3), few fine faint strong brown (7.5YR 5/8), and common fine faint red (2.5YR 4/8) mottles; weak fine subangular blocky structure; hard, firm, sticky, slightly plastic; few fine roots; common fine and medium pores; few thin clay films on faces of peds; very strongly acid; clear wavy boundary.

BCt1—35 to 42 inches; mottled light brownish gray (10YR 6/2), red (2.5YR 4/8), and strong brown (7.5YR 5/8) sandy clay loam; weak fine subangular blocky structure; hard, firm, sticky, slightly plastic; few fine roots; common fine pores; few thin clay films on faces of peds; very strongly acid; clear wavy boundary.

BCt2—42 to 50 inches; strong brown (7.5YR 5/8) sandy clay loam; common fine distinct red (2.5YR 4/8) and many medium and coarse distinct light gray (10YR 7/2) mottles; weak fine subangular blocky structure; hard, firm, sticky, slightly plastic; common fine roots; common fine pores; few patchy clay films; very strongly acid; clear wavy boundary.

C—50 to 60 inches; light gray (10YR 7/2) loamy sand; many coarse faint yellowish brown (10YR 5/8) mottles; single grained; loose, nonsticky, nonplastic; few fine roots; common bodies of red (2.5YR 4/8) sand; slightly acid.

The thickness of the solum ranges from 40 to 70 inches. Base saturation ranges from 35 to 60 percent at a depth of about 50 inches below the top of the argillic horizon.

The combined thickness of the A and E horizons ranges from 6 to 17 inches. These horizons are very strongly acid to slightly acid. The A horizon is very dark grayish brown, dark grayish brown, grayish brown, dark brown, and brown. The E horizon is dark grayish brown, grayish brown, light brownish gray, brown, pale brown, dark yellowish brown, and yellowish brown.

The Bt horizon is dark reddish brown, reddish brown, dark red, red, yellowish red, dark brown, brown, or strong brown. It has mottles in shades of gray, brown, yellow, and red. Reaction ranges from very strongly acid to moderately acid. The upper part of the Bt horizon is clay or clay loam. The lower part is clay loam or sandy clay loam.

The BC and C horizons have colors in shades of red, gray, brown, or yellow, or they are mottled in these colors. The BC horizon is sandy clay loam or clay loam. The C horizon is fine sandy loam, sandy loam, loamy fine sand, loamy sand, or sand. Reaction ranges from very strongly acid to slightly acid.

The Spurger soil is a taxadjunct to the series because the clay mineralogy is montmorillonitic. This difference, however, does not affect the use and management of the soil.

## Vamont Series

The Vamont series consists of very deep, nearly level and very gently sloping, somewhat poorly drained and poorly drained, very slowly permeable soils. These soils formed in thick beds of clayey marine sediments. Slopes range from 0 to 3 percent.

Typical pedon of Vamont silty clay, 0 to 1 percent slopes; from the intersection of Texas Highway 146 and Farm Road 787 in Rye, 2.8 miles north on Texas Highway 146 and 50 feet west in a forest:

A—0 to 3 inches; dark grayish brown (10YR 4/2) silty clay; few fine faint brownish yellow (10YR 6/6) mottles; moderate medium subangular blocky structure; very hard, firm, very sticky, plastic; common fine, medium, and coarse roots; common fine pores; very strongly acid; clear wavy boundary.

Bw—3 to 11 inches; mottled brownish yellow (10YR 6/6) and grayish brown (10YR 5/2) clay; weak medium subangular blocky structure; extremely hard, very firm, very sticky, very plastic; common fine and medium roots; few fine pores; common pressure faces; very strongly acid; clear wavy boundary.

Bss1—11 to 47 inches; light brownish gray (10YR 6/2) clay; many coarse distinct strong brown (7.5YR 5/8) mottles; weak medium and coarse subangular blocky structure; extremely hard, extremely firm, very sticky, very plastic; common fine and medium roots; many fine pores; many pressure faces; many intersecting slickensides; very strongly acid; gradual diffuse boundary.

Bss2—47 to 60 inches; grayish brown (10YR 5/2) clay; few fine prominent red (2.5YR 4/8) and common medium and coarse faint brown (7.5YR 4/4) mottles; weak fine and medium subangular blocky structure; extremely hard, extremely firm, very sticky, very plastic; common fine bodies of pale brown and strong brown material; many intersecting slickensides; moderately acid.

The thickness of the solum ranges from 60 to more than 80 inches. Undisturbed areas have gilgai microrelief. The microknolls are 4 to 12 inches higher than the microdepressions. Intersecting slickensides and pressure faces begin at a depth of 8 to 16 inches. Texture is clay or silty clay throughout the profile. The content of clay in the 10- to 40-inch control section ranges from 45 to 60 percent.

The A horizon is brown, dark brown, dark grayish brown, or very dark grayish brown. It has mottles in shades of yellow, brown, and gray. Reaction ranges from very strongly acid to neutral.

The Bw and Bss horizons are yellowish red, strong brown, gray, grayish brown, light brownish gray, light gray, pale brown, light yellowish brown, brownish yellow, yellowish brown, or light olive brown. They have mottles in shades of yellow, brown, red, and gray. Reaction ranges from very strongly acid to neutral. The number of round black concretions ranges from none to many. Some pedons have pitted concretions of calcium carbonate.

## Verland Series

The Verland series consists of very deep, nearly level, somewhat poorly drained, very slowly permeable soils. These soils formed in thick beds of clayey marine sediments. Slopes are 0 to 1 percent.

Typical pedon of Verland clay loam; from the intersection of Farm Road 787 and Texas Highway 146 in Rye, 1.1 miles west on Farm Road 787 and 150 feet north in a forest:

A—0 to 3 inches; grayish brown (10YR 5/2) clay loam; common fine and medium distinct brownish yellow (10YR 6/6) mottles; weak fine subangular blocky structure; hard, firm, sticky, slightly plastic; common

fine, medium, and coarse roots; few fine and medium pores; moderately acid; clear smooth boundary.

Bt1—3 to 10 inches; light brownish gray (10YR 6/2) clay; many fine prominent and few medium prominent strong brown (7.5YR 5/6) and reddish yellow (7.5YR 6/6) mottles; moderate fine and medium subangular blocky structure; extremely hard, very firm, very sticky, very plastic; few fine, medium, and coarse roots; few fine and medium pores; few patchy clay films on faces of peds; moderately acid; gradual smooth boundary.

Bt2—10 to 27 inches; light brownish gray (10YR 6/2) clay; many medium prominent and few fine prominent strong brown (7.5YR 5/6) and reddish yellow (7.5YR 6/6) mottles; moderate medium subangular blocky structure; extremely hard, very firm, very sticky, very plastic; few fine and medium roots; few fine and medium pores; few patchy clay films on faces of peds; moderately acid; gradual smooth boundary.

Bt3—27 to 36 inches; gray (10YR 6/1) clay; many fine and medium prominent strong brown (7.5YR 5/6) and reddish yellow (7.5YR 6/6) and common medium faint light brownish gray (10YR 6/2) mottles; moderate medium subangular blocky structure; extremely hard, very firm, very sticky, very plastic; few fine and medium pores; few patchy clay films on faces of peds; few pressure faces; moderately acid; gradual smooth boundary.

Bt4—36 to 60 inches; gray (10YR 6/1) clay; few fine and medium prominent yellowish red (5YR 5/8), few medium faint light brownish gray (10YR 6/2), and many medium and coarse prominent strong brown (7.5YR 5/6) and reddish yellow (7.5YR 6/6) mottles; moderate medium subangular blocky structure; extremely hard, very firm, very sticky, very plastic; few patchy clay films on faces of peds; few black stains along root channels; few black concretions; common pressure faces; moderately acid.

The thickness of the solum ranges from 60 to more than 80 inches.

The A horizon is dark gray, dark grayish brown, gray, or grayish brown. It has mottles in shades of brown and yellow. Reaction is moderately acid or slightly acid.

The Bt horizon is dark gray, dark grayish brown, gray, grayish brown, or light brownish gray. It has mottles in shades of brown, red, and yellow. It is clay, silty clay, silty clay loam, or clay loam. Reaction ranges from moderately acid to moderately alkaline. Some pedons have concretions of calcium carbonate at a depth of 24 to 60 inches.

## Voss Series

The Voss series consists of very deep, nearly level, moderately well drained, rapidly permeable soils. These soils formed in sandy alluvium. Slopes are 0 to 1 percent.

Typical pedon of Voss fine sand, occasionally flooded; from the intersection of Farm Road 223 and Farm Road 787 in Dolen, 1.6 miles east on Farm Road 787, about 3.5 miles east and south on a county road (New River Lake Estates Road), 0.4 mile east on a county road, and 100 feet west in a pasture:

A1—0 to 3 inches; dark grayish brown (10YR 4/2) fine sand; single grained; loose, nonsticky, nonplastic; common fine and medium and few coarse roots; many fine and medium and coarse pores; neutral; clear smooth boundary.

C1—3 to 9 inches; pale brown (10YR 6/3) fine sand; single grained; loose, nonsticky, nonplastic; common fine and medium and few coarse roots; many fine and medium and few coarse pores; neutral; clear smooth boundary.

C2—9 to 34 inches; light brownish gray (10YR 6/2) fine sand; single grained; loose, nonsticky, nonplastic; few fine and medium and coarse roots; few fine and many medium and coarse pores; neutral; clear smooth boundary.

C3—34 to 60 inches; light gray (10YR 7/2) fine sand; single grained; loose, nonsticky, nonplastic; few fine roots; few fine and many medium and coarse pores; neutral.

Reaction ranges from moderately acid to neutral throughout the profile.

The A horizon is dark gray or dark grayish brown. The C horizon is light brownish gray, light gray, pale brown, or very pale brown.

## Waller Series

The Waller series consists of very deep, nearly level, poorly drained, slowly permeable soils. These soils formed in thick beds of unconsolidated coastal marine sediments. Slopes are 0 to 1 percent.

Typical pedon of Waller loam; from the intersection of Farm Road 1010 and Texas Highway 321 in Cleveland, 6.7 miles south on Farm Road 1010, about 1.8 miles east on private road, and 100 feet north in a forest:

A—0 to 8 inches; grayish brown (10YR 5/2) loam; weak fine subangular blocky and granular structure; soft, very friable, slightly sticky, slightly plastic; common fine, medium, and coarse roots; many fine and very fine pores; common antcasts and wormcasts; many

crawfish krotovinas; many streaks of clean sand grains; decomposing leaves throughout; very strongly acid; clear wavy boundary.

E—8 to 22 inches; light brownish gray (10YR 6/2) loam; few medium faint grayish brown (10YR 5/2) and common medium and coarse distinct yellowish brown (10YR 5/6) mottles; weak fine subangular blocky structure; soft, very friable, slightly sticky, slightly plastic; common fine roots; many fine and very fine pores; many crawfish krotovinas; few streaks of clean sand grains; strongly acid; gradual irregular boundary.

Btg/E1—22 to 36 inches; grayish brown (10YR 5/2) clay loam; common fine and medium distinct yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; hard, firm, sticky, plastic; few fine roots; common very fine pores; many yellowish brown root stains; few thin clay films on faces of peds; about 30 percent tongues and pockets of light brownish gray silt loam (E); strongly acid; diffuse wavy boundary.

Btg/E2—36 to 60 inches; grayish brown (10YR 5/2) clay loam; common medium distinct yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; very hard, very firm, very sticky, very plastic; common fine pores; many fine yellowish brown root stains; few thin clay films on faces of peds; about 20 percent tongues and pockets of light brownish gray silt loam (E); very strongly acid.

The thickness of the solum ranges from 60 to more than 80 inches.

The A horizon is dark gray, gray, grayish brown, or dark grayish brown. It has no mottles or has mottles in shades of yellow and brown. Reaction ranges from very strongly acid to moderately acid.

The E horizon is gray, light gray, grayish brown, or light brownish gray. It has no mottles or has mottles in shades of yellow and brown. It is loam or fine sandy loam. Reaction ranges from very strongly acid to moderately acid.

The Btg/E horizon is gray, light gray, grayish brown, or light brownish gray. It has few or common mottles in shades of red, brown, and yellow. It is clay loam, silty clay loam, sandy clay loam, or loam. Reaction ranges from very strongly acid to moderately acid. This horizon is made up of 15 to 35 percent tongues and pockets of light brownish gray silt loam or very fine sandy loam (E material).

### Wockley Series

The Wockley series consists of very deep, nearly level, somewhat poorly drained, moderately slowly

permeable soils. These soils formed in thick beds of unconsolidated coastal plain sediments. Slopes are 0 to 1 percent.

Typical pedon of Wockley fine sandy loam; from the intersection of Texas Highway 105 and U.S. Highway 59 in Cleveland, 1.9 miles west on Texas Highway 105, about 0.9 mile south on a county road (Pin Oak Road), and 100 feet west in a forest:

A—0 to 4 inches; brown (10YR 5/3) fine sandy loam; weak fine subangular blocky structure; soft, very friable, slightly sticky, nonplastic; common fine, medium, and coarse roots and pores; strongly acid; clear smooth boundary.

E—4 to 28 inches; pale brown (10YR 6/3) fine sandy loam; weak fine subangular blocky structure; soft, very friable, slightly sticky, nonplastic; common fine, medium, and coarse roots; many fine, medium, and coarse pores; few fine black concretions; common vertical streaks of brown (10YR 5/3) fine sandy loam in the upper part; strongly acid; clear smooth boundary.

Bt—28 to 36 inches; yellowish brown (10YR 5/4) sandy clay loam; few fine faint light brownish gray (10YR 6/2) and many medium and coarse faint brownish yellow (10YR 6/6 and 6/8) mottles; moderate medium subangular blocky structure; hard, firm, sticky, slightly plastic; few medium and coarse roots; many fine and medium pores; common medium and coarse black concretions; moderately acid; gradual wavy boundary.

Btv—36 to 50 inches; yellowish brown (10YR 5/4) sandy clay loam; many medium and coarse faint brownish yellow (10YR 6/6 and 6/8) and common fine and medium faint light gray (10YR 7/2) mottles; moderate medium subangular blocky structure; hard, firm, sticky, slightly plastic; few medium roots; many fine and medium pores; many medium and coarse black concretions; about 7 percent plinthite; slightly acid; gradual wavy boundary.

Bt'—50 to 60 inches; mottled reddish yellow (7.5YR 6/8), light gray (10YR 7/2), and yellowish red (5YR 5/8) sandy clay loam; moderate medium subangular blocky structure; hard, firm, sticky, plastic; few small bodies of clean sand; about 3 percent plinthite; few fine black concretions; strongly acid.

The thickness of the solum ranges from 60 to more than 80 inches. The depth to horizons that have more than 5 percent plinthite ranges from 30 to 55 inches. Most pedons have few to many black concretions.

The combined thickness of the A and E horizons ranges from 16 to 30 inches. These horizons are strongly acid to slightly acid. The A horizon is very dark grayish brown, dark grayish brown, grayish brown, dark

brown, brown, or pale brown. The E horizon is grayish brown, brown, pale brown, or yellowish brown. It is fine sandy loam or loam.

The Bt horizon is brown, pale brown, yellowish brown, light yellowish brown, or light brown. It has no mottles or has mottles in shades of brown, gray, red, and yellow. It is loam, sandy clay loam, or clay loam. Reaction is strongly acid or moderately acid.

The Btv horizon is mottled in shades of brown, red, and gray. It is sandy clay loam or clay loam. Reaction ranges from strongly acid to slightly acid. The content of plinthite ranges from 5 to 15 percent.

### Woodville Series

The Woodville series consists of very deep, very gently sloping to moderately sloping, somewhat poorly drained, very slowly permeable soils. These soils formed in clayey marine sediments. Slopes range from 1 to 8 percent.

Typical pedon of Woodville fine sandy loam, 1 to 3 percent slopes; from the intersection of Farm Road 787 and Farm Road 223 in Dolen, 1 mile north on Farm Road 223 and 1,000 feet northeast in a pasture:

A—0 to 6 inches; brown (10YR 5/3) fine sandy loam; weak fine subangular blocky and granular structure; soft, friable, slightly sticky, nonplastic; common fine and medium roots; many fine and medium pores; moderately acid; clear wavy boundary.

E—6 to 11 inches; very pale brown (10YR 7/3) loam; many fine and medium distinct brownish yellow (10YR 6/8) mottles; weak fine subangular blocky and granular structure; soft, friable, slightly sticky, nonplastic; common fine roots; common fine and medium pores; common wormcasts; many small bodies and streaks of brown (10YR 5/3) fine sandy loam; strongly acid; clear wavy boundary.

Bt1—11 to 19 inches; red (2.5YR 4/8) clay; common coarse distinct pale brown (10YR 6/3) and yellow (10YR 7/6) mottles; moderate medium and coarse subangular blocky structure; very hard, firm, sticky, plastic; common fine roots; common fine pores; many clay films on faces of peds; common streaks of brown (10YR 5/3) fine sandy loam and very pale brown (10YR 7/3) loam; common pressure faces; very strongly acid; clear wavy boundary.

Bt2—19 to 27 inches; mottled red (2.5YR 4/8), pale brown (10YR 6/3), and reddish yellow (7.5YR 6/8) clay; moderate fine and medium blocky and subangular blocky structure; very hard, firm, sticky, plastic; few fine roots; many clay films on faces of peds; many pressure faces; very strongly acid; clear wavy boundary.

Bt3—27 to 60 inches; mottled red (2.5YR 4/8), reddish

yellow (7.5YR 6/8), very pale brown (10YR 7/3), and brownish yellow (10YR 6/6) clay; weak coarse subangular blocky structure; very hard, firm, sticky, plastic; few fine roots; few pressure faces; few fine dark concretions; very strongly acid.

The thickness of the solum ranges from 60 to more than 80 inches.

The A horizon is very dark grayish brown, dark grayish brown, grayish brown, dark brown, or brown. Reaction ranges from very strongly acid to slightly acid.

The E horizon is grayish brown, light brownish gray, brown, pale brown, or very pale brown. It is fine sandy loam or loam. Reaction ranges from very strongly acid to slightly acid.

The upper part of the Bt horizon is red, dark red, dark reddish brown, reddish brown, yellowish red, or strong brown. It has few or common mottles in shades of gray, red, brown, and yellow. It is clay. The content of clay in the control section ranges from 40 to 60 percent. Reaction ranges from very strongly acid or strongly acid.

The lower part of the Bt horizon is mottled in shades of gray, red, brown, and yellow. It is clay. Reaction is mainly very strongly acid or strongly acid but ranges from moderately acid to slightly alkaline. Some pedons have concretions of calcium carbonate, and some do not.

### Yeaton Series

The Yeaton series consists of very deep, nearly level, somewhat poorly drained, slowly permeable soils. These soils formed in thick beds of unconsolidated, loamy coastal plain sediments. Slopes are 0 to 1 percent.

Typical pedon of Yeaton loam, in an area of Mocreay-Yeaton complex; from the intersection of U.S. Highway 90 and Texas Highway 146 in Dayton, 5.5 miles south on Texas Highway 146 and 300 feet west in an area of cropland:

Ap—0 to 8 inches; dark gray (10YR 4/1) loam; weak fine subangular blocky structure; slightly hard, friable, slightly sticky, nonplastic; many fine and medium and few coarse roots; few fine and medium pores; neutral; clear smooth boundary.

E—8 to 13 inches; dark grayish brown (2.5Y 4/2) loam; common fine and medium distinct light olive brown (2.5Y 5/4) and few fine distinct light olive brown (2.5Y 5/6) mottles; weak coarse subangular blocky structure; slightly hard, friable, slightly sticky, nonplastic; few fine roots; few fine pores; common fine dark concretions; slightly alkaline; clear smooth boundary.

Bt1—13 to 22 inches; olive yellow (2.5Y 6/6) clay loam; few fine faint light olive brown (2.5Y 5/4) and common fine and medium distinct light brownish gray (2.5Y 6/2) mottles; moderate fine blocky structure; extremely hard, very firm, very sticky, plastic; few fine roots; few fine pores; common pressure faces; common light brownish gray and grayish brown clay films on faces of peds; few fine and coarse concretions of calcium carbonate; slightly effervescent; neutral; gradual wavy boundary.

Bt2—22 to 33 inches; light olive brown (2.5Y 5/6) clay loam; common fine and medium distinct light brownish gray (2.5Y 6/2) and few fine distinct yellowish brown (10YR 5/6) mottles; moderate medium angular blocky structure; extremely hard, very firm, very sticky, plastic; few fine roots; few fine pores; common light brownish gray clay films on faces of peds; few slickensides; few fine and coarse concretions of calcium carbonate; slightly effervescent; slightly alkaline; clear wavy boundary.

Btk1—33 to 45 inches; light brownish gray (10YR 6/2) loam; common medium distinct brown (10YR 5/3) and yellowish brown (10YR 5/4), common fine and medium prominent olive yellow (2.5Y 6/6), and common fine prominent light olive brown (2.5Y 5/6) mottles; moderate coarse prismatic structure parting to weak medium subangular blocky; very hard, firm, sticky, plastic; few fine roots; few fine pores; common gray clay films on faces of peds; few fine dark concretions; about 25 percent, by volume, concretions and soft masses of calcium carbonate; strong effervescence; moderately alkaline; gradual wavy boundary.

Btk2—45 to 61 inches; light brownish gray (10YR 6/2) loam; few fine faint very pale brown (10YR 7/4), many coarse distinct brown (10YR 5/3) and yellowish brown (10YR 5/4 and 5/6), and many medium and coarse prominent olive yellow (2.5YR 6/6) mottles; moderate coarse prismatic structure parting to weak medium subangular blocky; very hard, firm, sticky, plastic; few fine roots; few fine pores; common gray clay films on faces of peds; few fine dark concretions; about 20 percent

concretions and soft masses of calcium carbonate; strong effervescence; moderately alkaline; gradual wavy boundary.

Btk3—61 to 80 inches; light yellowish brown (10YR 6/4) silt loam; common medium and coarse distinct brownish yellow (10YR 6/6), common fine and medium distinct light gray (10YR 7/1), common medium distinct yellowish brown (10YR 5/8), and few fine and medium faint very pale brown (10YR 7/4) mottles; moderate coarse prismatic structure parting to weak medium angular blocky; very hard, firm, sticky, plastic; few fine roots; few fine pores; few dark concretions and soft masses; about 16 percent, by volume, concretions and soft masses of calcium carbonate; moderately alkaline.

The thickness of the solum ranges from 60 to more than 80 inches. The depth to horizons with secondary carbonates ranges from 13 to 28 inches. The content of clay in the control section ranges from 35 to 40 percent.

The A horizon is very dark gray, dark gray, gray, very dark grayish brown, dark grayish brown, or grayish brown. Reaction ranges from slightly acid to slightly alkaline.

The E horizon is dark grayish brown, grayish brown, light brownish gray, brown, pale brown, dark yellowish brown, yellowish brown, light yellowish brown, olive brown, or light olive brown. The number of mottles in shades of brown, yellow and olive ranges from none to common. This horizon is very fine sandy loam or loam. Reaction ranges from slightly acid to slightly alkaline.

The Bt and Btk horizons are brown, pinkish gray, light brown, pink, strong brown, reddish yellow, dark grayish brown, grayish brown, light brownish gray, light gray, pale brown, very pale brown, yellowish brown, dark yellowish brown, light yellowish brown, brownish yellow, yellow, olive brown, light olive brown, pale yellow, or olive yellow. They have few to many mottles in shades of red, brown, yellow, gray, and olive. Reaction is neutral or moderately alkaline. The content of concretions and soft masses of calcium carbonate ranges from 0 to 20 percent. The Bt horizon is clay loam or silty clay. The Btk horizon is silt loam, loam, or silty clay loam.



# Formation of the Soils

---

In this section the factors of soil formation are related to the formation of the soils in Liberty County. Also processes of horizon differentiation and the surface geology of the county are described.

## Factors of Soil Formation

The characteristics of a soil depend on the physical and mineral composition of the parent material, the climate under which the soil material has accumulated and has existed since accumulation, the plant and animal life on and in the soil, the relief, and the length of time the forces of soil development have acted on the soil material. All of these factors are important in the formation of soils, but the influence of each varies from one place to another.

### Parent Material

Parent material is the unconsolidated mass in which a soil forms. It affects the chemical and mineral composition of the soil. The parent material in Liberty County consists of unconsolidated sediments of Pleistocene and Miocene age of the Tertiary and Quaternary periods. The parent material of the soils in areas of the flatwoods consists of loamy deposits. The parent material of coast prairie soils are characterized by calcareous clays. The parent material on stream terraces consists of unconsolidated, alluvial sediments of clay, silt, sand, and gravel. The parent material on the flood plains consists of recent alluvium, mainly clays. The geology of the parent material is described in the section "Surface Geology."

### Climate

Liberty County has a humid subtropical climate. Summers are hot, and winters are somewhat mild. Because the climate is uniform throughout the county, no measurable differences in soil characteristics can be attributed to climate. The effects of rainfall, however, are modified by runoff in areas where the aspect of the slope varies.

### Plant and Animal Life

Plants, insects, micro-organisms, crawfish, earthworms, and many other organisms have contributed to the formation of the soils in Liberty County. Gains in content of organic matter and plant nutrients, mixing of the soil, and changes in structure and porosity are caused by plants and animals. Decaying plant roots, burrowing animals, and insects leave channels and pores that improve the movement of air and water. Minerals deep in the soil are removed by trees and returned to the surface layer when leaves decay. Because grasses have a fibrous root system, they add more organic matter to the soil than trees. The soils that formed under grasses are generally darker than soils that formed under forest vegetation.

### Relief

Relief, or topography, influences soil formation through its effect on drainage, erosion, plant cover, and soil temperature.

The relief in Liberty County is mostly nearly level or very gently sloping. A few areas are gently sloping or moderately sloping. The degree of profile development depends on the amount and depth of water in the soil. Most soils in nearly level areas have a distinctly developed profile. This can vary, however, depending on the natural drainage of the soil. Many soils in nearly level areas that are poorly drained and remain saturated with water much of the time do not have very distinct horizonation. They are gleyed and generally are poorly developed below a depth of about 60 inches. Many of the better drained soils that are nearly level to gently sloping, however, are well developed to a depth of more than 80 inches.

### Time

A great length of time is required for the formation of soils that have distinct horizons. Differences in the length of time that the parent material has been in place are reflected in the degree of development of soil horizons. Young soils show very little horizon development. Old soils have well developed horizons.

## Processes of Horizon Differentiation

Soil profiles are made up of a series of horizons that extend from the surface to the parent material. The horizons differ in one or more properties, such as thickness, color, texture, structure, consistence, porosity, and reaction.

Most profiles consist of four major horizons. These are the A, E, B, and C horizons. Some young soils do not have a B horizon. Other soils have a Bk or Ck horizon that has significant amounts of calcium carbonate. In Liberty County, the main processes that have contributed to the formation of horizons are the accumulation of organic matter; the leaching of calcium carbonate and bases; and the accumulation, formation, and translocation of silicate clay minerals. More than one of these processes have been active in most soils.

The A horizon is the surface layer. It is the horizon that has the maximum accumulation of organic matter. The E horizon is the horizon that has the maximum amount of leaching. If a soil is plowed, the disturbed layer is called the Ap horizon.

The B horizon is directly below the A or E horizons. It is the horizon that has the maximum accumulation of dissolved or suspended materials. It has a distinctly different structure than that of the A and E horizons. An A horizon that has a significant accumulation of clay is called a Bt horizon. This horizon is generally firmer than the horizons directly above and below it and generally has a blocky structure.

The C horizon is relatively unchanged by the soil-forming processes, although it may be somewhat modified by geologic processes.

## Surface Geology

Prepared by Saul Aronow, Department of Geology, Lamar University, Beaumont, Texas.

Liberty County lies in the West Gulf Coastal Plain geomorphic unit (11). The major geologic units dip toward the gulf at an angle generally less than 3 degrees. They crop out in bands that parallel the gulf coast. Thin columns of salt rise from a depth of more than 10,000 feet and interrupt the general dip toward the gulf in some areas of the county. This rise of salt produced circular geologic structures called salt domes. Liberty County has seven salt domes (4). The Davis Hill salt dome rises about 150 feet above its base elevation, and the Hull salt dome rises about 15 feet above its base elevation.

The principal geologic units that outcrop in Liberty County range in age from less than 10,000 years (Holocene flood plain or alluvium) to more than 1,000,000 years (middle Pleistocene). The Davis Hill salt dome east of Cleveland has small exposures of the

older Willis and Fleming Formations. These formations are more than 2.5 million years old.

The geology of Liberty County is described in a geologic atlas of Texas (16). The general soil map of the county can be used to correlate the soils and the geologic units.

## Fleming and Willis Formations

The Fleming and Willis Formations of Pliocene and Plio-Pleistocene age are the oldest geologic units that crop out in Liberty County. They are located in small areas at the higher elevations of the Davis Hill salt dome and can be seen in road cuts and shallow pits. These inliers have been pushed up to the surface from their original subsurface positions by the rise of the Davis Hill salt dome. The salt is now at a depth of about 1,000 feet (4).

The Fleming Formation, locally of fluvial origin, is partially gray to brown, calcareous clay and silt that has many concretions of calcium carbonate and partially calcite-cemented, fine to medium grained sandstone.

The Willis Formation is noncalcareous, reddish, mottled clay and noncalcareous, reddish, iron-oxide cemented sand and gravel. The sand and gravel, mostly petrified wood, is siliceous. The Willis Formation also is of fluvial origin.

The Davis Hill salt dome is mainly in the Vamont-Woodville-Aldine general soil map unit. Because the areas of the Fleming and Willis Formations that crop out are so small, no useful correlation with the general soil map units can be made. Some individual soils, however, are indicators of these outcrops. The Dylan soil probably best represents the Fleming Formation, and the Boykin, Choate, and Doucette soils best represent the Willis Formation. Also in this area the Woodville and Dylan soils are closely associated. They may represent either a thin, clayey residuum of the Willis Formation over a shallow Fleming Formation or a Fleming Formation leached of calcareous components.

