Series 1955, No. 5

Issued February 1960

SOIL SURVEY

Fort Bend County Texas

OUR SOIL ★ OUR STRENGTH

UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service
In cooperation with
TEXAS AGRICULTURAL EXPERIMENT STATION

HOW TO USE THE SOIL SURVEY REPORT

THIS SURVEY of Fort Bend County will help you plan the kind of farming that will protect your soils and provide good yields. It describes the soils, shows their location on a map, and tells what they will do under different kinds of management.

Find your farm on the map

In using this survey, start with the soil map bound in the back of this report. These sheets, if laid together, make a large photographic map of the county as it looks from an airplane. You can see woods, fields, roads, rivers, and many other landmarks on this map.

To find your farm on the large map, use the index to map sheets. This is a small map of the county on which numbered rectangles have been drawn to show where each sheet of the large map is located.

When you have found the map sheet for your farm, you will notice that boundaries of the soils have been outlined in red, and that there is a symbol for each kind of soil. All areas marked with the same symbol are the same kind of soil, wherever they appear on the map.

Suppose you have found on your farm an area marked with the symbol La. You learn the name of the soil this symbol represents by looking at the map legend. The symbol La identifies Lake Charles clay, 0 to 1 percent slopes.

Learn about the soils on your farm

Lake Charles clay, 0 to 1 percent slopes, and all the other soils mapped are described in the section Descriptions of the Soils. Soil scientists, as they walked over the fields and through the woodlands, described and mapped the soils; dug holes and examined surface soils and subsoils; measured slopes with a hand level; noted differences in growth of crops, weeds, brush, or trees; and, in fact, recorded all the things that they believed might affect suitability of the soils for farming.

With help from farmers and many other people, scientists placed each soil in a capability unit, which is a group of similar soils. Capability units can also be called management groups of soils. Capability units are grouped into capability classes and subclasses.

Lake Charles clay, 0 to 1 percent slopes, is in soil capability unit I–1. Turn to the section Use and Management of Soils and read what is said about soils in this capability unit. You will want to study the table, which tells you how much you can expect to harvest from Lake Charles clay, 0 to 1 percent slopes, under two levels of management. In columns A are yields to be expected under prevailing management; and in columns B are yields to be expected under improved management.

Make a farm plan

For the soils on your farm, compare your yields and farm practices with those given in this report. Look at your fields for signs of runoff and erosion. Then decide whether or not you need to change your methods. The choice, of course, must be yours. This survey will aid you in planning new methods, but it is not a plan of management for your farm or any other farm in the county.

If you find that you need help in farm planning, consult the local representative of the Soil Conservation Service. Your county agricultural agent, members of the staff of your State agricultural experiment station, and others familiar with farming in your county will also be glad to help you.

The field work for this survey was completed in 1955. Unless noted otherwise, all statements refer to conditions at the time of the survey.

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SOIL SURVEY OF FORT BEND COUNTY, TEXAS

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United States Department of Agriculture, Soil Conservation Service, in Cooperation With Texas Agricultural Experiment Station

Soil Survey Methods and Definitions

The scientist who makes a soil survey examines soils in the field, classifies the soils in accordance with facts that he observes, and maps their boundaries on an aerial photograph or other map.

FIELD STUDY.—The soil surveyor bores or digs many holes to see what the soils are like. The holes are not spaced in a regular pattern, but are located according to the lay of the land. Usually they are not more than a quarter of a mile apart and sometimes they are much closer. In most soils such a boring or hole reveals several distinct layers, called horizons, which collectively are known as the soil profile. Each layer is studied to see how it differs from others in the profile and to learn the things about this soil that affect its capacity to support plant growth.

Color is usually related to the amount of organic matter in soils of the same texture and clay mineralogy. The darker the surface soils, the more organic matter they contain. Streaks and spots of gray, yellow, and brown in the lower layers generally indicate poor drainage and poor aeration.

Texture, or the content of sand, silt, and clay, is determined by the way the soil feels when rubbed between the fingers. It is later checked by laboratory analysis. Texture determines how well the soil retains moisture, plant nutrients, and fertilizer, and whether it is easy or difficult to cultivate.

Structure, which is the way the individual soil particles are arranged in larger grains and the amount of pore space between grains, gives us clues to the ease or difficulty with which the soil is penetrated by plant roots and by moisture.

Consistence, or the tendency of the soil to crumble or to stick together, indicates whether it is easy or difficult to keep the soil open and porous under cultivation.

Other characteristics observed in the course of the field study and considered in classifying the soil include the following: The depth of the soil over bedrock or compact layers; the presence of gravel or stones in amounts that will interfere with cultivation; the steepness and pattern of slopes; the degree of erosion; the nature of the underlying parent material from which the soil has developed; surface and internal drainage; and acidity or alkalinity of the soil as measured by chemical tests.

CLASSIFICATION.—On the basis of the characteristics observed by the survey team or determined by laboratory tests, soils are classified by series, types, and phases.

As an example of soil classification, consider the Kenney series. In Fort Bend County, this series is made up of one soil type, subdivided into phases, as follows:

Series	*Type*	*Phase*
Kenney	Loamy fine sand	0 to 2 percent slopes.
		2 to 6 percent slopes.

Soil series.—Two or more soil types that differ in surface texture, but that are otherwise similar in kind, thickness, and arrangement of soil layers, are normally designated as a soil series. In a given area, however, it frequently happens that a soil series is represented by only one soil type. Each series is named for a place near which it was first mapped.

Soil type.—Soils having the same texture in the surface layers and similar in kind, thickness, and arrangement of soil layers are classified as one soil type. The soil type is the basic classification unit.

Soil phase.—Because of differences other than those of kind, thickness, and arrangement of layers, some soil types are divided into two or more phases. Slope variations, frequency of rock outcrops, degree of erosion, depth of soil over the substratum, or natural drainage are examples of characteristics that suggest dividing a soil type into phases.

The soil phase (or the soil type if it has not been subdivided) is the unit shown on the soil map. It is the unit that has the narrowest range of characteristics. Use and management practices therefore can be specified more exactly than for soil series or yet broader groups that contain more variation.

Miscellaneous land types.—Fresh steam deposits, or rough, stony, and severely gullied land that have little true soil are not classified into types and series, and they are identified by descriptive names such as Sandy alluvial land and Sloping alluvial land.

Soil complex.—When two or more soils are so intricately associated in small areas that it is not feasible to show them separately on the soil map, they are mapped together and called a soil complex. An example of this is the Bernard-Edna complex, 0 to 1 percent slopes.

General Description of the County

Agriculture is the main industry in Fort Bend County. The main source of farm income is from the sale of cotton, rice, and beef cattle. Livestock farming in 1955 was expanding; consequently, farmers are improving the carrying capacity of their pastures. They are removing brush and weeds, fertilizing the soil and seeding desirable forage plants, and controlling the grazing. New practices have been developed that allow farmers to use rice land in rotation with pasture. Other industries are oil, natural gas, sulfur, brick, and sugar refining.

The uplands are level to nearly level plains; streams are only slightly entrenched. They are treeless except in areas adjacent to the flood plains of the Brazos and San Bernard Rivers and of the larger streams. In places the elevation of the uplands varies but little from that of the Brazos River flood plains. The sandy soils of uplands have characteristically small, shallow surface depressions that hold water during rainy seasons. These areas need drainage before they can be successfully cultivated. The sandy soils have low inherent fertility, and most of them have subsoils that are poor in physical properties. The Edna soils, especially, have a subsoil that is firm and impermeable when moist or wet and hard when dry. Only drought-resistant crops and those that can be grown in cool seasons are suitable for these soils. The dark fine-textured soils of uplands are fertile and can be used for most crops commonly grown in the county.

Soils of the Brazos River flood plains are inherently fertile, and they are well suited to most crops grown in the county, except rice. The lower lying parts of the Brazos flood plains are overflowed about every 10 to 12 years, but major floods rarely occur.

Farmers in Fort Bend County have organized the Coastal Plains Soil Conservation District. The district, through its board of supervisors, arranges for farmers to receive technical help from the Soil Conservation Service in planning good use and conservation of the soils on their farms. The soil survey furnishes some of the facts needed for this technical help. The soil survey map and report are also useful to land appraisers, credit agencies, road engineers, and to others who are concerned with the use and management of land.

Location and Extent

Fort Bend County is in the center of the Gulf Coastal Prairie of Texas. Richmond, the county seat, is southwest of Houston and southeast of Austin. Distances by air from Richmond to principal cities in the State are shown in figure 1. The area of the county is 551,680 acres, or 862 square miles.

History and Development

Fort Bend County was formed from Austin County in 1837 and organized in 1838. Settlement of this area began in 1822 at which time the friendly Karankawa Indians occupied the territory. The county was named for a fort that had been built at a bend of the Brazos River.

Figure 1.—**Location of Fort Bend County in Texas.**

Early settlers were plantation owners from the older southeastern States, and those after the Civil War came from northern States. The population of the county in 1950 according to the United States census was 31,056.

Railroads were built into the county in 1853, 1879, and 1890. Oil was first discovered in 1920, and the search for additional supplies led to the finding of sulfur and salt.

Climate

Fort Bend County has a warm climate characterized by long growing seasons. Summers are hot and dry; winters are short and mild. The long frost-free period is suitable for diversified agriculture, and it also favors the development of pastures for expanding the livestock industry. As recorded at Sugar Land, Fort Bend County, the average date for the latest frost in spring is February 24 and that of the earliest frost in autumn is November 28. Temperature and precipitation data compiled from United States Weather Bureau records are given in table 1.

Prevailing winds from October through January are from the north; the rest of the year they are from the south and southeast. Tropical hurricanes from the Gulf of Mexico occasionally reach the county. They bring winds and torrential rains that damage crops. Rainfall is fairly evenly distributed throughout the year. How-

TABLE 1.—*Temperature and precipitation at Sugar Land, Fort Bend County, Tex.*

[Elevation, 79 feet]

Month	Temperature [1]			Precipitation [2]			
	Average	Absolute maximum	Absolute minimum	Average	Driest year (1917)	Wettest year (1941)	Average snowfall
	°F.	°F.	°F.	Inches	Inches	Inches	Inches
December	54.2	86	18	4.42	0.60	3.11	0.4
January	53.6	88	8	3.14	1.09	2.16	.1
February	55.6	88	17	2.71	.87	3.14	(3)
Winter	54.5	88	8	10.27	2.56	8.41	.5
March	63.6	91	22	3.03	1.35	5.65	0
April	68.9	95	35	3.45	1.45	6.58	0
May	75.2	104	41	4.51	2.34	8.50	0
Spring	69.2	104	22	10.99	5.14	20.73	0
June	81.2	106	54	3.52	.04	5.86	0
July	83.3	104	63	4.26	6.10	4.46	0
August	83.4	108	62	3.49	.86	3.07	0
Summer	82.6	108	54	11.27	7.00	13.39	0
September	79.4	102	44	3.59	1.51	15.14	0
October	71.7	98	28	3.46	.21	9.81	0
November	60.9	89	24	3.65	1.17	2.35	0
Fall	70.5	102	24	10.70	2.89	27.30	0
Year	69.2	108	8	43.23	17.59	69.83	.5

[1] Average temperature based on a 50-year record, through 1955; highest and lowest temperatures on a 25-year record, through 1930.

[2] Average precipitation based on a 56-year record, through 1955; wettest and driest years based on a 54-year record, in the period 1899–1955; snowfall, based on a 28-year record, through 1930.

[3] Trace.

ever, large amounts in spring often delay planting and cause insect infestations and other losses of crops.

Sudden changes in winter temperatures are caused by the extension of cold weather from the north and northwest. Cold waves are often accompanied by rain that occasionally turns into sleet or ice.

The relative humidity is high because the county is near the Gulf of Mexico. Breezes from the gulf generally cool the atmosphere at night. Early frosts seldom damage crops, but late frosts occasionally damage or kill crops planted early in spring. The early-planted crops, however, are damaged less by insects, and they mature before the weather becomes hot and dry.

Soils of Fort Bend County

In this section the associations are discussed and the soils are described.

Soil Associations

Soils of Fort Bend County occur in four main patterns called soil associations. One association consists of soils of the flood plains and three associations are soils of uplands. The soil associations in Fort Bend County are shown in figure 2. Each association consists of several soils that have different potentialities for agricultural use.

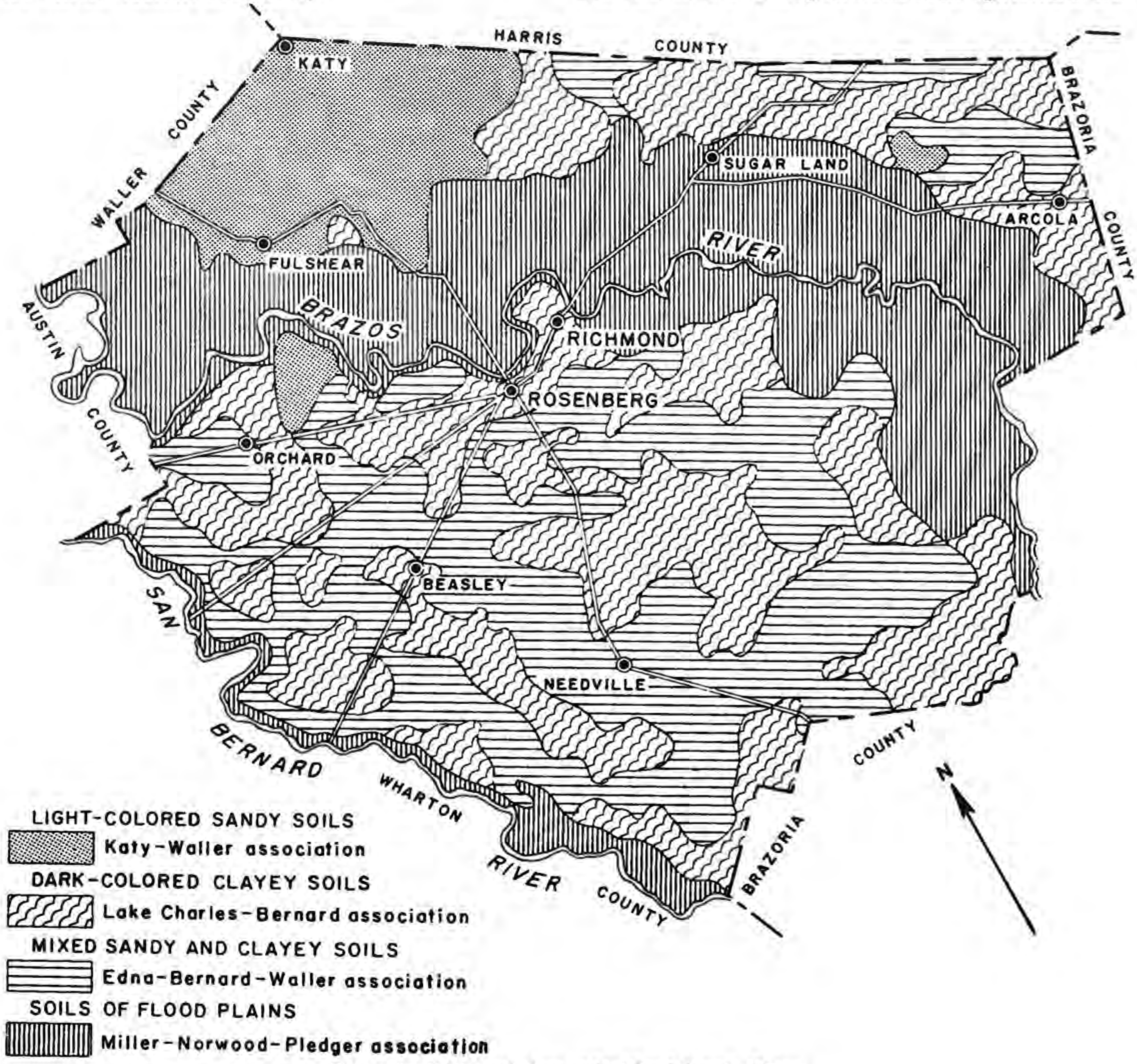

***Figure 2.*—Soil associations of Fort Bend County, Texas.**

TABLE 2.—*Suitability of soil associations for cropland*

Soil association	Percent of county	Acres	Suitability for cropland [1]					
			Excellent	Very good	Good	Fair	Poor	Unsuited
			Acres	*Acres*	*Acres*	*Acres*	*Acres*	*Acres*
Light-colored sandy soils (Katy-Waller association)	9. 9	54, 800			5, 600	26, 500	20, 700	2, 000
Dark-colored clayey soils (Lake Charles-Bernard association)	30. 9	170, 380		151, 680	17, 100			1, 600
Mixed sandy and clayey soils (Edna-Bernard-Waller association)	29. 5	163, 100			57, 800	76, 800	23, 900	4, 600
Soils of flood plains (Miller-Norwood-Pledger association)	29. 4	162, 200	99, 600	41, 000	4, 300			17, 300
Waste land, pits, and excavations	. 3	1, 200						1, 200
Totals	100. 0	551, 680	99, 600	192, 680	84, 800	103, 300	44, 600	26, 700

[1] Suitability for rice is not considered because some soils listed as poor are very good for rice.

Table 2 shows the suitability of the various associations for cropland.

Light-colored sandy soils (Katy-Waller association)

This soil association consists of the sandier soils and occurs in the northern part of the county. More than 90 percent is nearly level.

Agriculture on soils of this association is a combination of rice and livestock production. About 85 percent of the acreage is suitable for rice, but only about 60 percent is now in a rice-pasture rotation. Most of the rest is in permanent pasture. About 40 percent of the association, although well suited to rice, is poorly suited to cotton and corn because of poor surface drainage. All of the soils of the association, except for Clodine fine sandy loam, are only fair for row crops. Clodine fine sandy loam is moderately well drained, and if properly managed, produces good yields of row crops as well as of rice. However, very little row-crop farming is done on the Clodine soil.

The average farm in this association consists of more than 300 acres, but many farms have more than 1,000 acres. Land is commonly owned by nonresidents, who rent their land to resident operators. The part of the county in which this association occurs is thinly populated in contrast to other parts where agriculture is of the row-crop type.

Rotations of rice and pasture are the best uses for soils in this association. The gentle slopes can be used for field crops other than rice if the soil is properly fertilized and conserved. Nearly all slopes are now in pasture. Only about 200 acres of the Kenney-Fulshear complex, 4 to 8 percent slopes, is too steep to be cultivated.

Dark-colored clayey soils (Lake Charles-Bernard association)

This association consists of clay and clay loam soils. Lake Charles clay and Bernard clay loam make up the greater part. There are minor areas of less productive soils. This soil association occurs in many small and large areas throughout the uplands of the county, except in the vicinity of Fulshear and Katy.

Approximately 65 percent of these soils are in cultivation, and, except for occasional wooded areas, the rest is in pasture or in range. The rangeland is in a few large holdings. More farms in this association than in any other are operated by owners. Many farms are operated by tenants. The good condition of farm homes and other buildings indicates a prosperous agriculture. The average farm, excluding the very large landholdings, is about 100 acres.

Sloping areas in this association occur only in narrow strips adjacent to natural drainageways and are generally only a small part of a farm. Most of these areas are used for pasture, as they are highly susceptible to erosion. The 1,600 acres of Bernard-Edna clay loams, 4 to 8 percent slopes, is unsuited to cropland but is suitable for pasture.

One of the main problems in the use of the nearly level soils in this association is drainage during periods of excessive rainfall. In ordinary seasons, the soils of the group, except for Beaumont clay, are drained adequately by road ditches and shallow field ditches. Some additional field ditches are needed to help drain water from these heavy soils after hard rains. Beaumont clay requires artificial drainage for cultivation. If properly drained it can be farmed very much like the other level soils in the association.

Soils of this association are moderate to high in fertility but require phosphate and nitrogen fertilizers for best yields. These soils need more power for farm work than the sandier soils, but they are easily cultivated after a seedbed is prepared.

Lake Charles and Bernard soils, locally called blackland, are considered to be the best upland soils for cotton in Fort Bend County. The level phases of all soils in this association are excellent for rice. Pastures produce more forage on soils of this association than on other upland soils. Dallisgrass, whiteclover, and other suitable forage plants grow well if pastures are properly managed.

A combination of crop and livestock farming is best suited to Lake Charles and Bernard soils.

Mixed sandy and clayey soils (Edna-Bernard-Waller association)

This association consists of sandy loam to clay loam soils of uplands. The soils are intermixed in small areas or are closely associated in large areas. They are mainly in one large area in the southern part of the county that generally surrounds soils in the Lake Charles-Bernard association. A few smaller areas occur throughout most of the uplands in the county. In this association, approximately 134,000 acres is fair to good for row crops and excellent for rice. The poorly drained Edna-Waller complex and the Waller soils are unsuitable for row crops, but they are fair for rice.

About half of the acreage of the level or nearly level soils is cultivated. Most of this is in row crops, but a large acreage is used for rotations of rice and pasture. The rest, except for an occasional wooded area, is in pasture or native range. The acreage in range is in a few large ownerships of land, each containing more than 1,000 acres. This association contains about 9,000 acres that are on slopes greater than 1 percent and are not cultivated. This acreage can be cultivated if it is properly managed.

Excluding the few large holdings, the average size of farms is about 100 acres. Most farms are operated by owners, but some are operated by tenants.

Yields of cotton, corn, and other row crops are much lower on these soils than on soils of the Lake Charles-Bernard association. However, most farms contain some of the Bernard or Lake Charles soils, or both, and these help to maintain a moderate yield of crops. Edna and Bernard soils are only slightly less productive for rice than Lake Charles clay.

Rice is farmed on the soils of the Edna-Bernard-Waller association in about the same way as on the other soils of the county. Operators of rice farms or of rice and cattle farms usually have long-term leases on large acreages of land, some of which is rented from nonresident landowners.

The Edna and Waller soils are droughty. In addition, the Waller soils are too poorly drained for crops other than rice. Except for the Bernard soil, the soils in this association are low to moderate in fertility. The carrying capacity of pastures generally is low, especially in dry seasons, because the soils are droughty.

Soils of flood plains (Miller-Norwood-Pledger association)

This association consists entirely of alluvial soils. Most of it (about 156,000 acres) is in the rarely overflowed flood plains of the Brazos River and the southern part of the San Bernard River. The rest of the association occurs in the flood plains of the upper part of the San Bernard River and in those of other streams.

Soils in the flood plain of the Brazos River occur in large areas and are suitable for mechanized farming. The loamy soils, such as the Norwood, Asa, Yahola, and some of the Miller series, occupy natural levees along the present channel or along the old channels of the Brazos River and other elevated areas. The clay soils, such as those of the Miller and Pledger series, occupy large flat areas in the Brazos flood plain. Sandy alluvial land and Miller-Roebuck clays occur in low areas, mainly along bends of the Brazos River.

Most farms in the Brazos River flood plain range from 200 to 500 acres in size. There are a few plantation-type farms containing from 1,000 to over 5,000 acres. The work on large farms is done by sharecroppers and hired laborers. Some large holdings are operated as livestock farms; other large acreages are owned by nonresidents or are held as trusts and operated by farm managers. About one-third of the land in the Brazos River flood plain is cultivated, about one-fourth is wooded, and the rest is pastured. Cotton, alfalfa, and corn are the main crops. Rice is not grown on bottom-land soils. Fair to excellent pasture can be developed on the nonarable soils.

About 5,500 acres of Pledger clay is in the southern part of the San Bernard River flood plain and is not cultivated. This area is rarely flooded, but about 60 percent is still in forest containing hardwood trees of low value for lumber.

The rest of the association is made up of the Navasota-Iuka complex and the Kaufman and the Bibb soils. Kaufman soils and the Navasota-Iuka complex occupy the frequently overflowed flood plains of local streams and the flood plain of the San Bernard River from about 8 miles southeast of United States Highway No. 59 (the highway running southwest through Beasley), upstream to the Austin County line. Bibb soil occurs only in the narrow frequently overflowed flood plain of Buffalo Bayou in the northern part of the county. This small area is not shown on the soil association map.

The upstream part of the San Bernard River flood plain, occupied entirely by Kaufman clay and the Navasota-Iuka complex, is overflowed one or more times each year. Water is on these soils long enough to destroy crops. More than 90 percent of this area is still in woodland. If cleared and properly managed, these soils would provide fair to very good pasture.

Descriptions of the Soils

In the following pages the soil series, types, phases, complexes, and miscellaneous land types and the modal profiles for soil types in the county are described. Their relationship to agriculture is given to the extent present knowledge permits.

The modal profiles may differ somewhat from the profiles described in detail in the section Genesis, Morphology, and Classification of Soils for each series at a specified location in the county.

The approximate acreage in various uses and total acreage of the soils mapped in this county are listed in table 3. The location and distribution of the soils are shown on the soil map in the back of the report.

Asa Series

Soils of the Asa series are fertile and highly productive. They occupy the nearly level, rarely overflowed bottom lands mainly along the Brazos River.

Asa fine sandy loam (Aa).—A characteristic profile follows:

0 to 7 inches, brown heavy fine sandy loam; mildly alkaline to slightly acid; friable and crumbly when moist; hard crust forms on surface in fields after rains; boundary with layer below is clear.

7 to 34 inches, dark-brown to dark grayish-brown light clay loam; more reddish in the lower 12 to 16 inches; alkaline; crumbly and moderately friable when moist, hard when dry; moderately permeable to water and roots; boundary with layer below clear.

34 to 48 inches +, reddish-yellow calcareous loam parent material; contains a few soft and hard concretions of calcium carbonate.

The surface layer ranges from fine sandy loam to loam. It ranges from dark grayish brown to reddish brown in color, from 6 to 12 inches in thickness, and from slightly acid to alkaline in reaction. The subsoil texture ranges

Table 3.—*Approximate acreage in various uses and total acreage and the proportionate extent of soils*

Soil	Cropland	Pasture	Woodland	Miscellaneous [1]	Total	Percent of county
	Acres	Acres	Acres	Acres	Acres	
Asa fine sandy loam	500	1, 600	50	50	2, 200	0. 4
Asa silty clay loam	600	1, 300	450	50	2, 400	. 4
Asa-Pledger complex	2, 600	2, 900	1, 200	100	6, 800	1. 2
Beaumont clay	3, 100	4, 600	1, 100	200	9, 000	1. 6
Bernard clay loam, 0 to 1 percent slopes	16, 500	5, 900	200	600	23, 200	4. 2
Bernard-Edna complex, 0 to 1 percent slopes	33, 000	22, 100	1, 300	1, 400	57, 800	10. 5
Bernard-Edna clay loams, 1 to 4 percent slopes	300	1, 900	650	50	2, 900	. 5
Bernard-Edna clay loams, 4 to 8 percent slopes	100	700	100	(2)	900	. 2
Bibb fine sandy loam		(3)	800	(2)	800	. 1
Clodine fine sandy loam	4, 700	500	300	100	5, 600	1. 0
Edna fine sandy loam, 0 to 1 percent slopes	29, 700	44, 500	800	1, 800	76, 800	14. 0
Edna fine sandy loam, 1 to 4 percent slopes	500	5, 700	1, 400	100	7, 700	1. 4
Edna-Waller complex	3, 400	12, 300	100	400	16, 200	2. 9
Fulshear fine sandy loam, 1 to 4 percent slopes	(2)	700	(3)	(2)	700	. 1
Hockley loamy fine sand, 1 to 4 percent slopes	100	1, 250	(3)	50	1, 400	. 3
Katy fine sandy loam, 0 to 1 percent slopes	15, 800	5, 900	400	500	22, 600	4. 1
Katy fine sandy loam, 1 to 4 percent slopes	100	1, 950	400	50	2, 500	. 5
Katy-Waller complex	10, 700	3, 800		400	14, 900	2. 7
Kaufman clay		200	2, 700	(2)	2, 900	. 5
Kenney loamy fine sand, 0 to 2 percent slopes	(3)	2, 500	(3)	100	2, 600	. 5
Kenney loamy fine sand, 2 to 6 percent slopes	100	800	(3)	(2)	900	. 2
Kenney-Fulshear complex, 4 to 8 percent slopes	100	700	(3)	(2)	800	. 1
Lake Charles clay, 0 to 1 percent slopes	79, 300	38, 100	7, 880	3, 200	128, 480	23. 3
Lake Charles clay, 1 to 4 percent slopes	800	2, 400	1, 300	(2)	4, 500	. 8
Lake Charles complex, 4 to 8 percent slopes	(3)	500	200	(2)	700	. 1
Miller fine sandy loam	100	700	100	(2)	900	. 2
Miller silt loam	1, 500	2, 400	450	50	4, 400	. 8
Miller silty clay loam	800	1, 400	550	50	2, 800	. 5
Miller clay	18, 900	28, 500	15, 800	1, 500	64, 700	11. 7
Miller-Roebuck clays			900	(2)	900	. 2
Navasota-Iuka complex		(3)	2, 150	50	2, 200	. 4
Norwood silt loam	7, 100	10, 300	700	400	18, 500	3. 3
Norwood silty clay loam	2, 400	2, 600	400	100	5, 500	1. 0
Norwood clay	800	2, 300	550	50	3, 700	. 7
Pledger clay	5, 300	7, 200	12, 900	600	26, 000	4. 7
Roebuck clay	100	600	5, 000	100	5, 800	1. 1
Sandy alluvial land		200	5, 850	50	6, 100	1. 1
Sloping alluvial land	650	1, 900	1, 800	50	4, 400	. 8
Waller soils	1, 000	4, 700		100	5, 800	1. 1
Waller-Katy complex, slightly saline	1, 900	200	(3)	200	2, 300	. 4
Waste land, pits, and excavations				1, 200	1, 200	. 2
Yahola fine sandy loam	100	800	300	(2)	1, 200	. 2
Totals	242, 650	226, 600	68, 780	13, 650	551, 680	100. 0

[1] Approximate acres in roads, railroads, towns, farmsteads, and waste land.
[2] Less than 25 acres.
[3] Less than 50 acres.

from heavy sandy loam to clay loam; depths to calcareous material range from about 30 to 60 inches.

Included are occasional narrow swales or low places containing Pledger clay. These areas are too small to map separately. Some areas of Norwood silt loam containing less than 5 acres are also included. They are redder than the Asa soil and calcareous throughout.

Asa fine sandy loam is in capability unit I–2.

Asa silty clay loam (Ab).—A characteristic profile follows:

0 to 5 inches, dark grayish-brown silty clay loam; alkaline; crumbly and moderately friable when moist, hard when dry, and sticky when wet; crust forms on surface in fields after heavy rains; boundary gradual.

5 to 25 inches, dark grayish-brown heavy silty clay loam; reddish and more loamy in the lower part; alkaline; firm when moist, hard when dry, and sticky when wet; moderately permeable; much worm activity; boundary gradual.

25 to 50 inches +, reddish-yellow silt loam; moderate permeability; upper part alkaline, the lower part calcareous and has a few hard concretions of calcium carbonate; stratified with clay and very fine sandy loam; friable when moist; moderately permeable.

The surface layer ranges from brown to dark grayish brown in color and from 4 to 12 inches in thickness. Some areas are covered by a 2- or 3-inch mantle of calcareous overwash. The subsoil is dark-brown to dark grayish-brown clay loam to silty clay.

Included with this soil are narrow swales of Pledger clay and of Asa fine sandy loam or silt loam, too small to map separately.

Asa silty clay loam is in capability unit I–2.

Asa-Pledger complex (Ac).—This mapping unit of moderately well drained soils consists of about 60 percent Asa soils and 40 percent Pledger clay. The two soils are in small areas and are so intermixed that mapping them separately is impractical. The dominant soil in the complex is Asa silty clay loam, but some areas contain Asa fine sandy loam and silt loam.

The Asa soils are described under the Asa series in this part of the report. Pledger clay in this mapping unit generally has a loamy substratum within 3½ feet of the surface. Otherwise it is like the soil described under the Pledger series in this section.

The Asa soils occupy low ridges that are 2 to 12 inches higher than the swales occupied by Pledger clay.

The Asa-Pledger complex is in capability unit I-2.

Beaumont Series

The soil of this series is fertile, moderately productive, and imperfectly drained. It occupies the nearly level to slightly depressed areas on the prairies.

Beaumont clay (Ba).—A characteristic profile is as follows:

- 0 to 18 inches, dark-gray clay with distinct spots of yellowish brown; acid; very firm when moist and extremely sticky when wet; a hard crust forms on the surface in cultivated fields after rains; very slowly permeable; boundary gradual.
- 18 to 48 inches, gray clay; lighter in color than the horizon above but contains distinct yellowish-brown and brownish-yellow spots; acid to slightly acid; very firm when moist and extremely sticky when wet; boundary gradual.
- 48 to 84 inches, upper part light-gray clay mottled with olive brown and the lower part pale-yellow clay mottled with light gray; slightly acid to neutral; not so sticky as the two layers above; lower part of this layer contains small soft lumps and hard concretions of calcium carbonate. Below 84 inches the material is yellowish-red clay.