## Bentley and Montgomery Formations (Lissie Formation)

The Kirbyville-Waller-Sorter and the Splendora-Waller-Wockley general soil map units are in about the same areas where the Bentley and Montgomery Formations crop out. The Splendora-Waller-Wockley general soil map unit is predominantly in the area of the older Bentley Formation. The Bentley and Montgomery Formations are separated from each other and from the younger Beaumont Formation by low, poorly defined scarps or slope breaks. One of these scarps, along Luce Bayou, is the southern margin of the Kirbyville-Waller-Sorter general soil map unit. It separates the Beaumont Formation from the Montgomery Formation.

This gentle scarp rises at a rate of about 8 feet per mile. East of the Trinity River, however, the Beaumont Formation is not separated from the Montgomery Formation by a scarp. The scarp that separates the Bentley and Montgomery Formations is steeper. It has a slope of about 15 feet per mile.

In Liberty County, the Bentley, Montgomery, Willis, and Beaumont Formations consist of fluvial and deltaic sediments deposited by a sequence of the paleo-Trinity River in areas where it emerged from the Tertiary outcrop area and entered shallow coastal seas. Deposition was controlled by changes in sea level caused by the advance and retreat of continental ice sheets. These formations were probably deposited during periods when the sea level was high, similar to those of the present.

The alluvial and deltaic plains extend into the major river valleys as terraces that are parallel to streams. The terraces are discontinuous upstream but can be correlated with the coastal terraces based on slope and elevation.

Because of the general long-term, slow subsidence of the gulf coast region, the alluvial and deltaic plains along the coast tilted toward the gulf. The surface of older units is more steeply inclined than that of younger units as a result of successive tilts. For example, the older Bentley Formation tilts about 5 feet per mile while the Beaumont Formation tilts about 1.1 to 1.2 feet per mile (6).

The major topographic features of the Bentley and Montgomery Formations are small, undrained depressions and mounds and ridges. The Waller, Sorter, and Guyton soils are in depressions or flatwood ponds. The Kirbyville, Dallardsville, Otanya, and other soils are on mounds and small ridges. Neither the Bentley nor the Montgomery Formations have relict fluvial topography. Also, they do not have soil patterns related to fluvial patterns. The younger Beaumont Formation, however, does have these features and the microrelief features of the Bentley and Montgomery Formation.

The Bentley and Montgomery Formations are dissected by more streams than the Beaumont Formation is, but the loss of relict fluvial topography and soil patterns are not related to stream erosion. Probably the major factors in this loss of topography and soil patterns are the effects of slow mass-wasting, sheet erosion and deposition by flooding, erosion and deposition by wind during arid periods of the Pleistocene age, the small scale but cumulative effects of burrowing organisms, soil displacement by the expansion of tree roots, and the disturbance of the surface by windthrow.

### **Beaumont Formation**

The Beaumont Formation is the youngest and most extensive of the formations of Pleistocene age that crop out in the county. All of the coast prairie general soil map units, the Aris-Aldine-Anahuac, Beaumont-Lake Charles, Vamont-Woodville-Aldine, Bernard-Morey-Mocarey, and Vamont-Beaumont, are in areas of the Beaumont Formation.

North of Luce Bayou on the west side of the Trinity River, the Beaumont Formation occurs only as high-level stream terraces that are just below the area where the Bentley and Montgomery Formations crop out. The Vamont-Woodville-Aldine general soil map unit is in areas of these terraces. East of the Trinity River, in the extreme northern part of the county, the area of the Beaumont Formation that crops out becomes more narrow before occurring as stream terraces in Polk and San Jacinto Counties.

The Beaumont Formation has low-relief, relict, fluvial depositional topography that has related soil patterns. It has varying degrees of preservation. Some abandoned paleo-Trinity River channels have become part of intermittent stream courses. These include the upper reaches of Spindletop Bayou in the Double Gum Island area (map sheet 38), Horsepen Gully-Cypress Pond area (map sheet 38), Long Marsh area (map sheet 38), Cotton Creek-Pignut Gully (map sheet 49), and Abbots Creek (map sheet 46).

Remnants of meander channels, on slightly higher meandering ridges, are in areas of the Aris-Aldine-Anahuac and Bernard-Morey-Mocarey general map units. The channels and ridges represent the successively abandoned meandering paleo-Trinity River courses.

Flood basin deposits, between the meander ridges, formed the mostly clayey soils of the Beaumont-Lake Charles, Vamont-Beaumont, and Vamont-Woodville-Aldine general soil map units.

In most areas of the Aris-Aldine-Anahuac and Bernard-Morey-Mocarey general soil map units, the details of the depositional pattern can be slightly discerned from a few discontinuous segments of meandering channels. In some areas of these map units, the patterns are well preserved. In one area of the Aris-Aldine-Anahuac general soil map unit south of Hull and Daisetta, the pattern of the meandering channels and associated point bars is especially well preserved (map sheets 36, 42, 43, 48, 49, 53, 57, and 61). The Aris, Estes, Verland, and Lake Charles soils are representative of relict meandering channels. The Kemah-Aris, Aldine-Aris, and Anahuac-Aris complexes are representative of point bars. The Bernard-Morey-Mocarey general soil map unit, in the extreme

southwestern part of the county, also includes some well-defined meandering channel patterns (map sheets 50 and 54). Bernard and Lake Charles soils are in the relict channels in this area.

Most of the microrelief features (mounds and undrained depressions) are on the meander ridges.

Differences in the degree of preservation of the relict topographic features and attendant soil patterns are partially a result of processes that occurred during deposition of the Beaumont Formation and partially a result of post-depositional changes.

The main processes that contributed to the loss of fluvial topographic features during deposition were probably those associated with successive major changes in the course of the paleo-Trinity River. With each major change of course, abandoned meander belts were buried with clayey flood basin deposits.

Processes that contribute to post-depositional changes include erosion and deposits by wind, erosion and deposits by water, and organic activity under various climatic regimes. Variations in the time the meander belts were deposited may be partially responsible for differences in the degree of preservation. Older meander belts are more obscure because of longer exposure to post-depositional processes. In areas of the older Montgomery and Bentley Formations all such time differentials between the various parts of the surface no longer exist.

Some heavily forested areas of the Beaumont Formation in adjacent Jefferson and Chambers Counties are mostly devoid of relict fluvial features. In some areas of Liberty County, such as the Devers Woods area, the persistence of these topographic features is a deviation, probably because these forested areas are less than 100 years in age. Most of the soils in these forested areas are more typical of prairie soils than of forest soils. This suggests that the length of time forests have been in an area may be a factor in the presence or absence of fluvial features.

Some geologists believe that the Beaumont Formation was deposited during a high sea level of middle Wisconsin age (6). Some identify this time of deposition as the Farmdalian Interglacial Stage, which occurred about 25,000 to 35,000 years ago (5). Others identify the time of deposition as the Sangamonian Interglacial Stage, which occurred between the major Illinoian and Wisconsin Glacial Stages. The middle Wisconsin age that has been assigned begins to overlap the possible time range of deposition of the Deweyville terraces.

### Microrelief Features

Microrelief features in areas of the Bentley, Montgomery, and Beaumont Formations consist of

pimple mounds and undrained depressions (flatwood ponds in forested areas). Both pimple mounds and depressions contribute to some loss in the detail of the fluvial depositional topography in areas of the Beaumont Formation and the almost complete loss of topography in areas of the Bentley and Montgomery Formations.

Pimple mounds range from 2 to 5 feet in height and are as much as 150 feet in diameter. They generally are more rounded and distinct in the intermound areas of the Beaumont Formation and more elongated or ridgelike in areas of the older formations. Pimple mounds occur along the gulf coast from the western edge of the Mississippi River flood plain in Louisiana to Corpus Christi, Texas. They occur from east Texas northward into southeastern Oklahoma, Arkansas, and southern Missouri. A few isolated areas of mounds are in northwestern Iowa and northwestern Minnesota. In the Rocky Mountain region, mounds occur in New Mexico, Colorado, and Wyoming. Pimple mounds also occur in the western states of Washington, Oregon, Idaho, and California (8). They are called prairie mounds or mima mounds in areas other than Texas, Louisiana, and their contiguous states.

Aldine, Anahuac, Morey, and Yeaton soils are on mounds in areas of the Beaumont Formation. Dallardsville, Kirbyville, and Splendora soils are on mounds in areas of the Bentley and Montgomery Formations.

A major difference between the soils in mounded and unmounded areas is the thickness of the A and E horizons. Mounds generally occur in areas of soils that have sandy or loamy A and E horizons. In areas of the Beaumont Formation, mounds are only on the relict meander ridges of the Aris-Aldine-Anahuac and Bernard-Morey-Mocarey general soil map units. Mounds do not occur in the relict flood basins in areas of the Beaumont-Lake Charles general map unit. The distribution of mounds in areas of the older formations where clayey soils are absent is more uniform and is not controlled by relict topography.

The main processes that have been theorized for the origin of pimple mounds include erosional, accumulative, and organic (7, 14).

The erosional theory is widely believed. It proposes that intermound areas were eroded by running water, either channel flow or sheet flow, which left the mounds differentially high (10). Pedogenesis proceeded during the erosion, and the differing soil profiles of mound and intermound areas resulted.

The accumulative, or eolian, theory centers around small patches of vegetation that hold together soil material subject to sheet-flow erosion and the

establishment of slight topographic mounds. The vegetation traps windborne sand, silt, and aggregates, or clay pellets. The mound would then increase in height, mainly because of wind accretion and partially because of sheet-flow erosion around the base. In both the erosional and accumulative theories, soil formation keeps pace with wind-deposited increments and the A and E horizons are not fully pedogenic (7). Coppice mounds are in arid and semi-arid regions.

The major organic theory centers on the burrowing activities of small mammals, such as pocket gophers (8). The burrowing activity increases the volume of the soil, decreases the bulk density of the soil, and moves the soil to the center of the mound. The occurrence of gravelly mounds, which would not be possible with eolian accumulation, and the abrupt termination of mounds west of the Mississippi River support this theory.

The erosional theory proposes that large-scale sheet flow produced finely dissected topography that has very high stream density. A key issue is whether mounds formed during a climate similar to the present climate or during a period when the rate of rainfall was much higher. An accumulative, or eolian, theory assumes that the climate during the origin of the pimple mounds was more arid than the present climate.

Undrained depressions, or the flatwood ponds of forested areas, are circular to elongated, are generally less than 5 feet deep, and are less than 1,500 feet long. Intermittent lakes may be in the depressions. Some undrained depressions are permanently wet or marshy. Others become dry in the summer. Undrained depressions are most conspicuous in forested areas because trees do not typically grow in the depressions. The depressions are best developed in areas of the Montgomery and Bentley Formations. Waller, Sorter, and Guyton soils are in the depressions in areas of these formations. Verland, Bernard, Guyton, Vamont, Aris, and Mocarey soils are in the depressions in areas of the Beaumont Formation. Most of these soils are not restricted to these areas of undrained depressions.

The theories for the origin of undrained depressions center on segmented parts of stream channels or point-bar swales; blowouts or wind-excavated, deflated hollows; and subsidence or collapse features resulting from subsurface solution of soluble materials or the subsurface erosion of material (piping).

Some depressions in areas of the Beaumont Formation and Deweyville terraces are segmented parts of fluvial topography, thus indicating an early stage in the loss of depositional topography. This theory was also proposed for the origin of the Louisiana bagols, or baygalls, because the bagols were thought to be the

unfilled remnants of the deepest parts, or thalwegs, of river channels or point bar swales after the channels or swales were filled by floodwater sediment (9). This theory may be true for the flatter, higher surfaces, which are the last level surfaces of a terrace that was once continuous and that sloped toward the coast. In a few places, however, the depressions are on gentle slopes below remnants of the highest, adjacent flat surfaces. This indicates that the depressions formed after the erosion and mass-wasting of the slopes. Examples of these depressions include those in areas of Waller and Sorter soils on map sheets 4, 28, and 32. In the more arid climates, wind-excavated depressions are possible. To the south, in the low rainfall regions of Texas, the origin of depressions is clearly deflationary.

### **Deweyville Terraces and Deposits**

The Deweyville terraces occur mainly along the margins of the Trinity River flood plain in the central part of the county. They also are along the east fork of the San Jacinto River in the northwestern part of the county. In the areas along the Trinity River, the Deweyville terraces are the first terraces below the uplands and terraces of the Beaumont Formation. They mostly occur in areas of the Spurger-Bienville-Kenefick general soil map unit. In the areas along the San Jacinto River, the Deweyville terraces are the first terraces above the Holocene flood plain. The Deweyville terraces are not clearly localized in any map unit. Several levels of terraces are along both rivers.

The Deweyville terraces have been identified not only by their topographic position but by relict point bars and channel patterns whose radii of curvature are several times greater than those of the Holocene age channels of the Trinity River. These channel patterns suggest that stream discharges were several times greater in the late Pleistocene (late Wisconsin) age than in the Holocene age. Gravel and cobbles much coarser than material moved by the current Trinity River are also below the surface at depths that are not described in the soil profiles.

The major areas of the Deweyville terraces are along the Trinity River in places where the terrace surfaces are underlain by both fluvial material (depositional terraces) and by older material of Beaumont Formation age that has little, if any, fluvial cover (erosional or strath terraces). The soils in the Spurger-Bienville-Kenefick general soil map unit developed in areas of the depositional terraces. The Bienville soil and the minor Alaga soil are sandy throughout and may have been reworked by some eolian processes. The Spurger and Kenefick soils have illuvial clay in the subsoil. This indicates downward transport of clay and better horizon

development. The content of clay may be related to poorer sorting during deposition in a levee or flood basin or to the deposition of clay drapes following floodwater subsidence.

In many areas the large relict channels and point bar deposits are covered with thin layers of alluvial soils and parent materials that were deposited during great floods in the Holocene age. These thin layers are in areas of the northeastern corner of map sheet 18 and the western part of map sheet 22. In other places, such as areas of map sheet 56, terrace soils are on relict point bars and soils of Holocene age are in swales.

The straths, or cut surfaces, of the Deweyville terraces are underlain by materials of Beaumont Formation age. Most of these straths are in areas of the Vamont-Woodville-Aldine general soil map unit. Map sheet 6 shows the straths that occur on the east side of the Trinity River, along State Highway 146, where the terraces are capped with the soils of the Guyton-Aldine complex and with Guyton silt loam. Map sheets 30 and 31 show the high terrace that is bounded by Barrett Bayou and Farm Road 1011. This terrace includes Beaumont, Lake Charles, and Woodville soils and soils of the Kemah-Aris complex.

The Deweyville terraces along the East Fork of the San Jacinto River can best be identified in gravel pits west and northwest of Cleveland. Most of this area along the river has a well-defined scarp bounding either the terraces or the flood plain on the east side. Soils on these terraces include the Spurger, Bienville, Kenefick, Waller, and Landman soils.

In Chambers County, to the south, the features of the Deweyville terraces disappear below sea level, leaving only the large arcuate meander scars bounding the flood plain along the lower reaches of the Trinity River. The higher discharges, as indicated by the large-scale fluvial morphology and the coarseness of the deposits, were probably the result of more rainfall during some part or parts of the glacial advances and retreats. Some of the periods of more rainfall occurred during the lower

sea levels following deposition of the Beaumont Formation.

Radiocarbon dates on wood and bone from the Deweyville deposits are generally less than 25,000 and more than 12,000 years old. Older and younger dates, however, have been reported (1, 6). The possible time span of the Deweyville terraces encompasses at least one rise in sea level of late Wisconsin age (the Farmdalian Interglacial Stage) and a later decline in sea level (the Woodfordian Glacial Stage) (5). The higher strath terraces may record the first downcutting during a decline in sea level, and the deep sands and pebbles may record the backfilling during a rise in sea level.

### **Flood Plain Deposits and Holocene Sediments**

Soils in areas of the Kaman-Fausse-Mantachie general soil map unit developed from deposits of Holocene age on the flood plains along the Trinity River and the East Fork of the San Jacinto River.

The parent materials of the clayey Kaman, Estes, and Fausse soils consist of backswamp or flood basin deposits of the Trinity River. The Fausse soil is in abandoned oxbows. The Kaman soil is in the swales of point bar deposits and large, filled, abandoned meander channels of the Deweyville terraces. The sandy and loamy Voss, Mantachie, Owentown, Pluck, and Hatliff soils are in the higher areas of point bars and levees of Holocene age, which are along the river. In a few areas, Pluck and Mantachie soils are on the surface of large-scale Deweyville terrace point bars and Kaman soils are in the subadjacent lows.

The flood plain is narrow along the east fork of the San Jacinto River. Clayey flood basin deposits are absent, and a larger percentage of the coarser Hatliff, Mantachie, Pluck, and Voss soils are present.

The Holocene alluvium is graded to the current sea level. It is in the last stage of backfilling the previously deepened valley. The current sea level stabilized about 2,500 to 3,500 years ago.

## References

---

- (1) Alford, J.J., and J.C. Holmes. 1985. Meander scars as evidence of major climatic change in southwest Louisiana. *An. Assoc. Am. Geogr.* Vol. 75: 395-403.
- (2) American Association of State Highway and Transportation Officials. 1986. Standard specifications for highway materials and methods of sampling and testing. Ed. 14, 2 vols.
- (3) American Society for Testing and Materials. 1993. Standard classification of soils for engineering purposes. ASTM Stand. D 2487.
- (4) Anders, R.B., G.D. McAdoo, and W.H. Alexander. 1968. Ground-water resources of Liberty County, Texas. *Tex. Water Dev. Board Rep.* 72.
- (5) Beard, J.H., J.B. Sangree, and L.A. Smith. 1982. Quaternary chronology, paleoclimate, depositional sequences, and eustatic cycles. *Am. Assoc. Pet. Geol. Bull.* 66: 158-169.
- (6) Bernard, H.A., and R.J. LeBlanc. 1965. Resume of the quaternary geology of the northwestern Gulf of Mexico Province *In The Quaternary of the United States.* Princeton Univ. Press, pp. 137-185.
- (7) Carty, D.J. Characteristics of pimple mounds associated with the Morey soil of southeast Texas. Unpublished master's thesis completed in 1980 at Texas A&M University, College Station, Texas.
- (8) Cox, G.W. 1984. Mounds of mystery. *In Natural History*, vol. 93, no. 6, pp. 36-45.
- (9) Fisk, H.N. 1940. Geology of Avoyelles and Rapides Parishes. *La. Geol. Surv. Bull.* 18.
- (10) Goodarzi, N.K. 1978. Geomorphological and soil analysis of soil mounds in southwest Louisiana. Unpublished master's thesis completed in 1978 at Louisiana State University, Baton Rouge, Louisiana.
- (11) Hunt, C.B. 1974. Natural regions of the United States and Canada.
- (12) 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.

- (13) United States Department of Agriculture. 1984 (rev.). Procedures for collecting soil samples and methods of analysis for soil survey. Soil Surv. Invest. Rep. 1.
- (14) United States Department of Agriculture. 1988. Soil survey of Polk and San Jacinto Counties, Texas. Soil Conserv. Serv.
- (15) United States Department of Agriculture. 1993. Soil survey manual. U.S. Dep. Agric. Handb. 18.
- (16) University of Texas Bureau of Economic Geology. 1968. Geologic atlas of Texas, Beaumont sheet.

# 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 called peds. Clods are aggregates produced by tillage or logging.

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

**Association, soil.** A group of soils geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.

**Available water capacity (available moisture capacity).** The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as:

Very low .....	0 to 3
Low .....	3 to 6
Moderate .....	6 to 9
High .....	9 to 12
Very high .....	more than 12

**Base saturation.** The degree to which material having cation-exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, K), expressed as a percentage of the total cation-exchange capacity.

**Bisequum.** Two sequences of soil horizons, each of which consists of an illuvial horizon and the overlying eluvial horizons.

**Bottom land.** The normal flood plain of a stream, subject to flooding.

**Calcareous soil.** A soil containing enough calcium

carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

**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.

**Cation-exchange capacity.** The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity but is more precise in meaning.

**Chiseling.** Tillage with an implement having one or more soil-penetrating points that shatter or loosen hard, compacted layers to a depth below normal plow depth.

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

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

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

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

**Coarse fragments.** If round, mineral or rock particles 2 millimeters to 25 centimeters (10 inches) in diameter; if flat, mineral or rock particles (flagstone) 15 to 38 centimeters (6 to 15 inches) long.

**Coarse textured soil.** Sand or loamy sand.

**Complex, soil.** A map unit of two or more kinds of soil in such an intricate pattern or so small in area that it is not practical to map them separately at the

selected scale of mapping. The pattern and proportion of the soils are somewhat similar in all areas.

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

**Conservation tillage.** A tillage system that does not invert the soil and that leaves a protective amount of crop residue on the surface throughout the year.

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

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

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

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

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

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

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

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

*Cemented.*—Hard; little affected by moistening.

**Control section.** The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

**Deferred grazing.** Postponing grazing or resting grazing land for a prescribed period.

**Drainage class (natural).** Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:

*Excessively drained.*—Water is removed from the soil very rapidly. Excessively drained soils are

commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.

*Somewhat excessively drained.*—Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious.

Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.

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

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

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

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

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

**Drainage, surface.** Runoff, or surface flow of water, from an area.

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

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

*Erosion (accelerated)*—Erosion much more rapid than geologic erosion, mainly as a result of human or animal activities or of a catastrophe in nature, such as fire, that exposes the surface.

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

**Field moisture capacity.** The moisture content of a soil, expressed as a percentage of the oven-dry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity*, *normal moisture capacity*, or *capillary capacity*.

**Fine textured soil.** Sandy clay, silty clay, or clay.

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

**Forb.** Any herbaceous plant that is not a grass or a sedge.

**Fragipan.** A loamy, brittle subsurface horizon low in porosity and content of organic matter and low or moderate in clay but high in silt or very fine sand. A fragipan appears cemented and restricts roots. When dry, it is hard or very hard and has a higher bulk density than the horizon or horizons above. When moist, it tends to rupture suddenly under pressure rather than to deform slowly.

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

**Gilgai.** Commonly, a succession of microbasins and microknolls in nearly level areas or of microvalleys and microridges parallel with the slope. Typically, this is the microrelief of clayey soils that shrink and swell considerably with changes in moisture content.

**Gleyed soil.** Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors and mottles.

**Grassed waterway.** A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

**Gravel.** Rounded or angular fragments of rock up to 3 inches (2 millimeters to 7.6 centimeters) in diameter. An individual piece is a pebble.

**Ground water (geology).** Water filling all the unblocked pores of the material below the water table.

**Horizon, soil.** A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an uppercase letter represents the major horizons. Numbers or lowercase letters that follow represent subdivisions of the major horizons. An explanation of the subdivisions is given in the "Soil Survey Manual." The major horizons of mineral soil are as follows:  
*O horizon.*—An organic layer of fresh and decaying plant residue at the surface of a mineral soil.

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

*E horizon.*—The mineral horizon in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these.

*B horizon.*—The mineral horizon below an O, A, or E horizon. The B horizon is, in part, a layer of transition from the overlying horizon to the underlying C horizon. The B horizon also has distinctive characteristics, such as accumulation of clay, sesquioxides, humus, or a combination of these; prismatic or blocky structure; redder or browner colors than those in the A horizon; or a combination of these. The combined A and B horizons are generally called the solum, or true soil. If a soil does not have 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 in which the solum formed. If the material is known to differ from that in the solum, an Arabic numeral, commonly a 2, precedes the letter C.

*Cr horizon.*—Soft, consolidated bedrock beneath the soil.

*R layer.*—Consolidated rock (unweathered bedrock) beneath the soil. The bedrock commonly

underlies a C horizon but can be directly below an A or a B horizon.

**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.

**Illuviation.** The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

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

**Infiltration.** The downward entry of water into the immediate surface of soil or other material. This contrasts with percolation, which is movement of water through soil layers or material.

**Infiltration rate.** The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

**Intake rate.** The average rate of water entering the soil under irrigation. Most soils have a fast initial rate; the rate decreases with application time. Therefore, intake rate for design purposes is not a constant but is a variable depending on the net irrigation application. The rate of water intake, in inches per hour, is expressed as follows:

Less than 0.2 .....	very low
0.2 to 0.4 .....	low
0.4 to 0.75 .....	moderately low
0.75 to 1.25 .....	moderate
1.25 to 1.75 .....	moderately high
1.75 to 2.5 .....	high
More than 2.5 .....	very high

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

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

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

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

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

*Drip (or trickle).*—Water is applied slowly and under low pressure to the surface of the soil or into the soil through such applicators as emitters, porous tubing, or perforated pipe.

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

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

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

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

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

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

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

**Low strength.** The soil is not strong enough to support loads.

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

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

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

**Miscellaneous area.** An area that has little or no natural soil and supports little or no vegetation.

**Moderately coarse textured soil.** Coarse sandy loam, sandy loam, or fine sandy loam.

**Moderately fine textured soil.** Clay loam, sandy clay loam, or silty clay loam.

**Morphology, soil.** The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons,

and the thickness and arrangement of those horizons in the soil profile.

**Mottling, soil.** Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms are as follows: abundance—*few, common, and many*; size—*fine, medium, and coarse*; and contrast—*faint, distinct, and prominent*. The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium*, from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse*, more than 15 millimeters (about 0.6 inch).

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

**Neutral soil.** A soil having a pH value between 6.6 and 7.3. (See Reaction, soil.)

**Organic matter.** Plant and animal residue in the soil in various stages of decomposition.

**Pan.** A compact, dense layer in a soil that impedes the movement of water and the growth of roots. For example, *hardpan, fragipan, claypan, plowpan, and traffic pan*.

**Parent material.** The unconsolidated organic and mineral material in which soil forms.

**Ped.** An individual natural soil aggregate, such as a granule, a prism, or a block.

**Pedon.** The smallest volume that can be called “a soil.” A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

**Percolation.** The downward movement of water through the soil.

**Permeability.** The quality of the soil that enables water to move through the profile. Permeability is measured as the number of inches per hour that water moves through the saturated soil. Terms describing permeability are:

Very slow .....	less than 0.06 inch
Slow .....	0.06 to 0.2 inch
Moderately slow .....	0.2 to 0.6 inch
Moderate .....	0.6 inch to 2.0 inches
Moderately rapid .....	2.0 to 6.0 inches
Rapid .....	6.0 to 20 inches
Very rapid .....	more than 20 inches

**Phase, soil.** A subdivision of a soil series based on features that affect its use and management, such as slope, stoniness, and thickness.

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

**Piping** (in tables). Subsurface tunnels or pipelike cavities are formed by water moving through 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 semisolid to plastic.

**Plinthite.** The sesquioxide-rich, humus-poor, highly weathered mixture of clay with quartz and other diluents. It commonly appears as red mottles, usually in platy, polygonal, or reticulate patterns. Plinthite changes irreversibly to an ironstone hardpan or to irregular aggregates on repeated wetting and drying, especially if it is exposed also to heat from the sun. In a moist soil, plinthite can be cut with a spade. It is a form of laterite.

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

**Ponding.** Standing water on soils in closed depressions. Unless the soils are artificially drained, the water can be removed only by percolation or evapotranspiration.

**Poorly graded.** Refers to a coarse grained soil or 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.

**Productivity, soil.** The capability of a soil for producing a specified plant or sequence of plants under specific management.

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

**Range condition.** The present composition of the plant community on a range site in relation to the potential natural plant community for that site. Range condition is expressed as excellent, good, fair, or poor on the basis of how much the present plant community has departed from the potential.

**Rangeland.** Land on which the potential climax vegetation is predominantly grasses, grasslike plants, forbs, or shrubs suitable for grazing or browsing. It includes natural grasslands, savannas, many wetlands, some deserts, tundras, and areas that support certain forb and shrub communities.

**Range site.** An area of rangeland where climate, soil, and relief are sufficiently uniform to produce a distinct natural plant community. A range site is the product of all the environmental factors responsible for its development. It is typified by an association of species that differ from those on

other range sites in kind or proportion of species or total production.

**Reaction, soil.** A measure of the 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 degrees of acidity or alkalinity, expressed as pH values, are:

Extremely acid .....	below 4.5
Very strongly acid .....	4.5 to 5.0
Strongly acid .....	5.1 to 5.5
Moderately 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

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

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

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

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

**Runoff.** The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

**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-sized particles.

**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** (in tables). The movement of water through the soil adversely affects the specified use.

**Sequum.** A sequence consisting of an illuvial horizon and the overlying eluvial horizon. (See Eluviation.)

**Series, soil.** A group of soils that have profiles that are

almost alike, except for differences in texture of the surface layer or of the underlying material. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

**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 surface runoff.

**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.

**Silt.** As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

**Siltstone.** Sedimentary rock made up of dominantly silt-sized particles.

**Site index.** A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75 feet.

**Slickensides.** Polished and grooved surfaces produced by one mass sliding past another. In soils, slickensides may occur at the bases of slip surfaces on the steeper slopes; on faces of blocks, prisms, and columns; and in swelling clayey soils, where there is marked change in moisture content.

**Slick spot.** A small area of soil having a puddled, crusted, or smooth surface and an excess of exchangeable sodium. The soil is generally silty or clayey, is slippery when wet, and is low in productivity.

**Slippage** (in tables). The soil mass is susceptible to movement downslope when loaded, excavated, or wet.

**Slope.** The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

**Slope** (in tables). Slope is great enough that special practices are required to ensure satisfactory performance of the soil for a specific use.

**Sodicity.** The degree to which a soil is affected by exchangeable sodium. Sodicity is expressed as a sodium adsorption ratio (SAR) of a saturation

extract, or the ratio of Na<sup>+</sup> to Ca<sup>++</sup> + Mg<sup>++</sup>. The degrees of sodicity and their respective ratios are:

Slight .....	less than 13:1
Moderate.....	13-30:1
Strong .....	more than 30:1

**Soil.** A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

**Soil separates.** Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes, in millimeters, of separates recognized in the United States are as follows:

Very coarse sand.....	2.0 to 1.0
Coarse sand.....	1.0 to 0.5
Medium sand.....	0.5 to 0.25
Fine sand.....	0.25 to 0.10
Very fine sand.....	0.10 to 0.05
Silt.....	0.05 to 0.002
Clay.....	less than 0.002

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

**Structure, soil.** The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grained* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

**Stubble mulch.** Stubble or other crop residue left on the soil or partly worked into the soil. It protects the soil from wind erosion and water erosion after harvest, during preparation of a seedbed for the next crop, and during the early growing period of the new crop.

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

**Subsoiling.** Breaking up a compact subsoil by pulling a special chisel through the soil.

**Substratum.** The part of the soil below the solum.

**Subsurface layer.** Technically, the E horizon. Generally refers to a leached horizon lighter in color and

lower in organic matter content than the overlying surface layer.

**Surface layer.** The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters).

Frequently designated as the "plow layer," or the "Ap horizon."

**Taxadjuncts.** Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior.

**Terrace.** An embankment, or ridge, constructed on the contour or at a slight angle to the contour across sloping soils. The terrace intercepts surface runoff, so that water soaks into the soil or flows slowly to a prepared outlet.

**Terrace** (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

**Texture, soil.** The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand*, *loamy sand*, *sandy loam*, *loam*, *silt loam*, *silt*, *sandy clay loam*, *clay loam*, *silty clay loam*, *sandy clay*, *silty clay*, and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

**Tilth, soil.** The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

**Topsoil.** The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

**Trace elements.** Chemical elements, such as zinc, cobalt, manganese, copper, and iron, in soils in extremely small amounts. They are essential to plant growth.

**Upland** (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

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

**Well graded.** Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such 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 oven-dry basis, at

which a plant (specifically a sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

# Tables

---

TABLE 1.--TEMPERATURE AND PRECIPITATION

(Recorded in the period 1961-90 at Liberty, Texas)

Month	Temperature						Precipitation			
	Average daily maximum	Average daily minimum	Average daily	2 years in 10 will have--		Average number of growing degree days*	2 years in 10 will have--			Average number of days with 0.10 inch or more
				Maximum temperature higher than--	Minimum temperature lower than--		Less than--	More than--		
° F	° F	° F	° F	° F	Units	In	In	In		
January-----	60.5	39.0	49.8	81	17	126	3.77	1.72	5.52	6
February-----	64.5	42.1	53.3	82	23	159	3.63	1.92	5.13	5
March-----	71.8	49.5	60.6	87	28	341	3.13	1.57	4.50	4
April-----	78.7	57.7	68.2	90	37	546	3.46	1.00	5.45	4
May-----	84.9	64.2	74.6	94	48	758	5.35	2.21	8.01	5
June-----	90.2	69.9	80.0	98	58	891	6.09	2.29	9.26	6
July-----	92.9	72.2	82.6	99	64	947	4.33	2.31	6.10	7
August-----	93.7	71.7	82.7	101	62	956	3.94	2.21	5.74	6
September---	89.2	67.0	78.1	98	50	786	5.62	2.29	8.43	7
October-----	81.9	56.3	69.1	93	38	569	4.24	1.02	6.78	4
November-----	72.6	48.7	60.7	88	27	337	5.20	1.96	7.90	5
December-----	64.1	41.6	52.8	81	20	168	4.82	2.69	6.71	6
Yearly:										
Average---	78.8	56.7	67.7	---	---	---	---	---	---	---
Extreme---	107.0	7.0	---	101	15	---	---	---	---	---
Total-----	---	---	---	---	---	6,584	53.56	41.45	63.20	65

\* A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (50 degrees F).

TABLE 2.--FREEZE DATES IN SPRING AND FALL  
(Recorded in the period 1961-90 at Liberty, Texas)

Probability	Temperature		
	24 °F or lower	28 °F or lower	32 °F or lower
Last freezing temperature in spring:			
1 year in 10 later than--	Feb. 23	Mar. 7	Mar. 24
2 years in 10 later than--	Feb. 14	Feb. 27	Mar. 15
5 years in 10 later than--	Jan. 28	Feb. 11	Feb. 26
First freezing temperature in fall:			
1 year in 10 earlier than--	Nov. 28	Nov. 17	Nov. 5
2 years in 10 earlier than--	Dec. 9	Nov. 26	Nov. 11
5 years in 10 earlier than--	Dec. 29	Dec. 15	Nov. 24

TABLE 3.--GROWING SEASON  
(Recorded in the period 1961-90 at Liberty, Texas)

Probability	Daily minimum temperature during growing season		
	Higher than 24 °F	Higher than 28 °F	Higher than 32 °F
	Days	Days	Days
9 years in 10	290	271	235
8 years in 10	300	281	247
5 years in 10	319	299	270
2 years in 10	338	317	293
1 year in 10	348	326	305

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

Map symbol	Soil name	Acres	Percent
AaB	Alaga fine sand, 1 to 3 percent slopes-----	850	0.1
AdA	Aldine silt loam, 0 to 2 percent slopes-----	5,850	0.8
Ae	Aldine-Aris complex-----	62,500	8.3
An	Anahuac-Aris complex-----	17,550	2.3
Ar	Aris silt loam-----	11,850	1.6
As	Aris loam, depressional-----	2,850	0.4
Ba	Beaumont clay-----	88,270	11.8
Bd	Beaumont clay, depressional-----	1,850	0.2
Be	Bernard clay loam-----	7,750	1.0
Bm	Bernard-Morey complex-----	49,100	6.5
BnB	Bienville loamy fine sand, 0 to 2 percent slopes-----	4,500	0.6
BvB	Bienville-Kenefick complex, 1 to 3 percent slopes-----	9,000	1.2
ByB	Boykin loamy fine sand, 1 to 3 percent slopes-----	700	0.1
CoB	Choates loamy fine sand, 1 to 3 percent slopes-----	700	0.1
DaB	Dallardsville fine sandy loam, 1 to 3 percent slopes-----	480	0.1
DoB	Doucette loamy fine sand, 1 to 3 percent slopes-----	1,800	0.2
DyC	Dylan clay, 3 to 6 percent slopes-----	4,550	0.6
Es	Estes clay, frequently flooded-----	5,400	0.7
Fa	Fausse clay, frequently flooded-----	14,500	1.9
Gu	Guyton silt loam-----	3,000	0.4
Gy	Guyton-Aldine complex-----	13,000	1.7
Ha	Hatliff clay loam, occasionally flooded-----	2,900	0.4
Ho	Hockley fine sandy loam-----	400	0.1
Ka	Kaman clay, occasionally flooded-----	28,800	3.8
Kf	Kaman clay, frequently flooded-----	64,200	8.5
Kg	Katy fine sandy loam-----	2,350	0.3
Kh	Kemah silt loam-----	1,200	0.2
Km	Kemah-Aris complex-----	16,000	2.1
Kn	Kenefick fine sandy loam-----	3,150	0.4
Kr	Kirbyville fine sandy loam-----	48,600	6.5
LaA	Lake Charles clay, 0 to 1 percent slopes-----	22,863	3.0
LaC	Lake Charles clay, 2 to 5 percent slopes-----	1,000	0.1
LdB	Landman loamy fine sand, 0 to 2 percent slopes-----	550	0.1
Ma	Mantachie loam, frequently flooded-----	7,750	1.0
My	Mocarey-Yeaton complex-----	19,000	2.5
Ow	Oil-waste land-----	2,090	0.3
OyB	Otanya fine sandy loam, 1 to 3 percent slopes-----	6,200	0.8
Oz	Owentown fine sandy loam, occasionally flooded-----	3,300	0.4
Pt	Pits-----	2,150	0.3
Pu	Pluck fine sandy loam, frequently flooded-----	1,200	0.2
Sa	Segno fine sandy loam-----	1,150	0.2
Sb	Sorter loam-----	5,400	0.7
Sd	Sorter-Dallardsville complex-----	10,900	1.5
Sk	Sorter-Kirbyville complex-----	5,300	0.7
Sp	Splendora fine sandy loam-----	3,200	0.4
SrB	Spurger fine sandy loam, 0 to 2 percent slopes-----	7,200	1.0
SwB	Spurger-Waller complex, 0 to 2 percent slopes-----	12,000	1.6
VaA	Vamont silty clay, 0 to 1 percent slopes-----	18,550	2.5
VaB	Vamont clay, 1 to 3 percent slopes-----	3,800	0.5
Vd	Vamont silty clay, depressional-----	33,500	4.5
Ve	Verland clay loam-----	12,300	1.6
Vo	Voss fine sand, occasionally flooded-----	4,650	0.6
Vs	Voss fine sand, frequently flooded-----	650	0.1
Wa	Waller loam-----	17,500	2.3
Wc	Waller loam, depressional-----	1,450	0.2
Wd	Waller-Dallardsville complex-----	9,000	1.2
Wk	Waller-Kirbyville complex-----	40,000	5.3
Wn	Waller-Splendora complex-----	4,000	0.5
Wo	Wockley fine sandy loam-----	1,450	0.2
WvB	Woodville fine sandy loam, 1 to 3 percent slopes-----	3,150	0.4
WvD	Woodville fine sandy loam, 5 to 8 percent slopes-----	13,850	1.8
	Water areas more than 40 acres in size-----	4,540	0.6
	Total-----	753,293	100.0

\* Less than 0.1 percent.

TABLE 5.--PRIME FARMLAND

(Only the soils considered prime farmland are listed. Urban or built-up areas of the soils listed are not considered prime farmland. If a soil is prime farmland only under certain conditions, the conditions are specified in parentheses after the soil name)

Map symbol	Soil name
AdA	Aldine silt loam, 0 to 2 percent slopes (where drained)
Ae	Aldine-Aris complex (where drained)
An	Anahuac-Aris complex (where drained)
Ba	Beaumont clay (where drained)
Be	Bernard clay loam
Bm	Bernard-Morey complex (where drained)
ByB	Boykin loamy fine sand, 1 to 3 percent slopes
DaB	Dallardsville fine sandy loam, 1 to 3 percent slopes
DoB	Doucette loamy fine sand, 1 to 3 percent slopes
Ho	Hockley fine sandy loam
Ka	Kaman clay, occasionally flooded (where drained)
Kg	Katy fine sandy loam
Kn	Kenefick fine sandy loam
Kr	Kirbyville fine sandy loam
LaA	Lake Charles clay, 0 to 1 percent slopes
LaC	Lake Charles clay, 2 to 5 percent slopes
My	Mocarey-Yeaton complex (where drained)
OyB	Otanya fine sandy loam, 1 to 3 percent slopes
Oz	Owentown fine sandy loam, occasionally flooded
Sa	Segno fine sandy loam
Sb	Sorter loam (where drained)
Sd	Sorter-Dallardsville complex (where drained)
Sk	Sorter-Kirbyville complex (where drained)
Sp	Splendora fine sandy loam
SrB	Spurger fine sandy loam, 0 to 2 percent slopes
SwB	Spurger-Waller complex, 0 to 2 percent slopes (where drained)
VaA	Vamont silty clay, 0 to 1 percent slopes
VaB	Vamont clay, 1 to 3 percent slopes
Vd	Vamont silty clay, depressionnal (where drained)
Wa	Waller loam (where drained)
Wd	Waller-Dallardsville complex (where drained)
Wk	Waller-Kirbyville complex (where drained)
Wn	Waller-Splendora complex (where drained)
Wo	Wockley fine sandy loam

TABLE 6.--LAND CAPABILITY AND YIELDS PER ACRE OF CROPS AND PASTURE

(Yields are those that can be expected under a high level of management. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil)

Soil name and map symbol	Land capability	Rice	Soybeans	Grain sorghum	Corn	Bahiagrass	Common bermudagrass
		Bu	Bu	Bu	Bu	AUM*	AUM*
AaB----- Alaga	IIIs	---	---	---	60	7.0	7.0
AdA----- Aldine	IIIw	---	20	50	55	5.0	5.0
Ae: Aldine-----	IIIw	100	20	55	60	5.0	5.0
Aris-----	IVw	100	20	60	70	5.0	5.0
An: Anahuac-----	IIIw	120	25	70	50	5.0	5.0
Aris-----	IVw	100	20	60	70	5.0	5.0
Ar----- Aris	IVw	100	20	60	70	5.0	5.0
As----- Aris	VIw	---	---	---	---	5.0	5.0
Ba----- Beaumont	IIIw	120	20	75	70	6.0	6.0
Bd----- Beaumont	VIw	---	---	---	---	6.0	6.0
Be----- Bernard	IIw	130	30	90	80	7.0	6.0
Bm: Bernard-----	IIw	130	30	90	80	7.0	6.0
Morey-----	IIIw	120	25	80	75	5.0	5.0
BnB----- Bienville	IIs	---	25	---	80	6.5	7.0
BvB: Bienville-----	IIs	---	25	---	80	6.5	7.0
Kenefick-----	IIE	---	25	---	---	8.0	8.0
ByB----- Boykin	IIIs	---	---	---	---	8.0	6.0
CoB----- Choates	IIIw	---	---	---	---	8.0	6.0
DaB----- Dallardsville	IIw	---	---	---	---	5.0	5.0
DoB----- Doucette	IIIs	---	---	---	---	8.0	8.0

See footnotes at end of table.

TABLE 6.--LAND CAPABILITY AND YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Land capability	Rice	Soybeans	Grain sorghum	Corn	Bahiagrass	Common bermudagrass
		Bu	Bu	Bu	Bu	AUM*	AUM*
DyC----- Dylan	IVe	---	---	---	---	7.0	6.0
Es----- Estes	Vw	---	---	---	---	1.0	1.0
Fa----- Fausse	VIIw	---	---	---	---	---	---
Gu----- Guyton	IIIw	100	20	---	---	5.0	5.0
Gy: Guyton-----	IIIw	100	20	---	---	5.0	5.0
Aldine-----	IIIw	100	20	55	60	5.0	5.0
Ha----- Hatliff	IIw	---	20	---	---	7.0	6.5
Ho----- Hockley	IIs	100	20	70	80	5.0	6.0
Ka----- Kaman	IIw	---	---	100	50	---	5.0
Kf----- Kaman	Vw	---	---	---	---	---	4.0
Kg----- Katy	IIw	---	30	70	65	8.0	6.5
Kh----- Kemah	IIIw	110	25	80	---	6.0	6.0
Km: Kemah-----	IIIw	110	25	80	---	6.0	6.0
Aris-----	IVw	100	20	60	70	5.0	5.0
Kn----- Kenefick	I	---	25	---	---	8.0	8.0
Kr----- Kirbyville	IIw	---	---	---	70	6.0	6.0
LaA----- Lake Charles	IIw	130	25	90	75	5.0	5.0
LaC----- Lake Charles	IIIe	---	20	80	45	7.0	7.0
LdB----- Landman	IIIs	---	---	---	45	7.0	6.0
Ma----- Mantachie	Vw	---	---	---	---	6.0	6.0
My: Mocarey-----	IIIw	---	20	---	---	5.0	5.0

See footnotes at end of table.

TABLE 6.--LAND CAPABILITY AND YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Land capability	Rice	Soybeans	Grain sorghum	Corn	Bahiagrass	Common bermudagrass
		Bu	Bu	Bu	Bu	AUM*	AUM*
My: Yeaton-----	IIw	90	25	---	---	5.0	5.0
Ow**. Oil-waste land							
OyB----- Otanya	IIe	---	---	---	---	8.0	7.0
Oz----- Owentown	IIw	---	---	---	90	9.0	7.0
Pt**. Pits							
Pu----- Pluck	Vw	---	---	---	---	6.0	6.0
Sa----- Segno	IIs	---	---	65	85	8.0	8.0
Sb----- Sorter	IVw	---	---	---	---	5.0	5.0
Sd: Sorter-----	IVw	---	---	---	---	5.0	5.0
Dallardsville--	IIw	---	---	---	---	5.0	5.0
Sk: Sorter-----	IVw	---	---	---	---	5.0	5.0
Kirbyville----	IIw	---	---	---	70	6.0	6.0
Sp----- Splendora	IIw	---	---	60	60	7.0	6.0
SrB----- Spurger	IIIe	---	---	---	---	5.0	5.0
SwB: Spurger-----	IIIe	---	---	---	---	5.0	5.0
Waller-----	IVw	---	---	---	---	6.0	6.0
VaA----- Vamont	IIIw	100	30	70	60	5.0	5.0
VaB----- Vamont	IIIe	---	25	65	50	6.0	6.0
Vd----- Vamont	IVw	100	---	---	---	4.0	4.0
Ve----- Verland	IVw	100	---	---	---	4.0	4.0
Vo----- Voss	IVw	---	---	---	---	4.0	4.0

See footnotes at end of table.

TABLE 6.--LAND CAPABILITY AND YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Land capability	Rice	Soybeans	Grain sorghum	Corn	Bahiagrass	Common bermudagrass
		Bu	Bu	Bu	Bu	AUM*	AUM*
Vs----- Voss	VIw	---	---	---	---	4.0	4.0
Wa----- Waller	IVw	100	---	---	---	6.0	6.0
Wc----- Waller	VIw	---	---	---	---	---	---
Wd: Waller-----	IVw	---	---	---	---	5.0	5.0
Dallardsville--	IIw	---	---	---	---	6.0	6.0
Wk: Waller-----	IVw	100	---	---	---	5.0	5.0
Kirbyville-----	IIw	---	---	---	70	6.0	6.0
Wn: Waller-----	IVw	100	---	---	---	5.0	5.0
Splendora-----	IIw	---	---	60	60	6.0	6.0
Wo----- Wockley	IIIw	110	---	65	70	4.0	4.0
WvB----- Woodville	IIIe	---	---	---	---	8.0	8.0
WvD----- Woodville	VIe	---	---	---	---	8.0	8.0

\* 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 30 days.

\*\* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 7.--RANGELAND PRODUCTIVITY

(Only the soils that support rangeland vegetation suitable for grazing are listed)

Soil name and map symbol	Range site	Potential annual production for kind of growing season		
		Favorable Lb/acre	Average Lb/acre	Unfavorable Lb/acre
Ar, As----- Aris	Lowland-----	8,000	6,000	4,000
Ba----- Beaumont	Blackland-----	9,500	7,500	6,500
Bd----- Beaumont, depressional	Lowland-----	5,000	3,500	2,500
Be----- Bernard	Blackland-----	9,000	7,000	6,500
Bm*: Bernard-----	Blackland-----	9,000	7,000	6,500
Morey-----	Loamy Prairie-----	8,500	6,000	5,000
Kg----- Katy	Loamy Prairie-----	8,500	6,500	5,000
Kh----- Kemah	Loamy Prairie-----	7,000	6,500	6,000
Km*: Kemah-----	Loamy Prairie-----	7,000	6,500	6,000
Aris-----	Lowland-----	8,000	6,000	4,000
LaA, LaC----- Lake Charles	Blackland-----	9,500	8,000	6,500
My*: Mocarey-----	Loamy Prairie-----	9,000	7,500	6,000
Yeaton-----	Loamy Prairie-----	5,000	3,500	2,000
VaA, VaB----- Vamont	Blackland-----	7,500	6,000	2,500
Vd----- Vamont, depressional	Lowland-----	5,000	3,500	2,500
Ve----- Verland	Lowland-----	8,000	4,500	3,500

\* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY

(Only the soils suitable for production of commercial trees are listed. Absence of an entry indicates that information was not available)

Soil name and map symbol	Ordination symbol	Management concerns					Potential productivity			Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Plant competition	Common trees	Site index	Volume*	
AaB----- Alaga	8S	Slight	Moderate	Severe	Slight	Severe	Loblolly pine----- Longleaf pine----- Slash pine-----	80 70 80	230 90 ---	Loblolly pine.
AdA----- Aldine	9W	Slight	Moderate	Slight	Slight	Moderate	Loblolly pine----- Sweetgum----- Southern red oak----	90 90 80	330 210 ---	Loblolly pine, sweetgum, water oak.
Ae**: Aldine-----	9W	Slight	Moderate	Slight	Slight	Moderate	Loblolly pine----- Sweetgum----- Southern red oak----	90 90 80	330 210 ---	Loblolly pine, sweetgum, water oak.
Aris-----	9W	Slight	Moderate	Slight	Slight	Moderate	Loblolly pine----- Southern red oak---- Sweetgum-----	90 80 90	330 --- 210	Loblolly pine, sweetgum, water oak.
An**: Anahuac-----	9W	Slight	Moderate	Slight	Slight	Moderate	Loblolly pine----- Shortleaf pine-----	90 80	330 270	Loblolly pine, sweetgum, water oak.
Aris-----	9W	Slight	Moderate	Slight	Slight	Moderate	Loblolly pine----- Southern red oak---- Sweetgum-----	90 80 90	330 --- 210	Loblolly pine, sweetgum, water oak.
Ar----- Aris	9W	Slight	Moderate	Slight	Slight	Moderate	Loblolly pine----- Southern red oak---- Sweetgum-----	90 80 90	330 --- 210	Loblolly pine, sweetgum, water oak.
Ba----- Beaumont	9W	Slight	Severe	Severe	Slight	Severe	Loblolly pine----- Southern red oak---- Water oak----- Green ash-----	90 --- 90 90	330 --- --- ---	Loblolly pine, willow oak, green ash.
Be----- Bernard	9W	Slight	Moderate	Moderate	Slight	Moderate	Loblolly pine----- Southern red oak---- Water oak----- Shortleaf pine-----	90 80 90 80	330 --- --- 270	Loblolly pine, water oak.
Bm**: Bernard-----	9W	Slight	Moderate	Moderate	Slight	Moderate	Loblolly pine----- Southern red oak---- Water oak----- Shortleaf pine-----	90 80 70 80	330 --- --- 270	Loblolly pine, water oak.

See footnotes at end of table.

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns					Potential productivity			Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Wind-throw hazard	Plant competition	Common trees	Site index	Volume*	
<b>Bm**:</b> Morey-----	9W	Slight	Moderate	Moderate	Slight	Severe	Loblolly pine----- Longleaf pine----- Southern red oak----	90 80 80	330 150 ---	Loblolly pine, willow oak, green ash.
<b>BnB</b> ----- Bienville	10S	Slight	Moderate	Moderate	Slight	Moderate	Loblolly pine----- Longleaf pine----- Shortleaf pine-----	96 88 88	400 230 340	Loblolly pine.
<b>BvB**:</b> Bienville-----	10S	Slight	Moderate	Moderate	Slight	Moderate	Loblolly pine----- Longleaf pine----- Shortleaf pine-----	95 88 88	400 230 340	Loblolly pine.
Kenefick-----	10A	Slight	Slight	Slight	Slight	Slight	Loblolly pine----- Shortleaf pine----- Sweetgum----- Southern red oak----	96 85 --- ---	400 340 --- ---	Loblolly pine, sweetgum, southern red oak, black walnut.
<b>ByB</b> ----- Boykin	9S	Slight	Slight	Moderate	Slight	Moderate	Loblolly pine----- Shortleaf pine----- Longleaf pine----- Slash pine-----	90 80 80 ---	330 270 150 ---	Loblolly pine.
<b>CoB</b> ----- Choates	9W	Slight	Moderate	Moderate	Slight	Moderate	Loblolly pine----- Shortleaf pine----- Longleaf pine----- Sweetgum----- Southern red oak----	90 80 --- 90 ---	330 270 --- 210 ---	Loblolly pine, southern red oak, sweetgum.
<b>DaB</b> ----- Dallardsville	9W	Slight	Moderate	Moderate	Slight	Moderate	Loblolly pine----- Shortleaf pine----- Water oak----- Sweetgum----- Southern red oak----	90 80 90 90 ---	330 270 --- 210 ---	Loblolly pine, water oak, sweetgum.
<b>DoB</b> ----- Doucette	9S	Slight	Slight	Moderate	Slight	Moderate	Loblolly pine----- Shortleaf pine----- Longleaf pine-----	90 80 80	330 270 150	Loblolly pine.
<b>DyC</b> ----- Dylan	8C	-----	Severe	Moderate	Slight	Moderate	Loblolly pine----- Shortleaf pine----- Sweetgum----- Southern red oak----	80 70 70 70	230 170 --- ---	Loblolly pine, shortleaf pine, water oak.
<b>Es</b> ----- Estes	8W	Slight	Severe	Moderate	Slight	Moderate	Sweetgum----- Willow oak----- Water oak----- Green ash-----	93 86 93 ---	210 --- --- ---	Sweetgum, water oak, green ash, willow oak.

See footnotes at end of table.

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordi- nation symbol	Management concerns					Potential productivity			Trees to plant
		Erosion hazard	Equip- ment limita- tion	Seedling mortal- ity	Wind- throw hazard	Plant competi- tion	Common trees	Site index	Volume*	
Fa----- Fausse	4W	Slight	Severe	Severe	Severe	Severe	Baldcypress----- Water hickory----- Water tupelo----- Overcup oak----- Black willow----- Red maple-----	96 --- --- --- --- ---	--- --- --- --- --- ---	Baldcypress.
Gu----- Guyton	8W	Slight	Severe	Moderate	Slight	Severe	Loblolly pine----- Slash pine----- Sweetgum----- Green ash----- Cherrybark oak----- Water oak----- Willow oak-----	85 90 90 90 --- --- 78	280 --- 210 --- --- --- ---	Loblolly pine, water oak, green ash.
Gy**: Guyton-----	8W	Slight	Severe	Moderate	Slight	Severe	Loblolly pine----- Slash pine----- Sweetgum----- Green ash----- Cherrybark oak----- Water oak----- Willow oak-----	85 90 90 90 --- --- 78	280 --- 210 --- --- --- ---	Loblolly pine, water oak, green ash.
Aldine-----	9W	Slight	Moderate	Slight	Slight	Moderate	Loblolly pine----- Sweetgum----- Southern red oak----	90 90 80	330 210 ---	Loblolly pine, sweetgum, water oak.
Ha----- Hatliff	10W	Slight	Moderate	Moderate	Slight	Slight	Loblolly pine----- Slash pine----- Sweetgum----- Water oak----- Willow oak-----	95 --- 94 --- ---	400 --- 260 --- ---	Loblolly pine, eastern cottonwood, sweetgum, American sycamore.
Ho----- Hockley	9A	Slight	Slight	Slight	Slight	Slight	Loblolly pine----- Water oak----- Sweetgum----- Southern red oak----	90 90 90 80	330 --- 210 ---	Loblolly pine, sweetgum, black walnut, southern red oak.
Ka----- Kaman	6W	Slight	Severe	Severe	Slight	Moderate	Sweetgum----- Water oak-----	85 92	170 ---	Water oak.
Kf----- Kaman	6W	Slight	Severe	Severe	Slight	Moderate	Sweetgum----- Water oak-----	85 92	170 ---	Water oak.
Kg----- Katy	9W	Slight	Moderate	Slight	Slight	Moderate	Loblolly pine----- Shortleaf pine----- Longleaf pine-----	90 80 80	330 270 150	Loblolly pine, sweetgum, water oak.

See footnotes at end of table.

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordi-nation symbol	Management concerns					Potential productivity			Trees to plant
		Erosion hazard	Equip-ment limita-tion	Seedling mortal-ity	Wind-throw hazard	Plant competi-tion	Common trees	Site index	Volume*	
Kh----- Kemah	9W	Slight	Moderate	Slight	Slight	Moderate	Loblolly pine-----	90	330	Loblolly pine, water oak, sweetgum.
							Water oak-----	---	---	
							Sweetgum-----	90	210	
Km**: Kemah-----	9W	Slight	Moderate	Slight	Slight	Moderate	Loblolly pine-----	90	330	Loblolly pine, water oak, sweetgum.
							Water oak-----	---	---	
							Sweetgum-----	90	210	
Aris-----	9W	Slight	Moderate	Slight	Slight	Moderate	Loblolly pine-----	90	330	Loblolly pine, sweetgum, water oak.
							Southern red oak----	80	---	
							Sweetgum-----	90	210	
Kn----- Kenefick	10A	Slight	Slight	Slight	Slight	Slight	Loblolly pine-----	96	400	Loblolly pine, sweetgum, southern red oak, black walnut.
							Shortleaf pine-----	85	340	
							Sweetgum-----	---	---	
							Southern red oak----	---	---	
Kr----- Kirbyville	11W	Slight	Moderate	Slight	Slight	Moderate	Loblolly pine-----	100	460	Loblolly pine, sweetgum, southern red oak.
							Shortleaf pine-----	90	410	
							Slash pine-----	98	---	
							Longleaf pine-----	---	---	
LaA, LaC----- Lake Charles	8C	Moderate	Severe	Severe	Slight	Moderate	Loblolly pine-----	78	230	Loblolly pine, water oak, green ash, cherrybark oak.
							Water oak-----	80	---	
							Cherrybark oak-----	---	---	
							Sweetgum-----	---	---	
LdB----- Landman	9S	Slight	Moderate	Moderate	Slight	Slight	Loblolly pine-----	90	330	Loblolly pine.
							Shortleaf pine-----	80	270	
							Southern red oak----	---	---	
							White oak-----	---	---	
Ma----- Mantachie	9W	Slight	Severe	Severe	Slight	Severe	Sweetgum-----	96	260	Eastern cottonwood, cherrybark oak, green ash, sweetgum.
							Eastern cottonwood--	90	---	
							Cherrybark oak-----	90	---	
							Green ash-----	---	---	
My**: Mocarey-----	6W	Slight	Severe	Moderate	Slight	Moderate	Sweetgum-----	80	120	Green ash, water oak, sweetgum.
							Green ash-----	---	---	
							Water oak-----	---	---	
Yeaton-----	8W	Slight	Severe	Moderate	Slight	Moderate	Loblolly pine-----	80	230	Loblolly pine, green ash, water oak, sweetgum.
							Sweetgum-----	80	120	
							Green ash-----	---	---	

See footnotes at end of table.