This soil ranges from gray to very dark gray, mottled with various amounts and shades of yellow and brown. When the soil is dry, cracks form that are from ½ inch to 4 inches wide and as much as 36 inches or more deep. All horizons are very slowly permeable when the soil is thoroughly wet. The profile contains small dark hard shotlike concretions that contain iron and manganese.

Uncultivated areas have a distinct gilgai or hog-wallowed microrelief. Their surface consists of microknolls from 8 to 12 inches high and about 10 to 15 feet in diameter alternating with microdepressions.

Beaumont clay is in capability unit IIIw-1.

Bernard Series

Soils of the Bernard series are dark, fertile, and productive. They occupy nearly level to sloping upland. Slopes exceeding 1 percent in gradient are susceptible to erosion when cultivated.

Bernard clay loam, 0 to 1 percent slopes (Bb).—A characteristic profile follows:

- 0 to 6 inches, dark-gray clay loam; slightly acid; crumbly and friable when moist, hard when dry, and sticky when wet; thin crust forms on the surface after rains; slowly permeable; boundary gradual.
- 6 to 20 inches, dark-gray light clay finely mottled with yellowish brown; slightly acid; crumbly and friable when moist, very hard when dry, and sticky when wet; slowly permeable; boundary gradual.
- 20 to 54 inches, dark-gray clay with a few pale-olive to strong-brown spots in the upper part; spots are gray in the lower part; alkaline; firm when moist, sticky when wet, and very hard when dry; slowly permeable; boundary gradual.
- 54 to 72 inches, light brownish-gray clay with a few olive and yellowish-brown mottles in the upper part; mottles are reddish yellow in the lower part; alkaline; few small hard concretions of calcium carbonate, boundary gradual. Below 72 inches this layer grades gradually to the reddish-yellow calcareous clay loam substratum.

The clay loam surface layer ranges from 4 to 12 inches in thickness and from gray to dark grayish brown in color. In small areas the surface layer is a loam. The 6- to 20-inch layer ranges from dark gray to very dark gray.

Many small roundish areas of Edna soil are included with this soil. These areas are not more than 5 acres in size, and occupy less than 1 percent of the total area of Bernard clay loam. Also included with this soil are small areas of Lake Charles clay that do not exceed 1 percent of any one area of Bernard clay loam. Some areas of Bernard clay loam have white spots on the surface that are slightly saline. These spots are less than 1 acre in size.

Bernard clay loam is in capability unit I-1.

Bernard-Edna complex, 0 to 1 percent slopes (Be).—Bernard clay loam and Edna soils make up about equal proportions of this complex, but in individual areas the proportion of Bernard clay loam ranges from about 20 percent to 80 percent (fig. 3). The two soils are so

***Figure 3.*—The Bernard-Edna complex. The light-colored areas are Edna fine sandy loam, and the dark spots are Bernard clay loam. Actual contrast is much greater than in photo.**

intricately mixed that it is not practical to map them separately by soil types. Bernard clay loam occupies irregular to roundish areas ranging from less than 1/10 acre to about 2 acres, and they are slightly lower in elevation than areas of Edna soils. The Edna soils occupy slight mounds and ridges ranging in size from less than 1/10 acre to 2 acres. In cultivated fields little or no difference in elevation is noticeable between areas of Bernard and Edna soils.

Profiles of these two soils are the same as those described under the Bernard and the Edna series.

The Edna soils in this mapping unit vary from fine sandy loam to loam. In many areas where the surface layer is a clay loam, the soils are intergrades between the Bernard and the Edna series.

Most areas of Bernard-Edna complex include small depressions, or swales, of less than 1 acre occupied by Waller soils. These small depressions make up about 2 percent of mapping-unit areas, and they contain water only during the wet and cool seasons. Included also are areas of Lake Charles clay that are less than 5 acres in size. These inclusions comprise less than ½ to 1 percent of the mapping-unit area.

This complex has very slow surface drainage, and erosion is not a problem. Internal drainage of the Edna soils is very slow, and that of Bernard clay loam is slow. All areas of the Bernard-Edna complex need artificial drainage. Most areas, however, are drained adequately by field and road ditches in ordinary seasons. After unusually heavy rains, water stands long enough on some areas to damage crops. The Bernard-Edna complex is in capability unit IIs-1.

Bernard-Edna clay loams, 1 to 4 percent slopes (Bc).—This mapping unit has different proportions of the component soils, stronger slopes, and thinner soil layers than Bernard-Edna complex, 0 to 1 percent slopes. In addition, the B horizon of Bernard soil is lighter colored in this mapping unit and that of the Edna is more mottled than in the less sloping Bernard-Edna complex. This mapping unit consists of 60 to 70 percent Bernard soils, 20 to 30 percent Edna soils, and 5 percent brownish calcareous unnamed soil.

This complex is subject to erosion if cultivated. Management should consist of practices that control runoff and erosion. The unit is fair to good for crops, but its best use under the prevailing system of farming is for pasture.

Included are small areas of Lake Charles clay that comprise less than 2 percent of the mapping unit.

Bernard-Edna clay loams, 1 to 4 percent slopes, is in capability unit IIe-1.

Bernard-Edna clay loams, 4 to 8 percent slopes (Bd).—This mapping unit is more sloping and droughty and has thinner soil layers than the other members of the Bernard-Edna complex. It consists of about 50 percent Bernard soils, 40 percent Edna, and 10 percent brownish calcareous unnamed soil. These areas are more susceptible to erosion when cultivated or heavily grazed than areas of the less sloping soils. This mapping unit is poor for crops because it is droughty, low in fertility, and susceptible to erosion. It is best suited to native or improved pasture.

Included on some slopes of this mapping unit are narrow bands of Fulshear fine sandy loam comprising less than 2 percent of the mapping unit. There are also some knolls of Kenney loamy fine sand comprising less than 2 percent of the mapping unit.

Bernard-Edna clay loams, 4 to 8 percent slopes, is in capability unit IVe-1.

Bibb Series

Soils of the Bibb series are acid and frequently overflowed. They occur on the flood plain of Buffalo Bayou. Parent materials are sandy alluvial sediments that washed mainly from the Coastal Prairie.

Bibb fine sandy loam (Bg).—A characteristic profile follows:

0 to 12 inches, very pale brown fine sandy loam weakly spotted with brown and brownish yellow; acid; friable when moist, hard when dry; numerous pores; boundary gradual.

12 to 40 inches, stratified light brownish-gray loam and very pale brown sandy clay loam mottled with brownish gray and yellow; acid; friable when moist and very hard when dry; moderately permeable; rests on the substratum.

40 to 50 inches +, very pale brown sandy clay spotted with brownish yellow; acid; firm and massive; very slowly permeable.

The surface layer ranges from a loam to a fine sandy loam and from grayish brown to light gray. Mottling ranges from none to 25 percent of the soil mass and is yellowish, yellowish brown, and brown. Thickness of the friable upper part ranges from 30 to 46 inches.

This soil is not suitable for cultivation because of frequent flooding. Its use is further limited by a high water table during the cool and wet season. It is well suited to pasture if cleared of trees.

Bibb fine sandy loam is in capability unit Vw-1.

Clodine Series

Soils of the Clodine series are sandy, moderately productive, and somewhat poorly drained. They respond to good management.

Clodine fine sandy loam (Ca).—A characteristic profile follows:

0 to 12 inches, gray fine sandy loam; slightly acid; crumbly and friable when moist and slightly hard when dry; contains numerous fine pores; boundary gradual.

12 to 46 inches, gray loam in the upper part weakly spotted in many places with brownish-yellow and light-gray sandy loam in the lower part; slightly acid; friable when moist, hard to very hard when dry; porous; moderately permeable; boundary gradual.

46 to 70 inches +, white sandy clay mottled with brownish yellow; contains small pockets and lenses of sand; slowly permeable; numerous small concretions of calcium carbonate.

The surface soil ranges from loam to fine sandy loam and from dark gray to light brownish gray. The 12- to 46-inch layer ranges from loam to clay loam in the upper part to sandy clay in the lower part. Unless leveled in cultivation, all areas contain small low mounds of sandy materials. The surface of some areas of this soil contains small roundish white spots that are saline.

Included with this soil are small areas of Katy fine sandy loam and of Edna fine sandy loam. They comprise less than 1 percent of the mapping unit.

Clodine fine sandy loam is in capability unit IIs-1.

Edna Series

Soils of the Edna series are sandy and crusty and have a compact blocky subsoil. Their productivity is low. They occur on level, nearly level, and gently sloping areas.

Edna fine sandy loam, 0 to 1 percent slopes (Ea).—A characteristic profile follows:

0 to 8 inches, grayish-brown fine sandy loam; slightly acid; friable when moist and very hard when dry; a hard crust forms on the surface in cultivated fields after rains; boundary wavy but changes abruptly.

8 to 36 inches, grayish-brown compact sandy clay becoming light gray in the lower part; mottled with brownish yellow; very firm when moist and extremely hard when dry; very slowly permeable; blocky in the upper part and massive in the lower part.

Below the depth of 36 inches, the soil mass contains a few small concretions of hard calcium carbonate. It grades into yellowish-red sandy clay parent materials at depths ranging from 50 to 70 inches.

The surface soil ranges from gray to light brownish gray and from fine sandy loam to loam. Over the trough of a wave, its thickness ranges from 14 to 20 inches. The 8- to 36-inch horizon ranges from gray to dark grayish brown. Mottling ranges from none to 10 percent of the soil mass. Mottles, where present, are yellowish brown, yellow, or dark brown. Sand mounds 12 to 18 inches high and from 30 to 50 feet in diameter are common.

Included with Edna fine sandy loam, 0 to 1 percent slopes, are small low flat areas of Bernard clay loam.

They are not over 5 acres in size and are generally less than 2 acres. These inclusions are lower in most places than the Edna soils, and they occupy no more than 5 percent of the areas mapped. Small enclosed depressions occupied by Waller soils are also included with the Edna soil in places. When such areas comprise more than 15 percent of the mapping unit, the depressions are mapped as the Edna-Waller soil complex. Small areas of Katy fine sandy loam that occur where Katy and Edna soils join are included with Edna fine sandy loam, 0 to 1 percent slopes.

Edna fine sandy loam, 0 to 1 percent slopes, is droughty because of the compact blocky subsoil. It is best suited to drought-resistant, early-maturing, and cool-season crops. It is in capability unit IIs-1.

Edna fine sandy loam, 1 to 4 percent slopes (Eb).—This soil differs from the Edna fine sandy loam, 0 to 1 percent slopes, mainly in slopes. In addition, the A horizon is only 4 to 6 inches thick, and the subsoil is generally more strongly mottled with yellow and brownish yellow. The more sloping surface increases the hazard of erosion and droughtiness and lowers soil productivity. Included with this soil are small spots of Kenney, Fulshear, and Bernard soils.

Edna fine sandy loam, 1 to 4 percent slopes, can be cultivated, but because of low productivity, risk of erosion, and its occurrence with large smooth areas of other soils, its best use is as pasture land. Edna fine sandy loam, 1 to 4 percent slopes, is in capability unit IIIe-1.

Edna-Waller complex (Ec).—This mapping unit is a complex consisting of 70 percent Edna fine sandy loam, 28 percent Waller soils, and 2 percent Bernard clay loam. The Edna soils occupy slightly higher positions, and they surround depressions occupied by the Waller soils. The depressions containing Waller soils range from 1 to 10 acres, and they are too numerous to map separately. The areas of this complex are level to nearly level and are poorly drained. The profiles of Edna and Waller soils are similar to those described under the Edna and the Waller series.

Water stands in the Waller depressions for long periods in wet seasons and after heavy rains. The entire mapping unit must be drained artificially before it can be cultivated. Row crops are not very successful even on drained areas. Rice is the most productive crop under natural conditions, but drainage and some leveling are needed for good yields.

The Edna-Waller complex is in capability unit IVw-1.

Fulshear Series

Soils of the Fulshear series are moderately productive. They occupy gently sloping uplands and are susceptible to erosion when cultivated.

Fulshear fine sandy loam, 1 to 4 percent slopes (Fa).—A characteristic profile follows:

- 0 to 9 inches, brown fine sandy loam; slightly acid; friable; grades through a 3- to 5-inch transition zone to the B horizon.
- 9 to 38 inches, reddish-brown sandy clay mottled with brown in the upper few inches; lower part more sandy; slightly acid; friable and very crumbly when moist and very hard when dry; slowly permeable; grades into the parent material.
- 38 to 70 inches +, yellowish-red fine sandy loam; slightly acid or calcareous.

The surface layer is 5 to 16 inches thick and grayish brown to dark brown in color. The 9- to 38-inch layer ranges from sandy clay to sandy clay loam, and in places is not mottled in the upper part. Concretions of calcium carbonate at depths ranging from 24 to 60 inches are present in places. The surface gradient in a few small areas is as much as 5 or 6 percent.

Small knolls of Kenney loamy fine sand less than 100 feet in diameter are included with Fulshear fine sandy loam, 1 to 4 percent slopes. Where Edna soils are in close association with this soil, small areas and slopes of them are included. The Kenney inclusion occupies less than 2 percent of the Fulshear mapping unit, and the Edna occupies less than 1 percent. Also included in this unit are small spots of a brownish calcareous unidentified soil.

Fulshear fine sandy loam, 1 to 4 percent slopes, is in capability unit IIIe-1.

Hockley Series

Soils of the Hockley series are on gentle slopes, and they are well drained. They have low productivity but respond to management.

Hockley loamy fine sand, 1 to 4 percent slopes (Ha).—A characteristic profile follows:

- 0 to 24 inches, pale-brown loamy fine sand; acid; very friable when moist and somewhat loose when dry; grades through a transition layer below.
- 24 to 30 inches, yellowish-brown sandy clay loam mottled with brown; acid; friable and crumbly when moist and moderately hard when dry; moderately permeable; boundary gradual.
- 30 to 68 inches, brownish-yellow light sandy clay with coarse red mottles; acid; moderately friable when moist and hard when dry; not as crumbly as the layer above; moderately permeable; below 68 inches grades into the parent material consisting of acid stratified sandy clay and fine sandy loam mottled red, gray, and pale brown.

The surface layer is 15 to 36 inches thick. In color it ranges from pale brown to grayish brown and in texture from a light fine sandy loam to loamy fine sand. The 24- to 30-inch horizon ranges from 4 to 10 inches in thickness and from a heavy fine sandy loam to a sandy clay loam. Concretions containing iron and manganese are scattered throughout the profile in most places.

Katy soils make up about 5 percent of some areas of this mapping unit. Others include about 10 percent Fulshear and Fulshear-like soils, and still others include about 2 percent Kenney soils.

Hockley loamy fine sand, 1 to 4 percent slopes, is in capability unit IIe-2.

Katy Series

Soils of the Katy series are sandy, light colored, and of moderate to low fertility. They are mostly in the northern part of the county on nearly level areas. Small areas, however, are on slopes that are as much as 4 percent.

Katy fine sandy loam, 0 to 1 percent slopes (Ka).—A characteristic profile follows:

- 0 to 10 inches, light brownish-gray fine sandy loam; acid; friable.
- 10 to 24 inches, very pale brown or light-gray fine sandy loam; a few small spots of yellowish brown; acid; friable; porous; contains small roundish concretions of iron; boundary abrupt.
- 24 to 42 inches mottled gray, brownish-yellow, and red, sandy clay; acid; very firm when moist, extremely hard when dry,

and very sticky when wet; very slowly permeable; massive, breaks out in coarse blocks; occasional concretions of iron throughout the profile; boundary gradual.
42 to 84 inches, mottled light brownish-gray, yellowish-brown, and light-gray sandy clay; a few spots of red.

The sandy surface layers range from 14 to 30 inches in thickness. The surface layer ranges in color from brown to light brownish gray and in texture from fine sandy loam to light fine sandy loam. The texture of the 24- to 42-inch layer ranges from clay to sandy clay, and the mottles range from various shades of yellow to brown and red. Sandy mounds commonly occupy about 5 percent of the total surface area. In some places they cover as much as 10 percent.

Small depressions of Waller soils are included with this soil and occupy about 10 percent of the total area of the mapping unit. A few small knolls of Hockley soil are also included.

Katy fine sandy loam, 0 to 1 percent slopes, is in capability unit IIs–1.

Katy fine sandy loam, 1 to 4 percent slopes (Kb).—This soil differs from Katy fine sandy loam, 0 to 1 percent slopes, in having steeper slopes and better surface drainage. It occurs in association with the nearly level areas of Katy fine sandy loam. It is susceptible to erosion and requires careful management if cultivated. Profile characteristics of the two soils are about the same.

About 5 percent of the areas mapped as Katy fine sandy loam, 1 to 4 percent slopes, is Hockley loamy fine sand, and about 1 percent is Fulshear fine sandy loam.

This soil is in capability unit IIe–2.

Katy-Waller complex (Kc).—This mapping unit is a complex of Katy fine sandy loam and Waller soils. The approximate composition of the complex is: Katy fine sandy loam, 50 percent; Waller soils, 41 percent; Clodine fine sandy loam, 5 percent; Hockley loamy fine sand, 3 percent; Edna fine sandy loam, 1 percent.

Depressions of Waller soils ranging from less than 1 acre to as much as 6 to 7 acres are so numerous that it was not practical to map them separately. The drainage problem in these depressions restricts the use of the land. Rice is the only practical crop, but pastures can be improved considerably if the depressions are drained. The profiles of soils in this complex are described under their series names in this part of the report.

Some areas of this complex west of Clodine along Farm Road No. 1093 have occasional white spots on the surface that are slightly saline.

The Katy-Waller complex is in capability unit IVw–1.

Kaufman Series

Soils of the Kaufman series are dark heavy soils of the bottom lands. They occur on frequently overflowed flood plains of large creeks and of the San Bernard River. Kaufman soils are fertile, but they are too often flooded to be used for crops. If cleared of trees, these soils would be very good for pasture.

Kaufman clay (Kd).—A characteristic profile follows:

0 to 10 inches, very dark gray clay with very fine faint spots of very dark brown; slightly acid; crumbly when moist and sticky and plastic when wet; boundary clear.
10 to 42 inches +, dark-gray clay; upper part slightly mottled with brown and light olive brown; slightly acid; lower part faintly mottled with olive yellow; alkaline; hard when dry and sticky and plastic when wet; slowly permeable.

The color of this soil ranges from dark gray to very dark gray. In many places it is free of mottling and is stratified with gray and dark-gray clay.

Included with Kaufman clay are small areas of Navasota clay and a few small ridges of sandy Iuka soil. In the lower part of the San Bernard River flood plain, some areas of Pledger clay are included with the Kaufman clay.

Kaufman clay is in capability unit Vw–1.

Kenney Series

Soils of the Kenney series are light-colored deep sands of low productivity. They occupy gently sloping to sloping uplands. They respond to management and are best suited to special crops such as melons, vegetables, peas, and berries.

Kenney loamy fine sand, 0 to 2 percent slopes (Ke).—A characteristic profile follows:

0 to 54 inches, loamy fine sand, pale brown in the upper part and very pale brown in the lower part; acid; loose; boundary abrupt.
54 to 84 inches, mottled very pale brown and red sandy clay loam, more sandy in the upper few inches; acid: moderately friable when moist and hard when dry; porous; massive. This material grades below 84 inches to acid material consisting of mottled white and red sandy clay loam.

The surface layer is 36 to 72 inches thick and light brownish gray to brown. The substratum ranges from a sandy clay loam to a sandy clay. The parent material is usually stratified sandy clay loam and fine sand.

Included with this soil are a few small depressions that consist of Waller soils. These inclusions are less than 2 acres in size and make up only 1 percent of the total area of Kenney loamy fine sand, 0 to 2 percent slopes. This soil is in capability unit IIIs–1.

Kenney loamy fine sand, 2 to 6 percent slopes (Kg).—This soil occurs on slopes between the prairie and the flood plains of the San Bernard and the Brazos Rivers. It differs from Kenney loamy fine sand, 0 to 2 percent slopes, mainly in slopes. The profiles of the two soils are similar. Most of the soil has been in cultivation, but it is now used as old-field pasture. The soil can be safely cultivated but must be protected from erosion.

Slopes range from 1 to 10 percent. Small areas of Fulshear fine sandy loam containing 5 acres or less are included with this soil. Such inclusions occupy less than 5 percent of the total area of this mapping unit.

Kenney loamy fine sand, 2 to 6 percent slopes, is in capability unit IVs–1.

Kenney-Fulshear complex, 4 to 8 percent slopes (Kh).—This complex consists approximately of 65 percent Kenney loamy fine sand and 35 percent Fulshear fine sandy loam. The Kenney soil occupies ridges and knolls; the Fulshear soil generally occupies slopes surrounding small drainageways. The A horizon of the Fulshear soil has been completely eroded away in some small areas. Profiles of the Kenney and Fulshear soils are described under their series names in this part of the report.

Small areas of Hockley loamy fine sand are included with this complex. The Kenney-Fulshear complex is in capability unit VIe–2.

Lake Charles Series

Soils of the Lake Charles series are dark clays occurring in the level to nearly level prairies. They are the most

Figure 4.—**The hog-wallowed or gilgai microrelief of Lake Charles clay shown by the water-filled depressions.**

extensive soils in the county. The surface of these soils has a characteristic hog-wallowed microrelief (fig. 4).

Lake Charles clay, 0 to 1 percent slopes (La).—A characteristic profile from the bottom of a hog wallow follows:

0 to 34 inches, very dark gray clay; slightly acid; generally very firm when moist, but crumbly in the upper 10 to 12 inches; extremely plastic and sticky when wet; slowly permeable; change diffuse.

34 to 70 inches, transitional layer of dark-gray clay mottled with reddish yellow and light yellowish brown; lighter colored in the lower part; slightly acid in upper part; lower part alkaline and contains occasional concretions of calcium carbonate; very firm when moist, extremely sticky and plastic when wet; slowly permeable; grades into the parent material of yellowish-red calcareous clay at depths of 5 to 8 feet.

In areas between hog wallows the surface layer is from 5 to 10 inches thick; in hog wallows it is as much as 60 inches thick. In color the surface layer ranges from gray to black.

Included with Lake Charles clay are soils of the Bernard, Edna, and Beaumont series. Usually the Bernard soil is a narrow band that is included where Bernard and Lake Charles soils merge. It differs from Lake Charles clay in having a clay loam surface layer. The Edna soils occur in small roundish spots where the Bernard-Edna complex merges with Lake Charles clay. These included areas may contain up to 15 percent of Edna soils. The Beaumont soil occurs in small poorly drained areas intermixed with the Lake Charles clay. Less than 1 percent of the total area of Lake Charles clay consists of the included soils.

Lake Charles clay has a great swelling and contracting ratio. Upon drying, cracks form that are 2 to 6 inches wide, from 1 to 6 feet long, and as much as 3 feet or more deep. This cracking and consequent sloughing and swelling when wet is the cause of the hog-wallowed surface.

Lake Charles clay, 0 to 1 percent slopes, is in capability unit I–1.

Lake Charles clay, 1 to 4 percent slopes (Lb).—This soil differs from Lake Charles clay, 0 to 1 percent slopes, in gradient and in having thinner soil layers overlying the yellowish-red underlying material (fig. 5). In addition, the surface does not have the distinct hog-wallowed microrelief but is a series of low parallel ridges and shallow swales perpendicular to the slope. The A horizon is dark gray and ranges in thickness from 5 inches on the ridges to 40 or 46 inches in the swales. It is thinner as the slopes increase.

Included are small roundish spots of a reddish-brown calcareous clay and small areas of Bernard clay loam. Both inclusions do not exceed 2 percent of the total area of this mapping unit. This soil can be cultivated, but careful management is needed to prevent erosion.

Lake Charles clay, 1 to 4 percent slopes, is in capability unit IIe–1.

Figure 5.—**Lake Charles clay with a moderate fine and medium subangular blocky structure. Below 42 inches is reddish calcareous clay.**

Lake Charles complex, 4 to 8 percent slopes (Lc).—This soil complex occupies slopes between the prairie and the flood plains of the Brazos and the San Bernard Rivers. About 75 percent of it is Lake Charles clay. The rest consists of Bernard and Edna soils and a reddish-brown calcareous unidentified soil. Erosion has removed the dark-colored surface soil from the unidentified soil. The Bernard and Edna soils generally occupy ridges between the heads of drainageways. The A horizon of the Lake Charles soil is very dark gray, and it ranges from 6 to about 24 or 30 inches in thickness.

The soils in this mapping unit can be cultivated, but probably the best use for them is pasture. Erosion is a moderate to severe hazard in cultivated fields.

The Lake Charles complex, 4 to 8 percent slopes, is in capability unit IVe-1.

Miller Series

The Miller series consists of reddish calcareous bottom-land soils with a heavy clay substratum. These soils are productive and drought resistant. They occur mostly in level and nearly level areas, but in a few places the surface is undulating and sloping.

Miller fine sandy loam (Mb).—A characteristic profile follows:

0 to 25 inches, reddish-yellow fine sandy loam; calcareous; friable when moist and slightly hard when dry.
25 to 48 inches+, dark reddish-brown clay; calcareous; massive.

In places where the lime has been leached, the surface layer is noncalcareous. This layer consists of alluvial sediments from 20 to 30 inches thick that have been deposited on the original clay surface soil. The layer ranges from pink to reddish-yellow fine sandy loam to loamy fine sand. The substratum is a dark-gray to grayish-brown clay in places. These areas probably represent old buried soils.

Miller fine sandy loam is in capability unit I-3.

Miller silt loam (Mc).—This is a productive soil of the Brazos River bottom lands. It generally occupies natural levees along the present and old abandoned channels of the river.

0 to 12 inches, reddish-brown silt loam; calcareous; very crumbly and friable when moist and hard when dry; numerous fragments of snail shells; rests on the substratum.
12 to 42 inches+, dark reddish-brown clay; calcareous; very firm when moist, very hard when dry, and very sticky and plastic when wet; slowly permeable.

The surface layer ranges from 5 to 20 inches in thickness. It ranges in color from brown to reddish brown and in texture from very fine sandy loam to loam. In many areas this horizon contains thin strata or lenses of clay, silty clay loam, or loamy fine sand. The substratum ranges from reddish brown to dark reddish brown. In many areas the substratum is dark-gray to dark grayish-brown clay which is probably a buried soil.

Included with this mapping unit are small areas of Miller fine sandy loam. They are mostly on low ridges. Also included are areas of Miller silty clay loam in shallow swales that comprise about 5 percent of this mapping unit.

Miller silt loam is in capability unit I-2.

Miller silty clay loam (Md).—A representative profile follows:

0 to 8 inches, reddish-brown silty clay loam; calcareous; friable and crumbly when moist and slightly sticky when wet.
8 to 42 inches+, reddish-brown clay; calcareous; crumbly in the upper part when moist, very sticky and plastic when wet, and very hard when dry; slowly permeable.

The surface layer ranges from 4 to 12 inches in thickness and from reddish brown to dark reddish brown in color. The substratum in some areas is a dark-gray clay and probably is an old buried soil.

About 3 percent of this mapping unit is Miller silt loam, occurring on low ridges, and about 2 percent is Miller clay, occurring in shallow swales.

Miller silty clay loam is in capability unit I-2.

Miller clay (Ma).—This soil occurs on large nearly level bottom lands. It is fertile, productive, and the most extensive bottom-land soil in the county.

0 to 16 inches, dark reddish-brown heavy clay; calcareous; crumbly when moist and very sticky and plastic when wet; breaks down into many small granules when exposed; slowly permeable.
16 to 46 inches+, reddish-brown clay; very firm when moist, very hard when dry, and very sticky and plastic when wet; slowly permeable; massive.

The surface layer ranges from brown to dark reddish brown. The upper part of this horizon in some small areas is noncalcareous. A dark-gray to dark grayish-brown substratum occurs in parts of many areas of this soil. It is probably a buried soil beneath the more recently deposited reddish surface layer. Depth to this substratum ranges from 12 to 24 inches.

Included with Miller clay are small areas of Miller silt loam and Miller silty clay loam that occur on slightly higher positions on the landscape. Included also are small areas of Norwood clay on low ridges, of Pledger clay in shallow swales, and of Roebuck clay in small enclosed depressions. Individual included areas are 5 acres or less, and the sum of all inclusions is less than 5 percent of the total acreage of Miller clay.

Miller clay is in capability unit I-4.

Miller-Roebuck clays (Me).—This complex consists of approximately 65 percent Miller clay, 30 percent Roebuck clay, and 5 percent Norwood clay. It occupies the bends and adjacent areas of the Brazos River. Overflows occur at intervals of about 12 years. The surface of the complex is a series of parallel ridges and swales. Miller clay occupies most of the ridges and some of the better drained swales. Roebuck clay is in the poorly drained or enclosed swales, and Norwood clay is on a few of the ridges. Profiles of these soils are described under their series names. Poor drainage and a rough surface make cultivation almost impossible. If these soils are cleared of trees and other growth, excellent pastures can be developed.

Miller-Roebuck clays are in capability unit Vs-1.

Navasota-Iuka Series

The soils in this complex occur in an intricate pattern and are not mappable as separate units.

Navasota-Iuka complex (Na).—This complex consists of 30 to 40 percent Iuka soils and from 60 to 70 percent Navasota soils. It is in the upper part of the San Bernard River flood plain. Overflows are frequent, and water stands for several days to weeks at a time. This complex consists of a series of low narrow ridges and broad shallow sloughs that are too narrow to map separately. The ridges are generally occupied by sandy Iuka soils; the sloughs by Navasota clay and clay loam.

A characteristic profile of Navasota clay is:

- 0 to 8 inches, dark-gray clay, weakly spotted with grayish brown; acid; very firm when moist and very sticky and plastic when wet; massive; boundary clear.
- 8 to 44 inches+, grayish-brown clay, distinctly mottled with dark brown; acid; very firm when moist and very plastic and sticky when wet; massive.

Clay is the main texture, but the surface layer in some areas consists of dark-gray clay loam from 2 to 10 inches thick. The profile color ranges from dark gray to dark grayish brown mottled throughout with various shades of brown and yellow. Stratified clay loam and fine sandy loam are common below a depth of 24 inches.

A characteristic profile of Iuka clay loam is:

- 0 to 6 inches, dark grayish-brown clay loam; slightly acid; crumbly and friable when moist and sticky when wet; boundary clear.
- 6 to 42 inches+, light-gray sandy clay loam, strongly mottled with yellowish brown; acid; friable when moist, and hard when dry.

The texture of the surface layer ranges from clay loam to loamy fine sand. The lower part is stratified brownish fine sandy loam to grayish clay loam.

Small areas of Kaufman clay are included with this complex. These included areas occur in the lower part of the San Bernard River flood plain where the complex gradually grades to Kaufman clay.

The Navasota-Iuka complex is in capability unit Vw-1.

Norwood Series

The Norwood series consists of calcareous soils on the flood plain of the Brazos River. Most areas are nearly level, but a few consist of low parallel ridges and shallow swales. Norwood soils are well suited for field crops and pasture.

Norwood silt loam (Nc).—A characteristic profile follows:

- 0 to 18 inches, reddish-brown silt loam; strongly calcareous; very friable and crumbly when moist, slightly sticky when wet; moderately permeable; many fragments of snail shells; boundary gradual.
- 18 to 44 inches+, light reddish-brown silt loam; strongly calcareous; very friable and crumbly when moist, slightly sticky when wet; moderately permeable.

The surface layer ranges from 12 to 24 inches in thickness and from light reddish brown to reddish brown in color. In small areas the texture is a very fine sandy loam. The 18- to 44-inch layer is often stratified with thin lenses of silty clay loam and fine sandy loam. Some areas are underlain by strata of clay at depths of 30 to 40 inches. Other small areas are underlain by a grayish-brown material that probably is a buried soil.

Included with Norwood silt loam are small swales of Norwood silty clay loam comprising about 5 percent of the unit. Also included are narrow bands of Miller silt loam that occur where the Norwood silt loam merges with Miller clay or with other Miller soils. Some small knolls of Asa loam and Asa fine sandy loam are also included.

Norwood silt loam is in capability unit I-2.

Norwood silty clay loam (Nd).—A characteristic profile follows:

- 0 to 16 inches, dark-brown silty clay loam; calcareous; friable and crumbly when moist, hard when dry, and moderately sticky when wet; boundary gradual.
- 16 to 46 inches +, yellowish-red silt loam; strongly calcareous; very friable and crumbly when moist, slightly sticky when wet; moderately permeable.

The surface layer ranges from 6 to 20 inches in thickness and from dark brown to light reddish brown in color. In many places the 16- to 46-inch layer is stratified with lenses of clay and fine sandy loam.

Included with Norwood silty clay loam are small areas of Miller clay, Miller silty clay loam, and Norwood silt loam. Miller clay occupies small depressions, generally less than 1 acre. Miller silty clay loam occurs as bands where the Norwood silty clay loam merges with Miller clay. Norwood silt loam occupies some of the low ridges within areas of Norwood silty clay loam.

Norwood silty clay loam is in capability unit I-2.

Norwood clay (Nb).—A characteristic profile follows:

- 0 to 20 inches, reddish-brown clay; calcareous; crumbly when moist, very hard when dry, and very plastic and sticky when wet; slowly permeable.
- 20 to 54 inches +, light reddish-brown silt loam; calcareous; very friable and crumbly when moist; moderately permeable; may or may not rest on a stratum of clay.

The surface layer ranges from 19 to 25 inches in thickness and from reddish brown to dark reddish brown in color. Some small inclusions are noncalcareous. The 20- to 54-inch layer ranges from silty clay loam to loam. In more than 80 percent of the area, strata of silty clay, silt loam, or loam occur within the 20- to 54-inch layer. A few small areas are underlain by a grayish-brown material that is probably a buried soil.

Included with the Norwood clay mapping unit are Miller clay, Norwood silty clay loam, Norwood silt loam, Asa fine sandy loam, and Asa silty clay loam. Miller clay occupies swales and flats in areas of less than 5 acres. It comprises less than 2 percent of the total area of Norwood clay. Norwood silty clay loam and Norwood silt loam occupy low ridges. They make up about 5 percent of the total area of Norwood clay. The Asa soils occur on small knolls.

Norwood clay is in capability unit I-4.

Pledger Series

The Pledger series consists of dark clay soils. They occupy level to nearly level flood plains of the Brazos and the lower San Bernard Rivers. Drainage of the surface improves this soil for cultivation.

Pledger clay (Pa).—A characteristic profile follows:

- 0 to 30 inches, very dark gray clay; alkaline; very firm when moist, very hard when dry, and extremely sticky and plastic when wet; slowly permeable; soil in the upper few inches is very crumbly in cultivated fields; boundary gradual.
- 30 to 40 inches, brown clay; calcareous.
- 40 to 50 inches +, reddish-brown clay; calcareous; very firm when moist, very hard when dry, and very plastic and sticky when wet; slowly permeable; massive.

The surface layer is 14 to 30 inches thick. It ranges in color from very dark gray to dark brown and in texture from clay to silty clay. In places the layer of reddish-brown clay is stratified with materials of other textures, some of which are as light as very fine sandy loam. In a few places the lighter textured strata occur at depths of about 24 inches. Areas of soils that contain these strata are too small to be mapped.

Included with the Pledger clay are Miller clay, Pledger silty clay loam (not mapped in this county), Asa silty clay loam, and Roebuck clay. Miller clay comprises less than

1 percent of the Pledger clay mapping unit. Pledger silty clay loam and the Asa silty clay loam occupy low ridges or crests of slopes along drainageways. Pledger silty clay loam occurs as small areas of less than 1 acre. Where the proportion of Asa soils with Pledger clay exceeds about 20 percent, the areas were mapped as the Asa-Pledger complex. Roebuck clay, comprising less than 1 percent of the total area of Pledger clay, occurs as small depressions containing less than 5 acres.

Pledger clay is in capability unit I–4.

Roebuck Series

The Roebuck series consists of brownish poorly drained soils occupying the natural depressions of the Brazos River flood plain. These soils have to be drained before they can be cultivated or used as improved pasture.

Roebuck clay (Ra).—A characteristic profile follows:

0 to 15 inches, dark-brown clay; calcareous; very firm when moist, very hard when dry, and extremely plastic and sticky when wet; slowly permeable; boundary gradual.

15 to 42 inches +, reddish-brown clay with dark-gray and yellowish-brown spots; calcareous; very firm when moist, very hard when dry, and extremely sticky when wet; slowly permeable; a few small concretions of calcium carbonate.

The surface layer ranges from 10 to 20 inches in thickness and from brown to dark grayish brown in color.

Included with this mapping unit is a variant that is a very dark gray noncalcareous clay in the upper 12 to 30 inches.

Roebuck clay is in capability unit IIIw–2.

Sandy Alluvial Land

Sandy alluvial land (Sa).—This land type consists of mixed stratified sandy, silty, and clayey alluvium in bends of the Brazos River. It is on the lowest part of the flood plain adjacent to the river and occupies positions from the normal waterline to as much as 25 feet above it. The lowest areas are flooded each year; higher lying areas are flooded but once in 10 to 12 years.

The soils are so intricately mixed that they cannot be mapped separately. They range from loamy sands to clays. The sandy and silty soils generally occupy ridges, and the clays and silty clay loams are in swales. Many swales are also sandy. The sandy and silty soils are generally stratified with a droughty loamy fine sand and sand.

The surface is a series of parallel ridges and swales. Native areas are densely covered by trees, shrubs, and vines. The cleared areas soon become well sodded with bermudagrass.

This land type is generally considered unsuitable for cultivation because of the uneven surface and the hazard of floods. Excellent pastures can be established by clearing, fertilizing, and seeding.

Sandy alluvial land is in capability unit Vs–1.

Sloping Alluvial Land

Sloping alluvial land (Sb).—The approximate composition of this land type is as follows: Norwood soils, 32 percent; Miller soils, 32 percent; Pledger soils, 15 percent; Roebuck soils, 11 percent; and Asa soils, 10 percent.

This land type consists of old abandoned stream channels or sloughs and the sloping banks on the sides of channels throughout the Brazos River flood plain. Areas are long, narrow, and irregular and range from about 150 to 600 feet in width. Generally, about one-third of the width is old slough bottom and two-thirds slope. The slough bottoms are of Roebuck clay and poorly drained Pledger clay. The slopes may consist of the sandy, silty, or clayey soil types of the Asa, Norwood, Miller, and Pledger series.

Slopes range from 2 to 20 percent, but the average slope is about 8 percent.

Sloping alluvial land is in capability unit VIe–1.

Waller Series

The Waller series consists of grayish acid wet soils occurring in small shallow rounded depressions on the Gulf Coastal Prairie. These depressions range from less than 1 acre to 25 or 30 acres in size, and they are generally from 6 to 10 inches lower than the surrounding prairie. Water stands in the depressions for long periods.

Waller soils (Wa).—A characteristic profile follows:

0 to 12 inches, light-gray loam with a few fine yellowish-brown spots; acid; friable when moist, extremely hard when dry; boundary abrupt.

12 to 52 inches, mottled gray, reddish-yellow, and brownish-yellow sandy clay in the upper part, gradually changing to a very pale brown sandy clay loam mottled with brown, yellowish red, and pale yellow in the lower part; acid; very hard when dry; very slowly permeable; massive and porous; boundary gradual to parent material consisting of light-gray sandy clay loam distinctly mottled with brown and yellowish brown.

The surface layer ranges from fine sandy loam to sandy clay loam. The texture varies within depressions and from one depression to another. The color of the surface layer ranges from gray to light brownish gray. From zero to 15 percent of the exposed surface is mottled. The 12- to 52-inch layer ranges from gray to white; mottling occurs in various shades of yellow, brown, and red on 5 to 20 percent of the exposed surface. Pockets and lenses of white sand occur throughout the profile.

Included in the Waller mapping unit are small wet areas of Edna soils. Waller soils are in capability unit IVw–2.

Waller-Katy complex, slightly saline (Wb).—This mapping unit consists of approximately 30 percent Katy fine sandy loam, 30 percent Waller soils, 10 percent Clodine fine sandy loam, and 30 percent small white spots that are slightly saline. These soils are so intricately mixed that they cannot be mapped separately.

The white spots are irregularly shaped, contain less than 3 acres, and in places are only a few feet wide. They occur in flat areas between sandy mounds of the Katy soils, or they surround the base of mounds. The Waller soils are in distinct depressions between the mounds. The intervening flats between the mounds are occupied by Clodine fine sandy loam, by an intergrade between the Clodine and the Waller soils, and by the white spots. Profiles of the Katy, Waller, and Clodine soil members of this complex are described under the Katy, Waller, and Clodine series.

A characteristic profile from a white spot follows:

0 to 12 inches, light brownish-gray heavy fine sandy loam; alkaline; friable when moist and extremely hard when dry; very slowly permeable; porous; breaks out in coarse prisms; numerous very small lumps of salts; boundary gradual.

12 to 24 inches, gray clay loam, lower part faintly spotted with pale brown; upper part seems to be weakly cemented; very slowly permeable; natural soil aggregates are coated dark gray; boundary gradual.
24 to 56 inches, light-gray sandy clay loam mottled with yellow; concretions of calcium carbonate as much as 1½ inches in diameter comprise about 2 percent of the soil mass, boundary gradual.
56 to 120 inches+, white sandy clay mottled with brownish yellow; lenses of white sand noticeable in crevices.

These white spots are poorly drained, and they are poor for crops. The Waller-Katy complex, slightly saline, is in capability unit IVw-1.

Waste Land

Waste land (Wc).—This mapping unit consists of areas, usually enclosed by low earthen dikes, that have been used for the ponding of waste oil, salt water, and other toxic substances from sulfur and oil wells. The vegetation has been killed. Productivity probably cannot be restored for a long time after present use is discontinued.

Yahola Series

The Yahola series consists of reddish sandy calcareous soils. They generally occur on natural levees along the present and old channels of the Brazos River. The surfaces are convex, and in places the slopes are as much as 1 percent.

Yahola fine sandy loam (Ya).—A characteristic profile follows:

0 to 28 inches, reddish-brown fine sandy loam, lighter colored and slightly heavier textured in the lower part; calcareous; very friable when moist, slightly hard when dry; moderately permeable; many fragments of snail shells; boundary abrupt.
28 to 60 inches+, light reddish-brown light fine sandy loam stratified with silt loam and very fine sandy loam and with lenses of clay; calcareous; rapidly permeable.

The surface layer ranges from 15 to 30 inches in thickness. In color it ranges from pale brown to reddish brown and in texture from fine sandy loam to loamy fine sand. Stratification varies within the same area and from one area to another. A few small areas are underlain by a dark grayish-brown layer at depths ranging from 12 to 30 inches. This layer is an old soil recently buried by alluvial sediments.

Included with this mapping unit are small bands and areas of Miller silt loam and Norwood silt loam that are too small to be of significance in use and management.

Yahola fine sandy loam is in capability unit I-3.

Use and Management of Soils

In this section there is a general discussion of prevailing management and improved management. In addition, the soils of Fort Bend County are grouped into capability classes and units and the use and management of each capability unit are discussed. The average yields of principal crops grown under the prevailing management and the yields expected under improved management are given.

Prevailing Management

The moderately fertile heavy soils of uplands are mostly in small farms operated by owners. Very little of this acreage has reverted to pasture. The sandy soils of uplands are droughty and of low to moderate fertility. Some of these soils are no longer cultivated and are used for pasture.

In the Brazos River flood plain, the soils are used mostly for cotton and corn. Small acreages are used for alfalfa, sorghum, oats, and sudangrass. The Texas Prison System plants a large acreage in vegetables. Yields of crops in this area are high, but farmers increase them by use of fertilizers and by plowing under winter legumes.

A large acreage of the fertile soils in the flood plain of the Brazos River has reverted to pasture from cultivation. Absentee owners and the ownership of land in large blocks are mainly responsible for this shift in land use. Most farmers maintain drainage ditches and control insect pests.

Pastures.—Pastures are of two kinds—native and tame. Native pastures or grasslands predominate. They have been severely overgrazed, and many of the best species of grasses are almost extinct. Close grazing temporarily stops root growth (*3*) [1] and reduces vigor of the plants. Because of the poor vigor of the remaining grasses, weeds and low-quality grasses have become the principal range plants. The badly deteriorated native grasslands do not produce enough forage the year round, and very little is being done to improve them. Many operators control weeds to some extent, and a few of them control the grazing. In the past several years, a few small tame pastures have been established.

Crops.—Cotton and corn are the most important crops. Some farmers improve the yields from these crops by using fertilizers and by planting legumes. Crops that follow corn or cotton also benefit from the carryover effects of these soil amendments.

Row crops are generally rotated, but cotton is often grown on the same land from 2 to 4 consecutive years. Cotton land is improved by growing winter legumes as a green-manure crop.

The rotation of rice with cultivated crops has not proved practical. Rice is usually grown for 1 to 3 years on the same land. Cattle are generally pastured on rice fields as soon as the crop is harvested. They forage on green stubble, spilled grain, and volunteer rice plants. The fields are used as unimproved pasture for 2 or more years, or they are allowed to lie idle. Very few rice farmers attempt to increase forage by fertilizing and seeding pasture plants on old rice fields.

Woodland.—About 73,000 acres in the county are wooded. Most of the trees are low-grade hardwoods having little or no commercial value. Most woodlands are in the flood plains of rivers or on land adjacent to them. They are used for pasture, and little or no effort is made to improve the grazing capacity. Small acreages are cleared from year to year and planted to suitable forage species for improved pasture.

Drainage.—Drainage is a greater problem than erosion. More than 95 percent of the uplands have slopes of 1 percent or less. Only about 8 percent of the sloping or gently sloping uplands was cultivated in 1955. Twenty-five miles of terraces had been constructed to 1955.

Except in periods of excessive rain, most fields are drained adequately by ditches along turnrows and roadsides. Large fields are drained by supplemental drainage ditches.

[1] Italic numbers in parentheses refer to Literature Cited, p. 49.

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The Fort Bend County Drainage District has cleaned and enlarged all of the natural drains in the county except the Brazos and the San Bernard Rivers.

Suggestions for Improved Management

The upland soils are all moderate to low in supplies of phosphorus and nitrogen. The finer textured soils are moderate to high in supplies of potassium, but the sandy soils are low in this element. The productivity can be improved by adding fertilizers in amounts indicated by soil tests, or by the results obtained from experiments and field trials. The soils of Fort Bend County are not known to be deficient in any of the minor elements needed as plant nutrients.

Soils of the Brazos River flood plain have been farmed for many years, but they are still fertile and productive. However, the productivity can be increased by fertilizing and by using legumes in rotations with other crops. These practices improve the moisture-holding capacity and the permeability of the soils.

The soils should be worked at the proper moisture content, as a pan is formed if they are plowed when too wet. A pan can be broken most effectively by plowing deeply or by chiseling. A crop of grass or legumes also helps to eliminate the pan.

Pastures.—Native grasslands can be improved by deferred grazing, reseeding, uniform grazing, fertilizing, cross-fencing, and improving the supplies and distribution of water.

Ranchers need high-quality forage to supplement low-producing periods in their native grasslands. Tame pastures consisting of a perennial base grass overseeded with adapted legumes are profitable. Ranchers can provide almost continuous grazing by choosing suitable plants, establishing both cool-season and warm-season perennial grass pastures on separate fields, planting annual grasses to supplement these pastures, and fertilizing the perennial and supplemental grasses.

Table 4 shows the plants suitable for tame pastures on soils of Fort Bend County.

TABLE 4.—*Plants suitable for tame pasture on soils of Fort Bend County*

Soils	Warm-season pasture		Cool-season pasture	
	Perennial	Supplemental	Perennial	Supplemental
Asa fine sandy loam. Asa-Pledger complex. Miller fine sandy loam. Miller silt loam. Norwood silt loam. Sandy alluvial land. Sloping alluvial land. Yahola fine sandy loam.	Dallisgrass. Bermudagrass (common and coastal). Lespedeza. Hubam clover. Angletongrass. Medio bluestem.	Sudangrass. Johnsongrass.	Whiteclover. Rescuegrass (Texas 46). Burclover. Hubam clover.	Oats, wheat, barley. Vetch. Singletary peas.
Asa silty clay loam. Kaufman clay. Miller silty clay loam. Miller clay. Miller-Roebuck clays. Norwood silty clay loam. Norwood clay. Pledger clay. Roebuck clay.	Dallisgrass. Bermudagrass (common and coastal). Lespedeza. Angletongrass. Medio bluestem.	Sudangrass. Johnsongrass. Alfalfa. Millet. Alyce clover.	Louisiana red clover. Whiteclover. Fescue (Kentucky 31). Rescuegrass (Texas 46). Burclover. Hubam clover. Alfalfa. Alyceclover.	Oats, wheat, barley. Vetch. Ryegrass. Singletary peas.
Beaumont clay. Bernard clay loam, 0 to 1 percent slopes. Lake Charles clay, 0 to 1 percent slopes.	Dallisgrass. Bermudagrass (common and coastal). Little bluestem. Longtom. Angletongrass. Blue panicum. Medio bluestem.	Sudangrass. Johnsongrass. Millet. Alyce clover.	Louisiana red clover. Whiteclover. Burclover. Rescuegrass (Texas 46). Hubam clover. Fescue (Kentucky 31).	
Bernard-Edna complex, 0 to 1 percent slopes. Edna fine sandy loam, 0 to 1 percent slopes. Edna fine sandy loam, 1 to 4 percent slopes. Edna-Waller complex. Waller soils. Waller-Katy complex, slightly saline.	Bermudagrass (common). Little bluestem. K-R bluestem.	Sudangrass. Millet.	Burclover. Hubam clover. Alsike clover.	Oats, wheat, barley. Vetch. Ryegrass.
Bernard-Edna clay loams, 1 to 4 percent slopes. Bernard-Edna clay loams, 4 to 8 percent slopes. Fulshear fine sandy loam, 1 to 4 percent slopes. Lake Charles clay, 1 to 4 percent slopes. Lake Charles complex, 4 to 8 percent slopes.	K-R bluestem. Bermudagrass (common). Hubam clover. Angletongrass. Medio bluestem.	Sudangrass. Angletongrass. Medio bluestem. Alyce clover.	Hubam clover. Burclover. Rescuegrass (Texas 46). Fescue (Kentucky 31). Whiteclover. Red clover.	Oats, wheat, barley. Vetch. Ryegrass.

TABLE 4.—*Plants suitable for tame pasture on soils of Fort Bend County*—Continued

Soils	Warm-season pasture		Cool-season pasture	
	Perennial	Supplemental	Perennial	Supplemental
Bibb fine sandy loam Navasota-Iuka complex	Lespedeza Bermudagrass Dallisgrass Fescue (Kentucky 31)	Sudangrass	Burclover Rescuegrass (Texas 46) Fescue (Kentucky 31) Whiteclover (if protected). Louisiana red clover (if protected).	
Clodine fine sandy loam Hockley loamy fine sand, 1 to 4 percent slopes. Katy fine sandy loam, 0 to 1 percent slopes. Katy fine sandy loam, 1 to 4 percent slopes. Katy-Waller complex	Bermudagrass (common and coastal). Dallisgrass Little bluestem Blue panicum	Sudangrass Johnsongrass Angletongrass Medio bluestem Alyce clover	Burclover Crimson clover Whiteclover	Oats, wheat, barley. Vetch. Ryegrass.
Kenney loamy fine sand, 0 to 2 percent slopes. Kenney loamy fine sand, 2 to 6 percent slopes. Kenney-Fulshear complex, 4 to 8 percent slopes.	Blue panicum Weeping lovegrass	----------------	Weeping lovegrass	Oats, wheat, barley. Vetch.

Crops.—Experiments at the Rice-Pasture Experiment Station near Beaumont, Texas, show that rotations of rice and improved pasture increase the yields of rice and the pounds of beef per acre from the pasture (*7*). Rice-growers who do not have livestock can increase their yields of rice by rotating the crop with a cover of Hubam clover and Singletary peas followed by Alyce clover in summer.

Riceland can be converted to pasture by broadcasting grass and clover seed in standing rice at the last draining before harvest, and in rice stubble after harvest. Dallisgrass and clover are good for improved pasture. Bermudagrass, ryegrass, and tall fescue are also good in a rotation of rice and pasture if seeded at the proper time or allowed to volunteer.

To obtain highest crop yields, especially of cotton, insect pests must be controlled.

Fertilizer.—Legumes should be inoculated, properly fertilized with phosphate and potash, and then plowed under as green manure. Residues from fertilizer applied to legumes improves the yields of crops that follow in the rotation. The response of crops to fertilizers is best if soils are in good tilth.

Native pastures can be improved by applying nitrogen, phosphate, and potash to the soil. Phosphate alone seldom improves the growth of grasses, but it will increase the phosphorus content of the forage.

Fertilizers for the various crops and pastures should be applied in the kind and quantity indicated by soil tests.

Erosion control.—Terraces are needed to control runoff and erosion on slopes greater than 1 to 1½ percent. Supplemental practices should include cultivation along the contour and the maintenance of terraces and terrace outlets. Outlets and waterways should be established in grasses before the terraces are built.

Suggestions for improved management of soils by capability units are given in the following section.

Capability Groups of Soils

Capability grouping is a system of classification used to show the relative suitability of soils for crops, grazing, forestry, and wildlife. It is a practical grouping based on the needs, limitations, and risks of damage to the soils, and also on their response to management. There are three levels above the mapping unit in the grouping—unit, subclass, and class.

The capability unit, sometimes called a management group, is the lowest level of grouping. A capability unit consists of soils that are similar in kind of management they need, in risk of damage, and in general suitability for use.

The next broader grouping, the subclass, is used to indicate the dominant kind of limitation. The letter symbol "e" means that the main limiting factor is risk of erosion if the plant cover is not maintained; "w" means that excess water retards plant growth or interferes with cultivation; and "s" shows that the soils are shallow, droughty, or unusually low in fertility.

The broadest grouping, the land class, is identified by Roman numerals. All the soils in one class have limitations and management problems of about the same degree, but they are of different kinds as shown by the subclass. All the land classes except class I may have one or more subclasses.

In classes I, II, and III are soils that are suitable for annual or periodic cultivation of annual or short-lived crops. Class I soils are those that have the widest range of use and the least risk of damage. They are level, or nearly level, productive, well drained, and easy to work. They can be cultivated with almost no risk of erosion and will remain productive if managed with normal care.

Class II soils can be cultivated regularly but do not have quite so wide a range of suitability as class I soils. Some class II soils are gently sloping; consequently, they need moderate care to prevent erosion. Others may be slightly droughty or slightly wet, or somewhat limited in depth.

Class III soils can be cropped regularly but have a narrower range of use. These need even more careful management.

In class IV are soils that should be cultivated only occasionally or only under very careful management.

In classes V, VI, and VII are soils that normally should not be cultivated for annual or short-lived crops, but they can be used for pasture or range, as woodland, or for wildlife.

Class V soils are nearly level and gently sloping but are droughty, wet, low in fertility, or otherwise unsuitable for cultivation.

Class VI soils are not suitable for crops because they are steep or droughty or otherwise limited, but they give fair yields of forage or forest products. Some soils in class VI can, without damage, be cultivated enough so that fruit trees or forest trees can be set out or pasture crops seeded.

Class VII soils (none in Fort Bend County) provide only poor to fair yields of forage or forest products.

Class VIII soils (none in Fort Bend County) have practically no agricultural use. Some of the soils have value as watersheds, wildlife habitats, or recreation areas.

Capability classes and units in Fort Bend County are given in the following list.

Class I.—Soils that have few limitations in use.
- I–1: Nearly level, slowly permeable clays and clay loams.
- I–2: Nearly level, sandy and silty, slowly and moderately permeable bottom-land soils, infrequently flooded.
- I–3: Nearly level, sandy, moderately permeable bottom-land soils, infrequently flooded.
- I–4: Nearly level, clayey, slowly permeable bottom-land soils, infrequently flooded.

Class II.—Soils moderately limited for use as cropland.
- IIe–1: Gently sloping, slowly permeable clays and clay loams.
- IIe–2: Gently sloping, thick-surfaced, very slowly permeable fine sandy loams and moderately permeable loamy fine sands.
- IIs–1: Nearly level, very slowly permeable fine sandy loams and clay loams.

Class III.—Soils severely limited for cropland but suitable for a regular cropping system.
- IIIe–1: Gently sloping, slowly permeable and very slowly permeable fine sandy loams.
- IIIw–1: Nearly level, slowly permeable clays, slightly wet.
- IIIw–2: Depressed, slowly permeable bottom-land clays, wet.
- IIIs–1: Gently sloping, deep loamy fine sands.

Class IV.—Soils fairly well suited for limited or occasional cultivation under careful management.
- IVe–1: Sloping, slowly permeable clays and clay loams.
- IVw–1: Nearly level, slightly wet, very slowly permeable fine sandy loams.
- IVw–2: Depressed, very slowly permeable soils, wet.
- IVs–1: Sloping, deep loamy sands.

Class V.—Soils suitable for permanent vegetation with few or no permanent limitations.
- Vw–1: Sandy and clayey alluvial soils, frequently overflowed.
- Vs–1: Billowy, slowly permeable bottom-land clays and sands, occasionally overflowed.

Class VI.—Soils suitable for permanent vegetation with moderate limitations.
- VIe–1: Sloping alluvial soils.
- VIe–2: Sloping, deep loamy fine sands.

Description of capability units

In this section each capability unit is described and the soils in it are listed. In addition, suggestions are given about how to use and manage the soils of each unit.

CAPABILITY UNIT I-1

Nearly level, slowly permeable clays and clay loams.

Bernard clay loam, 0 to 1 percent slopes.
Lake Charles clay, 0 to 1 percent slopes.

These are the most productive upland soils and among the best rice soils in Fort Bend County. The supply of plant nutrients, except phosphorus, is high. The plant and soil-moisture relationship is fair. The soils have enough drainage for row crops, but all areas benefit from shallow field ditches.

The most commonly grown crops are cotton, rice, corn, sorghum, and small acreages of oats, winter peas, annual sweetclovers, and sudangrass. Alfalfa, cantaloups, and vegetables can also be grown.

Soil productivity can be improved by fertilizing with nitrogen and phosphate and by growing inoculated legumes at least every 3 or 4 years. The legumes should be fertilized with phosphate and plowed under as green manure to improve tilth, aeration, and permeability of the soil. The deep-rooted Hubam and Madrid clovers furnish organic matter and help to open the soil.

Fertilizers should be applied to all crops that do not follow legumes. Cotton should be given about 20 pounds of nitrogen and 40 pounds of phosphoric acid (P_2O_5) per acre before or at planting time. Corn and sorghum can be fertilized at the same rate, but they should be given an additional 30 pounds per acre of nitrogen as a side dressing when the crop is 24 to 30 inches tall.

Alfalfa grows well on these soils and should be fertilized with about 60 to 80 pounds per acre of phosphorus. Yields of about 2 tons per acre can be expected the first year, but after that the stand becomes thin. Growth is best during the cool season, but during the hot dry summers, alfalfa stands deteriorate rapidly. The deep roots of alfalfa improve the physical condition of the soil.

Rice grows well on these soils, and the best yields are obtained if the crop is topdressed with 80 pounds of nitrogen and 40 pounds of phosphorus per acre (*9*). The crop can be grown 2 years in succession in a 4-year rotation with improved pasture.

Although the soils in the capability unit can be managed alike, the Bernard clay loam can be worked earlier in spring and it dries faster after rains in summer. It can be worked at a higher moisture content than the Lake Charles clay, and it requires less power for plowing and cultivating.

Native meadows consist of little and big bluestem, Indiangrass, and species of *Paspalum* and *Panicum*. Tame pastures are mainly of bermudagrass and dallisgrass. Some pastures are infested with huisache bushes. Forage yields can be increased somewhat by applying phosphate (fig. 6).

***Figure 6.*—Improved pasture on Lake Charles clay consisting of lespedeza, white clover, bermudagrass, and dallisgrass that have been fertilized with 100 pounds per acre of phosphoric acid.**

CAPABILITY UNIT I-2

Nearly level, sandy and silty, slowly and moderately permeable bottom-land soils, infrequently flooded.

Asa fine sandy loam.
Norwood silt loam.
Miller silt loam.
Asa silty clay loam.
Norwood silty clay loam.
Miller silty clay loam.
Asa-Pledger complex.

These are fertile, productive, easily worked soils of the bottom lands. They are not as drought resistant as the finer textured soils of the bottom lands. The Asa soils seem to be more droughty than the Norwood soils. The Asa-Pledger complex has a slightly uneven surface. The soils need shallow field ditches in low spots for drainage in wet seasons.

The main crops are cotton, corn, alfalfa, and sorghum. Other crops that grow well are sudangrass, oats, rye, vetch, market vegetables, sweetclovers, and summer and winter peas.

Yields of crops can be increased for 1 or 2 years by the effects of plowing under a crop of winter legumes. Best yields are obtained if the legumes are inoculated and fertilized with 40 to 60 pounds of phosphoric acid (P_2O_5) per acre. Alfalfa yields can be increased by fertilizing with 50 to 60 pounds of phosphoric acid per acre. Crops that do not follow legumes require fertilizer for highest yields.

Plow pans caused by heavy farm machinery are problems in these soils. The pan can be broken most effectively by plowing deeply or by chiseling. A crop of deep-rooted legumes such as Hubam clover and alfalfa also helps open the pan.

Excellent pastures can be developed on these soils. Yearlong grazing can be obtained by pasture rotation, proper grass and legume mixtures, supplemental grazing, fertilization, and other good management.

CAPABILITY UNIT I-3

Nearly level, sandy, moderately permeable bottom-land soils, infrequently flooded.

Yahola fine sandy loam.
Miller fine sandy loam.

These are fertile to moderately fertile easily worked soils of the bottom lands. They are slightly more droughty than the other bottom-land soils in this county. Because of its underlying layer of clay, Miller fine sandy loam is less droughty than the more porous Yahola fine sandy loam.

All crops suited to the climate can be grown on these soils. The yields of row crops can be increased for at least 1 year through the nitrogen added by plowing under alfalfa, sweetclovers, or annual winter legumes. Legumes also furnish organic matter to improve moisture-holding capacity. Legumes and summer crops should be given about 80 pounds of phosphoric acid (P_2O_5) every 3 years for best yields.

Suitable for tame pastures are ryegrass, bermudagrass, dallisgrass, rescuegrass, sudangrass, and johnsongrass. Suitable legumes are white, bur, and crimson clovers, Singletary peas, and vetch. Yearlong grazing from tame pastures can be obtained by pasture rotation, supplemental pastures, proper grass and legume mixtures and fertilizers, and control of grazing.

CAPABILITY UNIT I-4

Nearly level, clayey, slowly permeable bottom-land soils, infrequently flooded.

Miller clay.
Norwood clay.
Pledger clay.

This unit consists of fine-textured fertile soils of the bottom lands. Norwood clay is well drained. Miller and Pledger clays are moderately well drained, but they are helped by artificial drainage in wet seasons. These soils stay wet longer than the loamy bottom-land soils, and they are harder to work. Erosion is not a problem on these soils.

All crops suited to the climate grow well on the soils of this capability unit. They are especially good for cotton and alfalfa. Other crops that grow well are corn, sorghum, sweetclover, oats, rye, market vegetables, and winter and summer peas.

The soils in this unit are low in nitrogen. Crop yields can be increased for 1 to 2 years by plowing under a crop of legumes as green manure. Yields of crops that do not follow alfalfa or other legumes are increased by applying nitrogen. Corn should get 30 pounds of nitrogen per acre at planting time and an additional 30 pounds as a side dressing when the crop is about knee high. The addition of phosphate fertilizer is believed to improve stands of alfalfa. Deep-rooted legumes like alfalfa and

Hubam clover improve the physical properties and the permeability of these soils to moisture, air, and roots.

Suitable for tame pastures are dallisgrass, bermudagrass, ryegrass, rescuegrass, and fescue. For supplemental pasture sudangrass, johnsongrass, and oats are good. Legumes suitable for tame pastures are white, bur, and sweetclovers, and Singletary peas. Yearlong grazing can be obtained from tame pastures by following the practices suggested in capability unit I–3.

CAPABILITY UNIT IIe-1

Gently sloping, slowly permeable clays and clay loams.

Bernard-Edna clay loams, 1 to 4 percent slopes.
Lake Charles clay, 1 to 4 percent slopes.

This capability unit consists of moderately productive soils. Supplies of plant nutrients, except phosphorus, are moderate to high. Plant and soil-moisture relationships are fair. Erosion is a hazard on heavily grazed pastures and on cultivated fields.

Only about 15 percent of the acreage of the soils in this unit is in cultivation and 25 percent is in woodland. The rest is in pasture and woods. Usually these soils occur on long narrow slopes leading to natural drains. They are only a small part of farms made up mainly of nearly level soils. However, these sloping soils can be cultivated if they are protected from erosion by terraces. Close-growing crops should be planted each year on alternate terrace intervals to prevent erosion and to improve the supply of organic matter. Row crops should be planted along the contour and followed by winter legumes.