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns					Potential productivity			Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Plant competition	Common trees	Site index	Volume*	
OyB----- Otanya	9A	Slight	Slight	Slight	Slight	Slight	Loblolly pine----- Longleaf pine----- Shortleaf pine----- Sweetgum----- Slash pine-----	90 82 80 --- 94	330 150 270 --- ---	Loblolly pine, sweetgum, southern red oak, black walnut.
Oz----- Owentown	11A	Slight	Slight	Slight	Slight	Slight	Loblolly pine----- Sweetgum----- Blackgum----- Southern red oak----- White oak-----	100 100 --- --- ---	460 310 --- --- ---	Loblolly pine, southern red oak, pecan, black walnut, sweetgum.
Pu----- Pluck	9W	Slight	Severe	Severe	Slight	Severe	Loblolly pine----- Sweetgum----- Water oak-----	90 90 ---	330 210 ---	Loblolly pine, water oak, sweetgum, green ash, cherrybark oak.
Sa----- Segno	9A	Slight	Slight	Slight	Slight	Slight	Loblolly pine----- Longleaf pine----- Shortleaf pine----- Sweetgum----- Southern red oak-----	90 77 80 90 80	330 150 270 210 ---	Loblolly pine, sweetgum, southern red oak.
Sb----- Sorter	9W	Slight	Severe	Severe	Slight	Severe	Loblolly pine----- Shortleaf pine----- Longleaf pine----- Water oak----- Southern red oak----- Sweetgum-----	91 80 80 90 80 90	330 270 150 --- --- 210	Loblolly pine, sweetgum, green ash, willow oak.
Sd**: Sorter-----	9W	Slight	Severe	Severe	Slight	Severe	Loblolly pine----- Shortleaf pine----- Longleaf pine----- Water oak----- Southern red oak----- Sweetgum-----	91 80 80 90 80 90	330 270 150 --- --- 210	Loblolly pine, sweetgum, green ash, willow oak.
Dallardsville----	9W	Slight	Moderate	Slight	Slight	Moderate	Loblolly pine----- Shortleaf pine----- Water oak----- Sweetgum----- Southern red oak-----	90 80 90 --- ---	330 270 --- --- ---	Loblolly pine, water oak, sweetgum.

See footnotes at end of table.

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordi- nation symbol	Management concerns					Potential productivity			Trees to plant
		Erosion hazard	Equip- ment limita- tion	Seedling mortal- ity	Wind- throw hazard	Plant competi- tion	Common trees	Site index	Volume*	
Sk**: Sorter-----	9W	Slight	Severe	Severe	Slight	Severe	Loblolly pine----- Shortleaf pine----- Longleaf pine----- Water oak----- Southern red oak---- Sweetgum-----	91 80 80 90 80 90	330 270 150 --- --- 210	Loblolly pine, sweetgum, green ash, willow oak.
Kirbyville-----	11W	Slight	Moderate	Slight	Slight	Moderate	Loblolly pine----- Shortleaf pine----- Slash pine----- Longleaf pine-----	100 90 98 ---	460 410 --- ---	Loblolly pine, sweetgum, southern red oak.
Sp----- Splendora	9W	Slight	Moderate	Moderate	Slight	Moderate	Loblolly pine----- Shortleaf pine----- Water oak----- Sweetgum-----	90 80 90 90	330 270 --- 210	Loblolly pine, southern red oak.
SrB----- Spurger	11W	Slight	Moderate	Slight	Slight	Moderate	Loblolly pine----- Shortleaf pine----- Southern red oak---- Sweetgum-----	101 90 90 100	460 410 --- 310	Loblolly pine, sweetgum, southern red oak.
SwB**: Spurger-----	11W	Slight	Moderate	Slight	Slight	Moderate	Loblolly pine----- Shortleaf pine----- Southern red oak---- Sweetgum-----	101 90 90 100	460 410 --- 310	Loblolly pine, sweetgum, southern red oak.
Waller-----	9W	Slight	Severe	Severe	Slight	Severe	Loblolly pine----- Water oak----- Sweetgum----- Shortleaf pine----- Longleaf pine-----	90 90 90 80 80	330 --- 210 270 150	Loblolly pine, green ash, willow oak, sweetgum.
VaA, VaB----- Vamont	9W	Slight	Severe	Moderate	Slight	Moderate	Loblolly pine----- Southern red oak----	90 80	330 ---	Loblolly pine, sweetgum, green ash.
Ve----- Verland	8W	Slight	Moderate	Moderate	Slight	Severe	Loblolly pine----- Sweetgum----- Water oak-----	83 80 70	230 120 ---	Loblolly pine, sweetgum, water oak, green ash.

See footnotes at end of table.

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordi- nation symbol	Management concerns					Potential productivity			Trees to plant
		Erosion hazard	Equip- ment limita- tion	Seedling mortal- ity	Wind- throw hazard	Plant competi- tion	Common trees	Site index	Volume*	
Vo, Vs----- Voss	9W	Slight	Moderate	Moderate	Slight	Slight	Loblolly pine----- Shortleaf pine----- Longleaf pine----- Sweetgum----- Water oak-----	91 80 --- --- ---	330 270 --- --- ---	Loblolly pine, eastern cottonwood, American sycamore, cherrybark oak.
Wa----- Waller	9W	Slight	Severe	Severe	Slight	Severe	Loblolly pine----- Water oak----- Sweetgum----- Shortleaf pine----- Longleaf pine-----	90 90 90 80 80	330 --- 210 270 ---	Loblolly pine, green ash, willow oak, sweetgum.
Wd**: Waller-----	9W	Slight	Severe	Severe	Slight	Severe	Loblolly pine----- Water oak----- Sweetgum----- Shortleaf pine----- Longleaf pine-----	90 90 90 80 80	330 --- 210 270 ---	Loblolly pine, green ash, willow oak, sweetgum.
Dallardsville-----	9W	Slight	Slight	Moderate	Slight	Moderate	Loblolly pine----- Shortleaf pine----- Water oak----- Sweetgum----- Southern red oak----	90 80 90 --- ---	330 270 --- --- ---	Loblolly pine, water oak, sweetgum.
Wk**: Waller-----	9W	Slight	Severe	Severe	Slight	Severe	Loblolly pine----- Water oak----- Sweetgum----- Shortleaf pine----- Longleaf pine-----	90 90 90 80 80	330 --- 210 270 ---	Loblolly pine, green ash, willow oak, sweetgum.
Kirbyville-----	11W	Slight	Moderate	Slight	Slight	Moderate	Loblolly pine----- Shortleaf pine----- Slash pine----- Longleaf pine-----	100 90 98 ---	460 410 --- ---	Loblolly pine, sweetgum, southern red oak.
Wn**: Waller-----	9W	Slight	Severe	Severe	Slight	Severe	Loblolly pine----- Water oak----- Sweetgum----- Shortleaf pine----- Longleaf pine-----	90 90 90 80 80	330 --- 210 270 ---	Loblolly pine, green ash, willow oak, sweetgum.
Splendora-----	9W	Slight	Moderate	Moderate	Slight	Moderate	Loblolly pine----- Shortleaf pine----- Water oak----- Sweetgum-----	91 80 90 90	330 270 --- 210	Loblolly pine, southern red oak, sweetgum, water oak.

See footnotes at end of table.

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordi- nation symbol	Management concerns					Potential productivity			Trees to plant
		Erosion hazard	Equip- ment limita- tion	Seedling mortal- ity	Wind- throw hazard	Plant competi- tion	Common trees	Site index	Volume*	
Wo----- Wockley	9W	Slight	Moderate	Slight	Slight	Moderate	Loblolly pine----- Southern red oak--- Sweetgum-----	90 --- 90	330 --- ---	Loblolly pine, sweetgum, southern red oak.
WvB, WvD----- Woodville	9C	Slight	Moderate	Slight	Slight	Moderate	Loblolly pine----- Shortleaf pine-----	90 78	330 270	Loblolly pine, sweetgum, cherrybark oak.

\* Volume is the yield in board feet (Doyle Rule) per acre per year over a 50-year period for fully stocked natural stands.

\*\* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 9.--RECREATIONAL DEVELOPMENT

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated)

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
AaB----- Alaga	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Moderate: droughty.
AdA----- Aldine	Severe: percs slowly.	Severe: percs slowly.	Severe: percs slowly.	Moderate: wetness.	Moderate: wetness.
Ae*: Aldine-----	Severe: percs slowly.	Severe: percs slowly.	Severe: percs slowly.	Moderate: wetness.	Moderate: wetness.
Aris-----	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.
An*: Anahuac-----	Severe: percs slowly.	Severe: percs slowly.	Severe: percs slowly.	Moderate: wetness.	Moderate: wetness.
Aris-----	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.
Ar----- Aris	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.
As----- Aris	Severe: ponding, percs slowly.	Severe: ponding, percs slowly.	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding.
Ba----- Beaumont	Severe: wetness, percs slowly.	Severe: wetness, too clayey, percs slowly.	Severe: too clayey, wetness, percs slowly.	Severe: wetness, too clayey.	Severe: wetness, too clayey.
Bd----- Beaumont	Severe: ponding, percs slowly.	Severe: ponding, too clayey, percs slowly.	Severe: too clayey, ponding, percs slowly.	Severe: ponding, too clayey.	Severe: ponding, too clayey.
Be----- Bernard	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.
Bm*: Bernard-----	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.
Morey-----	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: wetness.	Moderate: wetness.
BnB----- Bienville	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.	Moderate: droughty.

See footnote at end of table.

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
BvB*: Bienville-----	Moderate: too sandy.	Moderate: too sandy.	Moderate: slope, too sandy.	Moderate: too sandy.	Moderate: droughty.
Kenefick-----	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope.	Slight-----	Slight.
ByB----- Boykin	Moderate: too sandy.	Moderate: too sandy.	Moderate: slope, too sandy.	Moderate: too sandy.	Slight.
CoB----- Choates	Moderate: wetness, too sandy.	Moderate: wetness, too sandy.	Moderate: slope, wetness, too sandy.	Moderate: wetness, too sandy.	Moderate: wetness.
DaB----- Dallardsville	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Severe: erodes easily.	Moderate: wetness, droughty.
DoB----- Doucette	Moderate: too sandy.	Moderate: too sandy.	Moderate: slope, too sandy.	Moderate: too sandy.	Slight.
DyC----- Dylan	Severe: wetness, percs slowly, too clayey.	Severe: wetness, too clayey, percs slowly.	Severe: too clayey, percs slowly, wetness.	Severe: too clayey, wetness.	Severe: wetness, too clayey.
Es----- Estes	Severe: flooding, wetness, percs slowly.	Severe: wetness, too clayey, percs slowly.	Severe: too clayey, wetness, flooding.	Severe: wetness, too clayey.	Severe: wetness, flooding, too clayey.
Fa----- Fausse	Severe: flooding, ponding, percs slowly.	Severe: ponding, too clayey, percs slowly.	Severe: too clayey, ponding, flooding.	Severe: ponding, too clayey.	Severe: ponding, flooding, too clayey.
Gu----- Guyton	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Gy*: Guyton-----	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Aldine-----	Severe: percs slowly.	Severe: percs slowly.	Severe: percs slowly.	Moderate: wetness.	Moderate: wetness.
Ha----- Hatliff	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Ho----- Hockley	Slight-----	Slight-----	Moderate: small stones.	Slight-----	Slight.
Ka----- Kaman	Severe: flooding, percs slowly, too clayey.	Severe: too clayey, percs slowly.	Severe: too clayey, percs slowly.	Severe: too clayey.	Severe: too clayey.

See footnote at end of table.

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
Kf----- Kaman	Severe: flooding, percs slowly, too clayey.	Severe: too clayey, percs slowly.	Severe: too clayey, flooding, percs slowly.	Severe: too clayey.	Severe: flooding, too clayey.
Kg----- Katy	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: percs slowly.	Slight-----	Slight.
Kh----- Kemah	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.
Km*: Kemah-----	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.
Aris-----	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.
Kn----- Kenefick	Moderate: percs slowly.	Moderate: percs slowly.	Slight-----	Slight-----	Slight.
Kr----- Kirbyville	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.
LaA, LaC----- Lake Charles	Severe: percs slowly, too clayey.	Severe: too clayey, percs slowly.	Severe: too clayey, percs slowly.	Severe: too clayey.	Severe: too clayey.
LdB----- Landman	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.	Moderate: droughty.
Ma----- Mantachie	Severe: flooding, wetness.	Moderate: flooding, wetness.	Severe: wetness, flooding.	Moderate: wetness, flooding.	Severe: flooding.
My*: Mocarey-----	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: wetness.	Moderate: wetness.
Yeaton-----	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
Ow*. Oil-waste land					
OyB----- Otanya	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Slight-----	Slight.
Oz----- Owentown	Severe: flooding.	Slight-----	Moderate: flooding.	Slight-----	Moderate: droughty, flooding.
Pt*. Pits					

See footnote at end of table.

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
Pu----- Pluck	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness, flooding.	Severe: wetness.	Severe: wetness, flooding.
Sa----- Segno	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Slight-----	Slight.
Sb----- Sorter	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
Sd*: Sorter-----	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
Dallardsville-----	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Severe: erodes easily.	Moderate: wetness, droughty.
Sk*: Sorter-----	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
Kirbyville-----	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.
Sp----- Splendora	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
SrB----- Spurger	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: percs slowly.	Slight-----	Slight.
SwB*: Spurger-----	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: percs slowly.	Slight-----	Slight.
Waller-----	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
VaA, VaB----- Vamont	Severe: ponding, percs slowly.	Severe: ponding, too clayey, percs slowly.	Severe: too clayey, ponding, percs slowly.	Severe: ponding, too clayey.	Severe: ponding, too clayey.
Vd----- Vamont	Severe: ponding, percs slowly.	Severe: ponding, too clayey, percs slowly.	Severe: too clayey, ponding, percs slowly.	Severe: ponding, too clayey.	Severe: ponding, too clayey.
Ve----- Verland	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.
Vo----- Voss	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: droughty.
Vs----- Voss	Severe: flooding, too sandy.	Severe: too sandy.	Severe: too sandy, flooding.	Severe: too sandy.	Severe: droughty, flooding.

See footnote at end of table.

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
Wa----- Waller	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Wc----- Waller	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
Wd*: Waller-----	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Dallardsville-----	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Severe: erodes easily.	Moderate: wetness, droughty.
Wk*: Waller-----	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Kirbyville-----	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.
Wn*: Waller-----	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Splendora-----	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Wo----- Wockley	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
WvB----- Woodville	Severe: percs slowly.	Severe: percs slowly.	Severe: percs slowly.	Severe: erodes easily.	Slight.
WvD----- Woodville	Severe: percs slowly.	Severe: percs slowly.	Severe: slope, percs slowly.	Severe: erodes easily.	Slight.

\* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 10.--WILDLIFE HABITAT

(See text for definitions of "good," "fair," "poor," and "very poor." Absence of an entry indicates that 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 herba-ceous plants	Hardwood trees	Conif-erous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
AaB----- Alaga	Poor	Fair	Fair	Poor	Poor	Very poor.	Very poor.	Fair	Poor	Very poor.
AdA----- Aldine	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
Ae*: Aldine-----	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
Aris-----	Fair	Fair	Good	Fair	Fair	Good	Good	Fair	Fair	Good.
An*: Anahuac-----	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
Aris-----	Fair	Fair	Good	Fair	Fair	Good	Good	Fair	Fair	Good.
Ar----- Aris	Fair	Fair	Good	Fair	Fair	Good	Good	Fair	Fair	Good.
As----- Aris	Very poor.	Poor	Poor	Very poor.	Very poor.	Good	Good	Poor	Very poor.	Good.
Ba----- Beaumont	Fair	Fair	Poor	Fair	Fair	Fair	Good	Fair	Fair	Fair.
Bd----- Beaumont	Very poor.	Poor	Poor	Very poor.	Very poor.	Good	Good	Poor	Very poor.	Good.
Be----- Bernard	Fair	Good	Fair	Good	Good	Fair	Fair	Fair	Good	Fair.
Bm*: Bernard-----	Fair	Good	Fair	Good	Good	Fair	Fair	Fair	Good	Fair.
Morey-----	Fair	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
BnB----- Bienville	Fair	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
BvB*: Bienville-----	Fair	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
Kenefick-----	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
ByB----- Boykin	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
CoB----- Choates	Poor	Fair	Good	Good	Good	Fair	Poor	Fair	Good	Poor.
DaB----- Dallardsville	Fair	Good	Good	Good	Good	Fair	Fair	Fair	Good	Fair.

See footnote at end of table.

TABLE 10.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herba-ceous plants	Hardwood trees	Conif-erous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
DoB----- Doucette	Poor	Fair	Good	Good	Good	Poor	Very poor.	Fair	Good	Very poor.
DyC----- Dylan	Fair	Fair	Fair	Good	Good	Fair	Poor	Fair	Good	Poor.
Es----- Estes	Very poor.	Poor	Fair	Good	---	Fair	Fair	Poor	Fair	Fair.
Fa----- Fausse	Very poor.	Very poor.	Very poor.	Poor	---	Good	Good	Very poor.	Poor	Good.
Gu----- Guyton	Fair	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
Gy*: Guyton-----	Fair	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
Aldine-----	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
Ha----- Hatliff	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
Ho----- Hockley	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
Ka----- Kaman	Fair	Fair	Fair	Good	Poor	Fair	Good	Fair	Good	Fair.
Kf----- Kaman	Poor	Fair	Poor	Fair	Poor	Poor	Good	Poor	Fair	Fair.
Kg----- Katy	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
Kh----- Kemah	Fair	Good	Good	Fair	---	Good	Good	Fair	---	Fair.
Km*: Kemah-----	Fair	Good	Good	Fair	---	Good	Good	Fair	---	Fair.
Aris-----	Fair	Fair	Good	Fair	Fair	Good	Good	Fair	Fair	Good.
Kn----- Kenefick	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Kr----- Kirbyville	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
LaA----- Lake Charles	Fair	Fair	Fair	Good	Good	Fair	Good	Fair	Good	Fair.
LaC----- Lake Charles	Fair	Fair	Fair	Good	Good	Poor	Very poor.	Fair	Good	Poor.
LdB----- Landman	Poor	Fair	Good	Good	Good	Poor	Poor	Fair	Good	Poor.
Ma----- Mantachie	Poor	Fair	Fair	Good	---	Fair	Fair	Fair	Good	Fair.

See footnote at end of table.

TABLE 10.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herba- ceous plants	Hardwood trees	Conif- erous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
My*:										
Mocarey-----	Fair	Fair	Fair	Good	---	Fair	Good	Fair	Good	Fair.
Yeaton-----	Fair	Fair	Good	Good	Good	Fair	Good	Fair	Good	Fair.
Ow*:										
Oil-waste land										
OyB-----	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
Otanya										
Oz-----	Poor	Fair	Good	Good	Good	Poor	Poor	Fair	Good	Poor.
Owentown										
Pt*:										
Pits										
Pu-----	Poor	Fair	Fair	Fair	Fair	Good	Fair	Fair	Fair	Fair.
Pluck										
Sa-----	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
Segno										
Sb-----	Poor	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
Sorter										
Sd*:										
Sorter-----	Poor	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
Dallardsville-----	Fair	Good	Good	Good	Good	Fair	Fair	Fair	Good	Fair.
Sk*:										
Sorter-----	Poor	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
Kirbyville-----	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
Sp-----	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
Splendora										
SrB-----	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
Spurger										
SwB*:										
Spurger-----	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
Waller-----	Poor	Fair	Fair	Good	Fair	Good	Good	Fair	Good	Good.
VaA-----	Poor	Fair	Fair	Good	Good	Fair	Good	Fair	Good	Fair.
Vamont										
VaB-----	Fair	Fair	Fair	Good	Good	Fair	Poor	Fair	Good	Poor.
Vamont										
Vd-----	Poor	Fair	Fair	Good	Good	Fair	Good	Fair	Good	Fair.
Vamont										
Ve-----	Fair	Good	Fair	Good	---	Fair	Fair	Fair	Good	Fair.
Verland										

See footnote at end of table.

TABLE 10.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herba- ceous plants	Hardwood trees	Conif- erous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
Vo, Vs----- Voss	Poor	Poor	Fair	Good	Good	Poor	Poor	Poor	Good	Poor.
Wa----- Waller	Poor	Fair	Fair	Good	Fair	Good	Good	Fair	Good	Good.
Wc----- Waller	Very poor.	Poor	Poor	Very poor.	Very poor.	Good	Good	Poor	Very poor.	Good.
Wd*: Waller-----	Poor	Fair	Fair	Good	Fair	Good	Good	Fair	Good	Good.
Dallardsville----	Fair	Good	Good	Good	Good	Fair	Fair	Fair	Good	Fair.
Wk*: Waller-----	Poor	Fair	Fair	Good	Fair	Good	Good	Fair	Good	Good.
Kirbyville-----	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
Wn*: Waller-----	Poor	Fair	Fair	Good	Fair	Good	Good	Fair	Good	Good.
Splendora-----	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
Wo----- Wockley	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
WvB----- Woodville	Fair	Good	Good	Good	Good	Fair	Poor	Good	Good	Poor.
WvD----- Woodville	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.

\* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 11.--BUILDING SITE DEVELOPMENT

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
AaB----- Alaga	Severe: cutbanks cave.	Slight-----	Slight-----	Slight-----	Slight-----	Moderate: droughty.
AdA----- Aldine	Severe: wetness.	Severe: shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Moderate: wetness.
Ae*: Aldine-----	Severe: wetness.	Severe: shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Moderate: wetness.
Aris-----	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell, low strength, wetness.	Severe: wetness.
An*: Anahuac-----	Severe: wetness.	Moderate: wetness.	Severe: wetness, shrink-swell.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.
Aris-----	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell, low strength, wetness.	Severe: wetness.
Ar----- Aris	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell, low strength, wetness.	Severe: wetness.
As----- Aris	Severe: ponding.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: shrink-swell, low strength, ponding.	Severe: ponding.
Ba----- Beaumont	Severe: cutbanks cave, wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: low strength, wetness, shrink-swell.	Severe: wetness, too clayey.
Bd----- Beaumont	Severe: cutbanks cave, ponding.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: shrink-swell, low strength, ponding.	Severe: ponding, too clayey.
Be----- Bernard	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: low strength, wetness, shrink-swell.	Severe: wetness.

See footnote at end of table.

TABLE 11.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
<b>Bm*:</b>						
Bernard-----	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: low strength, wetness, shrink-swell.	Severe: wetness.
Morey-----	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: low strength.	Moderate: wetness.
<b>BnB:</b>						
Bienville-----	Severe: cutbanks cave.	Slight-----	Moderate: wetness.	Slight-----	Slight-----	Moderate: droughty.
<b>BvB*:</b>						
Bienville-----	Severe: cutbanks cave.	Slight-----	Moderate: wetness.	Slight-----	Slight-----	Moderate: droughty.
Kenefick-----	Slight-----	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, low strength.	Slight.
<b>ByB:</b>						
Boykin-----	Slight-----	Slight-----	Slight-----	Slight-----	Slight-----	Slight.
<b>CoB:</b>						
Choates-----	Severe: cutbanks cave, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.
<b>DaB:</b>						
Dallardsville-----	Severe: wetness, cutbanks cave.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, droughty.
<b>DoB:</b>						
Doucette-----	Severe: cutbanks cave.	Slight-----	Slight-----	Slight-----	Slight-----	Slight.
<b>DyC:</b>						
Dylan-----	Severe: cutbanks cave, wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: low strength, wetness, shrink-swell.	Severe: wetness, too clayey.
<b>Es:</b>						
Estes-----	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, wetness, flooding.	Severe: wetness, flooding, too clayey.
<b>Fa:</b>						
Fausse-----	Severe: ponding.	Severe: flooding, ponding, shrink-swell.	Severe: flooding, ponding, shrink-swell.	Severe: flooding, ponding, shrink-swell.	Severe: low strength, ponding, flooding.	Severe: ponding, flooding, too clayey.
<b>Gu:</b>						
Guyton-----	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, wetness.	Severe: wetness.
<b>Gy*:</b>						
Guyton-----	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, wetness.	Severe: wetness.

See footnote at end of table.

TABLE 11.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
Gy*: Aldine-----	Severe: wetness.	Severe: shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Moderate: wetness.
Ha----- Hatliff	Severe: cutbanks cave, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: wetness, flooding.	Severe: wetness.
Ho----- Hockley	Moderate: wetness.	Moderate: shrink-swell.	Moderate: wetness, shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Slight.
Ka----- Kaman	Severe: cutbanks cave, wetness.	Severe: flooding, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, shrink-swell.	Severe: shrink-swell, low strength, flooding.	Severe: too clayey.
Kf----- Kaman	Severe: cutbanks cave, wetness.	Severe: flooding, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, shrink-swell.	Severe: shrink-swell, low strength, flooding.	Severe: flooding, too clayey.
Kg----- Katy	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Slight.
Kh----- Kemah	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: low strength, wetness, shrink-swell.	Severe: wetness.
Km*: Kemah-----	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: low strength, wetness, shrink-swell.	Severe: wetness.
Aris-----	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell, low strength, wetness.	Severe: wetness.
Kn----- Kenefick	Slight-----	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, low strength.	Slight.
Kr----- Kirbyville	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: low strength, wetness.	Moderate: wetness.
LaA, LaC----- Lake Charles	Severe: cutbanks cave.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Severe: too clayey.
LdB----- Landman	Severe: cutbanks cave.	Slight-----	Moderate: wetness.	Slight-----	Slight-----	Moderate: droughty.
Ma----- Mantachie	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding.	Severe: flooding.

See footnote at end of table.

TABLE 11.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
My*: Mocarey-----	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: low strength, wetness.	Moderate: wetness.
Yeaton-----	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: shrink-swell, low strength.	Moderate: wetness.
Ow*. Oil-waste land						
OyB----- Otanya	Moderate: wetness.	Slight-----	Moderate: wetness.	Slight-----	Slight-----	Slight.
Oz----- Owentown	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: droughty, flooding.
Pt*. Pits						
Pu----- Pluck	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: wetness, flooding.	Severe: wetness, flooding.
Sa----- Segno	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.	Slight.
Sb----- Sorter	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
Sd*: Sorter-----	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
Dallardsville----	Severe: wetness, cutbanks cave.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, droughty.
Sk*: Sorter-----	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
Kirbyville-----	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: low strength, wetness.	Moderate: wetness.
Sp----- Splendor	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
SrB----- Spurger	Moderate: too clayey, wetness.	Moderate: shrink-swell.	Moderate: wetness, shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Slight.
SwB*: Spurger-----	Moderate: too clayey, wetness.	Moderate: shrink-swell.	Moderate: wetness, shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Slight.

See footnote at end of table.

TABLE 11.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
SwB*: Waller-----	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
VaA----- Vamont	Severe: cutbanks cave, wetness.	Severe: shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Severe: too clayey.
VaB----- Vamont	Severe: cutbanks cave, wetness.	Severe: shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Severe: too clayey.
Vd----- Vamont	Severe: cutbanks cave, ponding.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: shrink-swell, low strength, ponding.	Severe: ponding, too clayey.
Ve----- Verland	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: low strength, wetness, shrink-swell.	Severe: wetness.
Vo----- Voss	Severe: cutbanks cave, wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Severe: flooding.	Severe: droughty.
Vs----- Voss	Severe: cutbanks cave, wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Severe: flooding.	Severe: droughty, flooding.
Wa----- Waller	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Wc----- Waller	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
Wd*: Waller-----	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Dallardsville----	Severe: wetness, cutbanks cave.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, droughty.
Wk*: Waller-----	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Kirbyville-----	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: low strength, wetness.	Moderate: wetness.
Wn*: Waller-----	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Splendora-----	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.

See footnote at end of table.

TABLE 11.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
Wo----- Wockley	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, wetness.	Severe: wetness.
WvB, WvD----- Woodville	Moderate: too clayey, wetness.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Slight.

\* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 12.--SANITARY FACILITIES

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "good," and other terms. Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
AaB----- Alaga	Slight-----	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
AdA----- Aldine	Severe: wetness, percs slowly.	Slight-----	Severe: wetness, too clayey.	Moderate: wetness.	Poor: too clayey, hard to pack.
Ae*: Aldine-----	Severe: wetness, percs slowly.	Slight-----	Severe: wetness, too clayey.	Moderate: wetness.	Poor: too clayey, hard to pack.
Aris-----	Severe: wetness, percs slowly.	Moderate: seepage.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
An*: Anahuac-----	Severe: wetness, percs slowly.	Slight-----	Severe: wetness, too clayey.	Moderate: wetness.	Poor: too clayey, hard to pack.
Aris-----	Severe: wetness, percs slowly.	Moderate: seepage.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
Ar----- Aris	Severe: wetness, percs slowly.	Moderate: seepage.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
As----- Aris	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding, too clayey.	Severe: ponding.	Poor: too clayey, hard to pack, ponding.
Ba----- Beaumont	Severe: wetness, percs slowly.	Slight-----	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
Bd----- Beaumont	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding, too clayey.	Severe: ponding.	Poor: too clayey, hard to pack, ponding.
Be----- Bernard	Severe: wetness, percs slowly.	Slight-----	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.

See footnote at end of table.

TABLE 12.--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
Bm*: Bernard-----	Severe: wetness, percs slowly.	Slight-----	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
Morey-----	Severe: wetness, percs slowly.	Slight-----	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.
BnB----- Bienville	Moderate: wetness.	Severe: seepage.	Severe: seepage, wetness, too sandy.	Severe: seepage.	Poor: too sandy.
BvB*: Bienville-----	Moderate: wetness.	Severe: seepage.	Severe: seepage, wetness, too sandy.	Severe: seepage.	Poor: too sandy.
Kenefick-----	Moderate: percs slowly.	Severe: seepage.	Severe: seepage.	Slight-----	Fair: too clayey.
ByB----- Boykin	Slight-----	Moderate: seepage, slope.	Slight-----	Slight-----	Good.
CoB----- Choates	Severe: wetness, percs slowly.	Severe: seepage, wetness.	Severe: wetness.	Severe: seepage, wetness.	Fair: wetness.
DaB----- Dallardsville	Severe: wetness, percs slowly.	Severe: wetness, seepage.	Severe: wetness.	Severe: wetness, seepage.	Poor: wetness.
DoB----- Doucette	Slight-----	Moderate: seepage, slope.	Slight-----	Slight-----	Good.
DyC----- Dylan	Severe: wetness, percs slowly.	Moderate: slope.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
Es----- Estes	Severe: flooding, wetness, percs slowly.	Severe: flooding.	Severe: flooding, wetness, too clayey.	Severe: flooding, wetness.	Poor: too clayey, hard to pack, wetness.
Fa----- Fausse	Severe: flooding, ponding, percs slowly.	Severe: flooding, ponding.	Severe: flooding, ponding, too clayey.	Severe: flooding, ponding.	Poor: too clayey, hard to pack, ponding.
Gu----- Guyton	Severe: wetness, percs slowly.	Moderate: seepage.	Severe: wetness.	Severe: wetness.	Poor: wetness.

See footnote at end of table.

TABLE 12.--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
Gy*: Guyton-----	Severe: wetness, percs slowly.	Moderate: seepage.	Severe: wetness.	Severe: wetness.	Poor: wetness.
Aldine-----	Severe: wetness, percs slowly.	Slight-----	Severe: wetness, too clayey.	Moderate: wetness.	Poor: too clayey, hard to pack.
Ha----- Hatliff	Severe: flooding, wetness.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage, wetness.	Poor: seepage, too sandy, wetness.
Ho----- Hockley	Severe: wetness, percs slowly.	Moderate: seepage, wetness.	Moderate: wetness, too clayey.	Severe: seepage.	Fair: too clayey.
Ka, Kf----- Kaman	Severe: flooding, wetness, percs slowly.	Severe: flooding.	Severe: flooding, wetness, too clayey.	Severe: flooding, wetness.	Poor: too clayey, hard to pack.
Kg----- Katy	Severe: percs slowly.	Moderate: seepage.	Moderate: too clayey.	Slight-----	Fair: too clayey, thin layer.
Kh----- Kemah	Severe: wetness, percs slowly.	Slight-----	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
Km*: Kemah-----	Severe: wetness, percs slowly.	Slight-----	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
Aris-----	Severe: wetness, percs slowly.	Moderate: seepage.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
Kn----- Kenefick	Severe: percs slowly.	Severe: seepage.	Severe: seepage.	Slight-----	Fair: too clayey.
Kr----- Kirbyville	Severe: wetness.	Severe: wetness, seepage.	Severe: wetness.	Severe: wetness.	Fair: small stones, wetness.
LaA----- Lake Charles	Severe: percs slowly.	Slight-----	Severe: too clayey.	Slight-----	Poor: too clayey, hard to pack.
LaC----- Lake Charles	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight-----	Poor: too clayey, hard to pack.
LdB----- Landman	Severe: poor filter.	Severe: seepage.	Moderate: too sandy.	Severe: seepage.	Fair: too sandy.

See footnote at end of table.

TABLE 12.--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
Ma----- Mantachie	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness.
My*: Mocarey-----	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, small stones, wetness.
Yeaton-----	Severe: wetness, percs slowly.	Moderate: seepage.	Severe: wetness.	Severe: wetness.	Poor: wetness.
Ow*. Oil-waste land					
OyB----- Otanya	Severe: wetness, percs slowly.	Severe: wetness.	Moderate: wetness, too clayey.	Slight-----	Fair: too clayey, wetness.
Oz----- Owentown	Severe: flooding, wetness.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, wetness.	Fair: wetness.
Pt*. Pits					
Pu----- Pluck	Severe: flooding, wetness.	Severe: seepage, flooding, wetness.	Severe: wetness, flooding.	Severe: flooding, seepage, wetness.	Poor: wetness.
Sa----- Segno	Severe: wetness, percs slowly.	Severe: seepage, wetness.	Severe: seepage.	Severe: seepage.	Fair: too clayey, wetness.
Sb----- Sorter	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding.
Sd*: Sorter-----	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding.
Dallardsville-----	Severe: wetness, percs slowly.	Severe: wetness, seepage.	Severe: wetness.	Severe: wetness, seepage.	Poor: wetness.
Sk*: Sorter-----	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding.
Kirbyville-----	Severe: wetness.	Severe: wetness, seepage.	Severe: wetness.	Severe: wetness.	Fair: small stones, wetness.

See footnote at end of table.

TABLE 12.--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
Sp----- Splendora	Severe: wetness, percs slowly.	Moderate: seepage.	Severe: wetness.	Severe: wetness.	Poor: wetness.
SrB----- Spurger	Severe: percs slowly, wetness.	Slight-----	Severe: seepage, too clayey.	Moderate: wetness.	Poor: too clayey, hard to pack.
SwB*: Spurger-----	Severe: percs slowly, wetness.	Slight-----	Severe: seepage, too clayey.	Moderate: wetness.	Poor: too clayey, hard to pack.
Waller-----	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
VaA----- Vamont	Severe: wetness, percs slowly.	Slight-----	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack.
VaB----- Vamont	Severe: wetness, percs slowly.	Moderate: slope.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack.
Vd----- Vamont	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding, too clayey.	Severe: ponding.	Poor: too clayey, hard to pack, ponding.
Ve----- Verland	Severe: wetness, percs slowly.	Slight-----	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
Vo, Vs----- Voss	Severe: flooding, wetness, poor filter.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage, wetness.	Poor: seepage, too sandy.
Wa----- Waller	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
Wc----- Waller	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding.
Wd*: Waller-----	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
Dallardsville-----	Severe: wetness, percs slowly.	Severe: wetness, seepage.	Severe: wetness.	Severe: wetness, seepage.	Poor: wetness.
Wk*: Waller-----	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.

See footnote at end of table.

TABLE 12.--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
Wk*: Kirbyville-----	Severe: wetness.	Severe: wetness, seepage.	Severe: wetness.	Severe: wetness.	Fair: small stones, wetness.
Wn*: Waller-----	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
Splendora-----	Severe: wetness, percs slowly.	Moderate: seepage.	Severe: wetness.	Severe: wetness.	Poor: wetness.
Wo----- Wockley	Severe: wetness, percs slowly.	Severe: seepage, wetness.	Severe: wetness.	Severe: seepage, wetness.	Poor: wetness.
WvB, WvD----- Woodville	Severe: percs slowly, wetness.	Moderate: slope.	Severe: too clayey, wetness.	Severe: wetness.	Poor: too clayey, hard to pack.

\* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 13.--CONSTRUCTION MATERIALS

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," and other terms. Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
AaB----- Alaga	Good-----	Probable-----	Improbable: too sandy.	Poor: too sandy.
AdA----- Aldine	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
Ae*: Aldine-----	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
Aris-----	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
An*: Anahuac-----	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: thin layer.
Aris-----	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Ar, As----- Aris	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Ba----- Beaumont	Poor: low strength, wetness, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
Bd----- Beaumont	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
Be----- Bernard	Poor: low strength, wetness, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness, too clayey.
Bm*: Bernard-----	Poor: low strength, wetness, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness, too clayey.
Morey-----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.

See footnote at end of table.

TABLE 13.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
BnB----- Bienville	Good-----	Improbable: excess fines.	Improbable: excess fines.	Poor: too sandy.
BvB*: Bienville-----	Good-----	Improbable: excess fines.	Improbable: excess fines.	Poor: too sandy.
Kenefick-----	Good-----	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
ByB----- Boykin	Good-----	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy.
CoB----- Choates	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy.
DaB----- Dallardsville	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy.
DoB----- Doucette	Good-----	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy.
DyC----- Dylan	Poor: low strength, wetness, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
Es----- Estes	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
Fa----- Fausse	Poor: low strength, wetness, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
Gu----- Guyton	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Gy*: Guyton-----	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Aldine-----	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
Ha----- Hatliff	Poor: wetness.	Probable-----	Improbable: too sandy.	Poor: wetness, too sandy.
Ho----- Hockley	Fair: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
Ka, Kf----- Kaman	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Kg----- Katy	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.

See footnote at end of table.

TABLE 13.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Kh----- Kemah	Poor: low strength, wetness, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
Km*: Kemah-----	Poor: low strength, wetness, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
Aris-----	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Kn----- Kenefick	Good-----	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
Kr----- Kirbyville	Fair: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
LaA, LaC----- Lake Charles	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
LdB----- Landman	Good-----	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy.
Ma----- Mantachie	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
My*: Mocarey-----	Fair: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
Yeaton-----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Ow*. Oil-waste land				
OyB----- Otanya	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
Oz----- Owentown	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
Pt*. Pits				
Pu----- Pluck	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Sa----- Segno	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.

See footnote at end of table.

TABLE 13.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Sb----- Sorter	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, wetness.
Sd*: Sorter-----	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, wetness.
Dallardsville-----	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy.
Sk*: Sorter-----	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, wetness.
Kirbyville-----	Fair: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
Sp----- Splendora	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
SrB----- Spurger	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
SwB*: Spurger-----	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Waller-----	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
VaA, VaB----- Vamont	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Vd----- Vamont	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
Ve----- Verland	Poor: low strength, wetness, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
Vo, Vs----- Voss	Fair: wetness.	Probable-----	Improbable: too sandy.	Poor: too sandy.
Wa, Wc----- Waller	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.

See footnote at end of table.

TABLE 13.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Wd*: Waller-----	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Dallardsville-----	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy.
Wk*: Waller-----	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Kirbyville-----	Fair: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
Wn*: Waller-----	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Splendora-----	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Wo----- Wockley	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
WvB, WvD----- Woodville	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.

\* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 14.--WATER MANAGEMENT

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not evaluated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Limitations for--		Features affecting--		
	Pond reservoir areas	Embankments, dikes and levees	Drainage	Irrigation	Terraces and diversions
AaB----- Alaga	Severe: seepage.	Severe: seepage, piping.	Deep to water----	Droughty, fast intake.	Too sandy, soil blowing.
AdA----- Aldine	Slight-----	Moderate: hard to pack, wetness.	Percs slowly-----	Wetness, percs slowly, erodes easily.	Erodes easily, wetness, percs slowly.
Ae*: Aldine-----	Slight-----	Moderate: hard to pack, wetness.	Percs slowly-----	Wetness, percs slowly, erodes easily.	Erodes easily, wetness, percs slowly.
Aris-----	Moderate: seepage.	Severe: wetness.	Percs slowly-----	Wetness, percs slowly.	Erodes easily, wetness.
An*: Anahuac-----	Moderate: seepage.	Severe: hard to pack.	Percs slowly-----	Wetness, percs slowly, erodes easily.	Erodes easily, wetness, percs slowly.
Aris-----	Moderate: seepage.	Severe: wetness.	Percs slowly-----	Wetness, percs slowly.	Erodes easily, wetness.
Ar----- Aris	Moderate: seepage.	Severe: wetness.	Percs slowly-----	Wetness, percs slowly.	Erodes easily, wetness.
As----- Aris	Moderate: seepage.	Severe: ponding.	Ponding, percs slowly.	Ponding, percs slowly.	Erodes easily, ponding.
Ba----- Beaumont	Slight-----	Severe: hard to pack, wetness.	Percs slowly-----	Wetness, slow intake, percs slowly.	Wetness, percs slowly.
Bd----- Beaumont	Slight-----	Severe: hard to pack, ponding.	Ponding, percs slowly.	Ponding, slow intake, percs slowly.	Ponding, percs slowly.
Be----- Bernard	Slight-----	Severe: hard to pack, wetness.	Percs slowly-----	Wetness, percs slowly.	Wetness, percs slowly.
Bm*: Bernard-----	Slight-----	Severe: hard to pack, wetness.	Percs slowly-----	Wetness, percs slowly.	Wetness, percs slowly.
Morey-----	Slight-----	Severe: wetness.	Percs slowly-----	Wetness, percs slowly, erodes easily.	Erodes easily, wetness, percs slowly.
BnB----- Bienville	Severe: seepage.	Severe: seepage, piping.	Deep to water----	Droughty, fast intake.	Too sandy, soil blowing.

See footnote at end of table.

TABLE 14.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--		
	Pond reservoir areas	Embankments, dikes and levees	Drainage	Irrigation	Terraces and diversions
BvB*: Bienville-----	Severe: seepage.	Severe: seepage, piping.	Deep to water----	Droughty, fast intake.	Too sandy, soil blowing.
Kenefick-----	Moderate: seepage.	Moderate: thin layer, piping.	Deep to water----	Soil blowing-----	Soil blowing.
ByB----- Boykin	Moderate: seepage.	Moderate: piping.	Deep to water----	Fast intake, soil blowing.	Soil blowing.
CoB----- Choates	Severe: seepage.	Severe: piping, wetness.	Favorable-----	Wetness, fast intake.	Wetness.
DaB----- Dallardsville	Severe: seepage.	Severe: piping.	Cutbanks cave----	Wetness, erodes easily.	Wetness, erodes easily.
DoB----- Doucette	Moderate: seepage.	Severe: piping.	Deep to water----	Fast intake-----	Favorable.
DyC----- Dylan	Slight-----	Severe: hard to pack, wetness.	Percs slowly, slope.	Wetness, slow intake, slope.	Wetness, percs slowly.
Es----- Estes	Slight-----	Severe: wetness.	Percs slowly, flooding.	Wetness, slow intake, percs slowly.	Wetness, percs slowly.
Fa----- Fausse	Slight-----	Severe: hard to pack, ponding.	Ponding, percs slowly, flooding.	Ponding, slow intake, percs slowly.	Ponding, percs slowly.
Gu----- Guyton	Moderate: seepage.	Severe: piping, wetness.	Percs slowly----	Wetness, percs slowly, erodes easily.	Erodes easily, wetness, percs slowly.
Gy*: Guyton-----	Moderate: seepage.	Severe: piping, wetness.	Percs slowly----	Wetness, percs slowly, erodes easily.	Erodes easily, wetness, percs slowly.
Aldine-----	Slight-----	Moderate: hard to pack, wetness.	Percs slowly----	Wetness, percs slowly, erodes easily.	Erodes easily, wetness, percs slowly.
Ha----- Hatliff	Severe: seepage.	Severe: seepage, piping, wetness.	Flooding, cutbanks cave.	Wetness, droughty.	Wetness, too sandy.
Ho----- Hockley	Moderate: seepage.	Moderate: piping.	Deep to water----	Favorable-----	Soil blowing.
Ka, Kf----- Kaman	Slight-----	Severe: hard to pack, wetness.	Percs slowly, flooding.	Wetness, slow intake, percs slowly.	Wetness, percs slowly.

See footnote at end of table.

TABLE 14.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--		
	Pond reservoir areas	Embankments, dikes and levees	Drainage	Irrigation	Terraces and diversions
Kg----- Katy	Moderate: seepage.	Slight-----	Deep to water----	Soil blowing, percs slowly.	Erodes easily, soil blowing, percs slowly.
Kh----- Kemah	Slight-----	Severe: hard to pack, wetness.	Percs slowly----	Wetness, percs slowly, erodes easily.	Erodes easily, wetness, percs slowly.
Km*: Kemah-----	Slight-----	Severe: hard to pack, wetness.	Percs slowly----	Wetness, percs slowly, erodes easily.	Erodes easily, wetness, percs slowly.
Aris-----	Moderate: seepage.	Severe: wetness.	Percs slowly----	Wetness, percs slowly.	Erodes easily, wetness.
Kn----- Kenefick	Moderate: seepage.	Moderate: thin layer, piping.	Deep to water----	Soil blowing----	Soil blowing.
Kr----- Kirbyville	Moderate: seepage.	Severe: wetness.	Favorable-----	Wetness, soil blowing.	Wetness, soil blowing.
LaA----- Lake Charles	Slight-----	Severe: hard to pack.	Deep to water----	Slow intake, percs slowly.	Percs slowly.
LaC----- Lake Charles	Moderate: slope.	Severe: hard to pack.	Deep to water----	Slope, slow intake, percs slowly.	Percs slowly.
LdB----- Landman	Severe: seepage.	Severe: seepage, piping.	Deep to water----	Droughty, fast intake.	Favorable.
Ma----- Mantachie	Moderate: seepage.	Severe: piping, wetness.	Flooding-----	Wetness, flooding.	Wetness.
My*: Mocarey-----	Slight-----	Severe: wetness.	Favorable-----	Wetness, percs slowly, erodes easily.	Erodes easily, wetness.
Yeaton-----	Slight-----	Moderate: wetness.	Percs slowly----	Wetness, percs slowly, erodes easily.	Wetness, erodes easily.
Ow*. Oil-waste land					
OyB----- Otanya	Moderate: seepage.	Moderate: piping.	Deep to water----	Soil blowing----	Soil blowing.
Oz----- Owentown	Severe: seepage.	Severe: piping.	Flooding-----	Wetness, droughty.	Wetness, soil blowing.
Pt*. Pits					

See footnote at end of table.

TABLE 14.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--		
	Pond reservoir areas	Embankments, dikes and levees	Drainage	Irrigation	Terraces and diversions
Pu----- Pluck	Severe: seepage.	Severe: piping, wetness.	Flooding-----	Flooding, wetness.	Wetness.
Sa----- Segno	Severe: seepage.	Moderate: piping, wetness.	Favorable-----	Wetness-----	Wetness, soil blowing.
Sb----- Sorter	Slight-----	Severe: piping, ponding.	Ponding, percs slowly.	Ponding, percs slowly, rooting depth.	Erodes easily, ponding, percs slowly.
Sd*: Sorter-----	Slight-----	Severe: piping, ponding.	Ponding, percs slowly.	Ponding, percs slowly, rooting depth.	Erodes easily, ponding, percs slowly.
Dallardsville-----	Severe: seepage.	Severe: piping.	Cutbanks cave----	Wetness, erodes easily.	Wetness, erodes easily.
Sk*: Sorter-----	Slight-----	Severe: piping, ponding.	Ponding, percs slowly.	Ponding, percs slowly, rooting depth.	Erodes easily, ponding, percs slowly.
Kirbyville-----	Moderate: seepage.	Severe: wetness.	Favorable-----	Wetness, soil blowing.	Wetness, soil blowing.
Sp----- Splendora	Slight-----	Severe: wetness.	Percs slowly-----	Percs slowly, rooting depth.	Erodes easily, wetness, percs slowly.
SrB----- Spurger	Slight-----	Moderate: wetness, piping.	Percs slowly-----	Wetness, percs slowly.	Erodes easily, wetness.
SwB*: Spurger-----	Slight-----	Moderate: wetness, piping.	Percs slowly-----	Wetness, percs slowly.	Erodes easily, wetness.
Waller-----	Moderate: seepage.	Severe: piping, wetness.	Percs slowly-----	Wetness, percs slowly, erodes easily.	Erodes easily, wetness.
VaA, VaB----- Vamont	Slight-----	Severe: hard to pack, wetness.	Percs slowly-----	Wetness, slow intake.	Wetness, percs slowly.
Vd----- Vamont	Slight-----	Severe: hard to pack, ponding.	Ponding, percs slowly.	Ponding, slow intake, percs slowly.	Ponding, percs slowly.
Ve----- Verland	Slight-----	Severe: hard to pack, wetness.	Percs slowly-----	Wetness, percs slowly, erodes easily.	Erodes easily, wetness, percs slowly.
Vo----- Voss	Severe: seepage.	Severe: seepage, piping.	Flooding, cutbanks cave.	Wetness, droughty, fast intake.	Wetness, too sandy, soil blowing.

See footnote at end of table.

TABLE 14.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--		
	Pond reservoir areas	Embankments, dikes and levees	Drainage	Irrigation	Terraces and diversions
Vs----- Voss	Severe: seepage.	Severe: seepage, piping.	Flooding, cutbanks cave.	Wetness, droughty, fast intake.	Wetness, too sandy.
Wa----- Waller	Moderate: seepage.	Severe: piping, wetness.	Percs slowly----	Wetness, percs slowly, erodes easily.	Erodes easily, wetness.
Wc----- Waller	Moderate: seepage.	Severe: piping, ponding.	Ponding-----	Ponding, erodes easily.	Erodes easily, ponding.
Wd*: Waller-----	Moderate: seepage.	Severe: piping, wetness.	Percs slowly----	Wetness, percs slowly, erodes easily.	Erodes easily, wetness.
Dallardsville----	Severe: seepage.	Severe: piping.	Cutbanks cave----	Wetness, erodes easily.	Wetness, erodes easily.
Wk*: Waller-----	Moderate: seepage.	Severe: piping, wetness.	Percs slowly----	Wetness, percs slowly, erodes easily.	Erodes easily, wetness.
Kirbyville-----	Moderate: seepage.	Severe: wetness.	Favorable-----	Wetness, soil blowing.	Wetness, soil blowing.
Wn*: Waller-----	Moderate: seepage.	Severe: piping, wetness.	Percs slowly----	Wetness, percs slowly, erodes easily.	Erodes easily, wetness.
Splendora-----	Slight-----	Severe: wetness.	Percs slowly----	Percs slowly, rooting depth.	Erodes easily, wetness, percs slowly.
Wo----- Wockley	Slight-----	Severe: wetness.	Favorable-----	Wetness, soil blowing.	Wetness, soil blowing.
WvB----- Woodville	Slight-----	Severe: hard to pack.	Percs slowly----	Wetness, percs slowly.	Erodes easily, percs slowly, wetness.
WvD----- Woodville	Slight-----	Severe: hard to pack.	Percs slowly, slope.	Wetness, percs slowly, slope.	Erodes easily, percs slowly, wetness.

\* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 15.--ENGINEERING INDEX PROPERTIES

(The symbol < means less than; > means more than. Absence of an entry indicates that data were not estimated)

Soil name and map symbol	Depth	USDA texture	Classification		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	4	10	40	200		
AaB----- Alaga	0-8	Fine sand-----	SM, SP-SM	A-2, A-1-b, A-3	100	90-100	40-70	5-25	---	NP
	8-60	Loamy sand, loamy fine sand, fine sand.	SM, SW-SM, SP-SM	A-2	100	100	50-85	10-35	<25	NP-4
AdA----- Aldine	0-17	Silt loam-----	ML, CL, CL-ML	A-4	98-100	98-100	95-100	70-90	<30	NP-10
	17-25	Very fine sandy loam, loam, sandy clay loam.	CL	A-6, A-4	98-100	98-100	95-100	75-95	25-40	8-20
	25-60	Clay, silty clay	CH, CL	A-7-6	98-100	98-100	98-100	75-100	41-60	19-35
Ae*: Aldine-----	0-21	Fine sandy loam--	ML, SM, CL-ML, SM-SC	A-4	98-100	98-100	80-90	40-60	<30	NP-7
	21-29	Very fine sandy loam, loam, sandy clay loam.	CL	A-6, A-4	98-100	98-100	95-100	75-95	25-40	8-20
	29-60	Clay, silty clay	CH, CL	A-7-6	98-100	98-100	98-100	75-100	41-60	19-35
Aris-----	0-21	Silt loam-----	CL-ML, CL	A-4, A-6	98-100	95-100	95-100	60-85	21-34	4-14
	21-25	Clay loam, silty clay loam.	CL	A-6, A-7	100	95-100	95-100	55-75	39-48	18-25
	25-60	Clay, clay loam, silty clay loam.	CL, CH	A-7	100	95-100	95-100	60-80	42-62	21-36
An*: Anahuac-----	0-16	Silt loam-----	ML, CL-ML	A-4	95-100	95-100	85-100	65-95	20-30	2-7
	16-37	Silt loam, very fine sandy loam, loam.	ML, CL-ML	A-4	95-100	95-100	85-100	65-95	20-30	2-7
	37-80	Silty clay, clay	CH, CL	A-7	95-100	95-100	95-100	75-95	45-70	30-50
Aris-----	0-20	Silt loam-----	CL-ML, CL	A-4, A-6	98-100	95-100	95-100	60-85	21-34	4-14
	20-24	Clay loam, silty clay loam.	CL	A-6, A-7	100	95-100	95-100	55-75	39-48	18-25
	24-62	Clay, clay loam, silty clay loam.	CL, CH	A-7	100	95-100	95-100	60-80	42-62	21-36
Ar----- Aris	0-5	Silt loam-----	CL-ML, CL	A-4, A-6	98-100	95-100	95-100	60-85	21-34	4-14
	5-18	Clay loam, silty clay loam.	CL	A-6, A-7	100	95-100	95-100	55-75	39-48	18-25
	18-60	Clay, clay loam, silty clay loam.	CL, CH	A-7	100	95-100	95-100	60-80	42-62	21-36
As----- Aris	0-6	Loam-----	CL-ML, CL	A-4, A-6	98-100	95-100	95-100	60-85	21-34	4-14
	6-60	Clay, clay loam, silty clay loam.	CL, CH	A-7	100	95-100	95-100	60-90	42-62	21-36
Ba----- Beaumont	0-28	Clay-----	CH	A-7	100	95-100	69-100	65-95	55-73	35-42
	28-39	Clay, silty clay	CH	A-7	100	95-100	74-100	65-98	60-85	35-60
	39-60	Clay, silty clay	CH	A-7	100	95-100	75-100	70-98	75-90	50-65

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	4	10	40	200		
Bd-----	In									
Beaumont	0-17	Clay-----	CH	A-7	100	95-100	69-100	65-95	55-73	35-42
	17-55	Clay, silty clay	CH	A-7	100	95-100	74-100	65-98	60-85	35-60
	55-60	Clay, silty clay	CH	A-7	100	95-100	75-100	70-98	75-90	50-65
Be-----	0-6	Clay loam-----	CL	A-6, A-7	100	98-100	90-100	80-95	30-49	12-28
	6-49	Clay, silty clay	CL, CH	A-7	98-100	98-100	90-100	90-100	41-70	22-44
	49-72	Silty clay, silty clay loam, clay.	CL, CH	A-7	100	93-100	90-100	75-90	41-65	25-45
Bm*:										
Bernard	0-5	Clay loam-----	CL	A-6, A-7	100	98-100	90-100	80-95	30-49	12-28
	5-36	Clay, silty clay	CL, CH	A-7	98-100	98-100	90-100	90-100	41-70	22-44
	36-60	Silty clay, silty clay loam, clay.	CL, CH	A-7	100	93-100	90-100	75-90	41-65	25-45
Morey-----	0-8	Silt loam-----	CL, CL-ML	A-4, A-6	100	95-100	90-100	75-95	23-40	5-18
	8-36	Silty clay loam, silt loam.	CL	A-6, A-7	100	95-100	90-100	85-95	34-50	14-30
	36-60	Silty clay loam, silty clay, clay.	CL, CH	A-6, A-7	98-100	95-100	90-100	85-95	35-60	15-36
BnB-----	0-5	Loamy fine sand	SM, SC-SM	A-2-4, A-4	100	100	90-100	15-50	<25	NP-5
	5-40	Loamy fine sand, fine sand.	SM	A-2-4, A-4	100	100	90-100	15-50	<25	NP-3
	40-80	Loamy fine sand, fine sandy loam, fine sand.	SM, ML	A-2-4, A-4	100	100	90-100	20-55	<25	NP-3
BvB*:										
Bienville	0-3	Loamy fine sand	SM, SC-SM	A-2-4, A-4	100	100	90-100	15-50	<25	NP-5
	3-36	Loamy fine sand, fine sand.	SM	A-2-4, A-4	100	100	90-100	15-50	<25	NP-3
	36-80	Loamy fine sand, fine sandy loam, fine sand.	SM, ML	A-2-4, A-4	100	100	90-100	20-55	<25	NP-3
Kenefick-----	0-26	Fine sandy loam	SM, SC-SM, ML, CL-ML	A-4	100	100	75-100	40-60	<21	NP-6
	26-40	Sandy clay loam, clay loam, loam.	CL	A-6	100	100	80-100	55-85	29-38	10-15
	40-58	Fine sandy loam, sandy clay loam.	CL, SC, CL-ML	A-4, A-6	100	100	80-100	40-70	23-30	7-11
	58-72	Stratified very fine sandy loam to sand.	SM, ML	A-2-4, A-4	95-100	80-100	70-100	25-60	<21	NP-4
ByB-----	0-7	Loamy fine sand	SM	A-2-4, A-4	97-100	95-100	75-98	17-45	<25	NP-4
	7-22	Loamy fine sand	SM	A-2-4, A-4	97-100	95-100	70-98	17-45	<25	NP-4
	22-60	Sandy clay loam	CL	A-4, A-6,	95-100	95-100	80-98	36-55	22-45	8-30