Phosphate applied to winter legumes improves this crop and the crop that follows the legumes. Crops that do not follow legumes should be fertilized for best yields. Cotton should get about 30 pounds of nitrogen and 60 pounds of phosphoric acid (P_2O_5) per acre. Corn should get similar quantities of fertilizer plus an additional 30 pounds of nitrogen per acre as a side dressing.

Wooded areas contain trees of little or no market value. The land can be improved for pasture by eradicating the trees and seeding suitable pasture plants. Bermudagrass, little bluestem, K–R bluestem, brownseed paspalum, and burclover are suitable for pastures. The grazing should be regulated. Contour furrows or pits about 8 to 10 feet apart help reduce runoff from pastures.

CAPABILITY UNIT IIe-2

Gently sloping, thick-surfaced, very slowly permeable fine sandy loams and moderately permeable loamy fine sands.

Katy fine sandy loam, 1 to 4 percent slopes.
Hockley loamy fine sand, 1 to 4 percent slopes.

The Hockley surface soil is sandier than that of the Katy soil. It also absorbs water more readily and is not so likely to be eroded. Terracing is not very successful on these soils because of their thick sandy surface soils.

Most of this unit is in pasture. The crops best suited to the soils are corn, sorghum, sudangrass, cotton, oats, peanuts, vetch, rye, and summer and winter peas. Rice is grown, but slopes make irrigation difficult.

Cultivation should be along the contour to reduce runoff and prevent erosion. Runoff can also be reduced and the productivity of the soil improved if legumes are properly fertilized and plowed under as green manure.

Pastures should be managed as suggested under capability unit IIs–1.

CAPABILITY UNIT IIs-1

Nearly level, very slowly permeable fine sandy loams and clay loams.

Bernard-Edna complex, 0 to 1 percent slopes.
Clodine fine sandy loam.
Edna fine sandy loam, 0 to 1 percent slopes.
Katy fine sandy loam, 0 to 1 percent slopes.

These soils are moderate to low in productivity and in natural fertility. Bernard and Edna soils are low in phosphorus, and the Edna is low in nitrogen and potassium. The compact subsoil claypan of the Edna soil makes it droughty. The Katy subsoil is dense compact sandy clay, but the 18- to 30-inch sandy loam layer readily holds available moisture and provides a moderately deep feeding zone for roots.

Many areas of Edna and Bernard soils have shallow depressions occupied by Waller soils. In cultivated fields, these depressions are problems and should be filled in. The deeper ones should be drained by field ditches.

The most commonly grown crops on the Bernard and Edna soils are cotton, rice, corn, and sorghum. Small acreages of sudangrass, sweetclover, oats, and summer and winter peas are also grown. Corn is an uncertain crop because moisture is short in supply during the critical period of growth in June and July.

Rice is the main crop on the Katy and Clodine soils (fig. 7). Other suitable crops are peanuts, corn, watermelons, cotton, vegetables, sorghum, vetch, and winter and summer peas. These sandy soils are generally used for rice 1 year and as unimproved rice pasture for 2 to 3 years. Yields of rice can be increased if the crop is

***Figure 7.*—Rice, the main cereal crop of Fort Bend County. The levees distribute water for proper irrigation of the crop.**

grown for 1 year followed by improved pasture for 3 years, or for 2 years followed by improved pasture for 5 years.

All rice farmers use commercial fertilizers. The Texas Agricultural Experiment Station reports that the best yields of rice are obtained from Katy fine sandy loam by applying 40 pounds of nitrogen, 40 pounds of phosphoric acid (P_2O_5), and 20 pounds of potash per acre. Yields of rice and the efficiency of irrigation are improved by leveling the mounds on the surface of the Katy soil.

Productivity of the soils in this unit can be improved by applying mixed fertilizer containing phosphate, potash, and nitrogen. Deep-rooted legumes as Hubam clover should be grown at least 1 year in 3 to furnish organic matter and to help make the subsoil more pervious to air, moisture, and roots. Legumes, preferably of the winter variety, should be grown each year on cropland and amply fertilized with 60 to 80 pounds of P_2O_5 per acre.

Corn or cotton needs no additional fertilizer when it follows a crop of well-fertilized Hubam clover, vetch, or Austrian Winter peas. Otherwise corn or cotton should be fertilized at planting time. For best yields corn needs an additional 60 pounds of nitrogen per acre applied as a side dressing when the crop is 24 to 30 inches tall. Good yields of rice can be obtained if the crop is properly fertilized and grown for 1 year in a 4-year rotation with pasture, or for 2 successive years in a 5-year rotation with pasture. If the pasture is properly managed and fertilized, yields of rice are increased.

Most areas of these soils are drained adequately in ordinary seasons by ditches in fields and along roads. After hard rains, however, water may stand long enough on some areas to damage crops.

Native pastures or grasslands consist mainly of Texas needlegrass, bermudagrass, smutgrass, carpetgrass, and three-awn grass; and little bluestem, several species of *Panicum*, brownseed paspalum, annual weeds, false indigo, and scattered huisache. The yield and palatability of forage can be improved by fertilizing every 2 years with nitrogen and by applying about 60 pounds of phosphoric acid (P_2O_5) and 30 pounds of potash per acre every 3 years. Artificial drainage will also benefit native grasslands.

CAPABILITY UNIT IIIe-1

Gently sloping, slowly permeable and very slowly permeable fine sandy loams.

Fulshear fine sandy loam, 1 to 4 percent slopes.
Edna fine sandy loam, 1 to 4 percent slopes.

These soils are low in supply of plant nutrients, and they are subject to erosion. Only a small percentage of the area is cultivated. The compact subsoil in the Edna soil causes management problems. The Fulshear soil does not have a compact subsoil and is more permeable than the Edna soil.

The main crops grown on these soils are cotton, sorghum, corn, and rice. Other crops that can be grown are oats, sudangrass, vetch, crotalaria, and summer and winter peas. Rice is grown, but slopes make irrigation difficult. Corn is not recommended on the Edna soil because it is droughty.

Productivity can be maintained and erosion prevented by the use of a system of terraces and by stripcropping. A rotation of alternating strips of close-growing crops such as the deep-rooted legumes and row crops should be grown. Legumes need 60 pounds per acre of phosphoric acid (P_2O_5) and 30 pounds of potash for best growth. When used as green manure and cover crops, legumes furnish organic matter, increase productivity, and reduce runoff and erosion.

Crops that do not follow fertilized legumes require fertilizers for highest yields. Cotton needs about 40 pounds of nitrogen per acre, 60 pounds of phosphoric acid, and 30 pounds of potash. Sorghum, oats, and sudangrass need these quantities of fertilizer plus additional nitrogen applied as a side dressing for best yields.

Native pastures or grasslands consist of bermudagrass, needlegrass, little bluestem, and grass species of *Panicum* and *Paspalum*. Forage yields are low, but they can be increased by proper management that includes control of grazing, fertilizing, and reseeding where stands are poor.

CAPABILITY UNIT IIIw-1

Nearly level, slowly permeable clays, slightly wet.

Beaumont clay.

This soil is moderately fertile. Plant and soil moisture relationships are poor. If this soil is adequately drained, it is moderately to highly productive.

Good yields of rice, cotton, grain sorghum, and sudangrass can be obtained if the soil is artificially drained. Other crops that can be grown less successfully are corn, clover, and winter peas. Alfalfa is not recommended.

Except for the need of artificial drainage, Beaumont clay can be managed for crops and pasture of the same kinds as suggested for the Lake Charles clay in capability unit I-1.

CAPABILITY UNIT IIIw-2

Depressed, slowly permeable bottom-land clays, wet.

Roebuck clay.

This soil is in depressions of the bottom lands of the Brazos River. Water does not drain naturally from the surface of this soil, but most depressions can be adequately drained for cultivation. The more poorly drained areas can be drained enough to use as improved pasture.

If adequately drained, this soil can be managed for cultivation and for pasture like soils in capability unit I-4.

CAPABILITY UNIT IIIs-1

Gently sloping, deep loamy fine sands.

Kenney loamy fine sand, 0 to 2 percent slopes.

This soil is low in plant nutrients, but it responds well to management. Yields of crops are generally low under prevailing management. If the management is improved, high yields of special crops and moderate yields of field crops can be obtained. The moisture-holding capacity of the soil is low. Large quantities of moisture are lost through internal drainage, but that retained by the soil is nearly all available to crops.

Crops suited to this soil are watermelons, sweetpotatoes, market vegetables, peanuts, and corn. Other crops are Singletary peas, Dixie Wonder peas, vetch, and crimson clover for hay, forage, and soil improvement. Sweet corn and other early-maturing varieties of corn are better suited to the climate than field corn.

Organic matter will be added to the soil and the moisture-holding capacity improved by plowing under fertilized legumes and crop residues. Fertilizers are easily leached from this soil; consequently, they should be applied to legumes and to other crops in small quantities at intervals during the growing season rather than in large quantities at the beginning of the season. Summer crops should get a total of 80 pounds of nitrogen per acre, 80 pounds of phosphoric acid (P_2O_5), and 80 pounds of potash. Melons and vegetables need more fertilizer than corn and other field crops.

Pastures are poor on this infertile and droughty soil unless they are fertilized. When pastures are established on old fields, fertilizers should be applied at the rate of 20 pounds of nitrogen per acre, 40 pounds of phosphoric acid (P_2O_5), and 20 pounds of potash. Smaller quantities of phosphoric acid (P_2O_5) and potash are needed each year after the pasture has been established. If crimson clover is grown, it will need annual applications of lime and other fertilizers. The plants suited to pastures are Indiangrass, bermudagrass, and carpetgrass; weeping and purple lovegrasses; and big and little bluestem.

CAPABILITY UNIT IVe-1

Sloping, slowly permeable clays and clay loams.

Bernard-Edna clay loams, 4 to 8 percent slopes.
Lake Charles complex, 4 to 8 percent slopes.

Most of this unit is in pasture, and this is its best use. The cultivated areas have been damaged through erosion.

Vegetation can be established in gullies and eroded areas if diversion terraces are built above them. The grasses and legumes suited to these soils are little and big bluestem, K–R bluestem, bermudagrass, burclover, and Hubam clover. The soil should be fertilized and these species sown to revegetate old fields or badly eroded spots. Contour furrows help to reduce runoff and increase the absorption of water by the soil.

CAPABILITY UNIT IVw-1

Nearly level, slightly wet, very slowly permeable fine sandy loams.

Edna-Waller complex.
Waller-Katy complex, slightly saline.
Katy-Waller complex.

The soil complexes in this capability unit have numerous low wet areas or ponds that require drainage before the soil can be cultivated. They also have many mounds that must be leveled so that the fields can be adequately watered for rice production. Drainage problems are partly solved by leveling the mounds and filling the ponds. The soils in this unit are low in fertility. When drained, they can be fertilized and managed like the Katy and Edna soils in capability unit IIs–1. The Waller-Katy complex, slightly saline, and the Katy-Waller complex have spots high enough in salts to affect plant growth. Stands are hard to obtain. The soil in these saline spots becomes puddled, absorbs water slowly, and becomes very hard after drying. The presence of sodium may account to some extent for the unfavorable physical condition of the soils of these spots.

Most of the saline spots are low in organic matter. A covering of straw or other plant residues will supply organic matter (*6*). These spots are also low in available phosphorus and need phosphate fertilizer to increase growth of crops. Nitrogen fertilizer is also needed.

Rice is the only crop grown on the Katy-Waller complex and the Waller-Katy complex, slightly saline. Rice and small acreages of cotton and corn are grown on the Edna-Waller complex. If adequately drained, these soils are suitable for sorghum, Hubam clover, and sourclover (*Melilotus indica*).

Most of the acreage of the soils in this unit is in native grass. Forage production can be improved by draining, fertilizing, and seeding suitable pasture plants according to the suggestions in capability unit I–1, IIs–1, and IIIs–1.

CAPABILITY UNIT IVw-2

Depressed, very slowly permeable soils, wet.

Waller soils.

These soils must be drained before they can be cropped. The supply of plant nutrients is moderately low.

Rice is the crop best suited to Waller soils. On adequately drained areas, yields of rice can be increased by the use of fertilizer and by rotating rice with white and Alyce clovers. The fertilizer should consist of 80 pounds of nitrogen per acre and 40 pounds of phosphoric acid (P_2O_5). Rice yields are highest when the crop is grown for only 1 year in a rotation of 3 years or more with improved pasture. Good yields of rice are obtained when it is grown for 2 successive years in a rotation of 5 years or more with improved pasture.

The plants best suited to rice-pasture rotations are dallisgrass, bermudagrass, vaseygrass, and carpetgrass; longtom, tall fescue, whiteclover, and Persian and Alyce clovers.

The Waller soils in native grasses can be improved by drainage and fertilization and by the seeding of suitable grasses and legumes.

CAPABILITY UNIT IVs-1

Sloping, deep loamy sands.

Kenney loamy fine sand, 2 to 6 percent slopes.

Slight erosion occurs on cultivated areas of this soil. Close-growing crops should be grown whenever possible to reduce erosion. Clean-tilled crops should be preceded by a winter cover and followed by 2 years of close-growing crops to reduce the hazard of erosion.

If less sloping soils are available for cultivation, this soil could be best used for pasture. The practices suggested for capability units IIIs–1 apply to the management of pastures in this unit.

CAPABILITY UNIT Vw-1

Sandy and clayey alluvial soils, frequently overflowed.

Bibb fine sandy loam.
Kaufman clay.
Navasota-Iuka complex.

These soils cannot be cultivated because they are flooded often and for long periods. Excellent pastures can be established, but some areas may need draining.

The grasses and legumes suited to Kaufman clay are the same as those suited to the fine-textured soils of the Brazos River bottom land. The best grasses for the Navasota-Iuka complex and for Bibb fine sandy loam are bermudagrass, dallisgrass, carpetgrass, rescuegrass, and johnsongrass. The best legumes are burclover, lespedeza, vetch, and crimson clover. Sudangrass for supplemental pastures can be grown on the soils of this unit since floods are not probable during its growing season.

Phosphate should be applied to pastures every 2 to 3 years to improve the vigor of plants and the production of forage.

CAPABILITY UNIT Vw-1

Billowy, slowly permeable bottom-land clays and sands, occasionally overflowed.

Miller-Roebuck clays.
Sandy alluvial land.

These soils are 5 feet or more below the general level of the Brazos River flood plain. They are a series of ridges and swales. Their rough and choppy surface causes difficulty in the use of farm machinery. Drainage is poor, especially in the swales occupied by the finer textured soils. Most areas are flooded about every 12 years, but the bends of the river are flooded nearly every year. The poor drainage and unevenness of surface make the soils in this unit unsuitable for cultivation.

About 85 percent of the acreage is in trees. The rest is in pasture. Excellent pastures can be established on Sandy alluvial land and good pastures on Miller-Roebuck clays. Much of the acreage of these soils is being cleared.

The grasses and legumes suitable for pastures on these soils are the same as those described in capability unit I–3. The Miller-Roebuck clays are good for fescue.

CAPABILITY UNIT VIe-1

Sloping alluvial soils.

Sloping alluvial land.

This unit consists of fine- and coarse-textured soils that occur as narrow areas on the banks of streams and sloughs. Slopes average about 5 percent, but they range from 2 to 20 percent. The unit is unsuitable for cultivation because of the irregular slopes and the hazards of erosion. Some of the less sloping areas are in cultivation, but this unit is best suited for pasture.

Good permanent pastures can be established on this land type. The carrying capacity is lower than on the smoother soils in the Brazos River flood plain, and the grazing should be controlled to prevent overgrazing. The grasses and legumes suitable for pastures on this unit are the same as suggested for other bottom-land soils of the Brazos River.

CAPABILITY UNIT VIe-2

Sloping, deep loamy fine sands.

Kenney-Fulshear complex, 4 to 8 percent slopes.

The soils in this unit are too steep for cultivation. Pastures are poor because the soils are droughty and low in supply of plant nutrients. They can be improved and managed according to the practices described in capability unit IIIs–1.

Estimated Yields

The estimated average yields that can be expected from the principal crops grown on soils of Fort Bend County under two levels of management are given in table 5. The estimates in columns A are based mainly on information gathered through interviews with farmers, county agricultural workers, and others who have observed yields under prevailing or ordinary management. The estimates in columns B are based on the results obtained by the Texas Agricultural Experiment Station and by the better farmers on soils that are like or similar to those in the county. The management used to obtain the yields in columns B is described in the sections Suggestions for Improved Management and Description of Capability Units.

TABLE 5.—*Estimated average acre yields of principal crops*

[Yields in columns A are those expected over a period of years under prevailing management practices; those in columns B, under suggested improved management practices. Absence of yield indicates crop is seldom, if ever, grown]

Soil	Cotton		Corn		Rice		Alfalfa		Grain sorghum		Forage sorghum		Permanent pasture			
	A	B	A	B	A	B	A	B	A	B	A	B	A		B	
	Lb.	*Lb.*	*Bu.*	*Bu.*	*Lb.*	*Lb.*	*Ton*	*Ton*	*Lb.*	*Lb.*	*Ton*	*Ton*	*Acres for 1 cow and calf* [1]	*Months grazing season*	*Acres for 1 cow and calf* [1]	*Months grazing season*
Asa fine sandy loam	260	400	15	50	----	----	1. 5	3	2, 300	3, 000	2	3. 5	6	8	2. 5	9
Asa silty clay loam	275	450	25	60	----	----	2	3. 5	2, 700	3, 500	2	4	5	8	2. 5	10
Asa-Pledger complex	270	450	25	55	----	----	2	3. 5	2, 400	3, 200	2	3. 5	5	8	2. 5	10
Beaumont clay	240	380	12	25	2, 400	3, 200	----	----	2, 200	2, 700	2	2. 5	6	8	3	10
Bernard clay loam, 0 to 1 percent slopes	260	400	25	45	2, 400	3, 500	1. 5	2	2, 400	3, 400	2	3. 5	7	8	4	10
Bernard-Edna complex, 0 to 1 percent slopes	280	380	15	35	3, 000	3, 800	----	----	2, 200	2, 800	2	3	8	8	5	10
Bernard-Edna clay loams, 1 to 4 percent slopes	200	340	14	28	1, 600	----	----	----	2, 100	2, 600	1. 5	2	10	8	5	9
Bernard-Edna clay loams, 4 to 8 percent slopes	120	170	----	----	----	----	----	----	----	----	. 75	1	12	8	6	8
Bibb fine sandy loam	----	----	----	----	----	----	----	----	----	----	----	----	8	7	3	9
Clodine fine sandy loam	----	350	----	40	3, 200	4, 000	----	2	----	2, 900	----	3	8	9	4	10
Edna fine sandy loam, 0 to 1 percent slopes	190	275	12	24	3, 600	4, 400	----	----	1, 800	2, 200	1. 5	2. 5	10	7	5	9
Edna fine sandy loam, 1 to 4 percent slopes	150	190	8	20	1, 600	----	----	----	1, 300	1, 800	1	2	12	8	6	9

See footnotes at end of table.

TABLE 5.—*Estimated average acre yields of principal crops*—Continued

[Yields in columns A are those expected over a period of years under prevailing management practices; those in columns B, under suggested improved management practices. Absence of yield indicates crop is seldom, if ever, grown]

Soil	Cotton		Corn		Rice		Alfalfa		Grain sorghum		Forage sorghum		Permanent pasture			
	A	B	A	B	A	B	A	B	A	B	A	B	A		B	
	Lb.	*Lb.*	*Bu.*	*Bu.*	*Lb.*	*Lb.*	*Ton*	*Ton*	*Lb.*	*Lb.*	*Ton*	*Ton*	*Acres for 1 cow and calf* [1]	*Months grazing season*	*Acres for 1 cow and calf* [1]	*Months grazing season*
Edna-Waller complex	120	180	8	20	2, 800	3, 600				1, 800	1	2	12	8	5	9
Fulshear fine sandy loam, 1 to 4 percent slopes	160	250	12	25					2, 100	2, 800	1	2. 5	12	8	6	9
Hockley loamy fine sand, 1 to 4 percent slopes		280	14	30					1, 400	1, 800		2	10	8	6	9
Katy fine sandy loam, 0 to 1 percent slopes	180	350	12	40	3, 200	4, 000			2, 100	2, 900	1. 5	3	8	8	4	10
Katy fine sandy loam, 1 to 4 percent slopes	160	320	10	25	1, 800				2, 000	2, 800	1. 5	3	10	8	5	10
Katy-Waller complex					2, 800	3, 500							10	8	6	10
Kaufman clay												3	14	8	3	10
Kenney loamy fine sand, 0 to 2 percent slopes			8	20								1. 5	12	8	8	8
Kenney loamy fine sand, 2 to 6 percent slopes			8	18								1. 5	12	8	8	8
Kenney-Fulshear complex, 4 to 8 percent slopes													12	8	10	8
Lake Charles clay, 0 to 1 percent slopes	300	475	20	40	3, 600	4, 600	1. 5	2. 5	2, 500	3, 400	2	3. 5	6	8	3	10
Lake Charles clay, 1 to 4 percent slopes	230	340	15	30	2, 000				2, 100	2, 900	1. 5	2. 5	8	8	5	9
Lake Charles complex, 4 to 8 percent slopes	130										. 75	1. 5	10	8	5	9
Miller fine sandy loam	270	380	15	40				3	2, 000	2, 600	2	3. 5	6	8	2. 5	9
Miller silt loam	290	450	25	60			2	3. 5	2, 400	3, 000	2	3. 5	6	8	2. 5	10
Miller silty clay loam	300	475	25	60			2. 5	4	2, 800	3, 500	2. 5	4	5	8	2. 5	10
Miller clay	300	475	25	60			2. 5	4	2, 800	3, 500	2. 5	4	5	[2] 8	2. 5	10
Miller-Roebuck clays													14	8	2. 5	10
Navasota-Iuka complex													14	8	4	9
Norwood silt loam	280	400	20	50			2	3. 5	2, 400	3, 000		3. 5	6	8	2. 5	9
Norwood silty clay loam	300	475	25	60			2	4	2, 800	3, 500		4	5	8	2. 5	10
Norwood clay	300	475	25	60			2. 25	4	2, 800	3, 500		4	[2] 5	8	[2] 2. 5	10
Pledger clay	300	475	25	60			2	4	2, 800	3, 500	2. 5	4	[2] 5	8	[2] 2. 5	10
Roebuck clay [3]		400		50						3, 000		4	14	8	2. 5	10
Sandy alluvial land													14	8	2. 5	10
Sloping alluvial land	160		18										14	8	4	10
Waller soils					2, 400	2, 900						1. 5			6	8
Waller-Katy complex, slightly saline					2, 100	2, 600							12	8	7	9
Yahola fine sandy loam	270	380	15	40				3	2, 000	2, 600	1. 5	3	6	8	2. 5	9

[1] Average number of acres needed to furnish adequate grazing without injury to pasture for 1 cow and a calf for a grazing season.

[2] For areas cleared of trees.

[3] For areas artificially drained.

Genesis, Morphology, and Classification of Soils

Fort Bend County is almost in the geographic center of the Gulf Coastal Prairie (*2*). Except for shallow-trenched, timbered bottom lands, it is a flat, mostly treeless, plain.

Factors of Soil Formation

Soil is the product of forces of weathering and soil development acting on materials deposited or accumulated by geologic agencies. The characteristics of a soil depend upon (1) the physical and mineralogical composition of the parent material; (2) the climate under which the soil material has accumulated and existed; (3) the plant and animal life in and on the soil; (4) the relief, or lay of the land; and (5) the length of time these forces have acted on the soil material. The influence of climate on soil and plants is modified by the physical characteristics of the soil and soil material and by relief, which, in turn, strongly influences drainage, aeration, runoff, erosion, and exposure to sun and wind.

Parent material

Three geologic formations—Lissie, Beaumont, and Recent—comprise the parent materials of all the soils. Katy, Hockley, Clodine, and Kenney soils developed in the Lissie. Lake Charles, Beaumont, Bernard, Edna, Fulshear, and Waller soils have developed in the Beaumont geologic formation. The Recent is represented by the Alluvial soils only.

The Lissie plain consists of a series of coalescing river-built fans (*5*). Its general slope is about 5 feet per mile to the southeast. The formation is of Pleistocene age. The sediments of the Lissie formation (*4*) are probably reworked materials of the Willis formation. They were mixed to some extent with sediments brought down by streams and deposited as a flat outwash. The materials comprising the Lissie formation are variable from place to place in southeast Texas. They range from sands to sandy clays.

The Beaumont formation extends from the edge of the Lissie to the Recent deposits near the coast. The Beaumont plain has a slope of about 2 feet per mile toward the coast. The Beaumont, throughout large areas, has scarcely any stream dissection or gullying. This formation also extends up stream gaps cut through the Willis and Lissie formations.

The Beaumont overlies the Lissie formation in areas between streams because of their different slope gradients (*5*). The thickness of the Beaumont ranges from a feather edge along the Lissie-Beaumont contact to a maximum of about 100 feet along the Texas coastline. Although generally described as a clay formation, the Beaumont also contains limy clays, sandy clays, clayey sands, and fine sands. The lime is present in large nodules, in shell beds, and disseminated through the clays. The distribution of sandy areas is related to the system of distributory ridges.

The Beaumont plain of southeast Texas is composed of coalescent deltas of the ancient (probably late Pleistocene) Trinity and Brazos Rivers (*1*). The substrata underlying most soils on the part of the Beaumont plain in Fort Bend County are reddish, mostly calcareous sediments, suggestive of Brazos River sediments.

The Recent alluvial deposits of the Brazos River flood plain are mainly calcareous materials transported from western Texas. They are mixed to some extent, however, with sediments from all parts of the Brazos watershed.

The upper San Bernard River flood plain, from near the junction of West Bernard Creek and the San Bernard River north to the Austin County line, is composed of mixed sediments from the Blackland Prairie, Forested Coastal plain, and Gulf Coastal Prairie. The soils in that part of the San Bernard River flood plain are of the Kaufman, Navasota, and Iuka series.

The lower part of the San Bernard River flood plain, from about the junction of West Bernard Creek and the San Bernard River south to the Brazoria County line, is composed of sediments from the watersheds of West Bernard Creek, and the Colorado and San Bernard Rivers. During great floods in Recent time, part of the floodwaters of the Colorado River were carried by the San Bernard River below the junction of the West Bernard Creek and San Bernard River.

The principal soils in the southern part of the San Bernard flood plain are of the Pledger series, though there are also areas of Asa and Miller soils. All of these soils are also common in the Colorado River flood plain. The reddish, calcareous soils of the San Bernard flood plain are the result of backwater deposits from the Colorado River, which carried reddish, calcareous sediments.

The drainage areas of other smaller streams, such as Buffalo Bayou and Big Creek, are entirely in the Coastal Prairie. The soils of these flood plains are of the Kaufman, Iuka, and Bibb series.

Climate

The climate is of the humid, warm-temperate, continental type that prevails generally over the Gulf Coastal Prairie. Rainfall distribution and average temperature by months for Fort Bend County are given in table 1. Because climate is uniform over the county, differences among the soils are due to the factors of parent materials, plants and animals, relief, and time.

The effects of climate have been impressed to some degree on all soils of Fort Bend County. The impact is greatest where the regolith is intermediate in its chemical composition and physical constitution. Such regoliths consist of a wide variety of minerals and are intermediate in texture. Soils of the zonal groups are derived from regoliths of this type. Regions with humid, warm-temperate climates commonly have strongly weathered, leached, and acid soils of low fertility.

Plant and animal life

Many species of plants and animals influence the direction and rate of soil genesis. These species include higher plants and micro-organisms as well as the insects and larger animals that live in soils. Plants and animals largely determine the kinds of organic matter added to soil and the way in which it is incorporated with the soil. They transfer nutrient elements from one horizon to another. They may also shift soil materials from one horizon to another. Gains and losses in organic matter and nitrogen in soils, gains and losses of plant nutrients, and changes in porosity and in structure may be due to activities of plants and animals. Although these general effects are well known, the specific influences of the various species or groups of related species in the formation of any one soil are not.

Relief

Relief, or the lay of the land, is one control among several on the quantities of water that move over and through the soil. Other things being equal, more rainfall runs from steep slopes than from gentle ones. Less water is available, therefore, for development of horizons in soils on steeper slopes. More erosion may also follow. Conversely, soils with level slopes will absorb more of the rainfall and thus have more water for development of horizons. There is also likely to be less erosion. In depressed or concave positions in the landscape, extra water over and above rainfall will be added as runoff from adjacent slopes. These depressed or concave positions may be wet for long intervals. This wetness affects the direction and rate of horizon development. Through its general influences on runoff and drainage, relief inhibits some processes of horizon differentiation and favors others. Unlike profiles are therefore formed from the same kind of parent materials, but they are in different positions within the same landscape.

Relief in Fort Bend County ranges from level to gently sloping. The distinctness of horizons and the total thickness of solum are closely related to relief in the county. Soils with distinct horizons and thick solums occur on gentle slopes. Where slope gradients are greater, the soils have less distinct horizons and thinner solums. By way of contrast, the soils of level or nearly level areas generally are dense, slowly permeable, and poorly drained. Some exceptions are the moderately sandy, freely permeable sediments that occur in some stream terraces and in occasional patches of upland. These areas are well drained even though level or nearly level.

Relief is commonly a local rather than regional factor in soil genesis. Thus, relief is more often reflected in differences among soils within a given landscape than among the soils of different regions.

Time

Time is required for the formation of soils. The time required may be short, as it is for soils being formed from alluvial sediments in flood plains. It may be relatively long, as it has been for soils of the uplands. Other things being equal, the age of soils is reflected in the distinctness of horizons in the profile. The importance of time as a factor in soil formation always depends upon its combination with the other factors.

There is little evidence that time has been the cause of many of the differences among soils in Fort Bend County. Time has been an important factor in distinguishing the Alluvial soils from the others.

The land surfaces in the uplands have been in place for a long time. It seems likely that they have been exposed to weathering and soil formation for all of the Recent period and perhaps for an important part of the Pleistocene period. Some soils may be older than others, but effective differences seem to be small. The differences among them can be ascribed largely to parent materials and relief.

The Alluvial soils, occurring in flood plains, have been subject to horizon differentation for short periods of time. The sediments in the flood plain are of recent geological origin and have not been subject to processes of soil formation long enough to produce distinct horizons. Except for the Alluvial soils, however, differences among soils in the county are not the result of time.

Classification of Soils by Higher Categories

The units described in the text and shown on the map of a soil survey are established on the basis of soil characteristics as found in the field. Soils in a type have essentially the same drainage, relief, and color. On the basis of common characteristics, local soil types and series may be grouped successively into families, great soil groups, suborders, and finally into three orders: (1) Zonal, (2) intrazonal, and (3) azonal.

The soils of Fort Bend County are classified in table 6 according to soil orders and great soil groups. Study of this table will help the reader to understand the genetic relationships of the soils in the county. Following the table, the soil series and a typical profile of each series are described.

TABLE 6.—*Fort Bend County soil series classified into orders and great soil groups*

Great soil group	Series
ZONAL	
Reddish Prairie	Bernard, Clodine, Fulshear, Hockley.
INTRAZONAL	
Grumusol	Beaumont, Lake Charles.
Planosol	Edna, Katy.
Low-Humic Gley	Waller.
AZONAL	
Alluvial soils	Asa, Bibb, Iuka, Kaufman, Miller, Navasota, Norwood, Pledger, Roebuck, Yahola.
Regosol	Kenney.

Asa series.—The Asa series consists of Alluvial soils with calcareous substrata. The soils occupy high, rarely inundated, well-drained parts of the Brazos River flood plain and to a lesser extent the San Bernard River flood plain. Parent materials are of brown or reddish-brown calcareous alluvial sediments that washed from subhumid plains underlain mainly by the "Red Beds." Asa soils are never extremely sandy or clayey and usually contain much silt.

The following profile of Asa fine sandy loam is north of Rosenberg. The site is a bermudagrass pasture of about 30 acres.

- A_1 0 to 7 inches, brown (7.5YR 5/2; 3/2, moist) heavy fine sandy loam; weakly granular; friable when moist, slightly hard when dry, and slightly sticky when wet; pH 6.5; boundary clear.
- A_{12} 7 to 22 inches, very dark brown (7.5YR 3/2; 2/2, moist) light clay loam; moderate medium and very fine subangular blocky; porous; moderately friable when moist, hard when dry, and sticky when wet; pH 7.0; boundary gradual.
- AC 22 to 34 inches, reddish-brown (5YR 4/4; 3/4, moist) heavy loam or sandy clay loam; weak subangular blocky; moderately permeable; moderately friable when moist, hard when dry, and slightly sticky when wet; pH 7.5; boundary clear.
- C 34 to 48 inches +, reddish-yellow (5YR 6.5/6; 5.5/6, moist) loam grading to a fine sandy loam at a depth of 40 inches; calcareous; contains less than 1 percent by volume of soft fine lumps of calcium carbonate; permeability is moderately rapid; friable when moist.