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	4	10	40	200		
CoB----- Choates	0-4	Loamy fine sand	SM	A-2-4, A-4	97-100	95-100	75-100	15-40	<28	NP-4
	4-29	Loamy fine sand	SM	A-2-4, A-4	97-100	95-100	75-100	15-40	<28	NP-4
	29-50	Sandy clay loam	SC, CL, SC-SM, CL-ML	A-6, A-4, A-7	95-100	95-100	75-100	36-55	20-43	4-22
	50-60	Sandy clay loam	SC, CL, SC-SM, CL-ML	A-6, A-4, A-7	95-100	90-100	75-100	34-55	20-43	4-22
DaB----- Dallardsville	0-3	Fine sandy loam	SM, ML, SC-SM, CL-ML	A-4	100	98-100	70-95	40-65	<20	NP-7
	3-20	Fine sandy loam, loamy fine sand, loamy very fine sand.	SM, ML	A-4	100	98-100	70-95	40-65	<20	NP-3
	20-30	Very fine sandy loam, loam, loam, fine sandy loam.	SM, ML, SC-SM, CL-ML	A-4	100	98-100	70-95	40-65	<20	NP-7
	30-60	Sandy clay loam, loam, fine sandy loam.	SC-SM, SC, CL-ML, CL	A-4, A-6	100	98-100	80-95	36-75	20-35	5-17
DoB----- Doucette	0-3	Loamy fine sand	SM	A-2-4, A-4	97-100	95-100	80-99	15-40	<25	NP-4
	3-28	Loamy fine sand, fine sand.	SM	A-2-4, A-4	97-100	95-100	80-98	15-40	<25	NP-4
	28-60	Sandy clay loam	SC, SC-SM, CL, CL-ML	A-4, A-6	95-100	95-100	85-98	36-55	25-39	6-18
DyC----- Dylan	0-4	Clay-----	CH	A-7-6	95-100	95-100	95-100	75-95	51-75	30-48
	4-26	Clay-----	CH	A-7-6	95-100	90-100	90-100	75-95	65-90	38-60
	26-60	Clay-----	CH	A-7-6	90-100	85-100	80-98	65-96	65-98	38-64
Es----- Estes	0-8	Clay-----	CL, CH	A-7-6	100	100	95-100	69-100	41-55	23-35
	8-34	Silty clay, clay	CL, CH	A-7-6	100	100	95-100	75-100	41-60	25-40
	34-60	Sandy clay loam, silty clay loam, clay loam.	CL	A-7-6, A-6	100	100	95-100	65-95	30-46	15-30
Fa----- Fausse	0-5	Clay-----	CH, OH, MH	A-7-6	100	100	100	95-100	60-100	31-71
	5-32	Clay-----	CH	A-7-6	100	100	100	95-100	60-100	31-71
	32-60	Clay, silty clay, silty clay loam.	CH, MH, CL, ML	A-7-6	100	100	100	95-100	45-100	16-71
Gu----- Guyton	0-3	Silt loam-----	ML, CL-ML	A-4	100	100	95-100	65-90	<27	NP-7
	3-23	Silt loam, loam, very fine sandy loam.	CL, CL-ML	A-6, A-4	100	100	94-100	75-95	22-40	6-18
	23-72	Silt loam, silty clay loam, clay loam.	CL, CL-ML, ML	A-6, A-4	100	100	95-100	50-95	<40	NP-18
Gy*: Guyton	0-7	Silt loam-----	ML, CL-ML	A-4	100	100	95-100	65-90	<27	NP-7
	7-23	Silt loam, loam	CL, CL-ML	A-6, A-4	100	100	94-100	75-95	22-40	6-18
	23-60	Silt loam, silty clay loam, clay loam.	CL, CL-ML, ML	A-6, A-4	100	100	95-100	50-95	<40	NP-18

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	4	10	40	200		
Gy*:	In									
Aldine-----	0-8	Silt loam-----	ML, CL, CL-ML	A-4	98-100	98-100	95-100	70-90	<30	NP-10
	8-35	Very fine sandy loam, loam, sandy clay loam.	CL	A-6, A-4	98-100	98-100	95-100	75-95	25-40	8-20
	35-60	Clay, silty clay	CH, CL	A-7-6	98-100	98-100	98-100	75-100	41-60	19-35
Ha-----	0-3	Clay loam	CL	A-4	100	95-100	85-95	55-75	20-30	4-10
Hatliff-----	3-60	Stratified loam to sand.	SP-SM, SM, SC, SC-SM	A-2-4, A-4, A-3	100	95-100	50-90	5-45	<30	NP-9
Ho-----	0-23	Fine sandy loam	ML, CL-ML, SM, SC-SM	A-4, A-2-4	85-100	85-100	75-90	30-55	<25	NP-7
Hockley-----	23-72	Sandy clay loam, clay loam, loam.	CL	A-6, A-7, A-4	90-100	90-100	75-95	51-80	22-49	8-32
Ka-----	0-5	Clay-----	CH, CL	A-7	98-100	98-100	90-100	75-90	46-66	24-42
Kaman-----	5-24	Clay, silty clay	CH, CL	A-7	98-100	98-100	90-100	75-90	46-66	24-42
	24-60	Clay, silty clay	CH, CL	A-7	98-100	98-100	90-100	75-90	46-66	24-42
Kf-----	0-6	Clay-----	CH, CL	A-7	98-100	98-100	90-100	75-90	46-66	24-42
Kaman-----	6-24	Clay, silty clay	CH, CL	A-7	98-100	98-100	90-100	75-90	46-66	24-42
	24-60	Clay, silty clay	CH, CL	A-7	98-100	98-100	90-100	75-90	46-66	24-42
Kg-----	0-12	Fine sandy loam	ML, SM	A-4	98-100	98-100	98-100	38-60	<22	NP-3
Katy-----	12-23	Fine sandy loam, loam.	ML, SM, CL-ML, SC-SM	A-4	98-100	98-100	98-100	38-70	<22	NP-7
	23-60	Clay loam, sandy clay.	CL	A-6, A-7	100	98-100	96-100	55-75	33-48	18-30
Kh-----	0-18	Silt loam-----	ML, CL, CL-ML	A-4, A-6	100	100	90-100	70-90	22-32	3-11
Kemah-----	18-42	Clay, clay loam	CH	A-7-6	100	100	90-100	70-95	51-76	30-49
	42-60	Clay, clay loam, sandy clay loam.	CL, CH, SC	A-7-6	100	100	80-100	36-95	44-76	22-49
Km*:										
Kemah-----	0-19	Loam-----	CL, CL-ML	A-4, A-6	100	100	85-100	60-75	25-35	6-14
	19-42	Clay, clay loam	CH	A-7-6	100	100	90-100	70-95	51-76	30-49
	42-60	Clay, clay loam, sandy clay loam.	CL, CH, SC	A-7-6	100	100	80-100	36-95	44-76	22-49
Aris-----	0-18	Loam-----	CL-ML, CL	A-4, A-6	98-100	95-100	95-100	60-85	21-34	4-14
	18-60	Clay, clay loam, silty clay loam.	CL, CH	A-7	100	95-100	95-100	60-80	42-62	21-36
Kn-----	0-18	Fine sandy loam	SM, SC-SM, ML, CL-ML	A-4	100	100	75-100	40-60	<21	NP-6
Kenefick-----	18-52	Sandy clay loam, clay loam, loam.	CL	A-6	100	100	80-100	55-85	29-38	10-15
	52-65	Fine sandy loam, sandy clay loam.	CL, SC, CL-ML	A-4, A-6	100	100	80-100	40-70	23-30	7-11
	65-80	Stratified very fine sandy loam to sand.	SM, ML	A-2-4, A-4	95-100	80-100	70-100	25-60	<21	NP-4
Kr-----	0-15	Fine sandy loam	CL-ML, ML, CL, SM	A-4	95-100	95-100	85-100	48-78	<27	NP-8
Kirbyville-----	15-80	Sandy clay loam, loam, clay loam.	CL, SC	A-6, A-4, A-7-6	75-100	74-100	74-100	48-78	25-42	8-25

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Percentage passing sieve number--				Liquid limit Pct	Plas- ticity index
			Unified	AASHTO	4	10	40	200		
	In									
LaA----- Lake Charles	0-6 6-36 36-60	Clay----- Clay----- Clay-----	CH CH CH	A-7 A-7 A-7	100 98-100 94-100	99-100 98-100 94-100	80-100 80-100 80-100	75-100 75-100 75-95	58-80 54-90 51-90	35-55 37-60 30-60
LaC----- Lake Charles	0-4 4-36 36-60	Clay----- Clay----- Clay-----	CH CH CH	A-7 A-7 A-7	100 98-100 94-100	99-100 98-100 94-100	80-100 80-100 80-100	75-100 75-100 75-95	58-80 54-90 51-90	35-55 37-60 30-60
LdB----- Landman	0-52 52-72	Loamy fine sand Sandy clay loam, fine sandy loam.	SM, SC-SM CL, SC, CL-ML	A-2-4 A-4, A-6, A-2-6	95-100 95-100	95-100 90-100	85-100 80-100	14-35 32-55	<25 23-40	NP-7 6-20
Ma----- Mantachie	0-5 5-60	Loam----- Loam, clay loam, sandy clay loam, sandy loam.	CL-ML, SC-SM, SM, ML CL, SC, SC-SM, CL-ML	A-4 A-4, A-6	95-100 95-100	90-100 90-100	60-85 80-95	40-60 45-80	<20 20-40	NP-5 5-15
My*: Mocarey-----	0-12 12-18 18-80	Loam----- Loam, silty clay loam, clay loam. Loam, silty clay loam, clay loam.	CL, CL-ML CL CL	A-4, A-6 A-4, A-6, A-7-6 A-4, A-6	98-100 90-100 70-95	95-100 90-100 70-95	70-95 85-98 70-95	50-75 60-95 50-85	20-35 25-50 25-40	5-15 8-25 8-18
Yeaton-----	0-13 13-33 33-80	Loam----- Clay loam, silty clay loam, silty clay. Silt loam, loam, silty clay loam.	CL CH CL	A-6 A-7-6 A-6, A-7-6	100 98-100 80-100	100 95-100 80-100	85-100 90-100 80-100	60-90 70-95 60-90	28-40 51-76 34-49	11-21 29-49 15-28
Ow*. Oil-waste land										
OyB----- Otanya	0-12 12-48 48-80	Fine sandy loam Sandy clay loam, clay loam, fine sandy loam. Sandy clay loam, clay loam.	SM, SC-SM, ML, CL-ML SC, CL SC, CL	A-4 A-6, A-4 A-6, A-4	95-100 80-100 80-100	90-100 80-100 80-100	70-99 70-100 70-100	36-68 40-72 45-76	<25 20-35 22-40	NP-7 8-20 8-26
Oz----- Owentown	0-4 4-28 28-60	Fine sandy loam Fine sandy loam, loam, loamy fine sand, sandy loam. Loamy fine sand, fine sandy loam, loam.	SM, ML, CL-ML, SC-SM SM, ML, CL-ML, SC-SM SM, SC-SM, SC	A-4 A-4 A-4, A-2-4	100 100 100	95-100 95-100 95-100	80-100 80-100 80-100	36-66 36-66 20-49	<28 <28 <25	NP-10 NP-10 NP-10
Pt*. Pits										

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	4	10	40	200		
Pu----- Pluck	0-3	Fine sandy loam	SM, SC, ML, SC-SM	A-2-4, A-4	98-100	95-100	60-85	30-55	<25	NP-10
	3-12	Sandy clay loam, loam, silty clay loam.	CL, CL-ML, SC, SC-SM	A-4, A-6	98-100	95-100	90-100	36-85	25-40	6-18
	12-60	Loam, clay loam, fine sandy loam.	CL, SC, CL-ML	A-4, A-6, A-7-6	98-100	95-100	80-95	50-90	22-42	NP-20
Sa----- Segno	0-3	Fine sandy loam	ML, CL-ML, SM, SC-SM	A-4	90-100	90-100	85-100	36-55	<25	NP-7
	3-17	Fine sandy loam	ML, CL-ML, SM, SC-SM	A-4	90-100	90-100	85-100	36-55	<25	NP-7
	17-33	Sandy clay loam, clay loam, fine sandy loam.	CL, SC	A-6, A-4	80-100	80-100	70-100	40-60	20-35	8-20
	33-60	Sandy clay loam, clay loam.	CL, SC	A-6, A-7, A-4	80-100	80-100	70-100	40-60	22-49	8-32
Sb----- Sorter	0-18	Loam-----	ML, CL-ML	A-4	100	95-100	95-100	51-80	<20	NP-7
	18-72	Silt loam, loam, fine sandy loam.	ML, CL-ML	A-4	100	95-100	95-100	51-80	<20	NP-7
Sd*: Sorter-----	0-20	Silt loam-----	ML, CL-ML	A-4	100	95-100	95-100	51-80	<20	NP-7
	20-52	Silt loam, loam, fine sandy loam.	ML, CL-ML	A-4	100	95-100	95-100	51-80	<20	NP-7
	52-80	Silt loam, loam, fine sandy loam.	CL-ML, CL	A-4, A-6	100	95-100	95-100	51-80	18-32	4-15
Dallardsville---	0-6	Fine sandy loam	SM, ML, SC-SM, CL-ML	A-4	100	98-100	70-95	40-65	<20	NP-7
	6-28	Fine sandy loam, loamy fine sand, loamy very fine sand.	SM, ML	A-4	100	98-100	70-95	40-65	<20	NP-3
	28-52	Very fine sandy loam, loam, fine sandy loam.	SM, ML, SC-SM, CL-ML	A-4	100	98-100	70-95	40-65	<20	NP-7
	52-80	Clay loam, sandy clay, sandy clay loam.	CL, CL-ML, SC, SC-SM	A-4, A-6, A-7	100	98-100	85-98	45-80	20-42	5-22
Sk*: Sorter-----	0-10	Silt loam-----	ML, CL-ML	A-4	100	95-100	95-100	51-80	<20	NP-7
	10-60	Silt loam, loam, fine sandy loam.	ML, CL-ML	A-4	100	95-100	95-100	51-80	<20	NP-7
Kirbyville-----	0-12	Fine sandy loam	CL-ML, ML, CL, SM	A-4	95-100	95-100	85-100	48-78	<27	NP-8
	12-60	Sandy clay loam, loam, clay loam.	CL, SC	A-6, A-4, A-7-6	75-100	74-100	74-100	48-78	25-42	8-25

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	4	10	40	200		
Sp----- Splendor	0-18	Fine sandy loam	SM, SC-SM, ML, CL-ML	A-4	95-100	95-100	95-100	40-60	<20	NP-7
	18-31	Sandy clay loam, loam, clay loam.	CL, CL-ML	A-4, A-6	80-100	80-100	70-100	51-80	20-30	7-16
	31-60	Sandy clay loam, loam, fine sandy loam.	CL	A-6	80-100	80-100	70-100	51-80	25-35	12-20
SrB----- Spurger	0-12	Fine sandy loam	SM, ML, CL-ML, SC-SM	A-4	95-100	90-100	70-99	36-65	<25	NP-7
	12-24	Clay, clay loam	CH, CL	A-7-6	95-100	95-100	90-100	59-85	41-70	20-40
	24-50	Sandy clay loam, clay loam.	CL, SC, SC-SM, CL-ML	A-4, A-6	95-100	90-100	80-100	25-55	20-40	4-20
	50-60	Stratified fine sandy loam to sand.	SC-SM, SM, SP-SM	A-2-4, A-4, A-3	95-100	90-100	50-95	5-50	<20	NP-7
SwB*: Spurger-----	0-12	Fine sandy loam	SM, ML, CL-ML, SC-SM	A-4	95-100	90-100	70-99	36-65	<25	NP-7
	12-33	Clay, clay loam	CH, CL	A-7-6	95-100	95-100	90-100	59-85	41-70	20-40
	33-60	Sandy clay loam, clay loam.	CL, SC, SC-SM, CL-ML	A-4, A-6	95-100	90-100	80-100	25-55	20-40	4-20
	60-80	Stratified fine sandy loam to sand.	SC-SM, SM, SP-SM	A-2-4, A-4, A-3	95-100	90-100	50-95	5-50	<20	NP-7
Waller-----	0-5	Loam-----	ML, CL-ML	A-4	100	98-100	95-100	51-75	<25	NP-6
	5-35	Loam, silt loam, very fine sandy loam.	CL, CL-ML, ML	A-4, A-6	100	98-100	95-100	60-90	15-30	2-11
	35-60	Loam, sandy clay loam, clay loam, silty clay loam.	CL, CL-ML	A-4, A-6	100	98-100	95-100	60-90	20-40	4-20
VaA----- Vamont	0-3	Silty clay-----	CH	A-7	100	85-100	75-100	75-96	49-62	28-41
	3-47	Clay, silty clay	CH	A-7	100	95-100	75-100	75-94	48-76	30-49
	47-60	Clay, silty clay	CH	A-7	100	95-100	75-100	75-96	62-76	38-49
VaB----- Vamont	0-3	Clay-----	CH	A-7	100	85-100	75-100	75-96	49-62	28-41
	3-35	Clay, silty clay	CH	A-7	100	95-100	75-100	75-94	48-76	30-49
	35-60	Clay, silty clay	CH	A-7	100	95-100	75-100	75-96	62-76	38-49
Vd----- Vamont	0-3	Silty clay-----	CH, CL	A-7	100	90-100	75-100	75-96	49-62	28-41
	3-60	Clay, silty clay	CH, CL	A-7	100	95-100	75-100	75-94	48-76	30-49
Ve----- Verland	0-3	Clay loam-----	CH, CL	A-6, A-7-6	100	100	90-100	70-95	36-56	17-33
	3-60	Clay, silty clay, silty clay loam, clay loam.	CH	A-7-6	100	100	90-100	75-95	56-76	33-49
Vo----- Voss	0-3	Fine sand-----	SC-SM, SP-SM, SW-SM, SM	A-3, A-2-4	98-100	95-100	65-85	5-20	<25	NP-7
	3-60	Fine sand-----	SC-SM, SP-SM, SW-SM, SM	A-3, A-2-4	98-100	95-100	65-85	5-20	<25	NP-7

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	4	10	40	200		
Vs----- Voss	0-4	Fine sand-----	SC-SM, SP-SM, SW-SM, SM	A-3, A-2-4	98-100	95-100	65-85	5-20	<25	NP-7
	4-60	Fine sand-----	SC-SM, SP-SM, SW-SM, SM	A-3, A-2-4	98-100	95-100	65-85	5-20	<25	NP-7
Wa----- Waller	0-8	Loam-----	ML, CL-ML	A-4	100	98-100	95-100	51-75	<25	NP-6
	8-22	Loam, fine sandy loam.	CL, CL-ML, ML	A-4, A-6	100	98-100	95-100	60-90	15-30	2-11
	22-60	Loam, sandy clay loam, clay loam, silty clay loam.	CL, CL-ML	A-4, A-6	100	98-100	95-100	60-90	20-40	4-20
Wc----- Waller	0-8	Loam-----	ML, CL-ML	A-4	100	98-100	95-100	51-75	<25	NP-6
	8-12	Loam, fine sandy loam.	CL, CL-ML, ML	A-4, A-6	100	98-100	95-100	60-90	15-30	2-11
	12-60	Loam, sandy clay loam, clay loam, silty clay loam.	CL, CL-ML	A-4, A-6	100	98-100	95-100	60-90	20-40	4-20
Wd*: Waller-----	0-6	Loam-----	ML, CL-ML	A-4	100	98-100	95-100	51-75	<25	NP-6
	6-16	Loam, silt loam, very fine sandy loam.	CL, CL-ML, ML	A-4, A-6	100	98-100	95-100	60-90	15-30	2-11
	16-60	Loam, sandy clay loam, clay loam.	CL, CL-ML	A-4, A-6	100	98-100	95-100	60-90	20-40	4-20
Dallardsville---	0-4	Fine sandy loam	SM, ML, SC-SM, CL-ML	A-4	100	98-100	70-95	40-65	<20	NP-7
	4-27	Fine sandy loam, loamy fine sand, loamy very fine sand.	SM, ML	A-4	100	98-100	70-95	40-65	<20	NP-3
	27-47	Very fine sandy loam, loam, fine sandy loam.	SM, ML, SC-SM, CL-ML	A-4	100	98-100	70-95	40-65	<20	NP-7
	47-72	Sandy clay loam, loam, fine sandy loam.	SC-SM, SC, CL-ML, CL	A-4, A-6	100	98-100	80-95	36-75	20-35	5-17
Wk*: Waller-----	0-5	Loam-----	ML, CL-ML	A-4	100	98-100	95-100	51-75	<25	NP-6
	5-23	Loam, fine sandy loam.	CL, CL-ML, ML	A-4, A-6	100	98-100	95-100	60-90	15-30	2-11
	23-60	Loam, sandy clay loam, clay loam, silty clay loam.	CL, CL-ML	A-4, A-6	100	98-100	95-100	60-90	20-40	4-20
Kirbyville-----	0-21	Fine sandy loam	CL-ML, ML, CL, SM	A-4	95-100	95-100	85-100	48-78	<27	NP-8
	21-60	Sandy clay loam, loam, clay loam.	CL, SC	A-6, A-4, A-7-6	75-100	74-100	74-100	48-78	25-42	8-25

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	4	10	40	200		
Wn*: Waller-----	0-3	Loam-----	ML, CL-ML	A-4	100	98-100	95-100	51-75	<25	NP-6
	3-12	Loam, fine sandy loam.	CL, CL-ML, ML	A-4, A-6	100	98-100	95-100	60-90	15-30	2-11
	12-60	Loam, sandy clay loam, clay loam, silty clay loam.	CL, CL-ML	A-4, A-6	100	98-100	95-100	60-90	20-40	4-20
Splendora-----	0-28	Fine sandy loam	SM, SC-SM, ML, CL-ML	A-4	95-100	95-100	95-100	40-60	<20	NP-7
	28-43	Loam, fine sandy loam.	CL, CL-ML	A-4, A-6	80-100	80-100	70-100	51-80	20-30	7-16
	43-72	Sandy clay loam, loam, clay loam.	CL	A-6	80-100	80-100	70-100	51-80	25-35	12-20
Wo----- Wockley	0-28	Fine sandy loam	CL, ML, SC, SM	A-4, A-6	95-100	95-100	90-100	45-65	15-33	2-16
	28-60	Sandy clay loam, clay loam, loam.	CL, SC	A-4, A-6, A-7	85-100	85-100	80-100	45-80	20-49	8-32
WvB----- Woodville	0-11	Fine sandy loam	SM, ML, SC-SM, CL-ML	A-4	95-100	95-100	75-99	36-81	<30	NP-7
	11-60	Clay-----	CH	A-7	95-100	95-100	90-100	75-99	51-86	30-62
WvD----- Woodville	0-6	Fine sandy loam	SM, ML, SC-SM, CL-ML	A-4	95-100	95-100	75-99	36-81	<30	NP-7
	6-72	Clay-----	CH	A-7	95-100	95-100	90-100	75-99	51-86	30-62

\* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS

(The symbol < means less than; > means more than. Entries under "Erosion factors--T" apply to the entire profile. Entries under "Organic matter" apply only to the surface layer. Absence of an entry indicates that data were not available or were not estimated)

Soil name and map symbol	Depth		Moist bulk density	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors		Organic matter
	In	Pct							K	T	
			g/cc	In/hr	In/in	pH	mmhos/cm				Pct
AaB----- Alaga	0-8	1-10	1.60-1.75	6.0-20	0.05-0.09	4.5-6.5	<2	Low-----	0.10	5	.5-3
	8-60	2-12	1.60-1.75	6.0-20	0.05-0.09	4.5-6.5	<2	Low-----	0.10		
AdA----- Aldine	0-17	8-15	1.30-1.60	0.6-2.0	0.13-0.20	4.5-6.0	<2	Low-----	0.43	5	.5-2
	17-25	14-28	1.40-1.60	0.2-0.6	0.13-0.20	4.5-6.5	<2	Moderate---	0.43		
	25-60	40-60	1.30-1.60	<0.06	0.15-0.20	4.5-6.5	<2	High-----	0.32		
Ae*: Aldine-----	0-21	8-15	1.30-1.60	0.6-2.0	0.13-0.20	4.5-6.0	<2	Low-----	0.43	5	.5-2
	21-29	14-28	1.40-1.60	0.2-0.6	0.13-0.20	4.5-6.0	<2	Moderate---	0.43		
	29-60	40-60	1.30-1.60	<0.06	0.15-0.20	4.5-6.0	<2	High-----	0.32		
Aris-----	0-21	10-25	1.35-1.55	0.6-2.0	0.11-0.15	4.5-6.0	<2	Low-----	0.43	5	<2
	21-25	25-35	1.30-1.50	0.2-0.6	0.12-0.17	4.5-6.0	<2	Moderate---	0.32		
	25-60	35-50	1.40-1.60	<0.06	0.12-0.18	5.1-7.3	<2	High-----	0.32		
An*: Anahuac-----	0-16	10-25	1.25-1.40	0.6-2.0	0.13-0.20	5.1-6.5	<2	Low-----	0.37	5	1-3
	16-37	10-25	1.30-1.55	0.6-2.0	0.13-0.20	5.1-6.5	<2	Low-----	0.37		
	37-80	40-60	1.35-1.60	<0.06	0.12-0.18	4.5-6.0	<2	High-----	0.32		
Aris-----	0-20	10-25	1.35-1.55	0.6-2.0	0.11-0.15	4.5-6.0	<2	Low-----	0.43	5	<2
	20-24	25-35	1.30-1.50	0.2-0.6	0.12-0.17	4.5-6.0	<2	Moderate---	0.32		
	24-62	35-50	1.40-1.60	<0.06	0.12-0.18	5.1-7.3	<2	High-----	0.32		
Ar----- Aris	0-5	10-25	1.35-1.55	0.6-2.0	0.11-0.15	4.5-6.0	<2	Low-----	0.43	5	<2
	5-18	25-35	1.30-1.50	0.2-0.6	0.12-0.17	4.5-6.0	<2	Moderate---	0.32		
	18-60	35-50	1.40-1.60	<0.06	0.12-0.18	5.1-7.3	<2	High-----	0.32		
As----- Aris	0-6	10-25	1.35-1.55	0.6-2.0	0.11-0.15	4.5-6.0	<2	Low-----	0.43	5	<2
	6-60	35-50	1.40-1.60	<0.06	0.12-0.18	5.1-7.3	<2	High-----	0.32		
Ba----- Beaumont	0-28	40-55	1.30-1.40	0.06-0.2	0.15-0.20	5.1-6.0	<2	High-----	0.32	5	1-4
	28-39	45-60	1.30-1.50	<0.06	0.15-0.20	4.5-5.5	<2	High-----	0.32		
	39-60	45-60	1.30-1.50	<0.06	0.15-0.20	5.1-8.4	<2	High-----	0.32		
Bd----- Beaumont	0-17	40-55	1.30-1.40	<0.06	0.15-0.20	4.5-6.0	<2	High-----	0.32	5	1-4
	17-55	45-60	1.30-1.50	<0.06	0.15-0.20	4.5-5.5	<2	High-----	0.32		
	55-60	45-60	1.30-1.60	<0.06	0.15-0.20	5.1-8.4	<2	High-----	0.32		
Be----- Bernard	0-6	15-35	1.20-1.45	0.06-0.2	0.15-0.20	5.6-7.3	<2	Moderate---	0.32	5	2-6
	6-49	35-60	1.20-1.45	<0.06	0.12-0.18	5.6-7.8	<2	High-----	0.32		
	49-72	30-60	1.30-1.50	<0.06	0.15-0.20	6.6-8.4	<2	High-----	0.32		
Bm*: Bernard-----	0-5	15-35	1.20-1.45	0.06-0.2	0.15-0.20	5.6-7.3	<2	Moderate---	0.32	5	2-6
	5-36	35-60	1.20-1.45	<0.06	0.12-0.18	5.6-7.8	<2	High-----	0.32		
	36-60	30-60	1.30-1.50	<0.06	0.15-0.20	6.6-8.4	<2	High-----	0.32		
Morey-----	0-8	10-30	1.25-1.50	0.6-2.0	0.16-0.24	5.6-7.3	<2	Low-----	0.37	5	1-4
	8-36	20-35	1.25-1.50	0.06-0.2	0.18-0.22	5.6-7.8	<2	Moderate---	0.37		
	36-60	30-45	1.40-1.65	0.06-0.2	0.18-0.22	5.6-8.4	<2	High-----	0.37		
BnB----- Bienville	0-5	4-15	1.35-1.65	6.0-20	0.07-0.11	4.5-6.5	<2	Low-----	0.20	5	<2
	5-40	2-15	1.35-1.60	2.0-6.0	0.08-0.11	4.5-6.5	<2	Low-----	0.20		
	40-80	5-20	1.35-1.70	2.0-6.0	0.08-0.13	4.5-6.0	<2	Low-----	0.20		

See footnote at end of table.

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors		Organic matter
									K	T	
	In	Pct	g/cc	In/hr	In/in	pH	mmhos/cm				Pct
<b>BvB*:</b>											
Bienville-----	0-3	4-15	1.35-1.65	6.0-20	0.07-0.11	4.5-6.5	<2	Low-----	0.20	5	<2
	3-36	2-15	1.35-1.60	2.0-6.0	0.08-0.11	4.5-6.5	<2	Low-----	0.20		
	36-80	5-20	1.35-1.70	2.0-6.0	0.08-0.13	4.5-6.0	<2	Low-----	0.20		
Kenefick-----	0-26	5-15	1.30-1.45	2.0-6.0	0.11-0.15	4.5-6.0	<2	Low-----	0.24	5	<2
	26-40	20-34	1.35-1.55	0.6-2.0	0.12-0.18	4.5-6.0	<2	Moderate----	0.32		
	40-58	10-24	1.50-1.65	0.6-2.0	0.12-0.17	4.5-6.0	<2	Low-----	0.37		
	58-72	2-15	1.50-1.69	2.0-6.0	0.06-0.14	4.5-6.0	<2	Low-----	0.24		
<b>ByB-----</b>											
Boykin-----	0-7	3-10	1.40-1.60	6.0-20	0.07-0.11	4.5-6.5	<2	Low-----	0.20	5	<1
	7-22	3-10	1.40-1.60	6.0-20	0.07-0.11	4.5-6.5	<2	Low-----	0.20		
	22-60	18-30	1.45-1.70	0.6-2.0	0.13-0.17	4.5-6.0	<2	Low-----	0.28		
<b>CoB-----</b>											
Choates-----	0-4	5-12	1.50-1.65	6.0-20	0.07-0.11	5.1-6.5	<2	Low-----	0.17	5	<1
	4-29	5-12	1.50-1.65	6.0-20	0.07-0.11	5.1-6.5	<2	Low-----	0.17		
	29-50	20-35	1.40-1.60	0.6-2.0	0.12-0.17	3.6-5.5	<2	Low-----	0.32		
	50-60	15-30	1.50-1.69	0.2-0.6	0.12-0.15	3.6-5.5	<2	Low-----	0.32		
<b>DaB-----</b>											
Dallardsville-----	0-3	5-15	1.50-1.70	2.0-6.0	0.11-0.20	4.5-5.5	<2	Low-----	0.37	5	<1
	3-20	3-12	1.50-1.70	2.0-6.0	0.07-0.15	4.5-5.5	<2	Low-----	0.37		
	20-30	8-18	1.50-1.70	2.0-6.0	0.11-0.20	4.5-5.5	<2	Low-----	0.37		
	30-60	12-25	1.50-1.70	0.6-2.0	0.11-0.20	4.5-5.0	<2	Low-----	0.37		
<b>DoB-----</b>											
Doucette-----	0-3	3-10	1.45-1.60	6.0-20	0.07-0.11	5.1-6.0	<2	Low-----	0.20	5	<1
	3-28	3-10	1.50-1.65	6.0-20	0.07-0.11	5.1-6.0	<2	Low-----	0.20		
	28-60	20-35	1.35-1.55	0.6-2.0	0.13-0.17	4.5-5.5	<2	Low-----	0.24		
<b>DyC-----</b>											
Dylan-----	0-4	35-70	1.20-1.45	<0.06	0.12-0.18	6.6-7.8	<2	Very high	0.32	5	<2
	4-26	60-80	1.30-1.50	<0.06	0.12-0.18	6.6-8.4	<2	Very high	0.32		
	26-60	60-80	1.30-1.50	<0.06	0.12-0.18	7.9-8.4	<2	Very high	0.32		
<b>Es-----</b>											
Estes-----	0-8	40-59	1.40-1.55	<0.06	0.12-0.18	4.5-5.5	0-2	High-----	0.32	5	.5-5
	8-34	40-60	1.30-1.55	<0.06	0.12-0.18	3.6-5.5	0-4	High-----	0.32		
	34-60	25-40	1.45-1.65	0.06-0.2	0.12-0.18	3.6-6.0	0-4	Moderate----	0.32		
<b>Fa-----</b>											
Fausse-----	0-5	40-95	0.80-1.45	<0.06	0.18-0.20	5.6-7.3	<2	Very high	0.20	5	2-15
	5-32	60-95	1.10-1.35	<0.06	0.18-0.20	6.1-8.4	<2	Very high	0.24		
	32-60	35-95	1.10-1.45	<0.2	0.18-0.22	6.6-8.4	<2	Very high	0.24		
<b>Gu-----</b>											
Guyton-----	0-3	7-25	1.35-1.65	0.6-2.0	0.20-0.23	3.6-6.0	<2	Low-----	0.43	5	.5-4
	3-23	20-35	1.35-1.70	0.06-0.2	0.15-0.22	3.6-6.0	<2	Low-----	0.37		
	23-72	20-35	1.35-1.70	0.06-0.2	0.15-0.22	3.6-6.0	<2	Low-----	0.37		
<b>Gy*:</b>											
Guyton-----	0-7	7-25	1.35-1.65	0.6-2.0	0.20-0.23	3.6-6.0	<2	Low-----	0.43	5	.5-4
	7-23	20-35	1.35-1.70	0.06-0.2	0.15-0.22	3.6-6.0	<2	Low-----	0.37		
	23-60	20-35	1.35-1.70	0.06-0.2	0.15-0.22	3.6-6.0	<2	Low-----	0.37		
Aldine-----	0-8	8-15	1.30-1.60	0.6-2.0	0.13-0.20	4.5-6.0	<2	Low-----	0.43	5	.5-2
	8-35	14-28	1.40-1.60	0.2-0.6	0.13-0.20	4.5-6.0	<2	Moderate----	0.43		
	35-60	40-60	1.30-1.60	<0.06	0.15-0.20	4.5-6.0	<2	High-----	0.32		
<b>Ha-----</b>											
Hatliff-----	0-3	8-35	1.20-1.50	2.0-6.0	0.12-0.17	6.1-7.3	<2	Low-----	0.32	5	<1
	3-60	8-18	1.20-1.50	2.0-6.0	0.05-0.11	6.1-7.3	<2	Low-----	0.24		
<b>Ho-----</b>											
Hockley-----	0-23	8-20	1.40-1.50	2.0-6.0	0.10-0.15	5.1-6.5	<2	Low-----	0.24	5	.5-2
	23-72	18-35	1.50-1.70	0.6-2.0	0.12-0.17	5.1-6.5	<2	Moderate----	0.32		

See footnote at end of table.

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth		Moist bulk density	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors		Organic matter
	In	Pct							K	T	
	In	Pct	g/cc	In/hr	In/in	pH	mmhos/cm				Pct
Ka----- Kaman	0-5	40-60	1.30-1.50	<0.06	0.15-0.20	5.6-7.8	<2	High-----	0.32	5	1-3
	5-24	40-60	1.35-1.55	<0.06	0.14-0.18	5.6-8.4	<2	High-----	0.32		
	24-60	40-60	1.40-1.65	<0.06	0.14-0.18	5.6-8.4	<2	High-----	0.32		
Kf----- Kaman	0-6	40-60	1.30-1.50	<0.06	0.15-0.20	5.6-7.8	<2	High-----	0.32	5	1-3
	6-24	40-60	1.35-1.55	<0.06	0.14-0.18	5.6-8.4	<2	High-----	0.32		
	24-60	40-60	1.40-1.65	<0.06	0.14-0.18	5.6-8.4	<2	High-----	0.32		
Kg----- Katy	0-12	5-15	1.30-1.50	0.6-2.0	0.15-0.20	5.6-6.5	<2	Low-----	0.37	5	<2
	12-23	5-15	1.30-1.50	0.6-2.0	0.15-0.20	5.6-6.5	<2	Low-----	0.37		
	23-60	25-35	1.50-1.70	0.06-0.2	0.12-0.18	5.1-7.3	<2	Moderate----	0.32		
Kh----- Kemah	0-18	15-27	1.35-1.55	0.2-0.6	0.15-0.20	5.1-7.3	<2	Low-----	0.43	5	0-3
	18-42	35-60	1.30-1.50	<0.06	0.12-0.18	5.6-7.8	<2	High-----	0.32		
	42-60	25-60	1.40-1.60	<0.06	0.12-0.18	5.6-7.8	<2	High-----	0.32		
Km*: Kemah	0-19	15-27	1.35-1.55	0.2-0.6	0.15-0.20	5.1-7.3	<2	Low-----	0.37	5	0-3
	19-42	35-60	1.30-1.50	<0.06	0.12-0.18	5.1-7.8	<2	High-----	0.32		
	42-60	25-60	1.40-1.60	<0.06	0.12-0.18	5.6-7.8	<2	High-----	0.32		
Aris-----	0-18	10-25	1.35-1.55	0.6-2.0	0.11-0.15	4.5-6.0	<2	Low-----	0.43	5	<2
	18-60	35-50	1.40-1.60	<0.06	0.12-0.18	5.1-7.3	<2	High-----	0.32		
Kn----- Kenefick	0-18	5-15	1.30-1.45	2.0-6.0	0.11-0.15	4.5-6.5	<2	Low-----	0.24	5	<2
	18-52	20-34	1.35-1.55	0.6-2.0	0.12-0.18	4.5-6.0	<2	Moderate----	0.32		
	52-65	10-24	1.50-1.65	0.6-2.0	0.12-0.17	4.5-6.0	<2	Low-----	0.37		
	65-80	2-15	1.50-1.69	2.0-6.0	0.06-0.14	4.5-6.0	<2	Low-----	0.24		
Kr----- Kirbyville	0-15	5-15	1.50-1.70	2.0-6.0	0.11-0.15	4.5-6.0	<2	Low-----	0.32	5	<1
	15-80	18-30	1.50-1.70	0.6-2.0	0.15-0.20	4.5-5.5	<2	Low-----	0.28		
LaA----- Lake Charles	0-6	40-60	1.20-1.45	<0.06	0.15-0.20	5.6-7.8	<2	Very high	0.32	5	2-6
	6-36	40-60	1.20-1.45	<0.06	0.15-0.20	6.6-8.4	<2	Very high	0.32		
	36-60	35-60	1.30-1.50	<0.06	0.15-0.20	6.6-8.4	<2	Very high	0.32		
LaC----- Lake Charles	0-4	40-60	1.20-1.45	<0.06	0.15-0.20	5.6-7.8	<2	Very high	0.32	5	2-6
	4-36	40-60	1.20-1.45	<0.06	0.15-0.20	6.6-8.4	<2	Very high	0.32		
	36-60	35-60	1.30-1.50	<0.06	0.15-0.20	6.6-8.4	<2	Very high	0.32		
LdB----- Landman	0-52	2-8	1.50-1.65	6.0-20	0.05-0.10	5.1-6.5	<2	Very low----	0.17	5	<2
	52-72	18-35	1.55-1.75	0.2-0.6	0.10-0.15	4.5-6.0	<2	Low-----	0.24		
Ma----- Mantachie	0-5	8-20	1.50-1.60	0.6-2.0	0.16-0.20	4.5-5.5	<2	Low-----	0.28	5	1-3
	5-60	18-34	1.50-1.60	0.6-2.0	0.14-0.20	4.5-5.5	<2	Low-----	0.28		
My*: Mocarey	0-12	15-27	1.40-1.60	0.6-2.0	0.12-0.18	6.1-8.4	<2	Low-----	0.37	5	1-4
	12-18	18-35	1.50-1.65	0.2-0.6	0.15-0.22	7.4-8.4	<2	Moderate----	0.37		
	18-80	18-40	1.55-1.70	0.2-0.6	0.15-0.22	7.9-8.4	<2	Low-----	0.37		
Yeaton-----	0-13	10-20	1.35-1.65	0.6-2.0	0.13-0.24	6.1-7.8	<2	Low-----	0.37	5	1-3
	13-33	30-45	1.50-1.60	0.06-0.2	0.12-0.20	6.6-8.4	<2	High-----	0.32		
	33-80	18-35	1.50-1.70	0.2-0.6	0.15-0.24	7.4-8.4	<2	Moderate----	0.32		
Ow*. Oil-waste land											

See footnote at end of table.

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors		Organic matter
									K	T	
	In	Pct	g/cc	In/hr	In/in	pH	mmhos/cm			Pct	
OyB-----	0-12	5-18	1.40-1.60	2.0-6.0	0.10-0.15	4.5-6.5	<2	Low-----	0.28	5	<1
Otanya	12-48	12-25	1.50-1.70	0.6-2.0	0.15-0.20	4.5-5.5	<2	Low-----	0.32		
	48-80	23-35	1.50-1.70	0.2-0.6	0.15-0.20	4.5-5.5	<2	Low-----	0.32		
Oz-----	0-4	6-18	1.35-1.55	0.6-2.0	0.11-0.16	5.1-6.0	<2	Low-----	0.32	5	.2-1
Owentown	4-28	6-18	1.40-1.65	0.6-2.0	0.11-0.16	5.1-6.0	<2	Low-----	0.32		
	28-60	5-12	1.40-1.70	2.0-6.0	0.07-0.16	5.1-6.0	<2	Low-----	0.28		
Pt*. Pits											
Pu-----	0-3	8-20	1.10-1.30	2.0-6.0	0.11-0.15	5.6-7.3	<2	Low-----	0.20	5	<2
Pluck	3-12	20-35	1.20-1.50	0.6-2.0	0.16-0.20	5.6-7.8	<2	Moderate----	0.32		
	12-60	27-40	1.20-1.50	0.6-2.0	0.17-0.22	5.6-7.8	<2	Moderate----	0.32		
Sa-----	0-3	5-18	1.40-1.65	0.6-2.0	0.10-0.15	5.1-6.5	<2	Low-----	0.32	5	1-3
Segno	3-17	5-18	1.40-1.65	0.6-2.0	0.10-0.15	4.5-6.5	<2	Low-----	0.32		
	17-33	18-35	1.65-1.80	0.2-0.6	0.10-0.15	4.5-6.0	<2	Low-----	0.32		
	33-60	18-35	1.65-1.85	0.2-0.6	0.08-0.12	4.5-6.0	<2	Low-----	0.32		
Sb-----	0-18	3-10	1.60-1.80	0.6-2.0	0.15-0.20	4.5-6.5	<2	Low-----	0.43	5	<1
Sorter	18-72	10-18	1.65-1.85	0.06-0.2	0.15-0.20	4.5-6.5	<2	Low-----	0.49		
Sd*: Sorter-----	0-20	3-10	1.60-1.80	0.6-2.0	0.15-0.20	4.5-6.5	<2	Low-----	0.43	5	<1
	20-52	10-18	1.65-1.85	0.06-0.2	0.15-0.20	4.5-6.5	<2	Low-----	0.49		
	52-80	15-20	1.65-1.85	0.06-0.2	0.15-0.20	5.6-6.5	<2	Low-----	0.49		
Dallardsville---	0-6	5-15	1.50-1.70	2.0-6.0	0.11-0.20	4.5-5.5	<2	Low-----	0.37	5	<1
	6-28	3-12	1.50-1.70	2.0-6.0	0.07-0.15	4.5-5.5	<2	Low-----	0.37		
	28-52	8-18	1.50-1.70	2.0-6.0	0.11-0.20	4.5-5.5	<2	Low-----	0.37		
	52-80	25-40	1.50-1.70	0.2-0.6	0.12-0.20	4.5-5.0	<2	Moderate----	0.32		
Sk*: Sorter-----	0-10	3-10	1.60-1.80	0.6-2.0	0.15-0.20	4.5-6.5	<2	Low-----	0.43	5	<1
	10-60	10-18	1.65-1.85	0.06-0.2	0.15-0.20	4.5-6.5	<2	Low-----	0.49		
Kirbyville-----	0-12	5-15	1.50-1.70	2.0-6.0	0.11-0.15	4.5-6.0	<2	Low-----	0.32	5	<1
	12-60	18-30	1.50-1.70	0.6-2.0	0.15-0.20	4.5-5.5	<2	Low-----	0.28		
Sp-----	0-18	3-15	1.60-1.75	0.6-2.0	0.10-0.18	5.1-6.0	<2	Low-----	0.43	5	0-2
Splendora	18-31	18-30	1.65-1.75	0.2-0.6	0.10-0.14	4.5-5.5	<2	Low-----	0.32		
	31-60	18-30	1.70-1.85	0.06-0.2	0.10-0.12	4.5-5.5	<2	Low-----	0.32		
SrB-----	0-12	6-15	1.20-1.35	0.6-2.0	0.11-0.17	4.5-6.5	<2	Low-----	0.37	5	.5-2
Spurger	12-24	35-60	1.20-1.50	0.06-0.2	0.12-0.18	4.5-6.0	<2	Moderate----	0.32		
	24-50	18-35	1.20-1.50	0.2-0.6	0.12-0.17	4.5-6.0	<2	Low-----	0.32		
	50-60	2-20	1.20-1.50	0.6-6.0	0.05-0.15	4.5-6.5	<2	Low-----	0.32		
SwB*: Spurger-----	0-12	6-15	1.20-1.35	0.6-2.0	0.11-0.17	4.5-6.5	<2	Low-----	0.37	5	.5-2
	12-33	35-60	1.20-1.50	0.06-0.2	0.12-0.18	4.5-6.0	<2	Moderate----	0.32		
	33-60	18-35	1.20-1.50	0.2-0.6	0.12-0.17	4.5-6.0	<2	Low-----	0.32		
	60-80	2-20	1.20-1.50	0.6-6.0	0.05-0.15	4.5-6.5	<2	Low-----	0.32		
Waller-----	0-5	5-15	1.50-1.65	0.6-2.0	0.15-0.20	4.5-6.0	<2	Low-----	0.43	5	.5-2
	5-35	5-15	1.55-1.70	0.6-2.0	0.15-0.20	4.5-6.0	<2	Low-----	0.43		
	35-60	18-30	1.50-1.70	0.06-0.2	0.15-0.20	4.5-6.0	<2	Low-----	0.37		
VaA-----	0-3	40-60	1.15-1.40	<0.06	0.15-0.20	4.5-7.3	<2	High-----	0.32	5	.5-2
Vamont	3-47	45-60	1.20-1.45	<0.06	0.15-0.20	4.5-7.3	<2	High-----	0.32		
	47-60	45-60	1.20-1.45	<0.06	0.15-0.20	5.6-7.3	<2	High-----	0.32		

See footnote at end of table.

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors		Organic matter
									K	T	
	In	Pct	g/cc	In/hr	In/in	pH	mmhos/cm				Pct
VaB----- Vamont	0-3	40-60	1.15-1.40	0.06-0.2	0.15-0.20	4.5-7.3	<2	High-----	0.32	5	.5-2
	3-35	45-60	1.20-1.45	<0.06	0.15-0.20	4.5-7.3	<2	High-----	0.32		
	35-60	45-60	1.20-1.45	<0.06	0.15-0.20	5.6-7.3	<2	High-----	0.32		
Vd----- Vamont	0-3	40-60	1.15-1.40	<0.06	0.15-0.20	4.5-7.3	<2	High-----	0.32	5	.5-2
	3-60	45-60	1.25-1.45	<0.06	0.15-0.20	5.1-7.3	<2	High-----	0.32		
Ve----- Verland	0-3	27-40	1.30-1.50	0.06-0.2	0.15-0.22	5.6-6.5	<2	Moderate---	0.37	5	1-4
	3-60	40-60	1.30-1.50	<0.06	0.12-0.18	5.6-8.4	<2	High-----	0.32		
Vo----- Voss	0-3	2-10	1.45-1.65	6.0-20	0.02-0.06	5.6-7.3	<2	Low-----	0.15	5	<1
	3-60	2-10	1.40-1.60	6.0-20	0.02-0.08	5.6-7.3	<2	Low-----	0.15		
Vs----- Voss	0-4	2-10	1.45-1.65	6.0-20	0.02-0.06	5.6-7.3	<2	Low-----	0.15	5	<1
	4-60	2-10	1.40-1.60	6.0-20	0.02-0.08	5.6-7.3	<2	Low-----	0.15		
Wa----- Waller	0-8	5-15	1.50-1.65	0.6-2.0	0.15-0.20	4.5-6.0	<2	Low-----	0.43	5	.5-2
	8-22	5-15	1.55-1.70	0.06-0.2	0.15-0.20	4.5-6.0	<2	Low-----	0.43		
	22-60	18-30	1.50-1.70	0.6-2.0	0.15-0.20	4.5-6.0	<2	Low-----	0.37		
Wc----- Waller	0-8	5-15	1.25-1.45	0.6-2.0	0.15-0.20	4.5-6.0	<2	Low-----	0.43	5	.5-2
	8-12	5-15	1.30-1.50	0.6-2.0	0.15-0.20	4.5-6.0	<2	Low-----	0.43		
	12-60	18-30	1.35-1.65	0.6-2.0	0.15-0.20	4.5-6.0	<2	Low-----	0.37		
Wd*:											
Waller-----	0-6	5-15	1.50-1.65	0.6-2.0	0.15-0.20	4.5-6.0	<2	Low-----	0.43	5	.5-2
	6-16	5-15	1.55-1.70	0.06-0.2	0.15-0.20	4.5-6.0	<2	Low-----	0.43		
	16-60	18-30	1.50-1.70	0.6-2.0	0.15-0.20	5.6-7.3	<2	Low-----	0.37		
Dallardsville----	0-4	5-15	1.50-1.70	2.0-6.0	0.11-0.20	4.5-5.5	<2	Low-----	0.37	5	<1
	4-27	3-12	1.50-1.70	2.0-6.0	0.07-0.15	4.5-5.5	<2	Low-----	0.37		
	27-47	8-18	1.50-1.70	2.0-6.0	0.11-0.20	4.5-5.5	<2	Low-----	0.37		
	47-72	12-25	1.50-1.70	0.6-2.0	0.11-0.20	4.5-5.0	<2	Low-----	0.37		
Wk*:											
Waller-----	0-5	5-15	1.50-1.65	0.6-2.0	0.15-0.20	4.5-6.0	<2	Low-----	0.43	5	.5-2
	5-23	5-15	1.55-1.70	0.06-0.2	0.15-0.20	4.5-6.0	<2	Low-----	0.43		
	23-60	18-30	1.50-1.70	0.6-2.0	0.15-0.20	4.5-6.0	<2	Low-----	0.37		
Kirbyville-----	0-21	5-15	1.50-1.70	2.0-6.0	0.11-0.15	4.5-6.0	<2	Low-----	0.32	5	<1
	21-60	18-30	1.50-1.70	0.6-2.0	0.15-0.20	4.5-5.5	<2	Low-----	0.28		
Wn*:											
Waller-----	0-3	5-15	1.50-1.65	0.6-2.0	0.15-0.20	4.5-6.0	<2	Low-----	0.43	5	.5-2
	3-12	5-15	1.55-1.70	0.6-2.0	0.15-0.20	4.5-6.0	<2	Low-----	0.43		
	12-60	18-30	1.50-1.70	0.06-0.2	0.15-0.20	4.5-6.0	<2	Low-----	0.37		
Splendora-----	0-28	3-15	1.60-1.75	0.6-2.0	0.10-0.18	5.1-6.0	<2	Low-----	0.43	5	0-2
	28-43	18-30	1.65-1.75	0.2-0.6	0.10-0.14	4.5-5.5	<2	Low-----	0.32		
	43-72	18-30	1.70-1.85	0.06-0.2	0.10-0.12	4.5-5.5	<2	Low-----	0.32		
Wo----- Wockley	0-28	8-20	1.40-1.50	2.0-6.0	0.15-0.20	5.1-6.5	<2	Low-----	0.32	5	<2
	28-60	18-35	1.50-1.70	0.2-0.6	0.12-0.18	5.1-6.5	<2	Low-----	0.28		
WvB----- Woodville	0-11	5-18	1.20-1.40	0.6-2.0	0.13-0.18	4.5-6.5	<2	Low-----	0.43	5	<1
	11-60	40-60	1.40-1.60	<0.06	0.12-0.18	4.5-5.5	<2	High-----	0.32		
WvD----- Woodville	0-6	5-18	1.20-1.40	0.6-2.0	0.13-0.18	4.5-6.5	<2	Low-----	0.43	5	<1
	6-72	40-60	1.40-1.60	<0.06	0.12-0.18	4.5-5.5	<2	High-----	0.32		

\* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 17.--SOIL AND WATER FEATURES

("Flooding" and "water table" and terms such as "frequent," "brief," "apparent," and "perched" are explained in the text. The symbol < means less than; > means more than. Absence of an entry indicates that the feature is not a concern or that data were not estimated)

Soil name and map symbol	Hydro-logic group	Flooding			High water table			Bedrock		Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness	Uncoated steel	Concrete
					Ft			In			
AaB----- Alaga	A	None-----	---	---	>6.0	---	---	>60	---	Low-----	Moderate.
AdA----- Aldine	D	None-----	---	---	1.5-2.5	Perched	Nov-May	>60	---	High-----	High.
Ae*: Aldine-----	D	None-----	---	---	1.5-2.5	Perched	Nov-Mar	>60	---	High-----	High.
Aris-----	D	None-----	---	---	0-2.0	Perched	Nov-Mar	>60	---	High-----	Moderate.
An*: Anahuac-----	D	None-----	---	---	1.5-2.5	Perched	Oct-Mar	>60	---	High-----	Moderate.
Aris-----	D	None-----	---	---	0-2.0	Perched	Nov-Mar	>60	---	High-----	Moderate.
Ar----- Aris	D	None-----	---	---	0-2.0	Perched	Nov-Mar	>60	---	High-----	Moderate.
As----- Aris	D	None-----	---	---	+1-1.0	Perched	Sep-Jun	>60	---	High-----	Moderate.
Ba----- Beaumont	D	None-----	---	---	0-2.0	Apparent	Nov-Mar	>60	---	High-----	Moderate.
Bd----- Beaumont	D	None-----	---	---	+1-1.0	Apparent	Sep-Jun	>60	---	High-----	High.
Be----- Bernard	D	None-----	---	---	0.5-2.0	Perched	Dec-Feb	>60	---	High-----	Low.
Bm*: Bernard-----	D	None-----	---	---	0.5-2.0	Perched	Dec-Feb	>60	---	High-----	Low.
Morey-----	D	None-----	---	---	1.5-2.5	Perched	Dec-Feb	>60	---	High-----	Low.
BnB----- Bienville	A	None-----	---	---	4.0-6.0	Apparent	Dec-Apr	>60	---	Low-----	High.
BvB*: Bienville-----	A	None-----	---	---	4.0-6.0	Apparent	Dec-Apr	>60	---	Low-----	High.
Kenefick-----	B	None-----	---	---	>6.0	---	---	>60	---	Moderate	High.
ByB----- Boykin	B	None-----	---	---	>6.0	---	---	>60	---	Moderate	High.
CoB----- Choates	C	None-----	---	---	1.5-2.5	Apparent	Jan-Mar	>60	---	High-----	High.
DaB----- Dallardsville	C	None-----	---	---	1.0-2.0	Perched	Dec-Apr	>60	---	High-----	High.
DoB----- Doucette	B	None-----	---	---	>6.0	---	---	>60	---	Moderate	High.

See footnote at end of table.

TABLE 17.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro-logic group	Flooding			High water table			Bedrock		Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness	Uncoated steel	Concrete
				Ft			In				
DyC----- Dylan	D	None-----	---	---	0.5-2.0	Perched	Jan-Apr	>60	---	High-----	Low.
Es----- Estes	D	Frequent----	Long-----	Nov-May	0-1.5	Perched	Nov-May	>60	---	High-----	High.
Fa----- Fausse	D	Frequent----	Brief to very long.	Jan-Dec	+1.-1.5	Apparent	Jan-Dec	>60	---	High-----	Low.
Gu----- Guyton	D	None-----	---	---	0-1.5	Perched	Dec-May	>60	---	High-----	High.
Gy*: Guyton-----	D	None-----	---	---	0-1.5	Perched	Dec-May	>60	---	High-----	High.
Aldine-----	D	None-----	---	---	1.5-2.5	Perched	Nov-May	>60	---	High-----	High.
Ha----- Hatliff	C	Occasional	Brief-----	Nov-May	0-2.0	Apparent	Nov-Mar	>60	---	Low-----	Moderate.
Ho----- Hockley	C	None-----	---	---	3.5-5.0	Perched	Dec-Mar	>60	---	Moderate	High.
Ka----- Kaman	D	Occasional	Brief-----	Nov-Jun	1.5-2.5	Apparent	Sep-Jul	>60	---	High-----	Moderate.
Kf----- Kaman	D	Frequent----	Long-----	Nov-Jun	1.5-2.5	Apparent	Sep-Jul	>60	---	High-----	Moderate.
Kg----- Katy	D	None-----	---	---	>6.0	---	---	>60	---	High-----	Moderate.
Kh----- Kemah	D	None-----	---	---	0.5-1.5	Perched	Nov-Mar	>60	---	High-----	Moderate.
Km*: Kemah-----	D	None-----	---	---	0.5-1.5	Perched	Nov-Mar	>60	---	High-----	Moderate.
Aris-----	D	None-----	---	---	0-2.0	Perched	Nov-Mar	>60	---	High-----	Moderate.
Kn----- Kenefick	B	None-----	---	---	>6.0	---	---	>60	---	Moderate	High.
Kr----- Kirbyville	B	None-----	---	---	1.5-2.5	Perched	Jan-Mar	>60	---	High-----	Moderate.
LaA, LaC----- Lake Charles	D	None-----	---	---	>6.0	---	---	>60	---	High-----	Low.
LdB----- Landman	B	None-----	---	---	4.0-6.0	Perched	Oct-May	>60	---	Moderate	Moderate.
Ma----- Mantachie	C	Frequent----	Long-----	Jan-Mar	1.0-1.5	Apparent	Dec-Mar	>60	---	High-----	High.
My*: Mocarey-----	D	None-----	---	---	1.5-2.0	Perched	Nov-Apr	>60	---	High-----	Low.
Yeaton-----	C	None-----	---	---	1.0-1.5	Perched	Dec-Feb	>60	---	High-----	Low.

See footnote at end of table.

TABLE 17.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro-logic group	Flooding			High water table			Bedrock		Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness	Uncoated steel	Concrete
					<u>Ft</u>			<u>In</u>			
Ow*. Oil-waste land											
OyB----- Otanya	B	None-----	---	---	3.0-5.0	Perched	Dec-Apr	>60	---	High-----	High.
Oz----- Owentown	B	Occasional	Brief-----	Nov-May	2.5-4.0	Apparent	Oct-Jun	>60	---	Moderate	Moderate.
Pt*. Pits											
Pu----- Pluck	C	Frequent-----	Long-----	Dec-Mar	0-1.5	Apparent	Dec-Apr	>60	---	High-----	High.
Sa----- Segno	C	None-----	---	---	2.0-3.0	Perched	Dec-Apr	>60	---	High-----	High.
Sb----- Sorter	D	None-----	---	---	+ .5-2.5	Perched	Oct-May	>60	---	High-----	High.
Sd*: Sorter-----	D	None-----	---	---	+ .5-2.5	Perched	Oct-May	>60	---	High-----	High.
Dallardsville----	C	None-----	---	---	1.0-2.0	Perched	Dec-Apr	>60	---	High-----	High.
Sk*: Sorter-----	D	None-----	---	---	+ .5-2.5	Perched	Oct-May	>60	---	High-----	High.
Kirbyville-----	B	None-----	---	---	1.5-2.5	Perched	Jan-Mar	>60	---	High-----	Moderate.
Sp----- Splendora	C	None-----	---	---	0.5-2.0	Perched	Dec-May	>60	---	High-----	High.
SrB----- Spurger	C	None-----	---	---	2.5-3.5	Perched	Dec-Feb	>60	---	High-----	High.
SwB*: Spurger-----	C	None-----	---	---	2.5-3.5	Perched	Dec-Feb	>60	---	High-----	High.
Waller-----	B/D	None-----	---	---	0-2.5	Perched	Nov-Jun	>60	---	High-----	Moderate.
VaA, VaB----- Vamont	D	None-----	---	---	1.5-3.0	Apparent	Nov-Mar	>60	---	High-----	Moderate.
Vd----- Vamont	D	None-----	---	---	+1-1.0	Apparent	Nov-May	>60	---	High-----	Moderate.
Ve----- Verland	D	None-----	---	---	0-1.0	Apparent	Nov-Apr	>60	---	High-----	Moderate.
Vo----- Voss	B	Occasional	Brief-----	Oct-Mar	2.0-5.0	Apparent	Oct-May	>60	---	Low-----	Moderate.
Vs----- Voss	B	Frequent-----	Long-----	Oct-Mar	2.0-5.0	Apparent	Oct-May	>60	---	Low-----	Moderate.
Wa----- Waller	B/D	None-----	---	---	0-2.5	Perched	Nov-Jun	>60	---	High-----	Moderate.