Range in series characteristics: The A horizon ranges from fine sandy loam to silty clay loam and from dark grayish brown to reddish brown. It ranges from 4 to 12 inches in thickness, and from pH 6.5 to pH 7.5 in reaction. The surface in localized areas is covered by a thin mantle of calcareous overwash. The AC horizon ranges from a loam in the sandy types to light silty clay in the more clayey types. Depths to calcareous material range from 24 to 60 inches.

Topography and drainage: Surface runoff is slow. Internal drainage is medium in the sandy soils and medium to slow in the more clayey soils. There is very little hazard of flooding. The soils occupy nearly level areas, but surfaces are slightly convex.

Relations to other soils: Asa soils are more brown and less red than the Norwood, Miller, and Yahola soils. They are darker colored and sandier than Pledger soils, though formed from similar parent materials.

Distribution: Throughout the Brazos and the lower San Bernard River flood plains.

Beaumont series.—The Beaumont series consists of poorly drained soils of the intrazonal order. Parent materials are grayish to yellowish, mostly noncalcareous clays of the Beaumont geologic formation. The native vegetation consists of medium and tall grasses.

The following profiles (Nos. 1 and 2) of Beaumont clay are located 2.6 miles south-southeast of Pleak, Texas, along the south side of a county road, about 200 yards west of Fairchild Creek.

Profile No. 1 is in a native grass pasture, and it was taken on a microknoll that is about 8 inches higher than the microdepression. It is as follows:

A_{11} 0 to 18 inches, gray (10YR 5/1; 3.5/1, moist) clay with common, medium, and faint yellowish-brown mottles; moderate fine subangular blocky structure; large vertical cracks may extend to depths of 4 to 6 feet; nearly massive when wet, very firm when moist, extremely hard when dry, and extremely sticky and plastic when wet; when dry the surface forms a light-gray crust of silty clay or silty clay loam 5 to 10 mm. thick that can be seen in a cross section of soil; pH is 5.8 at a depth of 4 inches; boundary gradual.

A_{12} 18 to 32 inches, gray (10YR 6/1; 5/1, moist) clay with common, medium, and faint brownish-yellow and yellowish-brown mottles; weak blocky structure; apparently very slowly permeable; consistence same as for horizon above; pH 6.5 at a depth of 24 inches; boundary diffuse.

AC 32 to 64 inches, gray (10YR 6/1; 5/1, moist) clay with common, medium, and faint, olive-yellow mottles; massive or weak blocky structure; same consistence as horizon above; very slowly permeable; pH is 6.5 at a depth of 36 inches, 7.2 at 42 inches, and 8.0 at 58 inches; boundary gradual.

C_1 64 to 76 inches, mottled yellow (2.5Y 8/6; 7/6, moist) and white (5Y 8/1; 7/1, moist) clay; consistence same as for horizons above; noncalcareous, but pH is 8.0; boundary gradual.

C_2 76 to 84 inches+, white (5Y 8/1; 7/1, moist) clay; common, medium, and distinct strong-brown mottles and common, medium, and faint light olive-brown mottles; calcareous; contains up to 5 percent by volume of hard calcium carbonate concretions that range from 1/16 to 1/2 inch in diameter.

Profile No. 2 is located in a microdepression 5 feet from profile No. 1. It is as follows:

A_{11} 0 to 18 inches, dark-gray (10YR 4/1; 3/1, moist) clay with common, fine, and distinct strong-brown mottles that occasionally are yellowish red and more noticeable in the upper 6 inches, moderate fine subangular blocky structure; very firm when moist; extremely sticky and plastic when wet, and extremely hard when dry; surface forms a gray crust that is not as noticeable in microdepressions as on the microknolls; pH 5.5 at depths of 4 and 18 inches; boundary diffuse.

A_{12} 18 to 48 inches, gray (10YR 5/1; 4/1, moist) clay with common, fine, and distinct strong-brown mottles that occasionally are yellowish red; massive or weak blocky structure; apparently very slowly permeable; consistence same as horizons above; pH 5.5 at 36 inches and 6.0 at 48 inches; boundary diffuse.

AC 48 to 64 inches, gray (10YR 6/1; 5/1, moist) clay; common, medium, and faint light olive-brown mottles; massive; consistence same as for horizons above; pH is 7.5 at a depth of 62 inches; boundary gradual.

C_1 64 to 76 inches, white (5Y 8/1; 7/1, moist) clay with many medium and faint yellow mottles; matrix is noncalcareous but it contains a few calcium carbonate concretions as much as 3/4 inch in diameter; pH 8.0; boundary clear.

C_2 76 to 84 inches+, white (5Y 8/1; 7/1, moist) clay with many medium and distinct strong-brown and olive-yellow mottles; weakly calcareous and contains a few calcium carbonate concretions as much as 3/4 inch in diameter.

Range in characteristics: The A horizon ranges from gray to dark-gray. From 3 to 20 percent of the soil mass has mottles of brownish yellow and strong brown. Structure ranges from weak coarse to moderate fine blocky. The upper part of A horizon usually is stronger and finer. The thickness of the A horizon ranges from 8 inches on the microknolls to 48 inches in the microdepressions. Reaction ranges from pH 5.0 to pH 6.0. Depths to calcareous material range from 60 to 72 inches. All horizons contain occasional concretions of iron and manganese as much as 1/4 inch in diameter.

Topography and drainage: The soils occur in level to weakly concave topographic positions, and they have a distinct gilgai microrelief. Surface and internal drainage are very slow. Surface drainage is needed for cultivation.

Relations to other soils: Beaumont soils differ from Lake Charles soils in being poorly drained, mottled throughout, and less dark and crumbly. Bernard soils differ from Beaumont in having a clay loam A horizon and a subangular blocky upper B horizon. Edna soils differ in that they are lighter colored and have a claypan. Waller soils occupy distinct depressions, and they are less clayey and wetter than Beaumont soils.

Distribution: These inextensive soils occur as a few large and several small areas in association with the Lake Charles, Bernard, and Edna soils.

Bernard series.—The Bernard series consists of moderately fertile, slowly drained soils. Bernard soils are in the Reddish Prairie great soil group. They have developed from calcareous sandy clays and clays in the Gulf Coastal Prairie of southeast Texas.

The following profile of Bernard clay loam is located 0.3 mile east of Tavener, Texas, along the south side of U. S. Highway No. 90A. The site is a level cotton field that is slowly but adequately drained.

A_{1p} 0 to 6 inches, dark-gray (10YR 4/1; 3/1, moist) clay loam; moderate medium granular structure; moderately firm when moist and slightly sticky when wet; occasional shotlike concretions of iron and manganese; pH 6.0. In native areas the soil structure usually is compound moderate fine subangular blocky and moderate medium granular; boundary diffuse.

B_1 6 to 20 inches, dark-gray (10YR 4/1; 3/1, moist) light clay; contains a few strong-brown fine mottles that are associated with fine pinhead-size concretions containing iron and manganese; moderate medium subangular blocky and granular structure; readily crushes to a mass of firm aggregates when moist; hard when dry, and sticky when wet; pH 6.0; boundary diffuse.

B_{21} 20 to 36 inches, dark-gray (10YR 4/1; 3/1, moist) clay; a few fine mottles of strong brown that are associated with fine concretions containing iron and manganese; weak to moderate coarse irregular blocky structure; apparently slowly permeable; very firm when moist, very hard when dry, and very sticky when wet; pH 6.0 at a depth of 24 inches and 6.5 at 36 inches; boundary diffuse.

B_{22} 36 to 54 inches, gray (2.5Y 5.5/1; 4/1, moist) clay with few, fine, and faint strong-brown and yellowish-brown mottles (the yellowish brown surrounds the strong brown); concretions of iron and manganese as much as 1/4 inch in diameter; very firm when moist, very hard when dry, and very sticky when wet; pH 7.5 at a depth of 48 inches; boundary gradual.

C_1 54 to 60 inches, gray clay, the upper part tending toward clay and the lower part toward a sandy clay; soil matrix is noncalcareous, but it contains a few concretions of calcium carbonate and of iron and manganese; pH 8.0.

D_1 60 to 78 inches, pale-yellow (2.5Y 7/3; 6/3, moist) sandy clay with common, coarse, and distinct reddish-yellow mottles; matrix noncalcareous but contains a few to numerous calcium carbonate concretions as much as ½ inch in diameter; firm when moist, very hard when dry, and sticky when wet; ferruginous concretions fewer than in horizons above; boundary gradual.

D_2 78 to 90 inches +, reddish-yellow (7.5YR 6/6; 5/6, moist) light sandy clay loam becoming fine sandy loam near the base; weakly calcareous and contains occasional calcium carbonate and fine ferruginous concretions. The sandier strata in this layer are more sandy than the parent material from which the solum formed.

Range in characteristics: The A horizon ranges from loam to heavy clay loam. It ranges in thickness from 4 to 12 inches, in color from gray to dark gray, and in structure from compound granular and subangular blocky to fine blocky. The B_1 horizon ranges from clay loam to light clay and from a compound of moderate fine and medium subangular blocky and granular structure to moderate medium subangular blocky structure. Depth to reddish and usually calcareous substratum ranges from 4 to 7 feet. Generally a few concretions of calcium carbonate occur at depths of about 46 inches, but a few small areas contain them throughout the profile.

Topography and drainage: Bernard soils occupy mainly nearly level to level areas having gradients less than 1 percent. Some small areas have slopes as much as 8 percent. Cultivated areas having slopes of more than 1 percent are subject to water erosion. On nearly level areas, the surface drainage is very slow and internal drainage is slow. The drainage through shallow turnrow and road ditches usually is adequate for row crops.

Relations to other soils: Bernard soils differ from the Lake Charles soils mainly in surface texture, but they are usually less clayey throughout the profile. Edna soils differ from the Bernard in having a lighter color, an abrupt boundary between the A to the B horizons, and a compact and blocky B horizon. Waller soils occur in distinct depressions. Beaumont soils occur in concave positions, and they differ from Bernard soils in that they are well drained and have a clay A horizon.

Distribution: These soils occur extensively as small and large areas throughout the county except in the extreme northwestern part.

Bibb series.—The Bibb series consists of sandy, acid, frequently flooded Alluvial soils. The sediments were washed from the Gulf Coastal Prairie. The native vegetation consists of pin and willow oaks, elm, haw, and shrubs, vines, and grasses.

The following profile of Bibb fine sandy loam is located 13 miles north of Rosenberg, 1¾ miles south of Katy, and ⁷⁄₁₀ mile southwest of a county road.

A 0 to 12 inches, very pale brown (10YR 7/3; 5/3, moist) fine sandy loam with common, medium, and faintly brown and brownish-yellow mottles; massive structure; porous; friable when moist and very hard when dry; pH 5.0; boundary gradual.

AC 12 to 40 inches, stratified light brownish-gray (10YR 6/2; 4/2, moist) loam mottled with brown, and very pale brown (10YR 8/3; 6/3, moist) and yellow sandy clay loam; massive; friable when moist, and hard when dry; pH 4.5; boundary gradual.

D 40 to 50 inches +, very pale brown (10YR 8/3; 6/4, moist) sandy clay mottled with brownish yellow; massive; firm when moist, hard when dry, and sticky when wet; pH 5.5.

Range in characteristics: The A horizon is 6 to 16 inches thick. It ranges from very pale brown to grayish brown in color, from loam to fine sandy loam in texture, and from pH 5.0 to pH 6.0 in reaction. The amount of stratification varies widely. Reaction of the AC horizon ranges from pH of 4.5 to pH of 5.5. Depths to the D horizon range from 30 to 46 inches.

Topography and drainage: The surface is gently undulating; it consists of a series of shallow swales and low ridges. The soils are flooded 3 to 5 or more times a year, and water often stands for several days at a time. Surface drainage is very slow.

Relations to other soils: Bibb soils are lighter colored, more acid, and more poorly drained than Iuka soils. They are sandier and lighter colored than Navasota soils.

Distribution: The Bibb series is inextensive in this county, and it occurs only in the flood plain of Buffalo Bayou.

Clodine series.—The Clodine series developed from alkaline sandy clays that are probably of the Lissie geological formation. Native vegetation consists of short grasses, midgrasses, and myrtle bushes. Hardwoods have encroached along the streams. Saltmeadow cordgrass is a characteristic plant in saline spots.

The following profile of fine sandy loam is located 4.3 miles west of Clodine, 1.8 miles north of Farm Road No. 1093, and 0.25 mile north of Buffalo Bayou on the west side of ranch road. The site is a nearly level native upland.

A_1 0 to 12 inches, gray (10YR 5/1; 4/1, moist) fine sandy loam; massive; porous; friable when moist, slightly hard when dry; noncalcareous; pH 6.2; occasional small soft concretions of iron and manganese; numerous grass roots; boundary gradual.

B_1 12 to 27 inches, gray (10YR 6/1.5; 5/1.5, moist) loam with few, fine, and faint brownish-yellow mottles; massive; porous; friable when moist and hard when dry; slightly acid; concretions of iron and manganese numerous; grass roots less abundant; boundary gradual.

B_2 27 to 46 inches, light-gray (10YR 7/1.5; 6/1.5, moist) sandy clay loam; massive; fine porous; friable when moist, very hard when dry, and slightly sticky when wet; pH 8.0, but noncalcareous; iron and manganese concretions as in horizon B_1; small hard calcium carbonate concretions; few roots; boundary gradual.

C_1 46 to 70 inches, white (10YR 8/2; 7/2, moist) sandy clay with few, medium, and faint brownish-yellow mottles that surround iron and manganese concretions; massive; firm when moist, very hard when dry, and sticky when wet; small pockets and lenses of sand; iron and manganese concretions as much as ¼ inch in diameter are more numerous and larger than in horizon B_2; hard roundish calcium carbonate concretions from ¹⁄₃₂ to 1 inch in diameter occupy about 10 percent of the mass; boundary gradual.

C 70 to 120 inches +, white (10YR 8/2; 7/2, moist) sandy clay with common, medium, and distinct brownish-yellow (10YR 6/6; 5/6, moist) mottles; massive; firm when moist, very hard when dry, and sticky when wet; iron and manganese concretions numerous between 70 and 90 inches; pH 7.5; below 90 inches the parent material is more sandy, and pockets of it are more numerous; iron and manganese concretions are very few.

Range in characteristics: The A horizon ranges from loam to fine sandy loam. The range in thickness is from 8 to 16 inches, in color from gray to dark gray, and in reaction from pH 6.0 to pH 7.5. The B_1 horizon ranges from loam to clay loam. Its color ranges from gray to light brownish gray, and its thickness from 8 to 15 inches. In places in this horizon, mottlings are present; in others they are absent. Concretions of calcium carbonate are absent in the lower subsoil of a few small areas of this soil. Small roundish white spots or saline spots occur occasionally.

Topography and drainage: Clodine soils generally occupy level and nearly level areas, but small low sand mounds are common. Surface drainage is very slow, and internal drainage is slow. Shallow field and roadside ditches usually drain the soil adequately for cultivation.

Relations to other soils: Clodine soils have more friable, less compact, and less strongly mottled B horizons than Katy soils. Edna soils differ from the Clodine in that they have a blocky, compact sandy clay B horizon. Hockley soils differ in being more acid and in having a strongly mottled B horizon. Bernard soils are darker than the Clodine, and they have a more clayey B horizon.

Distribution: Clodine soils are inextensive. They occur in the northern part of the county, mostly bordering Buffalo Bayou.

Edna series.—The soils of the Edna series are moderately fertile Planosols. Parent materials of Edna soils in Fort Bend County are yellowish and gray weakly calcareous sandy clays of the Beaumont geologic formation. The native vegetation consists of medium and tall grasses. Hardwoods have encroached on low areas adjacent to streams.

The following profiles (Nos. 1 and 2) of Edna fine sandy loam are located at the road entrance to the Bryan farm 3.5 miles east-southeast of Rosenberg and 1 mile east of Lane Airport hangar.

Profile No. 1 is from the crest of a subsoil wave where the A horizon is thinnest:

- A 0 to 5 inches, grayish-brown (10YR 5.5/2; 4/1.5, moist) fine sandy loam; structureless to very weak granular; porous; friable when moist and hard when dry; thin weak platy surface crust when dry; pH 6.5; roots are abundant; boundary abrupt and wavy.
- B_{21} 5 to 20 inches, grayish-brown (10YR 5/1.5; 3/1.5, moist) heavy sandy clay with a few fine yellowish-red and brownish-yellow mottles; compound moderate fine and medium blocky; very firm when moist, extremly hard when dry, and very sticky when wet; roots abundant; pH 6.0 at depth of 12 inches; boundary gradual.
- B_{22} 20 to 36 inches, light brownish-gray (2.5Y 6/2; 5/2, moist) heavy sandy clay; few, fine, and faint yellow mottles; weak coarse blocky structure; compact; extremely firm when moist, extremely hard when dry, and very sticky when wet; occasional pinhead-size concretions of iron and manganese; pH 7.0 at depths of 30 inches; boundary gradual.
- B_3 36 to 54 inches, colors, texture, and consistence are the same as described for the B_{22} horizon; occasional concretions of calcium carbonate and of iron and manganese; noncalcareous; boundary gradual.
- C 54 to 60 inches+, reddish-yellow (5YR 6/8; 5/8, moist) sandy clay; a few streaks or mottles of gray; noncalcareous but contains occasional calcium carbonate concretions; pH is 8.0.

Profile No. 2 is in the trough of a subsoil wave where the A horizon is thickest. The site is about 3 or 4 feet from profile No. 1.

- A_1 0 to 18 inches, gray (10YR 5/1; 4/1.5, moist) fine sandy loam; occasional fine yellowish-brown mottles; structureless to very weak granular; porous; friable when moist and hard when dry; occasional shotlike concretions of iron and manganese; roots abundant; pH 6.0 at depth of 4 inches; boundary abrupt and wavy.
- A_2 18 to 22 inches, light-gray (10YR 7/1; 5/1, moist) fine sandy loam; few, fine, and faint yellow mottles; structureless; porous; very friable when moist, hard when dry; occasional concretions of shotlike iron and manganese; pH 5.5; boundary abrupt and wavy.
- B_{21} 22 to 32 inches, dark-gray (10YR 4.5/1; 4/1.5, moist) sandy clay; few, fine, and distinct yellowish-red mottles and few, fine, and faint mottles of yellow; moderate coarse blocky structure; very firm when moist, extremely hard when dry, and sticky and plastic when wet; roots noticeable between soil aggregates, but they seldom penetrate the aggregates; occasional shotlike concretions of iron and manganese; pH 6.3 at a depth of 24 inches; boundary gradual.
- B_{22} 32 to 46 inches, light brownish-gray (2.5Y 6/2; 5.5/2, moist) compact sandy clay; few, faint, and medium olive-yellow mottles; weak coarse blocky structure; very slowly permeable; occasional fine concretions of calcium carbonate and of iron and manganese; noncalcareous but pH is 8.0; boundary gradual.
- B_3 46 to 58 inches, pale-yellow (2.5Y 8/4; 7/4, moist) sandy clay; less than 1 percent of calcium carbonate concretions, but contains more than the B_{22} layer; occasional concretions of iron and manganese; boundary gradual.
- C 58 to 64 inches +, reddish-yellow (5YR 6/8; 5/8, moist) sandy clay with a few streaks or mottles of gray; noncalcareous but contains concretions of calcium carbonate and of iron and manganese; pH is 8.0.

Range in characteristics: The A horizon ranges from fine sandy loam to loam. There are many small areas of intermixed fine sandy loam and loam. Occasional small areas of clay loam (less than 5 acres in size) are included with the fine sandy loam. The thickness of the A horizon ranges from 3 inches over the crest of some of the suboil boundary waves to 22 inches over the trough between subsoil waves. The color of this horizon ranges from gray to light brownish gray.

The B_2 horizon ranges from dark gray or dark grayish brown to gray without mottlings, or it contains strong-brown, yellowish-brown, olive, or reddish mottles. The structure of the B_{21} horizon ranges from moderate coarse blocky and medium prismatic to moderate fine blocky; the wavy subsoil boundary is indistinct, or it is absent where the A horizon is loam or is finer textured than loam.

Depth to the reddish substratum ranges from 50 to 78 inches. This horizon commonly consists of stratified sandy clay, sandy clay loam, and fine sandy loam. The materials are calcareous in some places and noncalcareous in others.

Nearly all Edna soils have sandy mounds 6 to 18 inches high and 15 to 50 feet in diameter that occupy from 2 to 15 percent of the surface. Most of these mounds have been leveled by cultivation.

Topography and drainage: Most Edna soils occupy level to nearly level areas. Surface and internal drainage are very slow. Turnrow and roadside ditches provide adequate drainage most of the time for row-crop farming. However, where Edna and Waller soils occur in a complex, more drainage is needed. Areas of Edna soils having slopes ranging from 1 to 4 percent are susceptible to water erosion if the native vegetation is thinned or destroyed.

Relations to other soils: Edna soils are closely associated with the Bernard soils. Edna soils have blocky compact B horizons, whereas those of the Bernard are subangular blocky and more crumbly. Waller soils differ from Edna soils in that they occupy depressions, are lighter colored, and have sandier subsoils. Katy soils have a thicker A horizon and a more strongly mottled B horizon than the Edna soils. Clodine soils are more friable and have less compact B horizons.

Distribution: Edna soils occur in all parts of the county and are some of the most extensive soils of the uplands.

Fulshear series.—The Fulshear series consists of well-drained soils and is a member of the Reddish Prairie great soil group. Fulshear soils are strongly developed in weakly calcareous, moderately sandy alluvial or littoral Pleistocene sediments. The native vegetation consists of tall prairie grasses, but some areas are now covered by savannah midgrasses.

The following profile of Fulshear fine sandy loam is located 0.2 mile east of bridge crossing the San Bernard River, and 300 yards north of U. S. Highway No. 90A in the extreme western part of the county. The site is on a convex slope of about 3 percent.

A_1 0 to 9 inches, brown (7.5YR 5/3; 3/3, moist) fine sandy loam; weak granular; permeable; friable when moist, slightly hard when dry; pH 6.5; numerous roots; boundary gradual.

AB 9 to 12 inches, brown (10YR 4/3; 3/3, moist) loam; weak subangular blocky and moderate medium granular; friable when moist, hard when dry; permeable; pH 6.0; numerous roots; boundary gradual.

B_2 12 to 22 inches, mottled brown (10YR 4/3; 3/3, moist) and red (2.5YR 4/8; 3/3, moist) sandy clay; peds are coated dark reddish brown; compound moderate to strong very fine subangular blocky and medium blocky; moderately firm when moist, very hard when dry, and sticky when wet; pH 6.0; numerous roots.

B_3 22 to 38 inches, red (2.5YR 5/8; 4/8, moist) light sandy clay; peds have a coating of dark reddish brown; moderate medium blocky; moderately friable when moist, very hard when dry, and sticky when wet; pH 6.0; roots less numerous than in horizon above; boundary gradual.

C 38 to 78 inches +, yellowish-red (5YR 5/8; 4/8, moist) stratified fine sandy loam and loam; structureless; friable when moist; pH 6.0.

Range in characteristics: The A horizon ranges from grayish brown to dark brown. In structure it ranges from weak to moderate medium granular, in reaction from a pH of 5.5 to a pH of 6.5, and in thickness from 6 inches at the top of slopes to 16 inches at the bottom.

The AB horizon is 1 inch to 4 inches thick. It ranges from loam to light clay loam and from moderate medium granular structure to moderate medium subangular blocky structure.

The B_2 horizon ranges from yellowish red to reddish brown. Brown mottles are present in places, and dark collodial stains are common. The structure of the B_{21} horizon ranges from moderate medium blocky to weak blocky. In places calcium carbonate concretions occur below depths of about 24 inches.

Topography and drainage: Slopes range from 1 to 8 percent. Runoff is medium to rapid and internal drainage is slow. All areas of Fulshear soils are subject to erosion if the vegetative cover becomes poor or is destroyed.

Distribution: Fulshear soils are inextensive. They occur mainly on gentle slopes adjacent to the flood plain of the San Bernard River, but a few small areas are adjacent to the flood plain of the Brazos River.

Hockley series.—The Hockley series consists of well-drained, brownish soils. It is a member of the Reddish Prairie great soil group. Hockley soils have developed from noncalcareous sandy clay and sandy clay loam sediments of the Lissie geologic formation. The native vegetation consists of tall grasses and midgrasses, mostly species of the *Andropogon*, *Panicum*, and *Paspalum* genera.

The following profile of Hockley loamy fine sand is located 17 miles north-northwest of Rosenberg, 4 miles north-northwest of Fulshear, and 0.45 mile west of Farm Road No. 359. The site is a slope of 3 percent with a slightly convex surface.

A_1 0 to 24 inches, pale-brown (10YR 6/2.5; 4/2.5, moist) loamy fine sand; structureless; very friable when moist, loose when dry; pH 5.8 at depths of 3 and 15 inches; occasional concretions of iron and manganese; boundary clear.

B_1 24 to 30 inches, light yellowish-brown (10YR 6/4; 5/4, moist) sandy clay loam; common, medium, and distinct strong-brown mottles; massive; porous; moderately permeable; friable when moist; pH 5.0 at depth of 27 inches; occasional concretions of iron and manganese about ⅛ inch in diameter; boundary clear.

B_{21} 30 to 44 inches, brownish-yellow (10YR 6.5/6; 5.5/6, moist) heavy sandy clay loam or light sandy clay; common, medium, and distinct red (2.5YR 5/8; 5/8, moist) mottles; occasional small concretions of iron and manganese as much as ⅛ inch in diameter; weak blocky structure; firm when moist, hard when dry, sticky when wet; pH 5.0 at a depth of 38 inches; boundary diffuse.

B_{22} 44 to 68 inches, mottled brownish-yellow (10YR 6/6; 5/6, moist), red (2.5YR 5/8; 4/8, moist), and light-gray (10YR 7.5/1; 7/1, moist) heavy sandy clay loam or light sandy clay; the proportion of red increases with depth; massive; firm when moist, hard when dry, and sticky when wet; pH 5.0 at a depth of 60 inches; boundary diffuse.

C_1 68 to 80 inches, mottled red (10R 5/8; 4/8, moist), light reddish-brown (5YR 7/4; 6/4, moist), and light-gray (10YR 7.5/1; 7/1, moist) light sandy clay weakly stratified with sandy clay loam; massive; friable when moist; pH 5.0.

C_2 80 to 100 inches +, light-red (4YR 6/8; 5/8, moist) fine sandy loam; common, medium, and distinct light-gray (10YR 7.5/2; 7/2, moist) and very pale brown (10YR 7/3; 6/3, moist) mottles; lower part of horizon stratified with loamy fine sand; pH 5.0.

Range in characteristics: The A horizon ranges from light brownish gray to pale brown. It ranges from 15 to 30 inches in thickness and from light fine sandy loam to loamy fine sand in texture. The B_1 horizon ranges from pale brown to yellowish brown. Its thickness ranges from 4 to 10 inches and its texture from heavy fine sandy loam to sandy clay loam.

Topography and drainage: The soil is gently undulating. Dominant slopes are 2 to 3 percent, but they range from 1 to 6 percent. The more sloping areas are susceptible to water erosion. All areas are susceptible to blowing and drifting if the vegetation is removed.

Relations to other soils: Hockley soils are more friable throughout the profile and less clayey than the Katy soils. In addition they have a B horizon that is less compact and, in the upper part, more brownish or yellowish and less gray. Hockley soils have a thinner and less sandy A horizon than the Kenney soils. They differ from the Fulshear in having a yellowish or brown upper B horizon and a less friable, more clayey, and more mottled lower B horizon.

Distribution: Hockley soils are inextensive; they occur mainly as small areas in the northern part of the county.

Iuka series.—The Iuka series consists of moderately sandy acid Alluvial soils that are flooded one to three times or more each year. The soils consist of sediments washed from the Coastal Prairie and the Forested Coastal Plain. The native vegetation consists of pin and willow oaks, elm, pecan, and ash trees and a dense undergrowth of shrubs, vines, briers, and coarse grasses. In this county Iuka soils occur only in a complex with Navasota soils.

The following profile of Iuka clay loam is located 14 miles west of Rosenberg where U. S. Highway No. 90A crosses the San Bernard River. The site is native woodland.

- A_1 0 to 6 inches, dark grayish-brown (10YR 4/2; 3/2, moist) clay loam; weak medium granular; friable and crumbly when moist, hard when dry, and sticky when wet; pH 6.0; boundary clear.
- AC 6 to 30 inches, light-gray (2.5Y 7/2; 6/2, moist) sandy clay loam; many, medium, and faint yellowish-brown (10YR 6/4; 5/4, moist) mottles; massive; friable when moist, hard when dry, and slightly sticky when wet; pH 5.5; boundary abrupt.
- C 30 to 42 inches +, stratified sandy clay loam and fine sandy loam; color and reaction same as in layer above.

Range in characteristics: Surface texture ranges from loamy fine sand to clay loam, but it is dominantly a clay loam. The lower layers are stratified in places with brownish fine sandy loam to clay loam. Reaction in all layers ranges from pH 5.0 to pH 6.5.

Topography and drainage: Iuka soils occur only in the nearly level flood plain of the San Bernard River. The surface is formed by a series of ridges and swales. The lighter textured soil types occupy ridges; the clay loam soils occupy both ridges and swales. Iuka soils are moderately sandy, and the water table is high during the cool and wet season. They are imperfectly drained because of the high water table and frequency of flooding.

Relations to other soils: Iuka soils are sandier, browner, and better drained internally than the Navasota soils.

Distribution: The complex of Navasota-Iuka soils is inextensive. It occurs in the upper part of the San Bernard River flood plain.

Katy series.—The Katy series is a grayish Planosol. It developed from slightly acid to mildly alkaline sandy clay parent materials of the Lissie geologic formation in the Coastal Prairie. The native vegetation consists of tall grasses and midgrasses, mainly species of the *Andropogon*, *Panicum*, and *Paspalum* genera. Fine sandy loam is the only soil type mapped in the county.

The following profile of Katy fine sandy loam is located 10¼ miles north of Rosenberg and 150 yards east of the crossroads at Flewellen siding on the north side of Farm Road No. 1093. The site is a level meadow in native grass.

- A_1 0 to 14 inches, light brownish-gray (10YR 6/2; 4/2, moist) light fine sandy loam; few, fine, and faint yellowish-brown (10YR 5/4; 4/4, moist) mottles; structureless; porous; very friable when moist, slightly hard when dry; occasional concretions of iron and manganese as much as ⅛ inch in diameter; pH 5.5; numerous roots; boundary clear.
- A_2 14 to 22 inches, very pale brown (10YR 7/3; 6/3, moist) light fine sandy loam; few, fine, and distinct strong-brown and yellowish-brown mottles; structureless; porous; very friable when moist, slightly hard when dry; occasional shotlike concretions of iron and manganese; numerous grass roots; pH 5.5; boundary clear.
- B_{21} 22 to 42 inches, mottled gray (10YR 5/1; 4/1, moist), brownish-yellow (10YR 6/8; 5/8, moist) and red (2.5YR 4/8; 4/8, moist) sandy clay; some dark-gray organic stains or clayskins on outside of aggregates; moderate medium blocky; extremely hard when dry, very firm when moist, sticky and plastic when wet; very slowly permeable; occasional concretions of iron and manganese as much as ¼ inch in diameter; pH is 5.8 at depth of 30 inches and 6.5 at 36 inches; roots moderately numerous but more so between peds; boundary gradual.
- B_{22} 42 to 86 inches, mottled gray (10YR 5/1; 6/1, moist), yellow (10YR 7/8; 7/8, moist) and red (2.5YR 4/8; 4/8, moist) sandy clay; moderate coarse blocky structure; very slowly permeable; very firm when moist, extremely hard when dry, sticky and plastic when wet; pH 6.5 at depth of 48 inches, 7.0 at 60 inches, and 7.5 at 72 and 84 inches; very few roots; boundary gradual.
- C 86 to 96 inches +, same color as layer above, but slightly sandier; pH 7.5.

Range in characteristics: The A horizon ranges from 14 to 25 inches in thickness and from fine sandy loam to loamy fine sand in texture. Sandy mounds, 40 to 100 feet in diameter and 6 to 20 inches high, comprise from 2 to 10 percent of the surface of Katy fine sandy loam. When in mounds, the A horizon is from 30 to 42 inches thick. In places a transitional AB horizon occurs that is from ½ to 4 inches thick. The B_2 horizon ranges from clay to sandy clay, and in places it has a base color of gray with varying amounts of red and brown mottling. Areas near the contact of the Lissie and Beaumont formations contain concretions of calcium carbonate below the depth of about 42 inches. These areas usually have less gray and more yellowish coloration in the B horizons.

Topography and drainage: The topography is generally nearly level, but sandy mounds and depressions cause the surface to be gently undulating. Less than 10 percent of Katy soils have slopes in the range of 1 to 4 percent. Internal and surface drainage are very slow. Artificial drainage is necessary for cultivation if depressions are numerous on the surface.

Relations to other soils: Katy soils are associated with the Waller soils that occur on distinct depressions. They differ from them in having a less sandy subsoil. Katy soils differ from Hockley soils in having a less yellow and more gray color and a more compact, blocky B horizon. They are more acid than Clodine soils and have a more compact, more clayey, and more strongly mottled subsoil. They have a thicker A horizon and a more strongly mottled subsoil than the Edna soils.

Distribution: Katy soils are extensive. They occur as large areas in the northern part of the county and as small isolated areas in the rest of the county.

Kaufman series.—The Kaufman series consists of dark-gray to black, noncalcareous Alluvial soils. The native vegetation is mainly oak, elm, and hackberry trees of low value and palmetto shrubs. Pecan trees, bermudagrass, and buffalograss grow on the higher parts of the flood plains. Occasional cypress trees grow in the stream channels and sloughs. The Kaufman clay in the San Bernard River flood plain probably is a mixture of sediments that washed from the Coastal Prairie and the Forested Coastal Plain.

The following profile of Kaufman clay is located 15 miles southwest of Rosenberg, in the San Bernard River flood plain about 200 yards north of the bridge on U. S. Highway No. 59.

A 0 to 8 inches, very dark gray (2.5Y 3/1; 2/1, moist) clay with few fine mottles of very dark brown (7.5YR 4/6; 3/6, moist); compound moderate medium blocky and coarse granular or very fine subangular blocky structure; very hard when dry, very firm when moist, very sticky and plastic when wet; pH 6.5; boundary clear.

AC 8 to 22 inches, dark-gray (2.5Y 4/1; 3/1, moist) clay with few fine mottles of brown and light olive brown (2.5Y 5/4; 4/4, moist); moderate coarse blocky structure; consistence same as layer above; pH 6.5; boundary clear.

C 22 to 42 inches +, gray (2.5Y 5/1; 4/1, moist) clay with few medium faint olive-yellow (2.5Y 6/6; 5/6, moist) mottles; massive; very slowly permeable; consistence same as the A horizon; pH 7.5.

Range in characteristics: Calcium carbonate concretions as much as about ¼ inch in diameter occur in some profiles below a depth of about 18 inches. The reaction of the upper layer ranges from a pH of about 6.0 to 8.0. The A horizon ranges from dark gray to very dark gray, and in many profiles it is free of mottles. Below 30 inches the horizon may be stratified with gray and dark-gray clay.

Relations to other soils: Associated soils are of the Navasota, Iuka, and Pledger series. Navasota soils are more mottled, more acid, and lighter colored than the Kaufman soils. Iuka soils are more sandy, more acid, and lighter colored. Pledger soils differ in that they are underlain by reddish calcareous clayey alluvium at depths of 14 to 30 inches.

Topography and drainage: Kaufman soils occur in level or nearly level flood plains that overflow from 1 to 3 times a year. Water stands long enough to destroy crops. The soils are imperfectly or poorly drained because of frequency of flooding and the length of time they are under water. Internal drainage is slow.

Distribution: Kaufman soils are inextensive. They occupy a small part of the flood plains of the San Bernard River and some of the larger creeks in the county.

Kenney series.—The soils of the Kenney series are sandy Regosols underlain at depths of 4 to 6 feet by sandy clay to sandy clay loam. Apparently they consist of a slightly modified eolian mantle overlying more clayey materials that are genetically unrelated. Tall prairie grasses are the native vegetation.

The following profile of Kenney loamy fine sand is located 7.4 miles west-northwest of Rosenberg and 1.4 miles north of Texas Highway No. 36. The site is a nearly level undulating pasture in native grass.

A_{11} 0 to 22 inches, pale-brown (10YR 6/2.5; 4/2.5, moist) loamy fine sand; structureless; rapidly permeable; very friable when moist, soft when dry, and nonsticky when wet; pH 6.2 at depth of 6 inches; grass roots moderately numerous; boundary clear.

A_{12} 22 to 54 inches, very pale brown (10YR 7/4; 5.5/4, moist) loamy fine sand; structureless; consistence same as for horizon above; pH 6.0; grass roots moderately numerous; boundary clear.

AB 54 to 60 inches, very pale brown (10YR 7/5; 6/5, moist) loam with common, coarse, and prominent yellowish-red (5YR 5/8; 5/8, moist) and some reddish-yellow (7.5YR 7/6; 6/6, moist) mottles; massive; porous; moderately permeable; friable when moist, hard when dry, and slightly sticky when wet; pH 5.5; occasional grass roots; boundary gradual.

D_1 60 to 84 inches, mottled pale-brown (5YR 7/4; 5.5/4, moist) and red (10YR 4/6; 3/6, moist) sandy clay loam; massive; moderately permeable; porous; moderately friable when moist, hard when dry, and slightly sticky when wet; pH 5.8 at depth of 72 inches and 6.0 at depth of 84 inches; occasional grass roots; boundary gradual.

D_2 84 to 100 inches +, mottled white (N 8/0; 7/0, moist) and red (2.5YR 5/8; 4/8, moist) heavy sandy clay loam; weakly stratified with sandy clay; very hard when dry, moderately friable when moist, and moderately sticky when wet; pH 6.0 at depth of 90 inches.

Range in characteristics: The A_{11} horizon ranges from light brownish gray to brown. The A horizon ranges from about 40 to more than 72 inches in thickness. In many profiles iron or iron and manganese concretions are present in the lower part of the A horizon and in the substratum. The D horizon ranges from sandy clay loam to sandy clay, and the lower parts usually are stratified with sandy loam to fine sand.

Topography and drainage: Kenney loamy fine sand has slopes that range from 0 to about 8 percent. It occupies nearly level and slightly undulating areas to sloping areas on the breaks of natural drainageways. Runoff ranges from very slow on the nearly level areas to slow and medium on breaks of streams. Internal drainage is rapid.

Relations to other soils: Kenney soils are related to Hockley soils, but they differ in having a much thicker A horizon and no other genetic horizons in the profile. Fulshear soils differ from Kenney soils in having a less sandy A horizon and a strongly developed B horizon.

Distribution: Kenney soils are inextensive. They are in a few large and small areas, mainly in the western part of the county.

Lake Charles series.—The Lake Charles series is a member of the Grumusol great soil group. In Fort Bend County the parent materials are calcareous clays of the Beaumont geologic formation. The native vegetation consists of tall and medium grasses. Hardwood trees and huisache have grown up on soils of this series in some parts of the county.

The following profiles (Nos. 1 and 2) of Lake Charles clay are located 10½ miles west of Rosenberg and 1¼ miles north of Tavener, along east side of a county road and about 40 paces southeast of an intersection. The site is a level pasture in native grass.

Profile No. 1 is in a microdepression. It is as follows:

A_{11} 0 to 12 inches, very dark gray (10YR 3/1; 2.5/1, moist) clay; moderate very fine subangular blocky and granular structure; slowly permeable when moist, and very slowly permeable when wet; very firm when moist, extremely sticky and plastic when wet, and very hard when dry; occasional shotlike concretions of iron and manganese; pH 6.0 at depths of 4 inches and 12 inches; grass roots numerous; boundary gradual.

A_{12} 12 to 34 inches, color and texture same as for the layer above; fine and medium subangular blocky; pH 6.0 at a depth of 24 inches; boundary clear and wavy.

AC 34 to 48 inches, dark-gray (10YR 4.5/1; 3.5/1, moist) clay with common, medium, and distinct mottles of reddish yellow (7.5YR 6/8; 5/8, moist), red (2.5YR 5/8; 4/8, moist), and light yellowish brown (2.5Y 6/4; 5/4, moist); moderate fine and medium subangular blocky in upper part, coarse and blocky in lower part; very firm when moist, very hard when dry, and extremely sticky and plastic when wet; occasional shotlike concretions of iron and manganese; pH 6.8 at a depth of 36 inches and 7.5 at 48 inches; boundary gradual.

C 48 to 70 inches, gray (2.5Y 5/1; 3.5/1, moist) clay with few, medium and faint mottles of light yellowish brown (2.5Y 6/4; 5/4, moist) (strong brown in places); massive; consistence same as for layer above; occasional shot-size concretions of iron and manganese and of calcium carbonate, having a maximum diameter of ¼ inch; soil matrix noncalcareous; boundary gradual.

D 70 to 100 inches +, yellowish-red (5YR 5/6; 4/6, moist) clay with occasional streaks of light gray; calcareous; contains a few concretions of calcium carbonate.

Profile No. 2, on a microknoll about 5 feet from profile No. 1, is as follows:

A_1 0 to 8 inches, very dark gray (10YR 3/1; 2.5/1, moist) clay; moderate very fine subangular blocky; slowly permeable when moist and very slowly permeable when wet; very firm when moist, very hard when dry, and extremely sticky and plastic when wet; occasional shot-size concretions of iron and manganese; pH 6.3; boundary gradual.

AC 8 to 46 inches, gray (2.5Y 5.5/1.5; 5/1.5, moist) clay with common, medium and fine, faint pale-yellow (2.5Y 8/4; 7/4, moist) mottles; moderate fine subangular blocky structure in the upper few inches of horizon, grading to medium and coarse blocky in the lower part; occasional shot-size concretions of iron and manganese and of calcium carbonate; pH 7.5 at depth of 24 inches, but soil mass noncalcareous; boundary diffuse.

C 46 to 70 inches, color and texture same as for layer above except the mass contains 1 to 3 percent by volume of calcium carbonate concretions; soil mass noncalcareous but pH is 8.0; boundary gradual.

D 70 to 100 inches +, yellowish-red (5YR 5/6; 4/6, moist) clay with occasional streaks of light gray; a few concretions of calcium carbonate; calcareous.

Range in characteristics: The A horizon ranges from a thickness of 5 inches on the microknolls to 60 inches in the microdepressions. In color it ranges from gray to black, in structure from moderate very fine subangular blocky to moderate fine blocky, and in reaction from pH 6.0 to pH 7.5. The pH is higher on the microknolls. Depths to the reddish calcareous clay range from 4 to 8 feet. Stratification with silt loam and fine sandy loam occurs below 7 feet in some areas.

Topography and drainage: More than 95 percent of the Lake Charles clay is level or nearly level. Gilgai microrelief is common in all native areas. The elevation of microknolls is from 5 to 15 inches higher than that of the surrounding microdepressions. Surface drainage is very slow, and internal drainage is slow to very slow. Shallow turnrow and roadside ditches allow adequate drainage of excessive moisture from the surface of most areas to allow cultivation. However, additional drainage is generally beneficial. About 5 percent of the Lake Charles clay has slopes greater than 1 percent. These areas are subject to erosion when the vegetative cover becomes poor or is destroyed.

Relations to other soils: Lake Charles clay is better drained and has a finer, more distinct subangular blocky structure than Beaumont clay. In addition, it is more alkaline, generally darker, and unmottled. Lake Charles clay differs from Bernard soils in having a clay A horizon and no B horizon. It differs from Edna soils also in having no B horizon and in being more clayey.

Distribution: Lake Charles is the most extensive soil of the uplands in Fort Bend County. It occurs throughout the county except in the extreme northwestern part.

Miller series.—The Miller series consists mainly of calcareous, clayey Alluvial soils. The parent materials were sediments that washed from the western plains underlain by the "Red Beds." The native vegetation consisted of pecan, ash, pin oak, elm, and hackberry trees, and an understory of shrubs, vines, and coarse grasses.

The following profile of Miller clay is located on the east side of Farm Road No. 723, 1 mile north of the railroad crossing in Rosenberg. The site is a level field on the flood plain of the Brazos River.

A_{1p} 0 to 6 inches, dark reddish-brown (5YR 3/4; 2/4, moist) clay; compound moderate fine granular and fine subangular blocky; very firm when moist, very hard when dry, and very sticky when wet; calcareous; a few small concretions of calcium carbonate and numerous fragments of snail shells; boundary clear.

A_{12} 6 to 16 inches, color same as A_{1p} horizon; moderate medium and coarse subangular blocky structure; very firm when moist, very hard when dry, extremely sticky and plastic when wet; calcareous; boundary gradual.

AC 16 to 46 inches +, reddish-brown (5YR 4/4; 3/4, moist) clay; massive to weak blocky structure; when exposed and dried the mass breaks down into granules of medium size; consistence same as the A_{12} horizon; calcareous.

Range in characteristics: Miller silt loam has 8 to 16 inches of reddish-brown silt loam overlying reddish-brown clay. In contrast, Miller silty clay loam has 8 to 14 inches of reddish-brown silty clay loam overlying reddish-brown clay. In parts of many areas, Miller soils contain buried soils or strata of dark-gray soils at depths ranging from 8 to 40 inches. Miller soils range from reddish gray to dark reddish brown and reddish brown. Some areas are weakly stratified with silt loam and silty clay loam below a depth of about 12 inches. The stratification is erratic and occurs in areas too small to be mapped separately.

Topography and drainage: Most areas of Miller soils are level to nearly level. Shallow field and roadside ditches usually provide enough drainage for cultivation. The surface in some areas is a series of ridges and swales. The ridges are from 6 to 30 inches higher than the swales. Miller soils are flooded about once in 15 to 25 years.

Relations to other soils: Miller soils are more clayey in the subsurface layers than Norwood soils. Miller clay does not have a lighter textured substratum within a depth of 30 inches, whereas Norwood clay has a silty clay loam to silt loam substratum within the same depth. Roebuck soils occur in depressions, are darker than Miller soils, poorly drained, and weakly mottled. Yahola soils are sandier and the substratum consists of fine sandy loam or loamy sand. Pledger soils are very dark gray and noncalcareous in the surface soil. The substratum is reddish clay.

Distribution: Miller soils are the most extensive Alluvial soils in the county. They occur throughout the flood plains of the Brazos River and the lower flood plain of the San Bernard River.

Navasota series.—In Fort Bend County, the Navasota series occurs only in a complex with Iuka soils. The Navasota is dark, poorly drained, clayey Alluvial soil. It has developed from sediments that washed from the Coastal Prairie and Forested Coastal Plain. The vegetation consists of pin and willow oaks and elm and an understory of shrubs, vines, and coarse grasses.

The following profile of Navasota clay is located 14 miles west of Rosenberg where U. S. Highway No. 90A crosses the San Bernard River. The site is a frequently flooded level flood plain.

A 0 to 8 inches, dark-gray (10YR 4/1; 3/1, moist) clay with few, fine, and faint grayish-brown mottles; weak subangular blocky structure; very firm when moist, very hard when dry, and very sticky and plastic when wet; pH 6.0.

AC 8 to 44 inches, grayish-brown (10YR 5/2; 4/2, moist) clay with common, medium, and distinct dark-brown (10YR 4/3; 3/3, moist) mottles; massive; consistence same as the A horizon; pH is 5.0 at depths of 18 and 36 inches and 6.0 at 42 inches.

C 44 to 60 inches +, gray (10YR 5/1; 4/1, moist) clay weakly stratified with grayish-brown sandy clay loam; slightly acid.

Range in characteristics: The color ranges from dark gray to dark grayish brown. Mottles of dark brown and yellowish brown commonly occur throughout the profile. Weak stratification with clay loam or loam is common below a depth of about 24 inches. Reaction ranges from a pH of 5.0 to a pH of 7.5. This is more alkaline than is typical of the Navasota soils. Small areas of clay loam are included with this soil as mapped in the county.

Topography and drainage: Runoff is slow and internal drainage is slow to very slow. The soil is poorly drained mainly because of the frequency of overflow. It is usually flooded one to three or more times a year. It is covered by water for as long as 3 weeks at a time. Navasota clay occupies level flood plains that are commonly dissected by narrow shallow sloughs and old stream channels.

Relations to other soils: Navasota clay occurs in a complex with Iuka clay loam and fine sandy loam. Navasota clay occupies only the low areas or flats, whereas Iuka occupies narrow ridges as well as the low areas. Iuka differs from Navasota in that it is more sandy throughout the profile and better drained internally. The two soils are so intermixed that mapping them separately is not feasible. Kaufman clay differs from Navasota clay in that it is darker, less mottled, and less acid.

Norwood series.—The Norwood series consists of calcareous, loamy Alluvial soils. The parent materials were mainly silty calcareous sediments that washed from the plains of western Texas. The native vegetation consists of a vigorous growth of pecan, hackberry, elm, oak, and ash, and a dense undergrowth of shrubs and vines.

The following profile of Norwood silt loam is 12 miles northwest of Rosenberg and 1 mile south of Simonton, between the east side of a county road and an old river channel. The site is a nearly level cultivated field.

A 0 to 18 inches, reddish-brown (5YR 5/4; 4/4, moist) silt loam; weak medium granular structure; friable, when moist, hard when dry, and slightly sticky when wet; granular strongly calcareous; many fragmentary snail shells; boundary gradual.

AC 18 to 44 inches +, light reddish-brown (5YR 6/4; 5/4, moist) silt loam; massive; friable when moist, hard when dry, and slightly sticky when wet; strongly calcareous.

Range in characteristics: The color of the surface soil of the clay and silty clay loam types is darker than that of the silt loam. It ranges from dark reddish brown (5YR 3/3) to reddish brown (5YR 5/4) when dry. The A horizon of the silt loam type is light brown to reddish brown. In texture it ranges from silt loam to very fine sandy loam and in thickness from 12 to 24 inches. In many places the C horizon is stratified with one or more textures—clay, silty clay loam, and fine sandy loam. In some places erratic thin strata of clay underlie the silt loam at depths of 36 inches or more. In a few places the silt loam is underlain by dark-colored strata at depths of 12 inches or more. These strata are soils that have been covered by a mantle of recently deposited alluvium.

Topography and drainage: The Norwood soils usually are on nearly level to very gentle slopes of less than 1 percent. In a few areas, low microridges and shallow microswales only a few inches deep run parallel to the flow of floodwaters. They were formed by overflows. Norwood soils have slow to very slow runoff and medium internal drainage. There is enough natural drainage for cultivation.

Relations to other soils: Norwood soils are less clayey in the A and C horizons than Miller soils. The Asa soils differ from the Norwood in that they are brown to reddish brown and noncalcareous in the upper horizons. Yahola soils differ in that the C horizon is a fine sandy loam or loamy sand.

Distribution: Norwood soils are extensive and occur throughout the flood plain of the Brazos River. They mainly occupy the natural levees along the present channel and the old channels or sloughs of the Brazos River.

Pledger series.—The Pledger series consists of very slowly drained Alluvial soils. The parent materials were sediments that washed from the plains of west Texas and from the Blackland Prairies of central Texas. The native vegetation consists of elm, oak, ash, pecan, and hackberry and an understory of vines, haw, yaupon, and other shrubs, and coarse grasses.

The following is a profile description of Pledger clay in an area on the east side of Farm Road No. 723, 2 miles north of the railroad crossing in Rosenberg, and 150 yards south of the county road west of the crossing. The site is a nearly level cultivated field.

A_{1p} 0 to 5 inches, very dark gray (10YR 3/1; 2/1, moist) clay; in the surface 2 inches, structure is moderate fine granular, and below 2 inches it is massive or weak fine blocky; very firm when moist and extremely sticky when wet, aggregates are very hard when dry; noncalcareous, but pH is 8.0; boundary clear.

A_{12} 5 to 30 inches, very dark gray (10YR 3/1; 2/1, moist) clay; compound moderate medium subangular blocky and blocky; very firm when moist, extremely sticky when wet, and readily crumbles into firm peds that are extremely hard when dry; pH 8.0, but soil is noncalcareous; boundary gradual.

C 30 to 40 inches, brown (7.5YR 4/2; 3/2, moist) clay; weak medium subangular blocky; very firm when moist, very hard when dry and very sticky when wet; calcareous; a few small calcium carbonate concretions; boundary gradual.

D 40 to 50 inches +, reddish-brown (5YR 5/3; 4/3, moist) clay; massive; very firm when moist, very hard when dry, and very sticky when wet; calcareous; a few small hard concretions of calcium carbonate.

Range in characteristics: The A horizon of Pledger clay is 14 to 30 inches thick. It ranges in color from dark gray to very dark brown, in reaction from a pH 6.0 to pH 8.0, and in texture from silty clay to clay. The D horizon is stratified with other textures, and in many places it is a very fine sandy loam weakly stratified with clay. These lighter textured strata in many places are as shallow as 24 inches, but they are too erratic in depth and occurrence to be of significance.

Topography and drainage: Pledger soils usually occur as large nearly level to level areas. Runoff is very slow, and internal drainge is slow to very slow. Shallow field and roadside ditches provide enough drainage for the successful production of crops.

Relations to other soils: Pledger soils are closely associated with the reddish calcareous Miller soils. Asa soils are more sandy, better drained, and on higher positions on the landscape than the Pledger. Roebuck soils differ from Pledger in that they are poorly drained and occupy the depressions.

Distribution: Pledger soils occur throughout the Brazos River flood plain and in the lower part of the San Bernard River flood plain.

Roebuck series.—The Roebuck series consists of poorly drained Alluvial soils. The parent materials were sediments that washed mainly from the plains of west Texas and to some extent from the dark prairies of central Texas. The native vegetation consists of hackberry, ash, elm, swamp privet, and other water-loving plants.

The following profile is from an area of Roebuck clay 12 miles northwest of Rosenberg, 1.2 miles east of Simonton, and on the south side of Farm Road No. 1093. The site is an old slough or river channel with a concave surface.

A 0 to 15 inches, dark-brown (7.5YR 4/2; 3/2, moist) clay; moderate medium granular; very firm when moist, very hard when dry, and extremely plastic and sticky when wet; weakly calcareous, contains a few small concretions of calcium carbonate; boundary gradual.

AC 15 to 52 inches+, reddish-brown (5YR 5/3; 4/3, moist) clay with common, fine, and distinct dark-gray and yellowish-brown mottles; weak fine blocky structure; very firm when moist, very hard when dry, and extremely sticky and plastic when wet; strongly calcareous; a few small concretions of calcium carbonate.

Range in characteristics: The A horizon for Roebuck clay ranges from 10 to 20 inches in thickness and from brown to dark grayish brown in color. Included with the Roebuck soil in some areas is a very dark gray variant in which the upper 12 to 24 inches is noncalcareous.

Topography and drainage: The areas of Roebuck soil are in distinct depressions with concave surfaces. The depressions receive runoff from surrounding areas. They have no surface drainage and slow internal drainage. Artificial drainage is needed on the areas of Roebuck soil before they can be cultivated or used for improved pasture. Drained areas produce good crops and pasture.

Relations to other soils: Miller soils differ from Roebuck soils in that they are better drained and not mottled in the C horizon. Pledger soils are very dark gray and better drained, and the upper part of the profile is noncalcareous.

Distribution: Roebuck soils occupy the depressions, old river channels, and sloughs in the Brazos River flood plain.

Waller series.—The Waller series consists of light-colored acid poorly drained soils occurring in depressed areas of the Gulf Coastal Prairie. Waller soils appear to be intergrades between wet Regosols and Low-Humic Gley soils. The native vegetation consists of coarse water-tolerant grasses and sedges.

The following profile of Waller soil is from a depressed area 12 miles west-northwest of Rosenberg, 1¾ miles west-northwest of Orchard, 0.35 mile north of Texas Highway No. 36, and 0.35 mile east of a county road. The site is in native condition.

A 0 to 12 inches, light-gray (10YR 7/2; 5/2, moist) loam with a few fine yellowish-brown mottles; massive; porous; friable when moist and extremely hard when dry; pH 5.7; boundary clear.

AC_g 12 to 35 inches, gray (10YR 5/1; 4/1, moist) sandy clay mottled with reddish yellow (7.5YR 6/8; 5/8, moist) and brownish yellow (10YR 6/6; 5/6, moist); lower part grades into sandy clay loam; firm when moist, extremely hard when dry, and very plastic and sticky when wet; pH 5.7; boundary gradual.

C_{1g} 35 to 52 inches, very pale brown (10YR 7/3; 6/3, moist) sandy clay loam with common, medium, and distinct strong-brown, yellowish-red, and pale-yellow mottles; massive; porous; friable when moist and extremely hard when dry; pH 5.7; boundary gradual.

C_{2g} 52 to 62 inches+, light-gray (2.5Y 7/2; 6/2, moist) light sandy clay loam with common, medium, and distinct strong-brown and yellowish-brown mottles; massive; friable when moist and very hard when dry; pH 5.7.

Range in characteristics: The A horizon for Waller loam ranges from fine sandy loam to sandy clay loam in texture and from gray to light brownish gray in color. The amount of mottling ranges from none to 15 percent. The thickness of the A horizon ranges from 6 to 15 inches and the reaction from a pH of 5.5 to a pH of 6.0. Some areas have an AB horizon 4 to 8 inches thick consisting of sandy clay loam. The AC horizon ranges from gray to white. From 5 to 20 percent of the soil mass is mottled in various shades of brown and yellow. In many areas pockets and lenses of sand occur throughout the profile. Some areas contain small, hard concretions of calcium carbonate below the depth of about 46 inches.

Topography and drainage: Waller soils occupy depressed areas that are mostly roundish and from 6 to 26 inches lower than the surrounding soils. Surface drainage is lacking, and internal drainage is very slow. All areas need artificial drainage for cultivation. Rice is about the only crop that is grown on this soil.

Relations to other soils: Waller soils are associated with the Edna and Katy soils, but they occur in depressions and lack distinctly developed horizons.

Distribution: The total acreage of Waller soils is small, but they occur in many small roundish depressions throughout the county.

Yahola series.—The Yahola series consists of sandy calcareous Alluvial soils. Parent materials were sediments deposited by the Brazos River. The native vegetation consists of cottonwood, sycamore, ash, hackberry, and pecan and a dense undergrowth of shrubs and vines.

The following profile of Yahola fine sandy loam is located in a pasture on a natural levee of Jones Creek in the broad flood plain of the Brazos River.

A_1 0 to 12 inches, reddish-brown (5YR 5/4; 4/4, moist) fine sandy loam weakly stratified with silt loam; massive; porous; very friable when moist and slightly hard when dry; calcareous; contains small fragments of snail shells and numerous roots; boundary clear.

AC 12 to 28 inches, light reddish-brown (5YR 6/4; 5/4, moist) heavy fine sandy loam similar to the surface horizon; boundary clear.

C 28 to 60 inches +, light reddish-brown (5YR 6/4; 5/4, moist) light fine sandy loam stratified with silt loam and very fine sandy loam and with lenses of clay; very friable when moist; calcareous.

Range in characteristics: The A_1 horizon for Yahola fine sandy loam is 10 to 20 inches thick. In color it ranges from reddish brown to pale brown and in texture from fine sandy loam to loamy fine sand. Stratification is variable from area to area as well as in the same areas. A few areas are underlain by a dark grayish-brown layer (a buried soil) at depths ranging from 12 to 30 inches.

Topography and drainage: The surface in most areas is nearly level and weakly convex. In a few areas the surface is a series of low ridges and swales. Runoff is slow, and internal drainage is medium.

Relations to other soils: Yahola soils differ from the Norwood soils in that the subsoil and substratum are more sandy. Miller soils differ from Yahola in having clay in the subsoil and substratum. Asa soils differ in that they are darker and noncalcareous, and the subsoil and substratum consist of silt loam or of finer textured materials.

Distribution: The Yahola series occupies a few areas on natural levees along the Brazos River and along creeks on the edge of the flood plain of the Brazos River.

Analyses of Five Representative Soils [2]

One virgin profile for each of five extensive soil types in the Coastal Prairie and in Fort Bend County was sampled for laboratory analysis. The soils are Beaumont clay, Lake Charles clay, Bernard silty clay loam, Edna loam, and Katy fine sandy loam. Results of the laboratory studies follow. The particle-size and chemical analyses of each soil by horizons are shown in table 7.

The analyses were made by standard methods: Mechanical analysis by the method of Kilmer and Alexander, Soil Science 68: 15–24, 1949; pH by glass electrode using a 1:1 soil-water paste; organic matter by the method of Peech and others, U.S. Department of Agriculture Circular 757, 1947; phosphorus by the method of Olsen, Cole, Watanabe, and Dean, U.S. Department of Agriculture Circular 939, 1954; Exchangeable cations and cation-exchange capacity, U.S. Department of Agriculture Handbook No. 60, 1954.

Beaumont Clay

Beaumont Clay is extensive and occurs on large, nearly level, undissected areas in the eastern and most humid part of the Coastal Prairie. Runoff is very slow or lackiing

The studies of particle-size distribution in a profile of Beaumont clay (table 7) show that clay less than 0.002 mm. increases with depth of the solum, and it ranges from approximately 41 percent in the A_{11} horizon to 54 percent in the AC horizon. The D_u horizons have a significant decrease in sand and an increase in clay. Three-fourths of the clay in the solum is fine clay and one-fourth is coarse clay. However, in the D_u horizons there is a marked increase in the amount of coarse clay.

Clay less than 0.002 mm. is dominated by montmorillonite throughout the depth of the profile, but the content of illite increases markedly in the D_{u2} horizon. The fine clay fraction less than 0.0002 mm. is essentially montmorillonite; only traces or small amounts of kaolinite and illite are detected. The coarse clay consists mainly of quartz, kaolinite, illite, and lesser amounts of a vermiculite-chlorite complex.

The study of chemical properties (table 7) shows that the pH ranges from very strongly acid in the surface horizon to very slightly acid in the AC horizon. The D_u horizons contain calcium carbonate, and they are mildly to moderately alkaline. The phosphorus content is very low throughout the profile and does not exceed 7 parts per million. The exchangeable cations generally increase with depth. The lower exchange capacities in the D_{u2} horizon for the soil and for clay fractions reflect a higher content of illite. The exchange capacities of the clay fraction less than 0.0002 mm., with the exception of that in the D_{u2} horizon, furnish evidence for the monomineral (montmorillonite) composition of this fraction.

Lake Charles Clay

Lake Charles clay occurs as large, nearly level areas in the Coastal Prairie, and it is the dominant soil in the humid central and western parts. To the southwest, it merges with the closely related Victoria series in the drier Rio Grande Plain. The Victoria series is morphologically similar to Lake Charles clay but is calcareous.

Results of studies of particle-size distribution (table 7) show the clayey nature of Lake Charles clay. Silt and clay in the D_{u1} and D_{u3} horizons deviate significantly from the overlying horizons. Similarly, the distribution of coarse and fine clay in the D_u horizons varies significantly from that of the overlying horizons.

Clay less than 0.002 mm. is dominated by montmorillonite. Judging from X-ray diffraction analyses, there is an apparent increase in the illite content of this fraction in the D_u horizons. Montmorillonite dominates the fine clay throughout the depth of the profile. In most horizons, illite and kaolinite occur only in detectable amounts. The coarse clay consists mainly of kaolinite, illite, quartz, and a vermiculite-chlorite complex. The latter is most abundant in the D_u horizons.

The study of chemical properties (table 7) shows that the pH ranges from medium acid in the surface horizon to moderately alkaline in the C and D_u horizons. Calcium carbonate is at depths below 46 inches. The phosphorus does not exceed 7 parts per million. The percentage of exchangeable sodium and magnesium increases with depth; values are 17 percent and 44 percent, respectively. Exchangeable potassium does not exceed 2 percent The dominance of montmorillonite in the fraction less than 0.002 mm., as indicated by X-ray diffraction analyses, is supported by the exchange capacities of this fraction. Similarly, the exchange capacities for the fraction less than 0.0002 mm. support the X-ray diffraction analyses.

[2] This section was prepared by George W. Kunze, Associate Professor of Soil Mineralogy, Texas Agricultural Experiment Station, and Harvey Oakes, Soil Correlator, Soil Conservation Service. Irvin Mowery, Soil Scientist, SCS, assisted in the selection of sampling sites and the writing of profile descriptions.

The greater illite content in the fraction less than 0.0002 mm. is at least partly responsible for the decreased exchange capacity in the D_{u2} horizon.

Bernard Silty Clay Loam

Bernard soils occupy nearly level areas having plane to weakly concave surfaces. Gradients are dominantly less than 1 percent, and drainage is slow but adequate for crops. The Bernard soils are in slightly higher positions than the associated Lake Charles and Beaumont soils and in lower positions, as a rule, than the associated Edna and Katy soils. Bernard silty clay loam, the soil analyzed, was correlated as Bernard clay loam for the soil survey report.

Studies of particle-size distribution (table 7) show that the total clay content of the A_1 and the B_1 horizons is very similar, whereas the B_{21}, where the concentration of clay is highest, contains approximately 15 percent more clay than the overlying horizons. Furthermore, the greatest concentration of fine clay (less than 0.0002 mm.), is in the B_{21} horizon.