See footnote at end of table.

TABLE 17.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro-logic group	Flooding			High water table			Bedrock		Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness	Uncoated steel	Concrete
					<u>Ft</u>			<u>In</u>			
Wc----- Waller	B/D	None-----	---	---	+1-1.0	Perched	Nov-Jun	>60	---	High-----	Moderate.
Wd*: Waller-----	B/D	None-----	---	---	0-2.5	Perched	Nov-Jun	>60	---	High-----	Moderate.
Dallardsville----	C	None-----	---	---	1.0-2.0	Perched	Dec-Apr	>60	---	High-----	High.
Wk*: Waller-----	B/D	None-----	---	---	0-2.5	Perched	Nov-Jun	>60	---	High-----	Moderate.
Kirbyville-----	B	None-----	---	---	1.5-2.5	Perched	Jan-Mar	>60	---	High-----	Moderate.
Wn*: Waller-----	B/D	None-----	---	---	0-2.5	Perched	Nov-Jun	>60	---	High-----	Moderate.
Splendora-----	C	None-----	---	---	0.5-2.0	Perched	Dec-May	>60	---	High-----	High.
Wo----- Wockley	C	None-----	---	---	0.5-2.0	Perched	Nov-Feb	>60	---	High-----	Moderate.
WvB, WvD----- Woodville	D	None-----	---	---	2.5-4.0	Apparent	Dec-Feb	>60	---	High-----	High.

\* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 18.--PHYSICAL ANALYSIS OF SELECTED SOILS

(The symbol < means less than)

Soil name and sample number	Depth	Horizon	Particle-size distribution								Bulk density		COLE	Water content 1/3 bar		
			Sand								Silt (0.05- 0.002 mm)	Clay ( $<0.002$ mm)			1/3 bar	Air- dry
			Very coarse (2-1 mm)	Coarse (1-0.5 mm)	Medium (0.5- 0.25 mm)	Fine (0.25- 0.1 mm)	Very fine (0.1- 0.05 mm)	Total (2- 0.05 mm)								
In										g/cc	g/cc	Cm/cm	Pct (wt)			
-----Pct < 2 mm-----																
Anahuac: <sup>1</sup> S83TX-291-01)	0-8	Ap	0.1	0.3	0.4	6.1	32.9	39.8	54.4	5.8	1.27	1.35	0.021	30.8		
	8-16	A	0.0	0.1	0.4	4.9	32.4	37.8	54.8	7.4	1.27	1.38	0.028	34.4		
	16-26	E1	0.0	0.0	0.1	5.3	32.2	37.6	53.5	8.9	1.32	1.39	0.017	16.6		
	26-33	E2	0.0	0.0	0.0	5.1	30.2	35.3	53.3	11.4	1.35	1.44	0.022	16.7		
	33-37	E3	0.0	0.0	0.1	3.9	26.7	30.7	49.0	20.3	1.34	1.47	0.031	22.4		
	37-49	Btg1	0.1	0.1	0.1	2.3	18.9	21.5	36.9	41.6	1.35	1.73	0.086	30.5		
	49-62	Btg2	0.0	0.0	0.0	3.1	19.8	22.9	41.9	35.2	1.47	1.83	0.076	25.6		
	62-70	Btg3	0.0	0.0	0.0	3.1	20.3	23.4	41.1	35.5	1.48	1.90	0.087	28.1		
	70-80	Btg4	0.0	0.0	0.0	1.6	20.8	22.4	38.4	39.2	1.57	1.93	0.071	24.9		
Beaumont: <sup>2,3</sup> (S83TX-291-05)	0-8	Ap	0.1	0.1	0.1	3.4	23.8	27.5	35.8	36.7	1.51	1.94	0.087	27.6		
	8-25	Bg1	0.1	0.1	0.1	2.8	18.7	21.8	31.4	46.8	1.36	1.91	0.120	32.6		
	25-47	Bg2	0.0	0.1	0.1	2.5	16.7	19.4	33.1	47.5	1.37	1.95	0.125	33.9		
	47-57	Bg3	0.2	0.2	0.2	2.9	19.4	22.9	31.5	45.6	1.41	2.01	0.125	32.4		
	57-67	Bg4	0.1	0.0	0.0	2.8	19.7	22.6	31.1	46.3	1.46	2.01	0.112	30.5		
	67-83	Bg5	0.3	0.4	0.3	4.1	26.4	31.5	29.9	38.6	1.51	1.96	0.091	28.1		
Kemah: <sup>4</sup> (S83TX-291-02)	0-6	Ap	0.0	0.0	0.0	4.6	29.3	33.9	54.2	11.9	1.39	1.48	0.021	21.3		
	6-15	A	0.1	0.1	0.0	5.3	27.6	33.1	54.1	12.8	1.44	1.49	0.011	18.9		
	15-20	E	0.0	0.0	0.0	5.0	25.3	30.3	48.7	21.0	1.40	1.53	0.030	20.2		
	20-26	Bt1	0.0	0.0	0.1	2.7	16.1	18.9	36.4	44.7	1.33	1.76	0.098	31.8		
	26-35	Bt2	0.0	0.0	0.0	3.4	17.5	20.9	42.3	36.8	1.49	1.84	0.073	24.9		
	35-51	Bt3	0.0	0.0	0.0	3.9	16.9	20.8	45.1	34.1	1.58	1.95	0.073	23.1		
	51-65	Bt4	0.0	0.0	0.0	4.8	16.4	21.2	43.1	35.7	1.61	1.98	0.071	22.5		
	65-80	Bt5	0.7	0.3	0.1	3.1	17.1	21.3	40.3	38.4	1.56	1.92	0.072	24.0		

See footnotes at end of table.

TABLE 18.--PHYSICAL ANALYSIS OF SELECTED SOILS--(Continued)

Soil name and sample number	Depth	Horizon	Particle-size distribution								Bulk density		COLE	Water content 1/3 bar
			Sand					Silt (0.05- 0.002 mm)	Clay (<0.002 mm)	1/3 bar	Air- dry			
			Very coarse (2-1 mm)	Coarse (1-0.5 mm)	Medium (0.5- 0.25 mm)	Fine (0.25- 0.1 mm)	Very fine (0.1- 0.05 mm)					Total (2- 0.05 mm)		
	In		-----Pct < 2 mm-----								g/cc	g/cc	Cm/cm	Pct (wt)
Mocarey: <sup>1</sup> (S83TX-291-04)	0-8	Ap	0.0	0.1	0.1	10.2	26.5	36.9	40.3	22.8	1.45	1.59	0.031	21.6
	8-12	A	0.1	0.0	0.0	9.2	24.1	33.4	41.5	25.1	1.54	1.78	0.049	21.5
	12-18	Bw	0.4	0.5	0.2	9.1	23.2	33.4	40.3	26.3	1.50	1.69	0.041	22.0
	18-24	Bk1	2.7	1.6	0.6	8.8	20.9	34.6	39.2	26.2	1.58	1.74	0.033	18.8
	24-37	Bk2	3.1	1.4	0.6	7.7	21.5	34.3	38.4	27.3	1.59	1.80	0.042	19.2
	37-44	Bk3	1.6	1.3	1.0	8.2	21.7	33.8	40.3	25.9	1.62	1.81	0.038	18.5
	44-66	Bk4	0.4	0.1	0.2	7.5	22.9	31.1	41.0	27.9	1.63	1.85	0.043	19.7
	66-80	Bk5	0.3	0.1	0.1	5.5	21.9	27.9	43.1	29.0	1.62	1.91	0.056	20.3
Yeaton: <sup>1</sup> (S83TX-291-03)	0-8	Ap	0.1	0.1	0.4	7.0	25.0	32.6	47.2	20.2	1.35	1.35	0.000	26.1
	8-13	E	0.0	0.1	0.0	9.2	29.4	38.7	41.5	19.8	1.63	1.75	0.024	19.3
	13-22	Bt1	0.6	0.3	0.1	6.0	21.1	28.1	36.9	35.0	1.53	1.79	0.054	22.5
	22-33	Bt2	1.0	0.5	0.3	0.4	19.5	26.7	37.6	35.7	1.54	1.87	0.067	22.9
	33-45	Btk1	12.6	6.1	2.5	4.4	13.6	39.2	36.4	24.4	1.73	1.84	0.021	15.9
	45-61	Btk2	6.7	5.2	3.2	4.7	18.5	38.3	35.7	26.0	1.68	1.79	0.021	16.4
	61-80	Btk3	1.5	2.2	1.6	2.5	16.0	23.8	53.9	22.3	1.53	1.63	0.021	19.5

<sup>1</sup> Location of the pedon sampled is the same as that of the typical pedon described in the section "Soil Series and Their Morphology."

<sup>2</sup> From the intersection of U.S. Highway 90 and Texas Highway 146 in Dayton, 7.0 miles south on Texas Highway 146, about 2.3 miles southeast on a private road, and 80 feet south of the road.

<sup>3</sup> The pedon sampled is a taxadjunct to the Beaumont series because the surface layer has less than 40 percent clay.

<sup>4</sup> From the intersection of Texas Highway 146 and Texas Highway 105 in Moss Hill, 3.0 miles east on Texas Highway 105, and 300 feet northeast in a pasture.

TABLE 19.--CHEMICAL ANALYSIS OF SELECTED SOILS

(Analysis by the Soil Characterization Laboratory, Texas Agricultural Experiment Station, College Station, Texas)

Soil name and sample number	Depth	Horizon	Extractable bases				Cation-exchange capacity	Base saturation	Reaction 1:1 soil:water	Organic carbon
			Ca	Mg	K	Na				
	In		-----Meq 100g-----				Pct	pH	Pct	
Anahuac: <sup>1</sup> (S83TX-291-01)	0-8	Ap	3.0	0.5	0.0	0.1	7.1	51	6.0	1.27
	8-16	A	1.6	0.4	0.0	0.0	5.7	35	5.0	0.77
	16-26	E1	0.3	0.4	0.0	0.0	4.6	15	4.5	0.37
	26-33	E2	0.8	0.4	0.0	0.1	5.4	24	4.6	0.27
	33-37	E3	2.4	0.8	0.1	0.2	9.2	38	4.6	0.31
	37-49	Btg1	9.6	2.6	0.3	0.6	20.5	64	4.9	0.48
	49-62	Btg2	9.8	2.8	0.2	0.6	18.1	74	5.2	0.27
	62-70	Btg3	11.1	3.0	0.2	0.7	18.6	81	5.4	0.21
	70-80	Btg4	11.1	3.2	0.2	0.8	19.8	78	5.7	0.11
Beaumont: <sup>2,3</sup> (S83TX-291-05)	0-8	Ap	22.6	3.2	0.3	0.6	29.4	91	6.0	1.36
	8-25	Bg1	24.9	3.8	0.3	1.6	33.7	91	5.2	0.66
	25-47	Bg2	27.1	3.5	0.3	2.8	35.4	95	5.7	0.53
	47-57	Bg3	27.9	3.4	0.3	3.4	33.8	100	6.3	0.28
	57-67	Bg4	26.3	4.3	0.3	3.3	33.7	100	6.9	0.31
	67-83	Bg5	35.9	2.8	0.3	2.6	28.2	100	7.3	0.07
Kemah: <sup>4</sup> (S83TX-291-02)	0-6	Ap	6.3	0.9	0.0	0.1	9.5	78	5.8	1.27
	6-15	A	3.8	0.8	0.0	0.1	6.5	72	5.7	0.55
	15-20	E	6.2	0.7	0.0	0.1	9.9	70	5.2	0.40
	20-26	Bt1	17.6	1.6	0.2	0.3	24.8	80	5.0	0.56
	26-35	Bt2	16.5	1.1	0.2	0.3	20.7	88	5.4	0.27
	35-51	Bt3	17.4	1.1	0.1	0.3	19.4	97	5.8	0.17
	51-65	Bt4	17.7	1.3	0.2	0.3	21.3	92	6.7	0.07
	65-80	Bt5	30.3	1.5	0.2	0.3	25.4	100	6.9	0.06
Mocarey: <sup>1</sup> (S83TX-291-04)	0-8	Ap	16.7	1.7	0.2	0.1	23.3	81	7.5	1.50
	8-12	A	46.6	0.9	0.1	0.1	23.2	100	7.5	0.88
	12-18	Bw	46.6	1.1	0.1	0.1	20.7	100	7.7	0.45
	18-24	Bk1	44.2	0.9	0.1	0.1	20.2	100	7.9	0.45
	24-37	Bk2	42.3	0.9	0.1	0.1	22.1	100	7.9	0.56
	37-44	Bk3	42.6	0.9	0.2	0.1	22.4	100	8.0	0.39
	44-66	Bk4	44.4	1.0	0.2	0.2	22.3	100	7.8	0.25
	66-80	Bk5	11.1	3.2	0.2	0.8	19.8	78	5.7	0.11
Yeaton: <sup>1</sup> (S83TX-291-03)	0-8	Ap	20.5	1.9	0.2	0.1	20.4	100	7.1	1.20
	8-13	E	15.8	1.1	0.1	0.5	14.2	100	7.4	0.32
	13-22	Bt1	23.5	2.5	0.2	1.0	23.5	100	7.3	0.31
	22-33	Bt2	33.2	2.2	0.2	0.8	25.7	100	7.4	0.17
	33-45	Btk1	46.7	1.7	0.1	0.5	17.6	100	7.9	0.05
	45-61	Btk2	43.4	2.1	0.2	0.4	19.7	100	8.0	0.07
	61-80	Btk3	43.7	1.7	0.2	0.4	16.4	100	8.0	0.27

<sup>1</sup> Location of the pedon sampled is the same as that of the typical pedon described in the section "Soil Series and Their Morphology."<sup>2</sup> From the intersection of U.S. Highway 90 and Texas Highway 146 in Dayton, 7.0 miles south on Texas Highway 146, about 2.3 miles southeast on a private road, and 80 feet south of the road.<sup>3</sup> The pedon sampled is a taxadjunct to the Beaumont series because the surface layer has less than 40 percent clay.<sup>4</sup> From the intersection of Texas Highway 146 and Texas Highway 105 in Moss Hill, 3.0 miles east on Texas Highway 105, and 300 feet northeast in a pasture.

TABLE 20.--CLAY MINERALOGY OF SELECTED SOILS

(Analysis by the Soil Characterization Laboratory, Texas Agricultural Experiment Station, College Station Texas. Low indicates that 0 to 10 percent of the mineral was detected; medium, 10 to 50 percent; and high, more than 50 percent. Dashes indicate that none of the mineral was detected)

Soil name and sample number	Depth	Horizon	Clay minerals		
			Smectite	Kaolinite	Quartz
	<u>In</u>				
Anahuac: <sup>1</sup>					
S83TX-291-01	0-8	Ap	---	Medium	Medium
	37-49	Btg1	High	Medium	Low
	70-80	Btg4	High	Medium	Low
Kemah: <sup>2</sup>					
S83TX-291-02	0-6	Ap	Medium	Medium	Medium
	20-26	Bt1	High	Medium	Low
	65-80	Bt5	Medium	High	Low
Mocarey: <sup>1</sup>					
S83TX-291-04	0-8	Ap	High	Medium	Low
	12-18	Bw	High	Medium	Low
	66-80	Bk5	High	Medium	Low
Yeaton: <sup>1</sup>					
S83TX-291-03	0-8	Ap	High	Medium	Low
	13-22	Bt1	High	Medium	Low
	61-80	Btk3	High	Medium	Low

<sup>1</sup> Location of the pedon sampled is the same as that of the typical pedon described in the section "Soil Series and Their Morphology."

<sup>2</sup> From the intersection of Texas Highway 146 and Texas Highway 105 in Moss Hill, 3.0 miles east on Texas Highway 105, and 300 feet northeast in a pasture.

TABLE 21.--ENGINEERING INDEX TEST DATA

Soil name, report number, horizon, and depth in inches	Classification		Grain-size distribution										Liquid limit <sup>2</sup>	Plasticity index <sup>2</sup>	Particle density	Shrinkage		
	AASHTO	Unified	Percentage passing sieve-- <sup>1</sup>				Percentage smaller than--			Limit	Pct	g/cc				Limit	Linear	Ratio
			5/8 inch	3/8 inch	No. 4	No. 10	No. 40	No. 200	.05 mm				.005 mm	.002 mm				
													Pct			Pct	Pct	
<b>Alaga:<sup>3</sup></b>																		
(S82TX-291-09)																		
C1-----	8 to 40	A-4(0)	ML	100	100	100	100	90	10	5	0	0	22	3	2.62	17.0	0.0	1.75
<b>Beaumont:<sup>3</sup></b>																		
(S82TX-291-02)																		
Ap-----	0 to 10	A-7-5(46)	CH	100	100	100	100	100	93	81	64	46	73	42	2.63	13.0	22.8	1.96
Bssg1-----	28 to 39	A-7-6(51)	CH	100	100	100	100	100	96	90	70	57	73	45	2.69	16.0	21.3	1.84
<b>Dylan:<sup>4</sup></b>																		
(S82TX-291-06)																		
A-----	0 to 5	A-7-6(24)	CH	100	100	100	99	98	77	54	34	28	55	30	2.58	16.0	16.2	1.81
Bssk1-----	16 to 30	A-7-6(49)	CH	100	100	100	98	97	91	85	73	64	73	47	2.73	10.0	24.9	2.16
Bssk2-----	30 to 48	A-7-6(71)	CH	100	100	100	98	98	96	92	86	81	89	64	2.74	20.0	24.0	1.84
<b>Kirbyville:<sup>5</sup></b>																		
(S82TX-291-05)																		
A-----	0 to 4	A-4(0)	CL-ML	100	100	99	98	97	48	42	1	0	26	5	2.58	21.0	1.8	1.63
Bt/E1-----	21 to 33	A-6(7)	CL	99	89	77	74	74	48	37	23	21	39	25	2.67	18.0	10.4	1.82
<b>Lake Charles:<sup>3</sup></b>																		
(S82TX-291-01)																		
Ap-----	0 to 6	A-7-6(33)	CH	100	100	100	100	100	87	68	29	23	58	35	2.63	14.0	18.2	1.89
Bss1-----	18 to 36	A-7-6(41)	CH	100	100	100	100	100	92	77	43	32	62	40	2.68	12.0	20.4	2.01
Bss3-----	46 to 60	A-7-6(44)	CH	100	100	100	100	99	91	76	44	30	65	44	2.67	13.0	21.0	2.01
<b>Otanya:<sup>3</sup></b>																		
(S82TX-291-04)																		
A-----	0 to 4	A-4(0)	ML	100	100	100	100	99	66	53	3	2	22	2	2.59	19.0	1.8	1.66
Bt1-----	12 to 27	A-6(8)	CL	100	100	100	99	99	72	53	21	19	30	14	2.66	19.0	5.5	1.79
Btv1-----	48 to 60	A-6(13)	CL	100	100	99	99	99	76	56	25	23	36	19	2.67	19.0	8.7	1.76
<b>Spurger:<sup>3,6</sup></b>																		
(S82TX-291-10)																		
E-----	3 to 12	A-4(0)	CL-ML	100	100	99	99	96	40	29	8	5	22	6	2.61	18.0	1.5	1.81
Bt1-----	12 to 19	A-7-6(11)	CL	100	100	100	100	100	59	45	35	33	41	24	2.69	15.0	12.3	1.88
BC-----	42 to 50	A-6(0)	CL	100	100	100	100	100	26	22	17	16	27	10	2.63	18.0	4.4	1.78
<b>Vamont:<sup>3</sup></b>																		
(S82TX-291-03)																		
Bw-----	3 to 11	A-7-6(43)	CH	100	100	100	100	100	94	83	56	50	62	41	2.67	11.0	21.0	2.04
Bg2-----	47 to 60	A-7-6(52)	CH	100	100	100	100	100	96	87	64	58	71	48	2.68	16.0	21.0	1.87

See footnotes at end of table.

TABLE 21.--ENGINEERING INDEX TEST DATA--Continued

Soil name, report number, horizon, and depth in inches	Classification		Grain-size distribution										Liquid limit <sup>2</sup>	Plasticity index <sup>2</sup>	Particle density	Shrinkage			
	AASHTO	Unified	Percentage passing sieve-- <sup>1</sup>				Percentage smaller than--									Limit	Linear	Ratio	
			5/8 inch	3/8 inch	No. 4	No. 10	No. 40	No. 200	.05 mm	.005 mm	.002 mm	Pct	g/cc	Pct	Pct				
Woodville: <sup>7</sup> (S82TX-291-07)																			
A----- 0 to 3	A-4(4)	CL-ML	100	100	100	100	99	81	56	6	4	27	6	2.61	23.0	2.2	1.60		
Bt1----- 6 to 15	A-7-6(33)	CH	100	100	100	100	100	93	75	47	44	55	32	2.71	12.0	18.3	1.99		
Bt2----- 15 to 30	A-7-6(40)	CH	100	100	100	100	100	99	93	74	65	83	58	2.78	12.0	25.3	2.05		

<sup>1</sup> For grain size larger than 3/8 inch, square sieves were used that were slightly smaller than the equivalent round sieves but this does not seriously affect the data.

<sup>2</sup> Liquid limit and plasticity index were determined by the AASHTO-T89 and AASHTO-T90 methods except that soil was added to water.

<sup>3</sup> Location of the pedon sampled is the same as that of the typical pedon described in the section "Soil Series and Their Morphology."

<sup>4</sup> From the intersection of U.S. Highway 59 and Farm Road 787 in Cleveland, 14.0 miles east on Farm Road 787 to Dolen, 1.8 miles south and west on the Lone Star Industries gravel pit road, 0.2 mile north on a forest road, and 25 feet east of the road in a forest.

<sup>5</sup> From the intersection of U.S. Highway 59 and Farm Road 787 in Cleveland, 2.0 miles east on Farm Road 787, and 500 feet south in a forest.

<sup>6</sup> The pedon sampled is a taxadjunct to the Spurger series because the clay mineralogy is montmorillonitic rather than mixed.

<sup>7</sup> From the intersection of U.S. Highway 59 and Farm Road 787 in Cleveland, 12.5 miles northeast on Farm Road 787, about 2.0 miles north on Farm Road 223, about 1.0 mile west along a power line, and 100 feet north in a forest.

TABLE 22.--CLASSIFICATION OF THE SOILS

(An asterisk in the first column indicates that the soil is a taxadjunct to the series. See text for a description of those characteristics of the soil that are outside the range of the series)

Soil name	Family or higher taxonomic class
Alaga-----	Thermic, coated Typic Quartzipsamments
Aldine-----	Fine-silty over clayey, siliceous, thermic Aeric Glossaqualfs
Anahuac-----	Fine, montmorillonitic, thermic Udollic Albaqualfs
Aris-----	Fine, montmorillonitic, thermic Typic Glossaqualfs
Beaumont-----	Fine, montmorillonitic, thermic Entic Pelluderts
Bernard-----	Fine, montmorillonitic, thermic Vertic Argiaquolls
Bienville-----	Sandy, siliceous, thermic Psammentic Paleudalfs
Boykin-----	Loamy, siliceous, thermic Arenic Paleudults
Choates-----	Loamy, siliceous, thermic Arenic Plinthaquic Paleudults
Dallardsville-----	Coarse-loamy, siliceous, thermic Aquic Paleudults
Doucette-----	Loamy, siliceous, thermic Arenic Plinthic Paleudults
Dylan-----	Very-fine, montmorillonitic, thermic Aquentic Chromuderts
*Estes-----	Fine, montmorillonitic, acid, thermic Aeric Fluvaquents
Fausse-----	Very-fine, montmorillonitic, nonacid, thermic Typic Fluvaquents
Guyton-----	Fine-silty, siliceous, thermic Typic Glossaqualfs
Hatliff-----	Coarse-loamy, siliceous, nonacid, thermic Aquic Udifluvents
Hockley-----	Fine-loamy, siliceous, thermic Plinthic Paleudalfs
Kaman-----	Fine, montmorillonitic, thermic Typic Pelluderts
Katy-----	Fine-loamy, siliceous, thermic Aquic Paleudalfs
Kemah-----	Fine, montmorillonitic, thermic Typic Albaqualfs
Kenefick-----	Fine-loamy, siliceous, thermic Ultic Hapludalfs
Kirbyville-----	Fine-loamy, siliceous, thermic Plinthaquic Paleudults
Lake Charles-----	Fine, montmorillonitic, thermic Typic Pelluderts
Landman-----	Loamy, siliceous, thermic Grossarenic Paleudalfs
Mantachie-----	Fine-loamy, siliceous, acid, thermic Aeric Fluvaquents
*Mocarey-----	Fine-loamy, mixed, thermic Typic Haplaquolls
*Morey-----	Fine-silty, mixed, thermic Typic Argiaquolls
Otanya-----	Fine-loamy, siliceous, thermic Plinthic Paleudults
Owentown-----	Coarse-loamy, siliceous, thermic Fluventic Dystrochrepts
Pluck-----	Fine-loamy, siliceous, nonacid, thermic Typic Fluvaquents
Segno-----	Fine-loamy, siliceous, thermic Plinthic Paleudalfs
Sorter-----	Coarse-loamy, siliceous, thermic Typic Ochraqualfs
Splendor-----	Fine-loamy, siliceous, thermic Fragic Glossudalfs
*Spurger-----	Fine, mixed, thermic Albaquultic Hapludalfs
Vamont-----	Fine, montmorillonitic, thermic Aquentic Chromuderts
Verland-----	Fine, montmorillonitic, thermic Vertic Ochraqualfs
Voss-----	Mixed, thermic Aquic Udipsamments
Waller-----	Fine-loamy, siliceous, thermic Typic Glossaqualfs
Wockley-----	Fine-loamy, siliceous, thermic Plinthaquic Paleudalfs
Woodville-----	Fine, montmorillonitic, thermic Vertic Paleudalfs
Yeaton-----	Fine, montmorillonitic, thermic Aquic Hapludalfs

# Accessibility Statement

---

This document is not accessible by screen-reader software. The Natural Resources Conservation Service (NRCS) is committed to making its information accessible to all of its customers and employees. If you are experiencing accessibility issues and need assistance, please contact our Helpdesk by phone at (800) 457-3642 or by e-mail at [ServiceDesk-FTC@ftc.usda.gov](mailto:ServiceDesk-FTC@ftc.usda.gov). For assistance with publications that include maps, graphs, or similar forms of information, you may also wish to contact our State or local office. You can locate the correct office and phone number at <http://offices.sc.egov.usda.gov/locator/app>.

## Nondiscrimination Statement

### Nondiscrimination Policy

The U.S. Department of Agriculture (USDA) prohibits discrimination against its customers, employees, and applicants for employment on the basis of race, color, national origin, age, disability, sex, gender identity, religion, reprisal, and where applicable, political beliefs, marital status, familial or parental status, sexual orientation, whether all or part of an individual's income is derived from any public assistance program, or protected genetic information. The Department prohibits discrimination in employment or in any program or activity conducted or funded by the Department. (Not all prohibited bases apply to all programs and/or employment activities.)

### To File an Employment Complaint

If you wish to file an employment complaint, you must contact your agency's EEO Counselor (<http://directives.sc.egov.usda.gov/33081.wba>) within 45 days of the date of the alleged discriminatory act, event, or personnel action. Additional information can be found online at [http://www.ascr.usda.gov/complaint\\_filing\\_file.html](http://www.ascr.usda.gov/complaint_filing_file.html).

### To File a Program Complaint

If you wish to file a Civil Rights program complaint of discrimination, complete the USDA Program Discrimination Complaint Form, found online at [http://www.ascr.usda.gov/complaint\\_filing\\_cust.html](http://www.ascr.usda.gov/complaint_filing_cust.html) or at any USDA office, or call (866) 632-9992 to request the form. You may also write a letter containing all of the information requested in the form. Send your completed complaint form or letter by mail to U.S. Department of Agriculture; Director, Office of Adjudication; 1400 Independence Avenue, S.W.; Washington, D.C. 20250-9419; by fax to (202) 690-7442; or by email to [program.intake@usda.gov](mailto:program.intake@usda.gov).

### Persons with Disabilities

If you are deaf, are hard of hearing, or have speech disabilities and you wish to file either an EEO or program complaint, please contact USDA through the Federal Relay Service at (800) 877-8339 or (800) 845-6136 (in Spanish).

If you have other disabilities and wish to file a program complaint, please see the contact information above. If you require alternative means of communication for

---

program information (e.g., Braille, large print, audiotape, etc.), please contact USDA's TARGET Center at (202) 720-2600 (voice and TDD).

**Supplemental Nutrition Assistance Program**

For additional information dealing with Supplemental Nutrition Assistance Program (SNAP) issues, call either the USDA SNAP Hotline Number at (800) 221-5689, which is also in Spanish, or the State Information/Hotline Numbers (<http://directives.sc.egov.usda.gov/33085.wba>).

**All Other Inquiries**

For information not pertaining to civil rights, please refer to the listing of the USDA Agencies and Offices (<http://directives.sc.egov.usda.gov/33086.wba>).