Clay less than 0.002 mm. is dominated by montmorillonite throughout the profile. There is, however, a marked increase of illite in the CD horizon. The clay fraction less than 0.0002 mm. is almost all montmorillonite with only trace amounts of illite and kaolinite in most horizons. The CD horizon contains more illite. The coarse clay fraction is composed of kaolinite, illite, quartz, and lesser amounts of a vermiculite-chlorite complex.

Chemical properties for the profile of Bernard silty clay loam are shown in table 7. The pH ranges from very strongly acid in the surface horizon to mildly and moderately alkaline in the B_3 and CD horizons, respectively. Organic matter in the surface horizon is high when compared with other soils of the area. Phosphorus in the surface horizon is 11 parts per million—the highest in the five soils analyzed. This element is very low in all soils. For the profile as a whole, exchangeable sodium is lower than that in any of the other four soils. The reduced exchange capacities in the soil and clay fractions of the CD horizon is partly caused by the higher content of illite. Exchange capacities of both the fine and the coarse clay fractions support the results of X-ray diffraction analyses; namely, that montmorillonite is the dominating clay mineral.

Edna Loam

The Edna series represents the maximum degree of soil development in the Coastal Prairie. Edna soils are nearly level to gently sloping, and the drainage is slow to very slow. The closely related, somewhat darker Orelia soils developed in more calcareous sediment on similar surfaces, in a drier climate to the southwest. The Lufkin series is similar but more acid throughout, and it has developed from more acid parent material under savanna forest. Edna loam was correlated as Edna fine sandy loam for the soil survey report.

Results of studies of particle-size distribution in a profile of Edna loam are shown in table 7. The sharp increase in clay content of the B_{21} horizon over that of the A_1 is characteristic of the Planosol group of soils. The greater concentration of fine clay in the B horizon is also typical of the Planosols.

X-ray diffraction analyses indicate that montmorillonite dominates the clay fraction less than 0.002 mm. throughout the profile. There is, however, a marked increase of illite in the D horizon. The clay fraction less than 0.0002 mm. is almost entirely montmorillonite, but traces of illite and kaolinite occur in most horizons. Judging by X-ray analyses, there is a slight increase of kaolinite and illite in the fine clay fraction of the D horizon. The coarse clay fraction consists of kaolinite, illite, quartz, and a vermiculite-chlorite complex.

Chemical properties of the profile of Edna loam are shown in table 7. The pH ranges from medium acid in the B_{21} horizon to mildly and moderately alkaline in the deepest horizons, which contain calcium carbonate. The most phosphorus—9 parts per million—is in the surface horizon. Exchangeable cations generally increase with depth. Sodium shows the greatest increase. Exchange capacities of the clay fractions support X-ray diffraction analyses.

Katy Fine Sandy Loam

The Katy soils are nearly level to gently undulating. Surface drainage is slow to moderate, and internal drainage is very slow. These soils occupy topographic positions below Hockley and Kenney soils, which are more sandy and freely drained, but are higher than the more clayey soils of the Coastal Prairie.

Particle-size analysis (table 7) shows that most of the clay is in the B_{21} horizon, which contains 4 to 5 times the quantity in the overlying horizons. The decreased amount of fine clay in the A horizons and an accompanying increase in the B horizons is to be expected. Normally, however, a decrease in the amount of fine clay below the B_{21} horizon would be effected, rather than no change as in this profile. A satisfactory explanation for this is not available at the present time.

The clay less than 0.002 mm. is dominated by a kaolinitic material that has a (0.001) basal spacing of approximately 7.6 angstrom units. The spacing is similar to that of dehydrated halloysite (metahalloysite), but the morphological characteristics of the material are similar to kaolinite. Lesser quantities of a hydrous mica are also present. The coarse clay fraction is composed of kaolinite, quartz, hydrous mica, and possibly a trace or small percentage of chlorite. The kaolinite has a (0.001) basal spacing of approximately 7.2 angstrom units. Studies of chemical properties of the profile of Katy fine sandy loam (table 7) show that the pH values range from very strongly acid in the A_2 horizon to mildly alkaline in the C horizons.

The content of organic matter is the least in any of the five profiles analyzed. The phosphorus content is as low as in the other profiles studied. The content of exchangeable cations varies somewhat with depth. No satisfactory explanation is available for the inconsistencies in the exchange capacities between the coarse and the fine clay fractions. Similar results have been obtained for the clay fraction of a Katy soil from an adjoining county. The exchange capacities are high, considering the mineralogical composition of the clay fraction. Additional studies are in progress that will more adequately determine the mineralogical and chemical properties of this soil.

TABLE 7.—*Laboratory analyses*

Soil and horizon	Depth	Particle-size analysis							
		Very coarse, coarse, and medium sand (2.0-0.25 mm.)	Fine sand (0.25-0.10 mm.)	Very fine sand (0.10-0.05 mm.)	Total sand (2.0-0.05 mm.)	Total silt (0.05-0.002 mm.)	Total clay less than 0.002 mm.	Total clay fractions [1]	
								(0.002-0.0002 mm.[2])	Less than 0.0002 mm.[2]
	Inches	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*
Beaumont clay:									
A_{11}	0-12	1.1	9.6	9.1	19.8	39.1	41.1	21	79
A_{12}	12-25	2.0	8.8	8.2	19.0	33.0	47.9	22	78
A_{13}	25-37	1.5	9.0	8.5	19.0	32.7	48.2	23	77
A_{14}	37-50	.8	8.6	8.3	17.7	31.5	50.8	22	78
AC	50-66	.7	7.9	7.5	16.1	30.0	53.8	24	76
D_{u1}	66-90	1.3	3.0	2.7	7.0	24.4	68.6	32	68
D_{u2}	90-108+	.2	.2	.2	.6	35.7	63.8	42	58
Lake Charles clay:									
A_{11}	0-15	.8	3.6	5.2	9.6	35.9	54.5	25	75
A_{12}	15-31	.8	3.3	4.5	8.6	34.9	56.5	23	77
A_{13}	31-46	.6	2.4	3.6	6.6	31.0	62.3	24	76
AC	46-60	.7	1.8	3.1	5.6	29.0	65.4	28	72
C	60-68	2.1	1.4	4.0	7.5	32.3	60.2	30	70
D_{u1}	68-75	.5	.6	4.5	5.6	66.1	28.4	37	63
D_{u2}	75-85	2.4	.6	.6	3.6	39.5	56.9	44	56
D_{u3}	85-96	1.0	.5	.9	2.4	67.9	29.7	37	63
Bernard silty clay loam:									
A_1	0-9	.8	2.6	7.2	10.6	53.4	36.0	22	78
B_1	9-17	1.0	2.9	7.8	11.7	50.7	37.6	21	79
B_{21}	17-29	.7	2.0	5.5	8.2	39.8	52.0	15	85
B_{22}	29-49	.8	2.3	6.3	9.4	44.7	45.9	18	82
B_3	49-61	2.3	2.6	6.1	11.0	46.8	42.2	21	79
CD	61-72	3.6	1.3	3.8	8.7	50.1	41.1	33	67
Edna loam:									
A_1	0-5	1.0	10.8	25.3	37.1	47.0	15.9	33	67
B_{21}	5-14	.7	6.0	15.5	22.2	34.9	42.9	18	82
B_{22}	14-34	.4	6.3	16.0	22.9	36.6	40.5	16	84
B_3	34-54	1.5	6.1	13.1	20.6	36.8	42.6	22	78
C	54-73	1.5	3.3	8.6	13.4	35.3	51.4	30	70
D_u	73-86	.5	1.3	6.6	8.4	38.1	53.6	35	65
Katy fine sandy loam:									
A_1	0-12	1.9	30.7	21.9	54.5	39.1	6.4	53	47
A_2	12-25	1.6	29.8	22.4	53.8	37.7	8.5	45	55
B_{21}	25-28	1.1	19.8	18.1	39.0	24.7	36.4	17	83
B_{22}	28-46	1.3	23.7	22.0	47.0	29.0	24.0	23	77
B_3	46-64	.9	19.3	18.5	38.7	27.3	34.1	15	85
C_1	64-84	.8	20.5	20.3	41.6	26.3	32.2	17	83
C_2	84-110+	.7	16.9	21.1	38.7	29.0	32.4	18	82

[1] Calcium carbonate and organic matter removed before analysis.

of five representative soils

Chemical analysis										
pH	$CaCO_3$ equivalent	Organic matter	Phos-phorus	Exchangeable cations (meq. per 100 grams soil)				Cation-exchange capacity (meq. per 100 grams soil)		
				Ca	Mg	K	Na	Soil	(0.002 mm.[1])	(0.0002 mm.[1])
	Percent	*Percent*	*Parts/million*							
4.9	----------	2.9	7	11.5	7.3	0.3	0.7	29.9	72	95
4.9	----------	1.7	5	11.6	8.1	.3	1.2	32.0	72	98
5.1	----------	1.3	7	11.9	9.9	.3	1.7	34.3	72	98
5.4	----------	1.3	6	15.5	10.8	.4	2.7	35.4	76	97
6.5	----------	.8	4	17.2	12.7	.4	4.0	37.3	77	97
7.8	10.8	.3	4	----------	17.4	.9	5.7	46.8	80	96
7.9	22.2	.2	6	----------	13.6	.7	33.7	33.7	66	78
5.8	----------	4.2	7	24.1	11.7	.7	1.4	45.9	73	104
6.2	----------	3.0	6	24.5	12.3	.5	3.8	47.0	73	106
7.2	----------	2.7	6	27.3	16.0	.6	6.1	53.9	85	102
7.8	3.0	1.4	5	----------	17.8	.7	7.2	52.8	89	106
8.0	10.7	.8	5	----------	14.5	.7	6.3	42.1	82	100
8.4	12.3	.3	6	----------	7.1	.3	3.0	17.6	76	97
8.2	20.2	.3	6	----------	11.5	.7	5.3	32.6	76	87
8.3	16.0	.2	6	----------	8.4	.4	3.3	19.3	74	96
4.9	----------	5.9	11	16.0	5.6	.5	.3	32.2	72	97
5.0	----------	3.2	7	17.2	5.5	.3	.3	32.9	77	100
5.3	----------	1.6	6	21.6	7.6	.4	.5	39.7	84	102
6.1	----------	1.0	6	20.5	7.7	.4	.5	34.9	82	101
7.8	4.3	.5	5	----------	8.6	.4	.7	31.6	82	103
7.9	19.3	.3	5	----------	7.5	.5	.6	26.4	72	86
6.0	----------	3.0	9	7.0	2.9	.2	.3	13.8	70	100
5.7	----------	1.5	5	10.6	10.2	.3	1.8	30.7	85	101
6.8	----------	1.0	7	11.2	11.9	.3	3.3	31.0	84	103
7.7	2.2	.4	7	----------	12.6	.4	4.5	33.5	82	102
7.8	10.4	.3	4	----------	15.1	.6	5.1	36.4	81	102
7.9	19.5	.3	4	----------	13.2	.6	4.4	32.0	70	90
5.1	----------	1.1	7	1.1	.5	.04	.2	3.6	31	69
5.0	----------	.5	7	.9	.4	.04	.2	3.5	42	63
5.8	----------	.8	6	5.8	4.5	.2	1.8	16.7	61	57
5.1	----------	.9	6	2.9	2.1	.1	.7	10.1	55	60
6.9	----------	.4	5	6.6	4.7	.2	2.8	17.5	58	60
7.4	----------	.2	5	5.3	4.2	.1	2.7	15.9	55	57
7.5	----------	.2	5	6.5	4.9	.2	3.3	16.9	63	59

[2] Percentages of the total clay fractions were calculated on an organic-matter and calcium-carbonate-free basis.

464795--59----4

Summary

Laboratory studies show that the Katy soil has very little in common with the other four soils analyzed. However, the Beaumont, Lake Charles, Bernard, and Edna soils have several properties in common, which are discussed as follows.

Montmorillonite dominates both the coarse and the fine clay fractions throughout the depth of the profiles. The illite content generally increases significantly in the D_u horizons. This increase in illite is accompanied by a decreased exchange capacity of the clay fractions.

Particle-size distribution studies for the soil and for the clay fractions show some striking differences between the solum and underlying horizons. Except for the surface horizon of the Edna soil, the percentage of fine clay in the total clay of the solum ranges from 75 percent to 85 percent. The percentage of fine clay in the underlying horizons ranges from 56 percent to 70 percent. The consistent and significant difference in the amount of fine clay (or of the coarse clay), together with a small but significant change in clay mineral composition, indicates that the underlying sediments are of different material than those from which the soils have developed.

The analysis of one profile is not enough evidence to arrive at general conclusions or statements for a soil series. Nevertheless, the data are indicative of what might be expected. The phosphorus content of the major soil types of the Coastal Prairie apparently is low to very low. The content of potassium varies little throughout the depth of soil. In addition, the percentage of exchangeable potassium does not exceed 2.2 percent nor is the total content of it in any horizon in excess of 1 milliequivalent.

The content of sodium varies more than any of the exchangeable cations reported. Except for the Bernard profile, exchangeable sodium generally increases with depth. This increase may be as much as 16 to 17 times more than that reported for the Edna and Katy soils. These limited studies do not provide a satisfactory explanation for the low exchangeable-sodium content of the Bernard profile nor show the reason for no essential increase of sodium with depth.

Additional Facts About Fort Bend County

This section describes the land use, farms, transportation, markets, industries, water supply, and vegetation of Fort Bend County.

Land Use and Types of Farming

According to the 1954 census, about 75 percent of all farms in Fort Bend County are classified as field-crop farms. Cotton and corn are the main row crops; rice is the main cereal crop. The main cash crops are cotton and rice. The acreage of corn has decreased since about 1940 because the replacement of work stock by the tractor has lessened the demand for feed. The acreage in grain sorghum is increasing in some places because it is being grown as a cash crop to replace cotton and rice, which are under acreage controls. The county acreage of rice, however, has increased since 1940.

Row-crop farming is concentrated mostly in the upper two-thirds of the Brazos River flood plain and in the southwestern one-third of the county. Rice farming is concentrated in the southeastern part of the county west of the Brazos River, and in the Fresno-Arcola-Blue Ridge and the Fulshear-Clodine-Katy communities.

Trends in Fort Bend County farmland acreage from 1929 to 1954, as shown by the United States census, are shown in table 8.

TABLE 8.—*Number of farms and farmland acreage*

Use	1929	1939	1949	1954
Number of farms	4, 258	3, 644	2, 525	2, 407
	Acres	*Acres*	*Acres*	*Acres*
Total land in farms	448, 442	404, 575	601, 199	513, 196
Average size of farms	105. 3	111. 0	238. 1	213. 2
Cropland total	212, 612	203, 766	244, 407	226, 074
Cropland harvested	176, 008	153, 445	147, 378	145, 750
Cropland used only for pasture	(1)	(1)	69, 046	63, 295
Cropland not harvested and not pastured	5, 829	27, 421	27, 983	17, 029
Woodland total	43, 355	33, 284	102, 613	64, 030
Woodland pastured	39, 522	(1)	87, 025	57, 347
Woodland not pastured	3, 833	(1)	15, 588	6, 683
Other pasture, not cropland and not woodland	44, 281	118, 465	237, 358	211, 784
Other land (houses, lots, roads, etc.)	9, 608	(1)	16, 821	11, 308

[1] Not reported.

Farm Crops

The main crops are cotton, corn, and rice. Acreages of most of the crops grown in Fort Bend County are listed in table 9.

TABLE 9.—*Acreages of principal crops and number of bearing fruit trees in stated years*

Crop	1929	1939	1949	1954
	Acres	*Acres*	*Acres*	*Acres*
Corn, harvested for grain	32, 645	48, 569	20, 445	24, 936
Cotton, harvested	124, 107	74, 605	81, 854	63, 744
Rice, threshed or combined	12, 426	4, 897	23, 949	23, 775
Sorghum, all purposes except sirup	3, 103	6, 623	3, 437	8, 080
Cowpeas for all purposes except fresh market or processing	57	766	1, 598	9, 478
For green manure			1, 433	9, 017
Hay:				
Alfalfa	25	3, 426	3, 561	3, 150
Wild	6, 642	6, 934	5, 428	5, 289
Other, except grains	862	868	4, 840	4, 979
Potatoes	2, 790	507	[1] 230	[2] 184
Sweetpotatoes	253	271	[1] 81	[2] 157
Vegetables, harvested for sale	461	3, 911	1, 459	1, 786
	Number [3]	*Number* [3]	*Number* [3]	*Number*
Peach trees	2, 995	5, 103	656	105
Pear trees	1, 530	2, 278	1, 162	146
Plum and prune trees	3, 604	4, 229	372	22
Pecan trees, improved	25, 997	16, 833	5, 253	6, 980
Pecan trees, wild or seedling		53, 574	34, 169	14, 594

[1] Does not include acreage for farms with less than 15 bushels harvested.

[2] Does not include acreage for farms with less than 20 bushels harvested.

[3] One year later than year given at head of column.

Livestock and Livestock Products

The beef cattle industry has increased since 1940. Beef cattle production is fairly evenly distributed throughout the county, and it is an integral part of rotating land in rice and in pasture. The largest carrying capacities and the best forage for the longest grazing seasons are available from soils on the Brazos River flood plains. Most of the cattle are Brahmans or are crosses of this breed with other breeds. There are a few herds of Hereford and Angus cattle. Table 10 shows the number of livestock in Fort Bend County in stated years.

Practically all feed for cattle during the summer months is from native pasture. A few farmers and ranchers raise small acreages of sudangrass for supplemental grazing during the summer months when native pastures are short. When grasses are dormant in winter, cattle are fed hay or other feed. Improved and supplemental pastures on most soils furnish 9 to 10 months or more grazing in most years. Most cows and calves are sold to packing houses or through auctions in Houston. Grass-fed calves are sold in the fall. Dairying is not an extensive industry in Fort Bend County. Only 15 to 20 farms have been listed as dairy farms since 1940.

TABLE 10.—*Numbers of livestock and poultry in stated years*

Livestock	1930	1940	1950	1954
	Number	*Number*	*Number*	*Number*
Cattle and calves	41, 554	[1] 43, 694	66, 179	73, 000
Milk cows	5, 174	6, 875	6, 068	3, 558
All others	36, 380	36, 819	60, 111	69, 442
Horses and colts	5, 426	[1] 4, 164	2, 838	1, 766
Mules and colts	12, 291	[1] 7, 562	1, 893	634
Hogs and pigs	10, 069	[2] 10, 557	7, 704	7, 486
Sheep and lambs	1, 059	[3] 2, 918	1, 325	1, 306
Chickens	[1] 192, 116	[2] 208, 562	[2] 155, 354	[2] 160, 787
Turkeys raised	[4] 5, 762	[4] 18, 385	[4] 6, 300	10, 723

[1] Three months old and over.
[2] Four months old and over.
[3] Six months old and over.
[4] One year earlier than shown at head of column.

Farm Tenure

The number of farms operated by owners has increased since about 1930. About 54 percent of all farms are operated by owners or part owners, 45 percent by tenants, and 1 percent by managers. The largest percentage of owner-operated farms is in the uplands in the southwest one-third of the county.

The prevailing system of renting farms is sharecropping on a year-to-year basis. Some tenants farm the same place for a number of years, but arrangements are on a year-to-year basis. The sharecropper operates either on a third-and-fourth or half-and-half basis. The tenant on the third-and-fourth system furnishes equipment, supplies, and labor and gets two-thirds of the feed crops and three-fourths of the cash crops. In the half-and-half system, the tenant furnishes only the labor and gets half of all crops. The cash tenant pays rent on a yearly basis and keeps all crops.

Transportation and Markets

Fort Bend County is well traversed by highways and railroads. U. S. Highway No. 59, the main road to Corpus Christi, the lower Rio Grande valley, and Laredo, passes through the middle of Fort Bend County. U. S. Highways Nos. 90 and 90A, which connect Houston with San Antonio, are in the county. Texas Highways Nos. 6 and 36 cross the southwestern and eastern parts of the county. Areas off the main highways are accessible by paved farm-to-market roads. Nearly all other county roads are graveled and passable the entire year.

The main lines of the Texas and New Orleans Railroad between New Orleans and Los Angeles and between Houston and the lower Rio Grande valley pass through the middle of the county. Branch lines of this railroad also cross the county. The Gulf, Colorado and Santa Fe Railway, between Houston and Amarillo, crosses the central part of the county.

Houston, 30 miles northeast of Richmond, is a deep-water port and a good market for all farm products. Cotton is sold at the gin or at warehouses in Houston. If cotton is sold at the gin, it is taken to warehouses and compresses in Houston and resold. Most of the cottonseed is sold to the ginner who resells it to the cottonseed oil mill in Richmond. Most of the commercial sorghum grain is sold to breweries in Houston. Some of it is shipped out by boat. Corn is sold locally. Rice is sold at the dryers. Beef cattle are sold directly to packing plants or are sold at auction in Houston.

Industries

For many years agriculture was the only enterprise in Fort Bend County. In recent years several industries connected with agriculture have been established. A cottonseed oil mill and an oil emulsion plant are at Richmond, and a sugar refinery and cannery are at Sugar Land. The sugar refinery was built in the latter 1800's. Sugarcane was grown locally for the mill until sugarcane borers infested the fields. Cane extracts are still shipped to the mill for refining. In 1946, this was one of the largest sugar refineries in the world. Corn, peas, beans, and greens are processed at the cannery.

Other industries include manufacturing plants for bricks and refineries for crude oil, natural gas, sulfur, and salt. Small oilfields in the county produced about 16,104,850 barrels of oil in 1952. Sulfur of good quality is obtained from three fields. Salt is mined in the Blue Ridge oilfield. Large quantities of natural gas are obtained in conjunction with the production of crude oil. Recycling plants produce butane, propane, and gasoline from the crude oil.

Bricks are manufactured in Missouri City. The Texas Prison System also has a brick plant on the Harlem Farm. Three dehydrating plants and five rice dryers are located in the county. Cotton gins are convenient to all parts of the county. Other industries are moving into the county as the industrial area of Houston expands.

Water Supply

Water of good quality is available from wells in all parts of the county. Small quantities of water are available at depths of 16 to 20 feet. The shallow wells, however, fail during the dry summer months, and their water is not as good as that from deeper wells. Water of good quality and in sufficient quantity for household and livestock uses can be obtained from depths of 70 to 80 feet. Water for irrigation and other extensive uses can be obtained from depths of 300 to 500 feet. Most rice is irrigated by water pumped out of the Brazos River and conveyed through 4 large canals to farms in Fort Bend and surrounding counties. One of these canals supplies at least part of the water for the industrial area at Texas City, about 50 miles from the Brazos River.

The Brazos and the San Bernard Rivers flow continuously and furnish water for livestock in pastures along these streams. Many lakes and sloughs in the Brazos River bottom and manmade lakes on the upland also furnish water for livestock.

Vegetation

When Fort Bend County was first settled, about 95 percent of the upland vegetation consisted of coarse bunchgrasses of the species of *Andropogon*. The bottom lands were thickly wooded with pecan, ash, elm, pin and willow oaks, and hackberry trees. The understory consisted of smilax vines, yaupon (*Ilex* spp.) and other shrubs and coarse grasses. The wooded areas of uplands were adjacent to those of the bottom lands. About 68 percent of the bottom lands and a small acreage of the wooded uplands have been cleared.

Many of the original bunchgrasses have been eliminated by heavy grazing in the past 20 or 30 years. The vegetation is now of lower quality. Introduced plants such as bermudagrass, dallisgrass, and burclover are now common in many pastures.

The woodlands contain trees of low commercial value, and they yield small amounts of rough lumber, crossties, and fence posts. The native pecan trees produce small, hard-shelled nuts.

Engineering Interpretation of Soils

Soil surveys for agricultural purposes have considerable value for other uses. Engineers can use soil surveys in planning roads and highways, dams, levees, canals, and ditches, or other types of earth construction.

Engineers of the Texas State Highway Department, United States Bureau of Public Roads, and U. S. Soil Conservation Service have collaborated with the soil scientists of the U. S. Soil Conservation Service in writing this part of the soil survey report. This section is based on the knowledge and interpretations of scientists familiar with the soils together with observations, field tests, and laboratory analyses.

The data in this section will not obviate the need for sampling and testing soil materials for design and construction. However, these data can be used as a guide in p'anning sites or locations; eliminating tests of materials obviously unsuited for specific uses; locating materials approximating design and construction needs; and improving location, design, and construction of low-hazard structures that normally are built on the basis of general experience in the area.

A brief engineering description of each soil mapped in the county is given in table 11.

TABLE 11.—*Engineering description of soils*

Map symbol	Name	Selected characteristics significant to engineering
Aa	Asa fine sandy loam	Well-drained clayey fine sand; occurs in Brazos River flood plain but is infrequently inundated; may have thin sand or gravel beds 10 to 20 feet below land surface.
Ab	Asa silty clay loam	Moderately well drained clayey silt over clayey fine sand; stratified.
Ac	Asa-Pledger complex [1]	
Ba	Beaumont clay	Imperfectly drained fat clay; nearly level to slightly depressed topography.
Bb	Bernard clay loam, 0 to 1 percent slopes.	Well-drained lean clay; gently sloping to rolling topography.
Bc	Bernard-Edna clay loams, 1 to 4 percent slopes.	
Bd	Bernard-Edna clay loams, 4 to 8 percent slopes.	
Be	Bernard-Edna complex,[1] 0 to 1 percent slopes.	
Bg	Bibb fine sandy loam	Poorly drained clayey fine sand over clay; frequently flooded.
Ca	Clodine fine sandy loam	Poorly drained silty sand and clayey fine sand; nearly level relief with occasional mounds and white spots.
Ea	Edna fine sandy loam, 0 to 1 percent slopes.	Poorly drained sandy clay; nearly level to gently sloping relief with frequent mounds.
Eb	Edna fine sandy loam, 1 to 4 percent slopes.	
Ec	Edna-Waller complex [1]	
Fa	Fulshear fine sandy loam, 1 to 4 percent slopes.	Well-drained clayey sand; gently sloping.
Ha	Hockley loamy fine sand, 1 to 4 percent slopes.	Well-drained silty sand over sandy clay and silty clay; gently sloping.
Ka	Katy fine sandy loam, 0 to 1 percent slopes.	Poorly drained sand-silt over sandy clay; nearly level to gently sloping.
Kb	Katy fine sandy loam, 1 to 4 percent slopes.	
Kc	Katy-Waller complex [1]	
Kd	Kaufman clay	Imperfectly drained organic clay over fat clay.
Ke	Kenney loamy fine sand, 0 to 2 percent slopes.	Moderately well drained fine sand over clayey sand; gentle to steeply sloping.
Kg	Kenney loamy fine sand, 2 to 6 percent slopes.	
Kh	Kenney-Fulshear complex, 4 to 8 percent slopes.[1]	
La	Lake Charles clay, 0 to 1 percent slopes.	Moderately well drained fat clay; gentle to moderately sloping; 0 to 8 percent slopes, predominantly less than 1 percent.
Lb	Lake Charles clay, 1 to 4 percent slopes.	
Lc	Lake Charles complex, 4 to 8 percent slopes.[1]	
Mb	Miller fine sandy loam	Moderately well drained silty sand over fat clay; gently sloping; undulating in places.

TABLE 11.—*Engineering description of soils*—Continued

Map symbol	Name	Selected characteristics significant to engineering
Mc	Miller silt loam	Moderately well drained clayey silt over fat clay; nearly level.
Md	Miller silty clay loam	Moderately well drained fat clay; nearly level.
Ma	Miller clay	
Me	Miller-Roebuck clays [1]	
Na	Navasota-Iuka complex [2]	Poorly drained fat clay; frequently flooded.
Nb	Norwood clay	Well-drained clayey silt; nearly level to gently sloping natural levee.
Nc	Norwood silt loam	
Nd	Norwood silty clay loam	
Pa	Pledger clay	Poorly drained fat clay; nearly level flood plain.
Ra	Roebuck clay	Poorly drained fat clay; depressed areas.
Wa	Waller soils [3]	Poorly drained clayey silt over silty clay; depressed areas.
Wb	Waller-Katy complex, slightly saline.[1]	
Ya	Yahola fine sandy loam	Well-drained clayey silt; nearly level to gently sloping; may have thin sand or gravel beds 10 to 30 feet below the surface.

[1] See characteristics of the component soils.
[2] The major soil is Navasota clay.
[3] The major soil is Waller loam.

In table 12 are classifications of soil textures and estimates of soil characteristics as determined from field experiences and from soil profile descriptions in the agricultural part of the soil survey report.

Textural classes of the United States Department of Agriculture are defined in the Soil Survey Manual, Agriculture Handbook 18, U. S. Department of Agriculture. Classes of the Unified system are defined in The Unified Soil Classification System, Corps of Engineers, U. S. Army, Technical Memorandum No. 3-357. Those of the A. A. S. H. O. system are defined in the Standard Specifications for Highway Materials and Methods of Sampling and Testing, published by the American Association of State Highway Officials. These classifications were made by interpreting the soil profile descriptions for grain-size distribution and by field tests for dilatancy, strength, and toughness. These field estimates were strengthened by laboratory tests of samples from the major soil types in the county (see table 15).

Under grain size, table 12 gives the percentages passing a No. 10 sieve and a No. 200 sieve. These are estimated average percentages within a range of 5 to 10 percent.

In table 12, permeability of the soil material was estimated as it occurs in place without compaction. It was based on soil structure (*8*) and was compared with tests made on undisturbed cores of similar soil material.

The available water in inches per foot of soil depth is an approximation of the capillary water in the soil when wet to field capacity. When the soil is air dry, this amount of water will wet the soil material described to a depth of one foot without deeper percolation.

The reaction (pH) represents the relative concentration of hydrogen ions in the soils according to field tests. Values near 7.0 are considered as neutral in reaction, less than 7.0 are acid, and more than 7.0 are alkaline. Extremes of alkalinity or acidity are important, as these reactions may affect other structural materials and the treatment given the soil to make it stable.

A moderate to high degree of salinity in the soil not only affects plant growth, but it also may affect the suitability of the material for certain types of engineering construction. Soils in which salinity is not considered a problem are indicated by N. P. in table 12. Most of the soils in this county are salinized by using irrigation water of poor quality.

Values given for dispersion in table 12 are estimates of the ability of the soil to form water-stable aggregates or clusters of soil particles that resist slaking when wet. A soil with low dispersion gains stability as a construction material by the formation of these clusters or clods. A soil with a high dispersion slakes down to individual soil particles, loses stability, and may be subject to piping.

The shrink-swell potential is an indication of the volume change to be expected in the soil material with changes in moisture content.

Table 13 shows estimates of the suitability of the soil material for highway or road construction, according to field experiences. Ratings are given as good, fair, poor, or very poor.

Topsoil (table 13) is soil material suitable for covering the surface of cut or fill slopes to help establish vegetation that will protect or beautify the constructed section.

In table 13, grading characteristics indicate the best moisture conditions the soil should have to allow it to be moved by blade machinery and spread smoothly. Compaction characteristics indicate the ease or success with which the soil material can be compacted by use of light rolling or light compactive effort as might be available for county and farm roads.

Table 14 gives the estimated suitability of soils for embankments or waterways and the characteristics that might influence the application of drainage or irrigation practices for the control of soil moisture. The data are based on the interpretation of characteristics given in table 12 together with local experience in the use of the soils.

Table 15 gives the results of tests performed by the Bureau of Public Roads on soil samples submitted by the survey party near the time the survey was finished.

TABLE 12.—*Estimated engineering classifications and physical properties of soils*

Soil name and depth of layers in inches	Classification			Grain size—percentage passing—		Permeability less than—	Available water	Reaction	Salinity [1]	Dispersion	Shrink-swell potential
	USDA (texture)	Unified	A. A. S. H. O.	Sieve No. 10	Sieve No. 200						
Asa fine sandy loam:						*In/hour*	*In/foot*	*pH*			
0 to 7	Fine sandy loam	SM	A-4	100	40	1.0	1.5	7.0+	N. P.	Low	Low.
7 to 34	Sandy clay loam	CL-ML	A-6	100	65	.3	2.0	7.0+	N. P.	Low	Low.
34 to 38	Sandy clay	ML	A-6	100	55	.5	2.0	7.0+	N. P.	Low	Low.
Asa silty clay loam:											
0 to 5	Silty clay loam	ML	A-6	100	85	.5	2.0	7.0+	N. P.	Low	Low.
5 to 25	Silty clay loam	ML	A-6	100	85	.3	2.0	7.0+	N. P.	Low	Low.
25 to 50	Silt loam	ML	A-6	100	60	.4	2.0	7.0+	N. P.	Low	Low.
Beaumont clay:											
0 to 18	Clay	CH	A-7-5	100	90+	.01	2.5	6.0	N. P.	Low	Very high.
18 to 48	Clay	CH	A-7-5	100	90+	.01	2.5	7.0	N. P.	Moderate	Very high.
48 to 84	Clay	CH	A-7-5	100	90+	.01	2.5	7.5	N. P.	Moderate	Very high.
Bernard clay loam:											
0 to 6	Clay loam	CL	A-6	100	55	.25	2.8	6.5	N. P.	Low	Moderate.
6 to 20	Clay	CL	A-6	100	65	.15	2.5	6.8	N. P.	Low	Moderate.
20 to 54	Clay	CL	A-6	100	65	.15	2.5	7.0+	N. P.	Low	Moderate.
54 to 72	Clay	CL	A-6	100	60	.15	2.5	7.5+	N. P.	Low	Moderate.
Bibb fine sandy loam:											
0 to 12	Fine sandy loam	SM	A-4	100	45	.7	1.2	5.5	N. P.	Low	Low.
12 to 40	Loam	CL	A-6	100	60	.4	1.5	6.0	N. P.	Low	Low.
40 to 50	Sandy clay	CH	A-7-5	100	65	.01	2.0	6.0	N. P.	Low	Moderate.
Clodine fine sandy loam:											
0 to 12	Fine sandy loam	SM	A-4	100	45	1.0	1.5	7.0+	Moderate	Moderate	Low.
12 to 46	Sandy clay loam	ML	A-6	100	50	.5	2.0	7.0+	Moderate	Moderate	Moderate.
46 to 70	Sandy clay	CL-ML	A-7-6	100	50	.5	2.0	7.0+	Moderate	High	Moderate.
Edna fine sandy loam:											
0 to 8	Fine sandy loam	CL-SC	A-4	100	55	.5	1.2	6.5	N. P.	Low	Low.
8 to 36	Sandy clay	CL	A-7-6	100	70	.01	2.0	7.0+	N. P.	Low	Moderate.
Fulshear fine sandy loam:											
0 to 9	Fine sandy loam	SC	A-4	100	40	1.0	1.6	6.5	N. P.	Low	Low.
9 to 38	Sandy clay	CL	A-6	100	50	.5	1.8	6.8	N. P.	Low	Low.
38 to 70	Fine sandy loam	SC	A-4	100	45	1.0	1.5	7.5	N. P.	Low	Low.
Hockley loamy fine sand:											
0 to 24	Loamy fine sand	SMD	A-2	100	35	1.0	1.2	6.0	N. P.	Low	Low.
24 to 30	Sandy clay	CL	A-6	100	55	.5	1.8	5.0	N. P.	Low	Low.
30 to 44	Sandy clay	CL	A-6	100	60	.5	1.8	5.0	N. P.	Low	Low.
44 to 60	Sandy clay loam	ML	A-4	100	50	.5	2.0	5.5	N. P.	Low	Low.
Katy fine sandy loam:											
0 to 24	Fine sandy loam	SM-ML	A-4	100	45	1.0	1.2	5.5	N. P.	Low	Low.
24 to 86	Sandy clay	CL-CH	A-6	100	70	.1	2.0	6.5	N. P.	Moderate	Moderate.
Kaufman clay:											
0 to 10	Clay	OH	A-7-5	100	90+	.2	2.8	6.8	N. P.	High	High.
10 to 42	Clay	CH	A-7-5	100	90+	.1	2.5	7.0+	N. P.	High	High.

See footnote at end of table.

TABLE 12—*Estimated engineering classifications and physical properties of soils*—Continued

Soil name and depth of layers in inches	Classification			Grain size—percentage passing—		Permeability less than—	Available water	Reaction	Salinity [1]	Dispersion	Shrink-swell potential
	USDA (texture)	Unified	A. A. S. H. O.	Sieve No. 10	Sieve No. 200						
Kenney loamy fine sand:						*In/hour*	*In/foot*	*pH*			
0 to 54	Loamy fine sand	SM	A-2	100	10	5.0	1.2	6.5	N. P	Low	Low.
54 to 84	Sandy clay loam	SC	A-6	100	45	.5	2.0	6.8	N. P	Low	Low.
Lake Charles clay:											
0 to 8	Clay	CH	A-7-5	100	95	.1	2.8	6.3	N. P	High	Very high.
8 to 46	Clay	CH	A-7-5	100	95	.01	2.5	6.8	N. P	High	Very high.
46 to 70	Clay	CH	A-7-5	100	90+	.2	2.5	7.5	N. P	Moderate	High.
Miller fine sandy loam:											
0 to 33	Fine sandy loam	SM	A-4	100	45	.5	1.2	7.5	N. P	Low	Low.
33 to 48	Clay	CH	A-7-5	100	95+	.1	2.0	7.5	N. P	Moderate	High.
Miller silt loam:											
0 to 12	Silt loam	ML	A-4	100	75	.3	1.2	7.5	N. P	Moderate	Moderate.
12 to 42	Clay	CH	A-7-5	100	95+	.1	2.0	7.5	N. P	Moderate	High.
Miller clay:											
0 to 16	Clay	CH	A-7-5	100	95+	.2	2.5	7.5	N. P	Moderate	High.
16 to 46	Clay	CH	A-7-5	100	95+	.1	2.0	7.5	N. P	Moderate	High.
Navasota clay:											
0 to 8	Clay	CH	A-7-5	100	95+	.1	2.0	6.0	N. P	High	High.
8 to 44	Clay	CH	A-7-5	100	95+	.1	2.0	5.0–6.0	N. P	High	High.
Norwood silt loam:											
0 to 18	Silt loam	ML	A-6	100	70	.5	1.5	7.5+	N. P	Moderate	Low.
18 to 44	Silt loam	ML	A-6	100	75	.5	2.0	7.5+	N. P	Low	Low.
Pledger clay:											
0 to 5	Clay	CH	A-7-5	100	95+	.1	2.0	8.0	Moderate	Moderate	Very high.
5 to 30	Clay	CH	A-7-5	100	95+	.1	1.8	8.0	Moderate	Moderate	Very high.
30 to 40	Clay	CH	A-7-5	100	95+	.1	1.8	7.6	Moderate	Moderate	High.
40 to 50	Clay	CH	A-7-5	100	95+	.01	1.8	7.5	Moderate	Moderate	High.
Roebuck clay:											
0 to 15	Clay	CH	A-7-5	100	95+	.1	2.0	7.0	N. P	Moderate	High.
15 to 42	Clay	CH	A-7-5	100	95+	.1	1.8	7.0	N. P	Moderate	High.
Waller loam:											
0 to 12	Loam	ML	A-4	100	50	.3	1.8	5.7	N. P	Moderate	Low.
12 to 35	Sandy clay	CL	A-6	100	65	.2	2.0	5.7	N. P	Low	Low.
35 to 52	Sandy clay	CL	A-6	100	70	.2	2.0	5.7	N. P	Low	Low.
52 to 62	Sandy clay loam	CL	A-6	100	60	.3	2.0	5.7	N. P	Low	Low.
Yahola fine sandy loam:											
0 to 12	Fine sandy loam	ML	A-4	100	60	1.0	1.2	7.5	N. P	Low	Low.
12 to 28	Fine sandy loam	ML	A-4	100	70	.5	1.2	7.5	N. P	Low	Low.
28 to 60	Fine sandy loam	ML	A-4	100	65	.5	1.2	7.5	N. P	Low	Low.

[1] N.P. in column indicates that salinity is not a problem.

TABLE 13.—*Estimated suitability of soils for roads and earth structures*

Soil name and depth of layers in inches	Suitability for—					Grading characteristics of profile	Compaction characteristics of profile
	Open surface [1]	Base	Subbase	Subgrade	Topsoil		
Asa fine sandy loam:							
0 to 7	Fair to poor	Poor	Fair to poor	Good	Good	Good when moist or wet; poor when dry.	Good to poor; moist condition required.
7 to 34	Poor	Very poor	Poor	Fair	Fair		
34 to 48	Poor	Very poor	Poor	Fair	Fair		
Asa silty clay loam:							
0 to 50	Poor	Very poor	Poor	Fair	Fair	Good when moist; poor when wet or dry.	Good to poor; moist condition required.
Beaumont clay:							
0 to 84	Very poor	Very poor	Very poor	Poor	Poor	Fair when moist; poor when wet or dry.	Fair to poor.
Bernard clay loam:							
0 to 6	Poor	Very poor	Poor	Fair	Fair	Good when moist; fair when dry; poor when wet.	Fair to good.
6 to 72	Poor	Very poor	Poor	Fair	Poor		
Bibb fine sandy loam:							
0 to 12	Fair to poor	Poor	Fair to poor	Good	Fair	Good when moist or wet; fair when dry.	Fair to good.
12 to 40	Poor	Very poor	Poor	Fair	Fair		
40 to 50	Very poor	Very poor	Very poor	Poor	Very poor		
Clodine fine sandy loam:							
0 to 12	Fair to poor	Poor	Poor	Fair	Fair	Fair when moist, wet, or dry.	Poor to fair.
12 to 46	Poor	Very poor	Poor	Fair	Fair		
46 to 70	Very poor	Very poor	Very poor	Very poor	Very poor		
Edna fine sandy loam:							
0 to 8	Fair to poor	Poor	Fair to poor	Good	Fair	Good when moist or wet; poor when dry.	Good to fair with moist condition.
8 to 36	Very poor	Very poor	Very poor	Fair	Poor		
Fulshear fine sandy loam:							
0 to 9	Fair to poor	Poor	Fair to poor	Good	Good	Good	Fair.
9 to 38	Poor	Very poor	Poor	Fair	Poor		
38 to 70	Fair to poor	Poor	Fair to poor	Good	Fair		
Hockley loamy fine sand:							
0 to 24	Fair	Fair to poor	Fair	Good	Poor	Good when wet or moist; fair when dry.	Fair to poor.
24 to 44	Poor	Very poor	Poor	Good	Fair		
44 to 60	Fair to poor	Poor	Fair to poor	Good	Fair		
Katy fine sandy loam:							
0 to 24	Fair to poor	Poor	Fair to poor	Good	Fair	Good when moist or wet; fair to poor when dry.	Fair to good.
24 to 86	Poor	Very poor	Poor	Fair	Poor		
Kaufman clay:							
0 to 10	Very poor	Very poor	Very poor	Poor	Fair	Fair when moist	Poor.
10 to 42	Very poor	Very poor	Very poor	Poor	Poor		
Kenney loamy fine sand:							
0 to 54	Fair	Fair to poor	Fair	Good	Poor	Good when wet or moist; fair to poor when dry.	Fair to poor.
54 to 84	Poor	Very poor	Poor	Fair	Poor		
Lake Charles clay:							
0 to 70	Very poor	Very poor	Very poor	Poor	Poor	Fair when moist	Poor.
Miller fine sandy loam:							
0 to 33	Fair to poor	Poor	Fair to poor	Good	Fair	Above 33 inches, good when moist; below 33 inches, fair when moist.	Above 33 inches, fair to good; below 33 inches, fair to poor.
33 to 48	Very poor	Very poor	Very poor	Poor	Poor		

See footnote at end of table.

TABLE 13.—*Estimated suitability of soils for roads and earth structures*—Continued

Soil name and depth of layers in inches	Suitability for—					Grading characteristics of profile	Compaction characteristics of profile
	Open surface [1]	Base	Subbase	Subgrade	Top soil		
Miller silt loam:							
0 to 12	Fair to poor.	Poor	Fair to poor.	Good	Good	Above 12 inches, good when moist; below 12 inches, fair when moist.	Above 12 inches, fair to good; below 12 inches, fair to poor.
12 to 42	Very poor	Very poor	Very poor	Poor	Poor		
Miller clay:							
0 to 46	Very poor	Very poor	Very poor	Poor	Poor	Fair when moist	Fair to poor.
Navasota clay:							
0 to 44	Very poor	Very poor	Very poor	Poor	Poor	Poor	Poor.
Norwood silt loam:							
0 to 44	Poor	Very poor	Poor	Fair	Fair	Good	Fair.
Pledger clay:							
0 to 50	Very poor	Very poor	Very poor	Poor	Poor	Poor	Poor.
Roebuck clay:							
0 to 42	Very poor	Very poor	Very poor	Poor	Poor	Poor	Poor.
Waller loam:							
0 to 12	Fair to poor.	Poor	Fair to poor.	Good	Fair	Good when moist	Fair to good
12 to 62	Poor	Very poor	Poor	Fair	Fair		
Yahola fine sandy loam:							
0 to 60	Fair to poor.	Poor	Fair to poor.	Good	Fair	Good	Fair.

[1] Open surface refers to farm earth roads.

TABLE 14.—*Estimated suitability of soils for embankments and waterways and their drainage and irrigation characteristics*

Soil name	Embankments	Waterways	Drainage characteristics		Irrigation characteristics
			Surface	Subsurface	
Asa fine sandy loam	Poor stability; may be used with proper control for cores or dikes.	Poor stability; usually requires protection.	Slow to moderate.	Good to fair	Excellent except for rice; average intake rate, $I_a = 0.5$–1.0 inches per hour; basic intake rate, $I_b = 0.3$ inch per hour.
Asa silty clay loam	Poor stability; may be used with proper control for cores or dikes.	Poor stability; usually requires protection.	Slow	Good to fair	Good except for rice; $I_a = 0.5$; $I_b = 0.3$.
Beaumont clay	Fair stability with flat slopes; may be used for thin cores, blankets, and dike sections.	Good stability; withstands velocities up to 4 feet per second without protection.	Slow	Very slow	Good to fair; high initial intake rate when dry; $I_b < .01$.
Bernard clay loam	Fair stability; may be used for cores, blankets, and dike sections.	Fair stability; requires protection for velocities over 2.5 feet per second.	Moderate	Slow	Fair to poor; $I_a = 0.25$–0.5; $I_b = 0.15$.
Bibb fine sandy loam	Fair stability; may be used for cores or dikes.	Fair to good stability; requires protection for velocities over 3 feet per second.	Slow	Very slow	Poor; subject to flooding.

TABLE 14.—*Estimated suitability of soils for embankments and waterways and their drainage and irrigation characteristics*—Continued

Soil name	Embankments	Waterways	Drainage characteristics		Irrigation characteristics
			Surface	Subsurface	
Clodine fine sandy loam.	Should be stabilized to avoid piping.	Poor stability; usually requires protection.	Slow to moderate.	Fair	Fair except for rice; I_a=0.5–1.0; I_b=0.5.
Edna fine sandy loam	Stable	Fair to poor stability	Slow to moderate.	Fair	Fair to good; I_a=0.4–0.6; I_b<0.1.
Fulshear fine sandy loam.	Fairly stable; may be used for cores, blankets, and dikes.	Fair to good stability; usually requires protection for velocities over 2.5 feet per second.	Moderate	Fair	Good except for rice; I_a=0.5–1.0; I_b=0.5.
Hockley loamy fine sand.	Fairly stable; not well suited to shells but may be used for cores and dikes with upstream blanket and toe drainage.	Poor stability; usually requires protection.	Moderate	Good	Fair to poor; not suited to rice; I_a< 2.0; I_b=0.5.
Katy fine sandy loam	Poor to fair stability; may be used for dikes or other small embankments with proper control.	Fair to poor stability; usually requires protection for velocities over 2 feet per second.	Slow to moderate.	Very slow	Fair; good for rice; I_a=0.2–0.8; I_b<0.1.
Kaufman clay	Poor stability; may be used for small dike sections.	Fair to good stability	Slow	Very slow	Subject to frequent flooding.
Kenney loamy fine sand.	Fair stability; may be used for impervious cores and dikes.	Poor stability; usually requires protection.	Rapid	Good	Intake rate very high; erodes easily.
Lake Charles clay	Fair stability with flat slopes; use for thin cores, upstream blankets, and dike sections.	Good stability; can withstand velocities of 3 feet per second without protection.	Moderate to slow.	Very slow	Requires smoothing; initial intake rate rapid; I_a<0.01.
Miller fine sandy loam	Poor to fair stability; may be used for dikes or other small embankments.	Fair to poor stability; usually requires protection for velocities over 2 feet per second.	Moderate	Very slow	Good with water of good or excellent quality; I_a=0.5; I_b=0.2.
Miller silt loam	Poor to fair stability; may be used for cores, dikes, and blankets.	Fair to good stability	Moderate	Very slow	Fair to good; I_a=0.2–0.5; I_b=0.2.
Miller clay	Fair stability with flat slopes; may be used for thin cores, blankets, and dike sections.	Good stability	Slow	Very slow	Fair to good; initial intake rapid; I_b<0.1.
Navasota clay	Fair stability with flat slopes; may be used for thin cores, blankets, and dike sections.	Good stability	Very slow	Very slow	Not suitable.
Norwood silt loam	Poor stability	Poor stability	Moderate	Moderate	Good except for rice; I_a=0.5–1.0; I_b=0.4.
Pledger clay	Poor stability	Fair stability	Slow	Very slow	Fair to poor.
Roebuck clay	Fair stability with flat slopes.	Fair stability	Very slow	Slow	Poor.
Waller loam	Poor to fair stability; may be used for dikes or other small embankments.	Fair to poor stability	Very slow	Slow	Poor.
Yahola fine sandy loam.	Poor stability; may be used for small embankments.	Poor to fair stability	Moderate	Moderate	Good except for rice; I_a=0.5–1.0; I_b=0.5.

TABLE 15.—*Engineering test data*[1] *for soil samples*

Soil name, symbol, and depth of layer in inches	Classification		Grain-size distribution[4]									Liquid limit	Plasticity index	Maximum dry density	Optimum moisture
	Unified[2]	A.A.S.H.O.[3]	Percentage passing sieve				Percentage smaller than								
			No. 10	No. 40	No. 60	No. 200	.050 mm.	.020 mm.	.005 mm.	.002 mm.	.001 mm.				
Edna fine sandy loam (Ea):															
0 to 22	CL-ML	A-4(8)			100	79	61	35	16	12	12	22	4	116	12
22 to 32	CL	A-7-6(15)			100	85	72	53	37	33	33	44	26	106	19
Edna fine sandy loam (Eb):															
0 to 6	CL-SC	A-4(4)		100	99	55	45	29	17	12	10	19	2	118	12
6 to 38	CL	A-7-6(13)		100	99	69	62	49	36	32	31	41	25	111	16
Katy fine sandy loam (Ka):															
0 to 24	SM-ML	A-4(3)		100	97	49	36	19	9	6	5	15	0	116	10
24 to 36	CL-CH	A-7-6(16)		100	98	72	64	51	40	37	36	48	29	107	19
Katy fine sandy loam (Kb):															
0 to 25	SM-ML	A-4(3)		100	98	51	39	21	10	7	7	15	1	119	10
25 to 38	CL-CH	A-7-6(17)		100	99	72	64	51	40	36	35	50	32	108	17
Katy fine sandy loam (Kc) (part of Katy-Waller complex):															
0 to 26	SM	A-4(2)	100	99	95	43	34	21	10	7	6	NP[5]	NP[5]	121	9
26 to 38	CL	A-6(11)	100	99	96	65	57	45	36	33	32	39	22	109	17
Lake Charles clay (La):															
0 to 8	CH	A-7-5(20)		100	99	94	89	79	64	58	53	79	48	88	26
8 to 46	CH	A-7-5(20)			100	97	93	84	70	65	61	88	55	93	26
Lake Charles clay (Lb):															
0 to 34	CH	A-7-6(20)		100	99	93	87	76	59	50	45	67	41	92	25
Miller clay (Ma):															
0 to 36	CH	A-7-5(20)			100	99	98	94	75	64	56	68	38	95	23

[1] Tests performed by Bureau of Public Roads in accordance with standard procedures of the American Association of State Highway Officials (A. A. S. H. O.).

[2] Based on the Unified Soil Classification System, Tech. Memo. 3-357, v. 1, Waterways Experiment Station, Corps of Engineers, March 1953.

[3] Based on the Classification of Soils and Soil-Aggregate Mixtures for Highway Purposes, A. A. S. H. O. Designation: M 145-49.

[4] According to the American Association of State Highway Officials Designation: T 188. Results by this procedure frequently differ somewhat from results that would have been obtained by the soil survey procedure of the Soil Conservation Service (SCS). In the A. A. S. H. O. procedure, the fine material is analyzed by the hydrometer method, and the various grain-size fractions are calculated on the basis of all the material in the soil sample, including that coarser than 2 mm. in diameter. In the SCS soil survey procedure the fine material is analyzed by the pipette method, and the material coarser than 2 mm. in diameter is excluded from calculations of grain-size fractions. The mechanical analyses used in this table are not suitable for use in naming textural classes for soils.

[5] NP=Nonplastic.

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Soils of Fort Bend County, Texas:

Map symbol	Soil	Profile	
		Surface soil	Subsoil
Aa	Asa fine sandy loam	Brown fine sandy loam; about 9 inches thick; alkaline.	Dark-brown light clay loam; weak subangular blocky; friable; alkaline.
Ab	Asa silty clay loam	Dark grayish-brown silty clay loam; about 8 inches thick; alkaline.	Dark grayish-brown silty clay loam; moderate medium subangular blocky and granular; alkaline.
Ac	Asa-Pledger complex	Dark grayish-brown to dark-gray fine sandy loam to clay; alkaline.	Same as Asa and Pledger soils
Ba	Beaumont clay	Gray crusty clay mottled with yellowish brown; fine subangular blocky; about 15 inches thick; acid.	Mottled gray, yellowish-brown, and brownish-yellow clay; weak coarse blocky; slightly acid.
Bb	Bernard clay loam, 0 to 1 percent slopes.	Dark-gray clay loam; slightly granular; friable; about 9 inches thick; acid.	Dark-gray subangular blocky and granular light clay over coarse blocky clay; slightly acid.
Be	Bernard-Edna complex, 0 to 1 percent slopes.	Same as Bernard and Edna profile	Same as Bernard and Edna soils
Bc	Bernard-Edna clay loams, 1 to 4 percent slopes.	Same as Bernard and Edna soils; surface layer about 6 inches thick.	Same
Bd	Bernard-Edna clay loams, 4 to 8 percent slopes.	Same as Bernard and Edna soils; surface layer about 4 inches thick.	Same
Bg	Bibb fine sandy loam	Very pale brown fine sandy loam mottled with brown and yellowish brown; about 12 inches thick; acid.	Mottled grayish and yellowish-brown stratified alluvium of about sandy clay loam texture; acid.
Ca	Clodine fine sandy loam	Gray alkaline fine sandy loam; about 12 inches thick; alkaline.	Weakly mottled gray loam over sandy clay loam; alkaline.
Ea	Edna fine sandy loam, 0 to 1 percent slopes.	Grayish-brown crusty fine sandy loam; about 8 inches thick; slightly acid.	Mottled grayish-brown and brownish-yellow compact sandy clay; blocky; slightly acid.
Eb	Edna fine sandy loam, 1 to 4 percent slopes.	Grayish-brown crusty fine sandy loam; about 6 inches thick.	Same
Ec	Edna-Waller complex	Same as Edna and Waller soils	Same as Edna and Waller soils
Fa	Fulshear fine sandy loam, 1 to 4 percent slopes.	Brown fine sandy loam; about 10 inches thick; slightly acid.	Reddish-brown clay loam to sandy clay over yellowish-red sandy loam; subangular blocky and blocky; slightly acid.
Ha	Hockley loamy fine sand, 1 to 4 percent slopes.	Pale-brown loamy fine sand; about 25 inches thick; acid.	Strongly mottled red and brownish-yellow light sandy clay; friable; weak blocky; acid.
Ka	Katy fine sandy loam, 0 to 1 percent slopes.	Light brownish-gray fine sandy loam; about 22 inches thick; acid.	Strongly mottled gray, red, and yellow compact sandy clay; blocky; acid.
Kb	Katy fine sandy loam, 1 to 4 percent slopes.	Light-brownish-gray fine sandy loam; about 22 inches thick.	Same
Kc	Katy-Waller complex	Same as Katy and Waller soils	Same as Katy and Waller soils
Kd	Kaufman clay	Very dark gray clay; medium blocky and granular; firm; about 10 inches thick; slightly acid.	Gray clay weakly mottled in places; blocky; alkaline.
Ke	Kenney loamy fine sand, 0 to 2 percent slopes.	Pale-brown loamy fine sand over very pale brown loose loamy fine sand, 40 to 70 inches thick; acid.	None
Kg	Kenney loamy fine sand, 2 to 6 percent slopes.	Same	None
Kh	Kenney-Fulshear complex, 4 to 8 percent slopes.	Same as Kenney and Fulshear soils	None
La	Lake Charles clay, 0 to 1 percent slopes.	Very dark gray, subangular blocky and granular clay; slightly acid.	Dark-gray moderate medium subangular blocky clay; slightly acid.
Lb	Lake Charles clay, 1 to 4 percent slopes	Same	Same
Lc	Lake Charles complex, 4 to 8 percent slopes.	Very dark gray, subangular blocky and granular clay; spotted with red.	Mottled reddish-brown and gray clay; blocky; calcareous.

Summary of Important Characteristics

Parent materials	Topographic position	Drainage		Moisture relations	Natural fertility	Capability unit
		Surface	Internal			
Calcareous reddish-yellow to red loamy alluvium.	Nearly level low stream terrace.	Slow	Medium	Good	High	I-2
Same	Same	Slow	Medium to slow	Good	High	I-2
Same	Stream terraces. Asa occupies low ridges and shallow swales. Pledger occupies swales.	Very slow	Medium to slow	Good	High	I-2
Light-gray to white alkaline to calcareous clay, usually underlain by reddish material below depths of 5 to 7 feet.	Level or concave surfaces on prairies.	Same	Very slow	Poor	High	IIIw-1
Gray calcareous sandy clay and clay, usually reddish below 4 or 5 feet.	Nearly level	Same	Slow	Fair	High	I-1
Same as Bernard and Edna soils.	Nearly level	Same	Slow to very slow.	Fair to very poor.	Medium to high.	II-1
Same as Bernard and Edna soils; solum slightly thinner.	Gently sloping	Medium	Slow	Fair to poor	Medium to high.	IIe-1
Same as Bernard and Edna soils; reddish loamy or clayey earths below about 4 feet.	Sloping	Rapid	Slow	Fair to poor	Medium	IVe-1
Pale-brown sandy alluvium; acid.	Level to uneven; flood plain.	Very slow; extended inundation.	Very slow; periodic high water table.	Good	Medium	Vw-1
Sandy clay; slightly acid to alkaline.	Nearly level; coastal terrace.	Very slow	Slow but adequate for row crops.	Very good	Medium	IIs-1
Sandy clays; grayish in upper part, reddish below about 4 feet; calcareous.	Nearly level; prairie	Very slow	Very slow but adequate for field crops.	Very poor	Medium	IIs-1
Same	Gently sloping; prairie	Medium	Very slow	Very poor	Medium	IIIe-1
Same	Level, with slight depressions.	Very slow; Waller soils are ponded.	Very slow	Very poor	Medium	IVw-1
Reddish sandy clay loam, apparently of old alluvium; calcareous.	Gently sloping; probably stream terrace.	Medium	Slow	Good	Medium	IIIe-1
Red, gray, and pale-brown sandy clay and sandy clay loam; acid.	Gently sloping; prairie	Medium	Medium	Good	Low	IIe-2
Mottled red, yellow, and gray sandy clay; slightly acid.	Nearly level; prairie	Very slow	Very slow	Good	Low	IIs-1
Same	Gently sloping; prairie	Slow	Very slow	Good	Low	IIe-2
Same	Katy is moundy; Waller is depressed; prairie.	Very slow and ponded.	Very slow	Fair	Low	IVw-1
Clayey alluvial sediments; usually reddish below 3 or 4 feet; alkaline.	Level; flood plain	Very slow; frequently overflowed.	Slow	Fair	High	Vw-1
Mottled pale-brown and red and gray sandy clay loams; acid.	Sloping to gently sloping uplands (coastal terrace).	Very slow	Rapid	Very good	Very low	IIIs-1
Same	Sloping uplands (coastal terrace).	Slow	Rapid	Very good	Very low	IVs-1
Same	Same	Medium	Rapid	Very good	Very low	VIe-2
Gray clay mottled red; calcareous; changing to reddish loamy earths at depths of about 5 feet; calcareous.	Nearly level prairie (coastal terrace).	Very slow	Very slow	Fair	High	I-1
Same	Gently sloping prairie	Slow to medium	Slow	Fair	High	IIe-1
Gray clay mottled red; calcareous; reddish earths at depths from 1 to 3 feet.	Sloping	Rapid	Slow	Fair	High	IVe-1

Soils of Fort Bend County, Texas:

Map symbol	Soil	Profile	
		Surface soil	Subsoil
Mb	Miller fine sandy loam	Reddish-yellow fine sandy loam; dominantly 20 to 25 inches thick; calcareous.	Dark reddish-brown clay; calcareous.
Mc	Miller silt loam	Reddish-brown silt loam; dominantly 14 inches thick; calcareous.	Dark reddish-brown clay; calcareous.
Md	Miller silty clay loam	Reddish-brown, silty clay loam; about 8 inches thick; calcareous.	Reddish-brown clay; calcareous
Ma	Miller clay	Dark reddish-brown clay; granular and fine subangular blocky; calcareous.	Reddish-brown calcareous clay
Me	Miller-Roebuck clays	Same as Miller clay and Roebuck clay	Same as Miller clay and Roebuck clay
Na	Navasota-Iuka complex	Grayish and brownish clayey and sandy alluvium; acid.	Alluvium ranging from clay to stratified sand and clay; acid.
Nc	Norwood silt loam	Reddish-brown silt loam; about 15 inches thick; calcareous.	Light reddish-brown silt loam; calcareous.
Nd	Norwood silty clay loam	Dark-brown silty clay loam; about 16 inches thick; calcareous.	Reddish-brown to yellowish-red silt loam; calcareous.
Nb	Norwood clay	Reddish-brown clay; about 10 to 24 inches thick; calcareous.	Light reddish-brown loam to silty clay loam; calcareous.
Pa	Pledger clay	Very dark gray clay; fine blocky and granular; about 28 inches thick; calcareous.	Brown clay; calcareous
Ra	Roebuck clay	Dark-brown clay; about 15 inches thick; calcareous.	Reddish-brown clay; weakly mottled with gray and yellowish brown; calcareous.
Sa	Sandy alluvial land	Reddish sandy alluvium; calcareous	Reddish alluvium; calcareous
Sb	Sloping alluvial land	Reddish alluvium and dark-gray alkaline alluvium; calcareous.	Reddish and dark-gray clayey and silty alluvium; calcareous or alkaline.
Wa	Waller soils	Light-gray loam; about 10 inches thick; acid.	Mottled grayish, reddish, and brownish sandy clay to sandy clay loam; acid.
Wb	Waller-Katy complex, slightly saline	Same as Waller and Katy; 30 percent saline spots.	Same as Waller and Katy soils; saline spots very compact.
Ya	Yahola fine sandy loam	Reddish-brown fine sandy loam; about 15 inches thick; calcareous.	Light reddish-brown light fine sandy loam stratified with silt loam; calcareous.

Summary of Important Characteristics—Continued

Parent materials	Topographic position	Drainage		Moisture relations	Natural fertility	Capability unit
		Surface	Internal			
Mostly clayey alluvium; calcareous.	Level flood plain	Slow	Slow	Very good	Medium	I-3
Same	Level	Slow	Slow	Good	High	I-2
Same	Level	Very slow	Slow	Fair	High	I-2
Same as the subsoil	Level	Same	Slow	Fair	High	I-4
Same as the subsoil	Low flat ridges and swales.	Same	Slow	Fair	High	Vs-1
Local alluvial sediments; acid	Level and uneven flood plain.	Slow	Periodic high water table.	Fair	Medium	Vw-1
Alluvium, usually stratified below 40 to 50 inches; calcareous.	Nearly level flood plain	Slow	Medium	Very good	High	I-2
Same	Same	Slow	Medium	Very good	High	I-2
Calcareous alluvium	Same	Very slow	Slow in upper part, medium below.	Fair	High	I-4
Reddish-brown clayey alluvium; calcareous.	Level flood plain	Same	Slow	Fair	High	I-4
Same	Depressions on flood plain.	Lacking	Slow	Fair	High	IIIw-2
Reddish-brown stratified sandy and clayey calcareous alluvium.	Low ridges and shallow swales; flood plain.	Slow	Rapid	Very good	Medium	Vs-1
Reddish silty to clayey alluvium; calcareous.	Old river channels and adjacent slopes.	Medium to rapid.	Slow to medium.	Good	High	VIe-1
Light-gray sandy clay loam; acid.	Depressions (blow outs) on coastal terraces.	Ponded	Very slow	Fair	Low	IVw-2
Same	Level; coastal terrace	Very slow	Very slow	Fair	Low	IVw-1
Calcareous sandy alluvium	Nearly level flood plain	Slow	Medium	Very good	Medium	I-3

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